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Current Account Determinants for the Jamaican Economy

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Abstract

This paper investigates the main determinants of selected components of the current account of Jamaica's Balance of Payments. Using standard vector error correction models (VECM), the paper assesses the impact of changes in relative prices and income on the demand for imports, tourism services and remittance flows. One objective is to recover the long-run income and relative price elasticities associated with each variable. The other is to investigate the validity of claims that models with relative prices disaggregated into its constituent parts are more relevant than those that impose the classical homogeneity assumption. The paper finds that, with the exception of consumer imports, all of the models that do not impose the homogeneity assumption produce results that are more consistent with theory. In this context, real GDP growth in the domestic economy is significant in explaining the long run behaviour of capital and raw material imports. Tourist arrivals from the United States respond positively to changes in US GDP, but also to higher cost of vacationing at home. The evidence on remittance flows suggests that the decision to remit funds is driven by an altruistic motive in the long-run.

Keywords: current account, REER, imports, cointegration
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1.0 INTRODUCTION

This paper develops models of selected components of Jamaica's current account. Focus is placed on import volumes, tourist arrivals and private current transfer inflows (remittances), the intention being to recover the long-run elasticities that can be used to generate reliable forecast of these variables.

Despite the existence of ample literature on the main factors that determine the various components of the current account, the importance of these factors are understandably country specific. In developing economies, for example, empirical studies have found that trade restrictions can cause a divergence between actual and desired imports, leading to overstated demand elasticities. Developing economies are also found to have fewer domestic substitutes and a relatively inelastic demand for capital goods (Calderon et al. (1999), Deyak et al (1993) and Faini et al (1988)). In this context, it is important for each country to identify the economic factors most relevant to the evolution of its current account.

As a working hypothesis, we evaluate the relative benefits of modelling the current account with disaggregated components of relative prices as against a more aggregated index of the real effective exchange rate (REER). When the disaggregated components of the REER are included in the model, imports (with the exception of consumer goods) are found to have a positive and significant relationship with domestic income in the long-run. A 1.0 per cent increase in foreign income leads to respective increases of 2.22 per cent and 0.94 per cent in remittance inflows and tourist arrivals. Models that incorporate the disaggregated components of relative prices therefore provide an important advantage in the estimation stage.

The remainder of the paper is structured as follows: Section 2 examines the main developments in Jamaica's current account over the review period. This will be followed by a brief discussion of the relevant determinants as proposed by existing literature on current account determination. The data and estimation methodologies employed are presented in

Section 4. Results and analysis are contained within Section 5, while conclusions and possible policy recommendations are presented in Section 6.

2.0 Evolution of Jamaica's Current Account (1990-2006)

2.1 Current Account

Jamaica can be classified as having a large, persistent current account deficit. The country's current account deficit, expressed as a percentage of GDP, averaged 9.7 per cent between 2001 and 2006, significantly above the average surplus of 2.0 per cent of GDP for selected emerging market economies over the same period (see Table 1A, Appendix). The deficit increased by an average of US$134.0 million per year over the period.

The performance of the current account predominantly reflected a widening merchandise trade deficit, with partially offsetting improvements in the surpluses on the services and current transfers sub-accounts (see Table 1C, Appendix). The deficit on the goods sub-account, influenced by a faster growth in imports relative to exports, increased at an annual average rate of 12.9 per cent over the period. An annual rate of increase of 15.4 per cent was recorded on the services account, influenced primarily by expansions in the travel sub-account. Net current transfer inflows, influenced mainly by remittances, have also become increasingly important during the sample period, moving from approximately 3.5 per cent of GDP in 1990 to 16.9 per cent of GDP in 2006.[2]

[2] Part of the increase in reported remittance receipts is due to improved data capture over the years, but despite this remittance flows have clearly undergone a dramatic increase. See Jackson (2005).

Imports

Jamaica's expenditure on imports averaged 42.0 per cent of GDP over the sample period, increasing to US$5.1 billion in 2006 from US$1.9 billion in 1990.[3] The United States remained the dominant source market for imports, accounting for approximately 50.0 per cent of imports. This was followed by imports from the CARICOM and Latin American countries, which averaged 10.0 per cent and 9.0 per cent, respectively (see Figure 1A in the Appendix). A plot of Jamaica's imports is shown as Figure 2 in the Appendix.

Imports can be disaggregated into consumer goods, raw materials and capital goods. During the review period, spending on raw materials imports, which abstract from fuel imports, accounted for approximately 48.0 per cent of total spending on imports. Consumer imports were the second largest contributor to Jamaica's import bill. Capital goods accounted for approximately 19.0 per cent of total imports over the period, with its share remaining relatively stable except for a large decline between 1990 and 1991.

There is some variability in the various components of total imports, some of which is related to seasonal patterns (see figure 3 and Tables 1B in the Appendix). The relative dispersion of the consumer good import series from its mean is the highest with a coefficient of variation of 40.0 per cent. The kurtosis statistic and Jarque-Bera statistic suggests that the distribution of the series are non-normal (See table 1C in the Appendix). The non-normality in the series could be attributed to the presence of seasonality in import data (Franklin, 2005).

2.2 Tourism

Net earnings from travel services have contributed significantly to limiting the size of Jamaica's current account deficit during the review period (see Table 1D, Appendix). The tourism industry is one of the largest earners of foreign exchange for Jamaica, with inflows from this source averaging 18.0 per cent of Jamaica's real GDP between 1990 and 2004.[4] Tourist arrivals increased at an annual rate of 5.9 per cent, moving to 3.0 million visitors in 2006 from 1.4 million in 1990. During this period, stop over visitor arrivals was dominated

[3] See Franklin (2005) for a detailed study on imports in Jamaica between 1995 and 2005.
[4] Tourism was ranked at number seven in terms of the contribution to GDP in 2004.

primarily by visitors from the USA, United Kingdom (UK) and Canada, who accounted for 68.3 per cent, 14.8 per cent and 9.2 per cent of total stopover arrivals, respectively.

2.3 Remittances[5]

The Jamaican economy is highly dependent on remittances. Inflows from this source averaged 9.6 per cent of GDP during the review period. Remittances increased to US$1.6 billion in 2006 from US$155.4 million in 1990, surpassing earnings from travel in 2002, and the last three years of the review period. The growth in remittance inflows coincided with the liberalization of the capital account and an increase in communication technology that facilitated more rapid and more cost effective methods of money transfer.

3.0 Literature Review

3.1 Current Account

Several approaches to modelling a country's current account balance, or its components, have been proposed in the literature. The earliest approaches identified relative prices of traded goods and services as the main determinants of the current account (Robinson (1950), Johnson (1977)). A devaluation of the home currency, relative to the currencies of the country's trading partner, in the presence of unemployed resources and sticky wages and prices, increases exports and reduces imports. The 'absorption' approach extended this focus by accounting for the role of income, national savings and consumption decisions on the balance of payments. Obstfeld and Rogoff (1994) noted that a current account deficit would increase (decrease) if domestic savings fell (increase). In this context, non-residents fill the void by increasing claims on domestic assets. Calderon et al, (1999) and Ghosh and Ostry (1995) viewed the current account as a mechanism for smoothing consumption over time as agents react to macroeconomic developments that alter current and expected future domestic income (output) and absorption (demand). Importantly, this approach recognized financial prices as a determinant of the current account. The recognition that the demand and supply of money also explains the relationship between inflation and the marginal propensity to absorb

[5] Remittances are defined as transfers (excluding savings, portfolio investments and income from seasonal workers) sent by migrants living in a foreign economy to residents of their country of origin.

led to the development of the monetary approach. According to Johnson (1977) a surplus or deficit in the balance of payments is explained by a disequilibrium in the money market.

Although modelling and forecasting the current account balance is essential, Mann and Pluck (1994) argue that aggregated approaches overlook most of the important dynamics of the current account that are essential for policy making. The authors note that past and future developments of the current account may depend critically on the commodity composition of trade, which may change over time. In this regard, this paper estimates trade elasticities for the main components of Jamaica's current account. We therefore discuss the main determinants of the components of the current account in the section below.

3.2 Imports

Import demand (M) (in volume terms) generally depends on relative prices of traded goods between a domestic and foreign economy and income:

$$M = F(\frac{EP_d}{P_f}, Y) \qquad (1)$$

Y represents real domestic income, the ratio $\frac{EP_d}{P_f}$ is typically referred to as the real effective exchange rate (REER), E is the nominal exchange rate, P_d is the price index for domestically produced import competing goods and P_f is the foreign price index of a country's trading partners. A positive relationship between imports and both the REER and real GDP is expected. However, Magee (1973) proffered that the relationship between imports and real GDP could be negative. Since imports represent the difference between domestic consumption and production, the domestic production of goods that were originally imported could rise at a faster rate than consumption as real GDP increases. In terms of the REER, conventional theory suggests that as foreign prices increase (or domestic prices fall) the quantity of imports is expected to fall as domestic agents substitute away from imported goods. This is, however, dependent on the relevant elasticities as well as the availability of substitutes. A depreciation in the exchange rate is also expected to have a similar effect.

The findings from empirical studies on this issue are mixed. Faini et al (1988) estimated an import demand function for 50 developing countries. They found that, for most of the countries, imports were relatively inelastic with respect to prices while income elasticities were higher than one, violating the neoclassical assumption of unitary income elasticities. This was attributed to time varying government import restrictions, which resulted in unstable estimates. To correct the instability, the authors included the degree of import controls in the economy by incorporating, inter alia, the level of foreign exchange reserves in their model. This approach was also taken by Dash (2005) who estimated an import demand function for India. The quantity of imports was found to be cointegrated with import prices, domestic prices, GDP and foreign exchange reserves. All variables were found to be significant determinants of import demand. In the case of Jamaica, Henry and Longmore (2003) modelled imports, exports and tourism using Jamaica's REER, real GDP and the output gap.[6] They found that, for the most part, Jamaica's REER, real GDP and the output gap had little explanatory power. In some cases the elasticities for various categories of imports were contrary to a priori expectations.

It is plausible to include permanent income in the specification of import demand.[7] This assumes that the consumer makes decisions on their mix of consumption spending and asset acquisition by maximizing the following utility function:

$$E\left[\sum_{t=0}^{\infty} \beta^t U(C_{t,} M_t)\right]$$

subject to

$$A_t = (1 + R_t) A_{t-1} + Y_t - P_t^h C_t - P_t^f M_t \qquad (2)$$

where E is the expectation operator, U (C_t M_t) is the utility function of the real consumption of domestically produced goods (C) and real consumption of imported goods (M). A_t is the real financial assets at the end of the period t, R_t is the real interest rate on these assets, Y_t is

[6]The output gap measures the difference between real and potential GDP. The implicit assumption behind the use of the output gap as an additional determination of M is that imports should increase as income rises. Additionally, if domestic absorption is high relative to potential output, this should lead to an increase in the demand for imports as local supplies are exhausted.

[7] See Hong (1999)

real non-property income in period t, P_h is the price of domestic goods and P_f is the price of imported goods. The solution with respect to imports implies that the optimal flow of imports is a linear function of relative prices and real interest rates.[8] Higher real interest rates reflect an increase in the relative price of future consumption and should cause a decline in the quantity of imports.

Although most studies model import demand with the REER, Deyak, Sawyer and Sprinkle (1993) disaggregated relative prices into foreign prices, domestic prices and the nominal exchange rate. They noted that this specification avoided the homogeneity restriction implied by the REER composite.[9] The authors argued that this restriction might not be applicable in all cases as consumers may react differently to a change in import prices than to an equal but opposite change in domestic prices. This is particularly important for emerging economies that do not have viable import substitutes and usually display significant preferences for foreign goods. Deyak et al (1993) concluded that imports respond almost immediately to foreign and domestic prices while the impact of the exchange rate is lagged.

3.3 Tourism

Income in the tourists' country of origin, relative prices and transportation cost are the most frequently cited determinants of tourist arrivals (Lim et al (2003), Sahley (2005)). Other determinants include the weather, political instability and the incidence of crime.

The demand for international travel is expected to be positively related to income. Tourist may be deterred from travelling to a specific destination if domestic prices (P_d) are high, relative to the price of vacationing in the country of origin (P_f). Although hotel prices are often quoted in US dollars, changes in the exchange rate are still useful in capturing changes in auxiliary prices (i.e. excursions, souvenirs, dinning out etc). Depreciation in the nominal exchange rate (E) should therefore foster an increase in tourist arrivals.

[8] For proof see Clarida (1996)

[9] Homogeneity reflects the assumption that the import demand elasticity with respect to foreign prices is equal and opposite in sign to the elasticity with respect to domestic prices.

A number of econometric models have been used to quantify the factors that influence tourist arrivals in a particular country.[10] Katafono and Gounder (2004) found that visitor arrivals to Fiji responded positively to an increase in the trade weighted real GDP of its major trading partners in the long-run. The response to an increase in domestic prices was, however, contrary to expectations. Their model suggested that an increase in domestic prices resulted in a rise in arrivals in the long-run. The authors attributed this to the possibility that tourists are not deterred by higher prices in the long term. For Jamaica, Henry and Longmore (2003) did not confirm a statistical significant relationship between the foreign income and tourist arrivals between 1990 and 2001. Malcolm (2003), however, found that the REER, income in the source market and the density ratio for tourism were significant in explaining tourism arrivals[11].

3.4 Remittances

It is generally accepted that remittances increase as emigration grows and as the conduits of remitting improve. However, the increasing importance of remittances for many emerging market economies has made understanding the intrinsic motivation behind a migrant's decision to send money to their country of origin more important. Sander (2004) noted that although remittances are mainly sent to assist with household consumption (reflecting the so called welfare motive), they may also be sent to finance micro or small scaled businesses, or to fund childhood education (reflecting an investment motive). Vargas-Silva and Huang (2005) further contended that the investment motive reflects the migrants desire to benefit from the household's success or to return home in the future.

In the context of the foregoing, the volume of remittances will depend on income or economic activity and prices in the country of residence and the country of origin.[12] Migrants are also motivated to send more money to their country of origin when the cost of remitting, which includes both the fee charged by the institution declines.

[10] See Katafono and Gounder (2004), Greenidge (1998), Salman (2003) and Lim (1997).
[11] The density ratio is an indicator of maturity of the tourism product. It is measured by the ratio of total tourist arrivals to population.
[12] See McLeod et al (2003) and Sander (2004).

Vargas-Silva and Huang (2005) in their study of remittance flows between the USA and the rest of the world found that host country (remittance sending) variables were the key determinants of remittance flows. For Jamaica, McLeod et al (2003) modelled remittances using weighted per capita foreign GDP, domestic per capita GDP, domestic CPI, interest rate differential and the unofficial exchange rate premium as dependent variables. The authors found that remittances displayed a real investment motive, evidenced by positive, significant coefficient on domestic per capita GDP. The coefficient on the interest rate differential was, however, not statistically significant. Poirine (1997) and Rapport (2005) found that remittances are a fixed loan payment and hence will not react to the macroeconomic conditions of the host or home country.

4.0 Estimation Methodology & Data

For our import demand function, we propose a log-linear model that captures the impact on imports of domestic income (*Y*), domestic and foreign prices (P_d and P_f), the nominal exchange rate and real interest rates:

$$LN(M_{ct}) = \beta_0 + \beta_1 \ln(Y) + \beta_2 \ln(P_f) + \beta_3 \ln(P_d) + \beta_4 \ln(E) + \beta_5 \ln(R_t) + U \quad (2)$$

Our a priori expectations are as follows: $\beta_1 > 0; \beta_3 > 0; \beta_2 \leq 0, \beta_4 < 0, \beta_5 < 0$

The basic framework for tourism demand function can be represented as follows:

$$LN(T) = \beta_0 + \beta_1 \ln(Y_f) + \beta_2 \ln(P_d) + \beta_3 \ln(P_f) + \beta_4 \ln(E) + U \quad (3)$$

T is the number of tourist arrivals and Y_f is the real foreign income of the main source countries. Tourism demand is expected to be sensitive to prices, including the general cost of tourism services in the destination country as well as transportation costs. Our priors are as follows[13]: $\beta_1 > 0, \beta_2 \leq 0, \beta_3 > 0, \beta_4 > 0, \beta_5 \pm$.

Empirical models of remittances are typically specified as follows:

[13] A variable with a coefficient that can be positive or negative is represented by the ± sign.

$$LN(R) = \beta_0 + \beta_1 \ln(Y_f) + \beta_2 \ln(Y_d) + \beta_3 \ln(P_d) + \beta_4 \ln(P_f) + \beta_5 \ln(R_d - R_f) + \beta_6 \ln(E) + U \quad (5)$$

$\beta_1 > 0, \beta_2 \pm, \beta_3 \pm, \beta_4 \leq 0, \beta_5 \pm, \beta_6 \pm$.

If there is an investment motive, then $\beta_2 > 0$, $\beta_3 < 0$ and $\beta_5 > 0$. The real interest rate differential, which captures portfolio effects, should display a positive relationship with remittances, but including it in the regression depends critically on the type of remittance data used. A welfare motive would be reflected by opposite signs on the coefficients of domestic income and prices while the coefficient of the interest differential would be zero. A migrant is also expected to send more money home as foreign GDP (Y_f) increases. Higher prices in the host country (P_f) should discourage remittances. The relationship between remittances and the exchange rate, however, depends critically on the motives of migrants. Vargas Silva (2007) explains that if the household receives funds in their domestic currency, which is the case for Jamaica, then migrants will adjust transfers as the exchange rate appreciates or depreciates. A migrant may send less money to their home country as the exchange rate depreciates because remittances, once converted, are worth more to the house hold. Increasing transfers, however, would allow the migrant who plans to return home eventually to take advantage of the depreciation. By increasing the value of the transfer in local currency a migrant may be encouraged to send more money home to upgrade the services available to the home country household and increase levels of investment in family run micro-businesses.

It is useful to note that we extended existing models of current account dynamics in Jamaica in two respects. The tourism model is extended to include US airfares, prices of recreational activities and gas prices in the USA to account for substitute price effect for alternative vacation options. Imports are disaggregated in consumer goods, capital goods and raw materials (excluding fuel). Departing from the traditional import demand function, we also include, as an alternative, a model that disaggregates the real effective exchange rate (REER).

4.1 Vector Error Correction Model

This paper adopts the Johansen (1995) cointegration approach to model the selected components of Jamaica's current account because it solves the endogeneity problem and allows for the recovery of long run elasticities.[14] While the general framework is of the form of a vector autoregressive (VAR) process, if there is a cointegrating relationship then a VECM of the following form is estimated:

$$\Delta X_t = \alpha_0 + \alpha_1 \beta' X_{t-1} + \sum_{i=1}^{n} \beta_i \Delta X_{t-i} + \varepsilon_i \qquad (6).$$

X_t is an nx1 dimensional non-stationary vector process and α_0 is an n x 1 vector of constants. $\alpha_1 \beta' X_{t-1}$ is the error correction term described by Hoffman and Rasche (1999). It is the product of a $n \times r$ matrix of error correction coefficients known as the speed of adjustment factor (α_1), and the transpose of a $n \times r$ matrix of the cointegrated vectors (β') and data lagged by one month.[15] A negative and significant value for the speed of adjustment factor indicates that the estimated equation is not explosive and that convergence is achieved in the long-run. This specification also includes the lag of the variables in differences (ΔX_{t-i}), a $n \times n$ matrix of VAR coefficients (β_i) and an n x 1 vector of error terms (ε_t). The Johansen (1991) full information maximum likelihood procedure is used to estimate the VECM and to evaluate the cointegrating rank of $\alpha_1 \beta'$.

In terms of evaluating the output of the VECM, the short-term responsiveness of the variables under examination are ascertained from the appropriate impulse response functions and variance decompositions. Long run estimates can be recovered from the coefficient matrix $\alpha_1 \beta'$ by normalizing specific variables of interest in the β vector. King et al (1991) noted that normalizing restrictions should be chosen in a way that associates each shock with

[14] The VAR representation is often presented as follows: $X_t = \alpha_0 + \sum_{i=1}^{n} \Pi X_{t-i} + \varepsilon_t$, where Π is an n x n coefficient matrix.

[15] r represents the cointegration rank.

a familiar economic mechanism or theoretical construct. Stability conditions for the VECM's are examined and the appropriate tests conducted on the residuals of the systems.

4.2 Data

This paper employs quarterly data from 1990 to June 2006. Data on consumer goods, raw material (net of fuel), capital goods imports, domestic inflation and the bi-lateral exchange rate between the USA and Jamaica were obtained from the Bank of Jamaica's (BOJ) database. The REER as defined previously is calculated by the BOJ. The selected countries for the weighted trading partner CPI include the USA, Trinidad and Tobago, the UK and China among others.

Ideally, the demand function for imports should be estimated with the quantity of imports as the dependent variable. However, information on volumes (or real imports) is not readily available for Jamaica. In this context it was necessary to find appropriate deflators for the nominal import data. We adopt the approach used by Henry and Longmore (2003), where it was assumed that import prices are likely to have a significant correlation with export prices of the USA. Data on US export prices, obtained from the Bureau of Labour Statistics (BLS), were used to formulate indicators of Jamaica's import prices. This assumption reflects the fact that during the period 1990- 2003, the USA accounted for an average of 45.0 per cent of Jamaica's annual import bill.

Data on the number of stopover visitor arrivals was obtained from BOJ's database. Data on US expenditure on foreign travel along with price indices for airfares and US recreational services were obtained from the US Bureau of Economic Analysis and the US Bureau of Labour Statistics. Gas prices in the United States were used as a proxy for vacation alternatives in that these prices directly affect the overall cost of vacationing in the USA. Gross private current transfer inflows, estimated by the BOJ, are used as a proxy for remittances. Data on real US GDP and the purchasing power index was sourced from the US Bureau of Labour Statistics.

Jamaican real GDP data for the period 1996 to 2004 was obtained from the Statistical Institute of Jamaica (STATIN), while estimates generated by the Bank of Jamaica (BOJ) were used for periods prior to 1996. Given the change in the method of estimation a break was discovered in 1996. To ensure continuity between both series the two series had to be spliced to ensure continuity.

All the variables were log linearized. Tests for seasonality were also conducted and, where necessary, variables were seasonally adjusted using the census X-12 procedure.

5.0 Results

5.1 Time Series Properties of the Data

5.1.1 Unit Root Tests

The Phillips-Peron (PP) and Augmented Dickey-Fuller (ADF) unit root tests are performed on both levels and first differences of all the variables. The results, which are presented in Table 2 in the Appendix, confirm that the variables are generally integrated of order one and hence are first difference stationary.

5.2 Cointegration Tests

Given the fact that all variables are non-stationary and integrated of order one, the VAR-based cointegration test developed by Johansen (1988, 1991) is applied for each model (see Tables 3 -7 in the Appendix). The number of lags included in the model is important and can affect the results of the cointegration test. In order to correctly identify the lag structure we run an unrestricted VAR in the levels of the I(1) variables. The Schwarz criterion is used to test for the significance of these lags. For the models that included the disaggregated components of the REER four lags were adopted for the consumer imports model while one lag is selected for the capital, raw material and tourism models. Two lags were adopted for the remittances model. For the alternative model that includes the traditional composite REER, one lag is selected for the raw material and capital goods import model while seven lags are selected for the consumer goods model. One lag is chosen for the remittance and tourism model.

The results of the cointegration test are shown for the models that disaggregate the REER in tables 3-7 in the appendix. The maximal eigenvalue test statistic indicates that there are two cointegrating equations in the consumer goods import and tourism VECM. The test identifies 3 cointegrating equations for the remittances and raw material import models. The maximal eigenvalue test statistic rejects the null hypothesis of no cointegration in favour of one cointegrating equation in the capital goods import model. For the models that include the composite REER the consumer and raw material import VECM the maximal eigenvalue test statistic identify two cointegrating vectors. One cointegrating vector is identified for the capital goods imports, tourism and remittances model

5.2 Model Selection

The choice of the appropriate import model for each category of imports was informed by their predictive power by estimating the mean square error (MSE), root mean square error (RMSE), mean absolute error (MAE) and Theil U statistics (see table 1). For capital goods, the VECM with the disaggregated components of the REER has the lowest mean squared error (MSE), root mean squared error (RMSE) and mean absolute error (MAE) when compared to the model with the composite REER. The Theil U for this model also suggests that the forecasts are superior. For consumer imports the composite REER model is superior while little is gained by disaggregating the REER for the raw material import model. The raw material import model with the disaggregated REER, however, is more consistent with a priori expectations since it has an income elasticity that is close to one.

Similar tests performed on the tourism and remittance models indicate that the disaggregated REER model is superior in both cases. This conclusion is supported by an evaluation of the long run elasticities for the competing models. The magnitude and sign of the long run elasticities conform to a priori expectation for both models when the disaggregated components of the REER are included.

Table 1 Model evaluation – In-sample Forecasts

Models	MSE	RMSE	MAE	Theil U
Capital Imports				
Composite REER	0.27	0.521	0.458	0.022
Disaggregated REER	0.05	0.231	0.167	0.009
Consumer Imports				
Composite REER	0.002	0.044	0.033	0.001
Disaggregated REER	0.009	0.095	0.080	0.003
Raw Material Imports				
Composite REER	0.014	0.116	0.091	0.005
Disaggregated REER	0.014	0.116	0.091	0.005
Remittance Model				
Composite REER	0.099	0.315	0.263	0.029
Disaggregated REER	0.005	0.070	0.053	0.007
Tourism Model				
Composite REER	0.190	0.436	0.395	0.036
Disaggregated REER	0.020	0.142	0.126	0.011

5.2.1 Long-run Elasticities

Long-run elasticities are presented for the appropriate models based on the superiority of their in-sample forecast. Long run elasticity estimates are obtained by normalizing consumer imports, raw materials imports, capital goods imports, tourist arrivals and remittances to one. Using the approach described by King (1991), for the disaggregated REER model, an additional normalizing restriction is placed on the nominal exchange rate given the presence of two cointegrating vectors in the tourism VECM. This variable is chosen because it lacks significance in all the models. Identification of the long run elasticities in the remittances cointegrating space, given three cointegrating vector, required two additional restrictions. The US CPI is normalized in the raw material import model while the remittance model restricts domestic real GDP. A summary of the long run elasticities are presented in Table 3. The model of choice for the consumer imports model includes the composite REER. Given the presence of two cointegrating equations in this equation, the REER is also normalized in the long run.

Table 3: Long Run Elasticities for Jamaica's Current					
	Disaggregated REER				**Composite REER**
	Capital Imports	**Raw Mat. Imports**	**Remittances**	**Tourism**	**Consumer Imports**
Y_d	0.62 (1.12)	0.93 (4.3)	0	-	-0.1 (-0.78)
P_d	1.14 (2.27)	-	0.31 (1.12)	-0.37 (-3.37)	-
P_f	6.62 (0.79)	0	-	-	-
E	-8.52 (-5.73)	0	0	0	-
Y_f	-	-	2.22 (0.58)	0.94 (0.58)	-
P_{gas}	-	-	-	0.39 (1.88)	-
REER	-	-	-	-	0

Notes: The t-stats are presented in parenthesis.

0 indicate that an variable has been restricted while a – indicates that the variable is not included in the model

The response of imports, tourism and remittances to domestic income and prices are mixed. A 1.0 per cent increase in income results in a 0.93 per cent increase in raw material imports in the long-run. Domestic income, as proxied by real GDP, was not statistically significant in explaining capital and consumer goods imports. The sign on the income elasticity of consumer import demand was also contrary to expectations. Raw material imports and remittances do not respond to changes in domestic prices in the long run. However, a 1.0 per cent increase in domestic prices (auxiliary service charges) results in a 0.37 per cent decline in visitor arrivals. This negative relationship is generally characteristic of 'low-budget' tourists.

Contrary to expectations, a change in real incomes in the USA is not a significant determinant of tourist arrivals in the long run. The price of gas in the USA, which is used as a proxy for the price of alternatives to our tourism product, is however weakly significant and

has the correct sign. A one per cent increase in gas prices fosters a 0.39 per cent increase in tourist arrivals.

5.3 Impulse Response and Variance Decomposition

5.3.1 Imports

Impulse response functions for the relevant models are presented in Figures 5-15 of the appendix. They are based on a one standard deviation shock and, with the exception of the response to domestic CPI, largely meet a priori expectations.

Consumer goods imports respond negatively to an increase in domestic income (See Figure 5). The negative response suggests that growth in domestic income may be associated with increased production of consumer import substitutes. The variable however responds positively to a one standard deviation positive shock to the REER (loss in domestic competitiveness) (See Figures 8).

Capital goods and raw material imports respond positively to a one standard deviation shock to real GDP (see Figure 6-7). Capital goods imports respond positively to the shock after the second quarter. This may reflect 'time to build' issues that are usually associated with capital intensive projects. Raw material imports respond positively after the second quarter but the impact dissipates by the sixth quarter. Figure 17 in the Appendix shows that remittances respond negatively to a positive shock in the Jamaican real GDP after the second quarter, supporting the view that inflows reflect a form of social security or aid provided by migrants.

Consistent with a priori expectations, capital goods and raw material imports respond negatively to a positive shock to the nominal exchange rate (a depreciation) after the second quarter (See Figures 9-10). A shock to the nominal exchange rate also increases tourist arrivals after the second quarter, suggesting that the cost of auxiliary services is important (See Figure 16 in the Appendix). Nominal exchange rates are not expected to directly impact the cost of a tourist's hotel stay because prices are usually quoted in US dollars. Contrary to expectations, however, there is a negative response of remittance inflows to a positive shock

to the Jamaican exchange rate after the first quarter. This suggests that in the short run migrants respond to a depreciation or a decline in one of the cost of remitting by sending less money home.

The response to domestic CPI is, however, contrary to expectations in the capital goods import models (See Figures 12). Capital goods imports respond positively to the shock in the second quarter but display a negative relationship throughout the remaining forecast horizon. The results may reflect the possible price inelasticity of imports given the lack of readily available domestic substitutes. The altruistic motive for sending remittances is reflected in the positive relationship between domestic prices and remittances. Consistent with expectations, however, a positive shock to domestic prices reduces tourist arrivals after the second quarter, largely reflecting the deterring impact of costs of auxiliary services on tourist arrivals (See Figure 16). A negative response is, however, generated from a shock to foreign prices in the capital goods import models (See Figures 14). Raw material imports, however, respond positively after the fourth quarter. An increase in gas prices in the USA (proxy for foreign prices) results in an increase in arrivals after the second quarter as US residents react to higher domestic transportation costs (See Figure 16).

In terms of host country variables, remittances respond positively to a positive shock in real USGDP in the second quarter but the impact dissipates over the forecast horizon (See Figure 17). As expected, a positive shock to the US GDP leads to an increase in tourist arrivals after the first quarter (See Figure 16).

Variance Decompositions

The results of the variance decomposition for the import models over an 8 quarter horizon are reported in Tables 8-10 in the appendix. For the consumer imports model, the results suggest that a shock to consumer import itself and the REER explain most of the forecast variance in the medium and long term. The impact of a shock to domestic income builds gradually to 10.14 per cent in the long term horizon. For the capital goods imports model, a shock to capital goods imports itself explains most of the forecast variability. The impact of a shock to the other variables are largely insignificant, explaining less than 10 per cent of the

forecast variability over the medium and long term (See Table 9). As shown in Table 10, the fraction of the error variance in forecasting raw material imports due to innovations in the variable itself is expectedly close to 100 per cent in the short horizons but it falls steadily to approximately 86.11 per cent in the long term. Innovations to real GDP, foreign and domestic prices are largely insignificant.

The variance decomposition for the tourism VECM indicates that the fraction of the error variance in forecasting stop-over arrivals due to innovations in the variable itself falls steadily to approximately 69.72 per cent in the long horizons. A one standard deviation shock to gas prices (P_{gas}) and the exchange rate explain most of the variability in the long term. The impact of shocks to price and income variables, however, remain low throughout both horizons, suggesting that tourists are not price sensitive. For the remittances model, domestic macroeconomic variables explain most of the observed variance in remittance inflows over the long term.

6.0 CONCLUSION

This paper estimates the major determinants of selected components of the Jamaican current account. The models that do not impose the homogeneity constraint of the REER produce results that are more consistent with theory. The performance of the consumer imports model is, however, improved by including the REER in its composite form. Shocks to real GDP displayed the most consistent and significant impact on capital goods and raw material imports in the long term.[16] The estimates from the regression with tourist arrivals broadly support Malcolm's (2003) finding that source country income positively influences arrivals. With regard to current transfer inflows, our results suggest that macroeconomic conditions in Jamaica largely determine the level of remittance flows. It is also evident that an altruistic motive is dominant in explaining the variability in remittance flows in the long run.

[16] The long term here is loosely defined as 8.0 quarters.

APPENDIX

Table 1 A
Selected Emerging Market Economies
Current Account Deficit as a per cent of GDP
1990-2005

Country Name	1990-2000	2001	2002	2003	2004	2005	2006
Argentina	-2.6	-1.4	8.5	6.2	2.1	3.1	3.8
Dominican Republic	-2.7	-3.0	-3.2	5.3	4.8	-1.4	-2.5**
Chile	-2.7	-1.6	-0.9	-1.1	2.2	1.1	3.6
Haiti	-1.8	-3.8	-2.7	-1.6	-1.5	1.3	n.a
Costa Rica	-4.0	-3.7	-5.1	-5.0	-4.3	-4.8	-4.9
Malaysia	0.6	8.3	7.5	12.9	12.6	15.3	17.2
Philippines	-3.5	-2.4	-0.4	0.4	1.9	2.4	n.a
Singapore	14.0	13.7	13.5	24.0	24.5	28.4	n.a
Barbados	n.a	-4.3	-6.8	-6.3	-11.9	-12.0	-8.1
Average	-0.3	0.2	1.2	3.9	3.4	3.7	2.3
Memo							
Jamaica	**-3.2**	**-10.0**	**-13.6**	**-10.2**	**-6.3**	**-11.9**	**-12.7**

Source: International Financial Statistics (IMF). Data for Jamaica sourced from the Bank of Jamaica

** Averaged over 1992-2000 due to missing data*

**based on GDP estimate for 2005 (2006 unavailable)

Table 1B: Summary Statistics for Imports (1990-2004)

	Mean	Std. Deviation	Coefficient of Variation (%)	Skewness
Consumer Goods (MN US$)	194.1	77.7	40.0	0.3
Raw Materials (MN US$)	246.5	43.8	17.8	-1.0
Capital Goods (MN US$)	132.7	36.7	27.7	0.2
Visitor Arrivals ('000)	499.2	114.2	22.9	0.8
Remittances (MN US$)	217.2	91.5	42.1	1.1

Source: Bank of Jamaica (BOJ)

Table 1C: Seasonal Factors and Normality Indicators (Imports)

	Q1	Q2	Q3	Q4	Kurtosis	Jarque Bera
Consumer Goods ('Mn US$)	0.93	0.95	0.96	1.18	1.91	4.28
Raw Materials ('Mn US$)	0.97	0.98	0.98	1.07	3.89	12.29
Capital Goods ('Mn US$)	0.98	0.94	1.00	1.08	2.66	0.83

Table 1D:Jamaica's Current Account (1990-2005)

Categories	**1990 (US$MN)**	**2006 (US$MN)**	**Annual Average (US$MN)**	**Annual average growth rate (%)**	**Annual Average % of GDP**
Current Account	**-328**	**-1171.43**	**-401.7**	**-11.9**	**-5.6**
Merchandise Trade Account	**-784.8**	**-2938.72**	**-1241**	**-12.9**	**-18.6**
Export s	1,157.60	2,117.30	1435.3	3.3	23.5
Imports	1,942.40	5,056.02	2676.3	6.8	42
Services	**185.4**	**621.8**	**393.2**	**15.4**	**5.9**
Travel	686.3	1,596.62	964.4	4.5	15.7
Visitors (000's)	1,384.60	3,015.40	1,249.90	5.9	N/A
Income	**-517.1**	**-603.07**	**-461**	**-4.5**	**-6.8**
Current tansfers	**271.4**	**1748.56**	**743.1**	**13.1**	**11**
Remittances	155.4	1441.4	654.8	1.4	9.6

Source: Bank of Jamaica

Figure 1: Imports from Principal Trading Partners: Annual Average 1990 - 2003

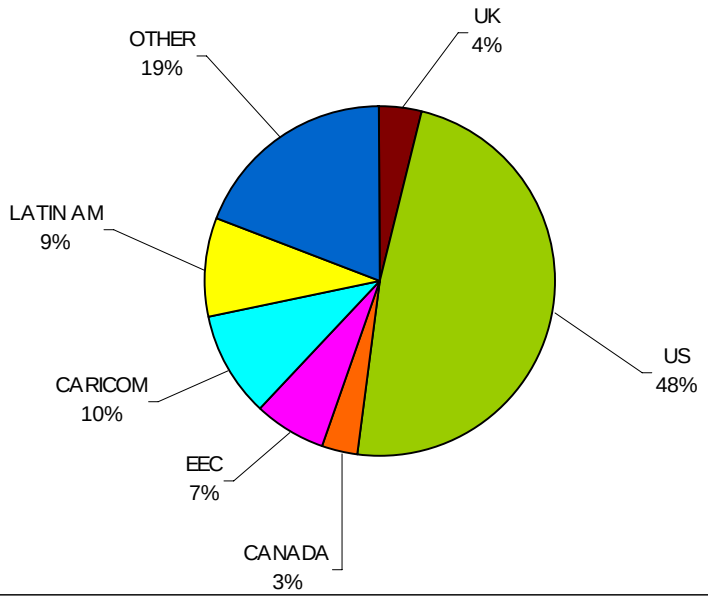


Figure 2 - Quarterly Imports: (March 1990 - September 2006)

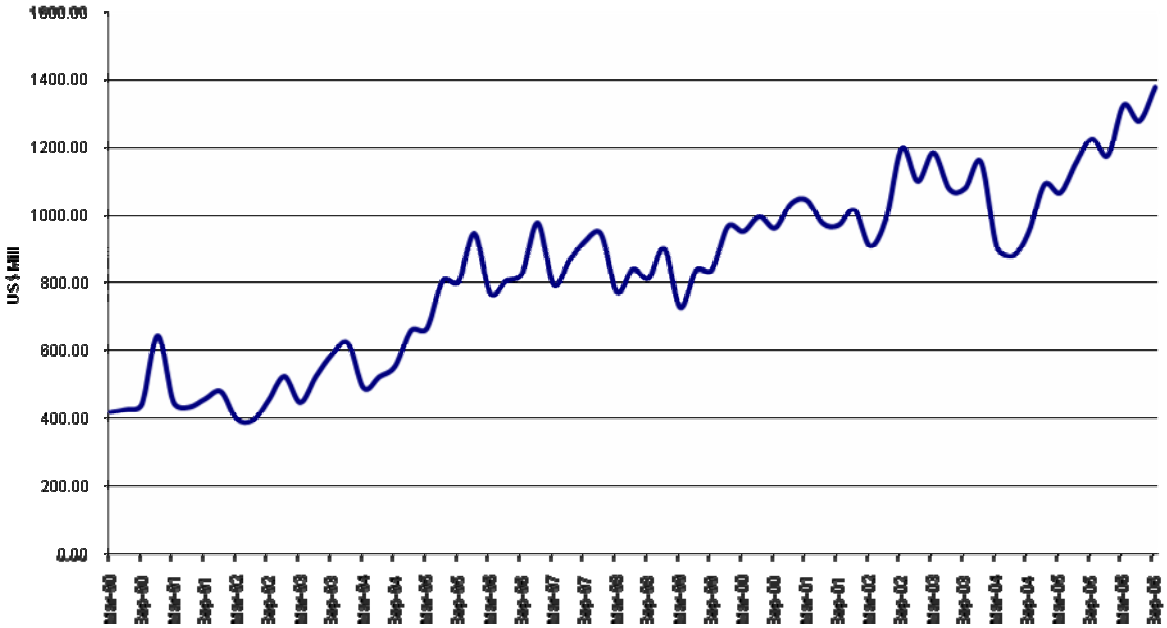


Figure 3 - Composition of Imports

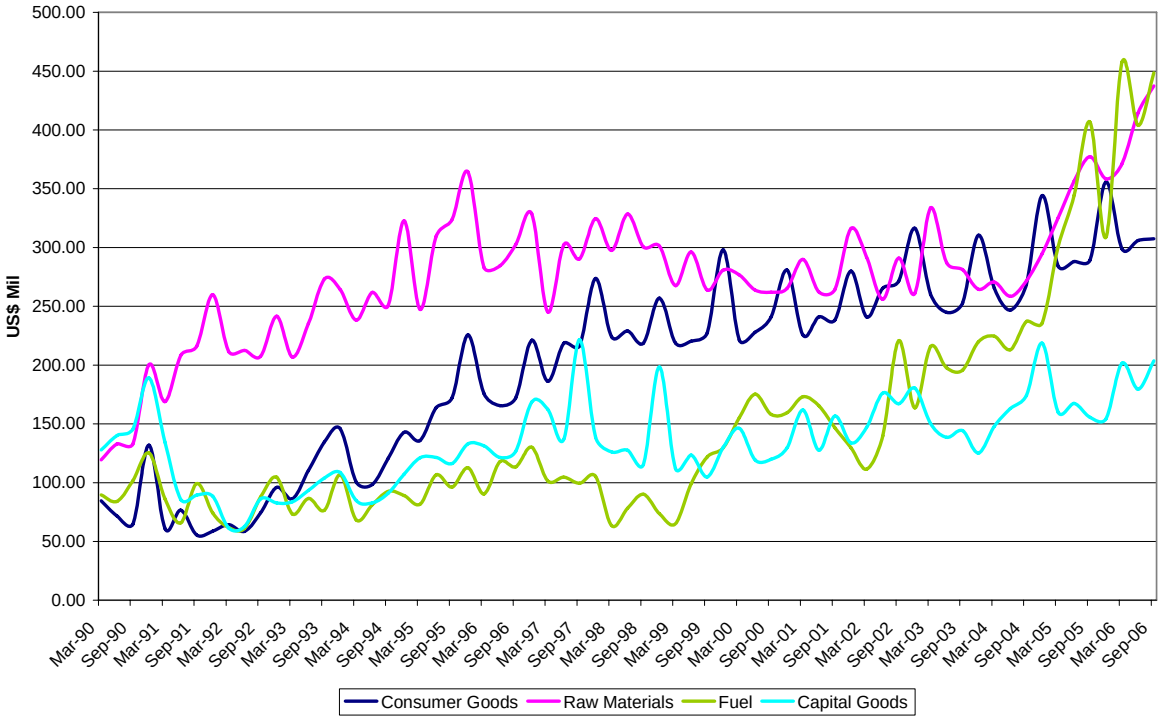


Figure 4 - Tourist Arrivals and USGDP: 1990-2006

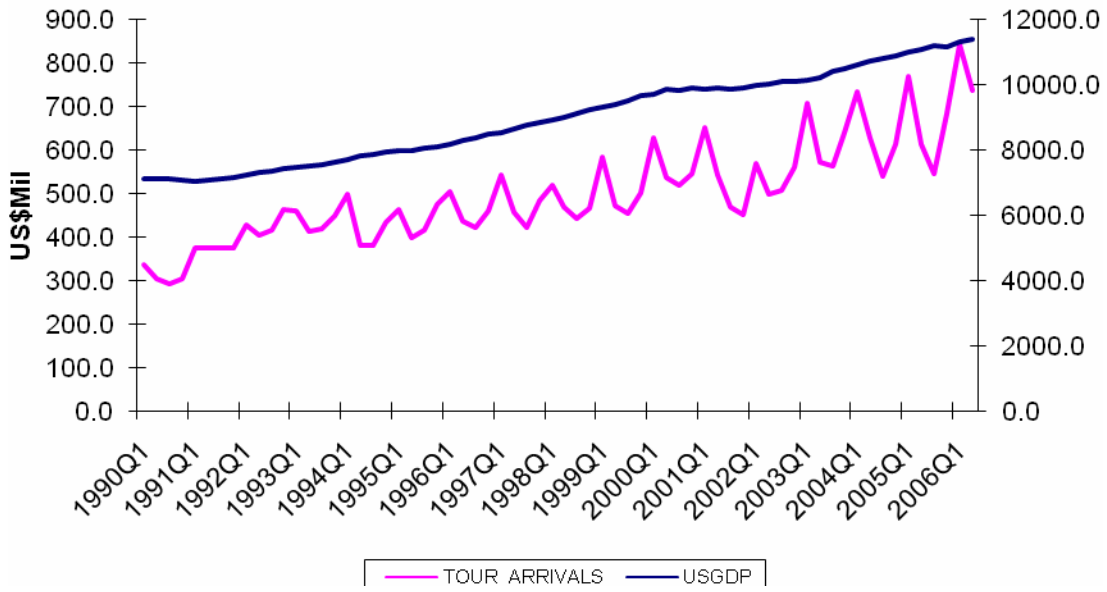


Table 2: Unit Root Tests

	ADF				PP			
	Without Trend		With Trend		Without trend		With Trend	
Variables	Level	First diff.	Level	First diff.	Level	First diff.	Level	First diff.
Lnconimp_sa	-1.242	-11.903	-2.903	-11.827	-0.966	-11.965	-2.730	-11.901
Lncapimp	-1.966	-11.020	-4.312	-5.250	-2.653	-12.291	-4.198	-12.806
Lnrawimp	-2.460	-3.011	-2.458	-7.139	-4.394	-13.379	-4.791	-13.691
Lnuscpi	-1.566	-5.165	-3.847	-5.127	-1.227	-5.022	-3.691	-4.995
Lndomcpi	-4.383	-2.522	-3.776	-3.341	-5.189	-2.749	-3.015	-3.681
Lnrgdp_sa	-1.566	-4.842	-1.632	-4.951	-0.921	-20.516	-5.123	-19.989
Lner	-1.659	-6.929	-8.139	-6.683	-1.976	-7.493	-3.594	-7.768
Lnfdi	-0.795	-13.268	-3.500	-13.392	-0.237	-8.738	-3.734	-8.763
LnFiscal	-2.460	-14.411	-2.526	-14.344	-2.592	-16.959	-3.715	-17.959
Lntour	-1.078	-4.710	-4.236	-4.541	-2.586	-13.428	-5.686	-13.235
Lnremit	-0.621	-7.304	-1.847	-7.127	-0.535	-8.298	-1.764	-18.564
lngasp	0.271	-8.465	-1.288	-4.454	0.387	-8.465	-1.288	-8.664
Lnuspp	-0.053	-6.438	-4.690	-6.029	-2.675	-4.459	-5.866	-4.701
Lnusgdp	0.880	-3.470	-2.874	-3.440	0.533	-6.055	-2.644	-6.086

Notes: (i) 95% critical values for ADF and PP statistic (without trend) = -2.91
(ii) 95% critical values for ADF and PP statistic (with trend) = -3.49

Cointegration Analysis

Table 3 Johansen Cointegration Test: Consumer Imports

Null Hypothesis[1]	r=o	r=1	r=2	r=3
Eigenvalue	0.82	0.70	0.27	0.188
$\hat{\lambda}_{max}$[3]	105.75	73.58	19.93	12.74
95% Critical Value	*38.33*	*32.12*	*25.82*	*19.39*
$\hat{\lambda}_{trace}$[3]	220.01	114.26	40.67	20.73
95% Critical Value	*88.80*	*63.88*	*42.92*	*25.87*

Table 4 Johansen Cointegration Test: Capital Imports

Null Hypothesis[1]	r=o	r=1	r=2	r=3
Eigenvalue	0.49	0.35	0.25	0.19
$\hat{\lambda}_{max}$[3]	43.19	27.92	18.19	14.14
95% Critical Value	37.16	*30.82*	*24.25*	*17.14*
$\hat{\lambda}_{trace}$[3]	115.26	72.07	44.14	25.95
95% Critical Value	*79.34*	*55.24*	*35.01*	*18.39*

Table 5 Johansen Cointegration Test: Raw Mat. Imports

Null Hypothesis[1]	r=o	r=1	r=2	r=3
Eigenvalue	0.47	0.24	0.19	0.0
$\hat{\lambda}_{max}$[3]	40.17	17.94	14.04	0.0
95% Critical Value	*24.15*	*17.79*	*11.22*	*4.12*
$\hat{\lambda}_{trace}$[3]	72.17	31.99	14.05	0.0
95% Critical Value	*40.17*	*24.27*	*11.22*	*4.12*

Table 6 Johansen Cointegration Test: Tourist Arrivals

Null Hypothesis[1]	r=o	r=1	r=2
Eigenvalue	0.59	0.41	0.32
$\hat{\lambda}_{max}$[3]	57.11	33.96	25.09
95% Critical Value	*38.33*	*32.12*	*25.82*
$\hat{\lambda}_{trace}$[3]	134.78	77.67	43.71
95% Critical Value	*88.80*	*63.88*	*42.91*

Table 7 Johansen Cointegration Test: Remittances

Null Hypothesis[1]	r=o	r=1	r=2	r=3
Eigenvalue	0.68	0.46	0.34	.26
$\hat{\lambda}_{max}$ [3]	71.12	39.098	26.84	18.69
95% Critical Value	*38.33*	*32.11*	25.82	*19.38*
$\hat{\lambda}_{trace}$ [3]	164.06	92.93	53.84	27.00
95% Critical Value	*88.80*	*63.87*	42.92	*25.87*

Table 6 Johansen Cointegration Test: Tourist Arrivals

Null Hypothesis[1]	r=o	r=1	r=2
Eigenvalue	0.59	0.41	0.32
$\hat{\lambda}_{max}$ [3]	57.11	33.96	25.09
95% Critical Value	*38.33*	*32.12*	*25.82*
$\hat{\lambda}_{trace}$ [3]	134.78	77.67	43.71
95% Critical Value	*88.80*	*63.88*	*42.91*

Table 7 Johansen Cointegration Test: Remittances

Null Hypothesis[1]	r=o	r=1	r=2	r=3
Eigenvalue	0.68	0.46	0.34	.26
$\hat{\lambda}_{max}$ [3]	71.12	39.098	26.84	18.69
95% Critical Value	*38.33*	*32.11*	25.82	*19.38*
$\hat{\lambda}_{trace}$ [3]	164.06	92.93	53.84	27.00
95% Critical Value	*88.80*	*63.87*	42.92	*25.87*

Variance Decomposition of Imports

Table 8: Consumer Imports (CONS)

Variable	8-Quarter Horizon (Long Term)
CONS	75.99
Y_d	10.14
REER	13.87

Table 9: Capital Imports (CAPS)

Variable	8-Quarter Horizon (Long Term)
CAPS	93.36
Y_d	0.29
E	5.23
P_d	0.29
P_f	0.75

Table 10: Raw Material Imports (RAW. MATS)

Variable	8-Quarter Horizon (Long Term)
RAW.MATS	86.11
Y_d	7.28
E	4.33
P_f	2.27

Table 11: Variance Decomposition for Tourism (TOUR)

Variable	8-Quarter Horizon (Long Term)
TOUR	69.72
Y_f	1.65
E	5.39
P_d	4.24
P_{gas}	18.98

Table 12: Variance Decomposition for Remittances

	8 Quarter Horizon (Medium Term)
REMIT	78.49
Y_d	6.19
E	8.60
Y_f	1.30
P_d	5.41

Impulse Response to Cholesky One S.D. Innovations

Response of Imports to Real GDP

Figure 5: Response of Consumer Imports to Real GDP

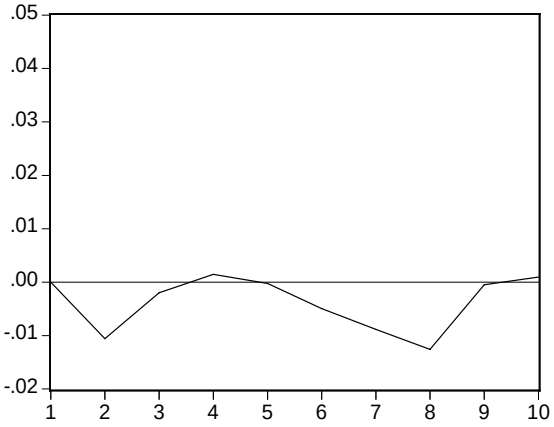


Fig. 6: Response of Capital Imports to Real GDP

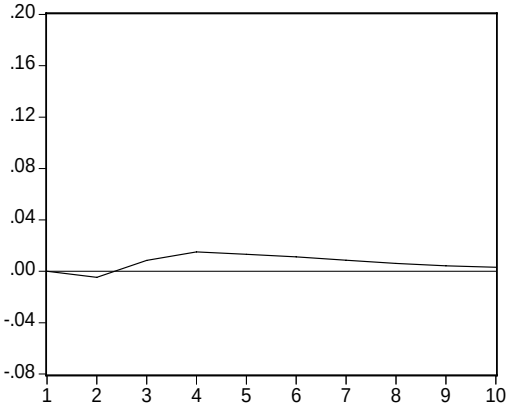
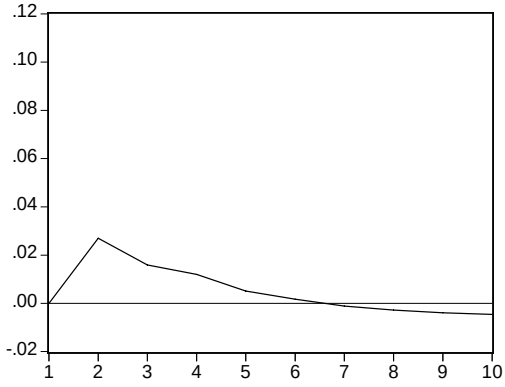


Figure 7: Response of RAW Material Imports to Real GDP



Response of Imports to the Exchange Rate

Figure 8: Response of Consumer Imports to the REER

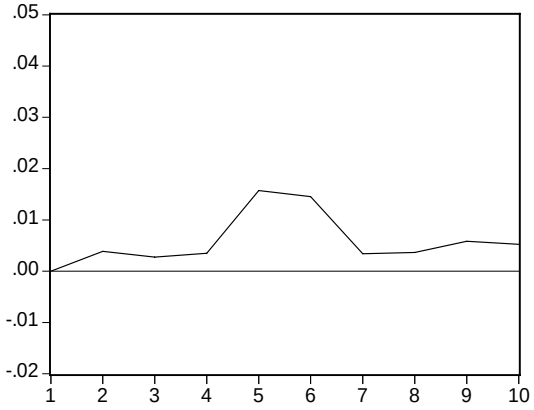


Fig 9: Response of Capital Imports to the Nom. Exchange Rate

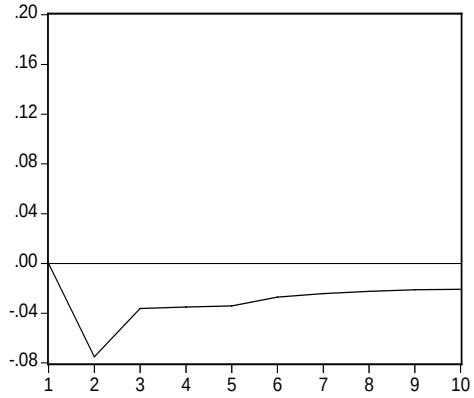
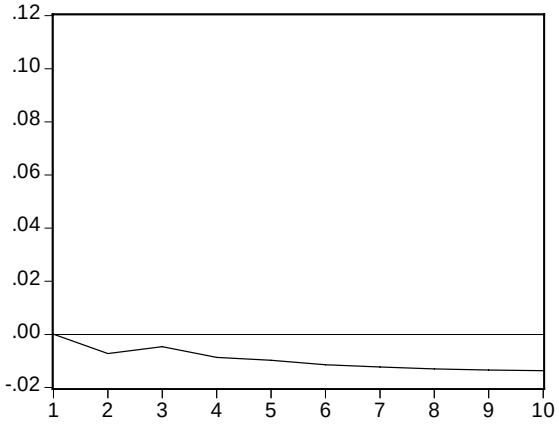
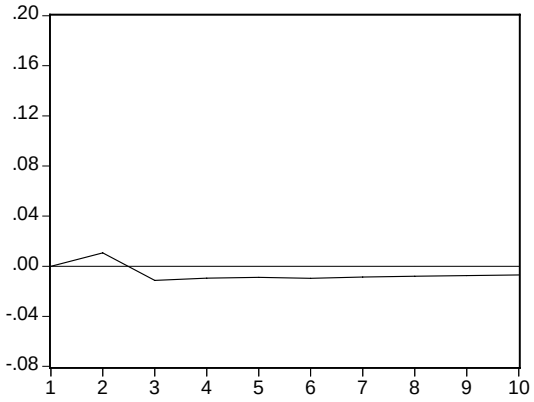


Fig 10: Response of Raw Material to the Nominal Exchange Rate



Response of Imports to Domestic CPI

Fig 12: Response of Capital Imports to DOM. CPI



Response of Imports to US CPI

Fig 14: Response of Capital Imports to US CPI

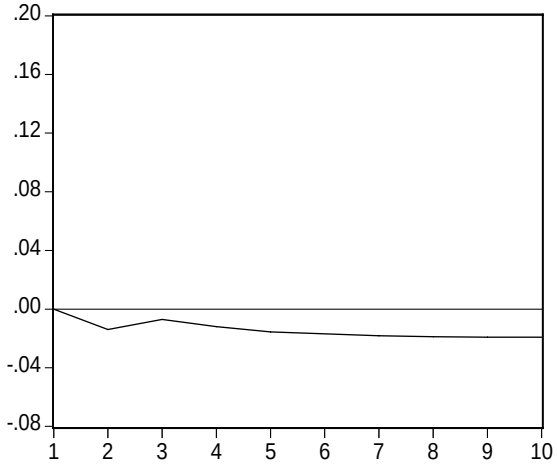


Fig 15: Response of Raw Material to US CPI

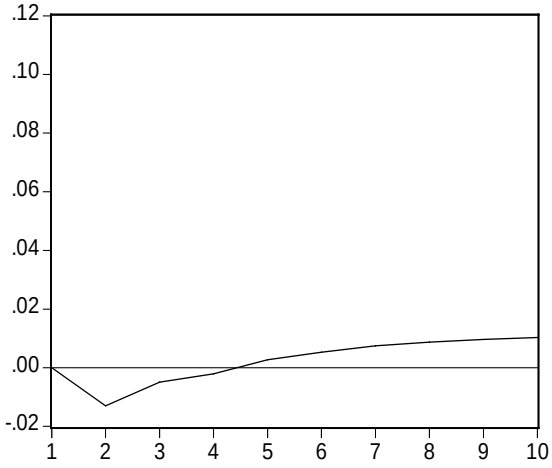


Figure 16: Impulse Response Function - Tourism

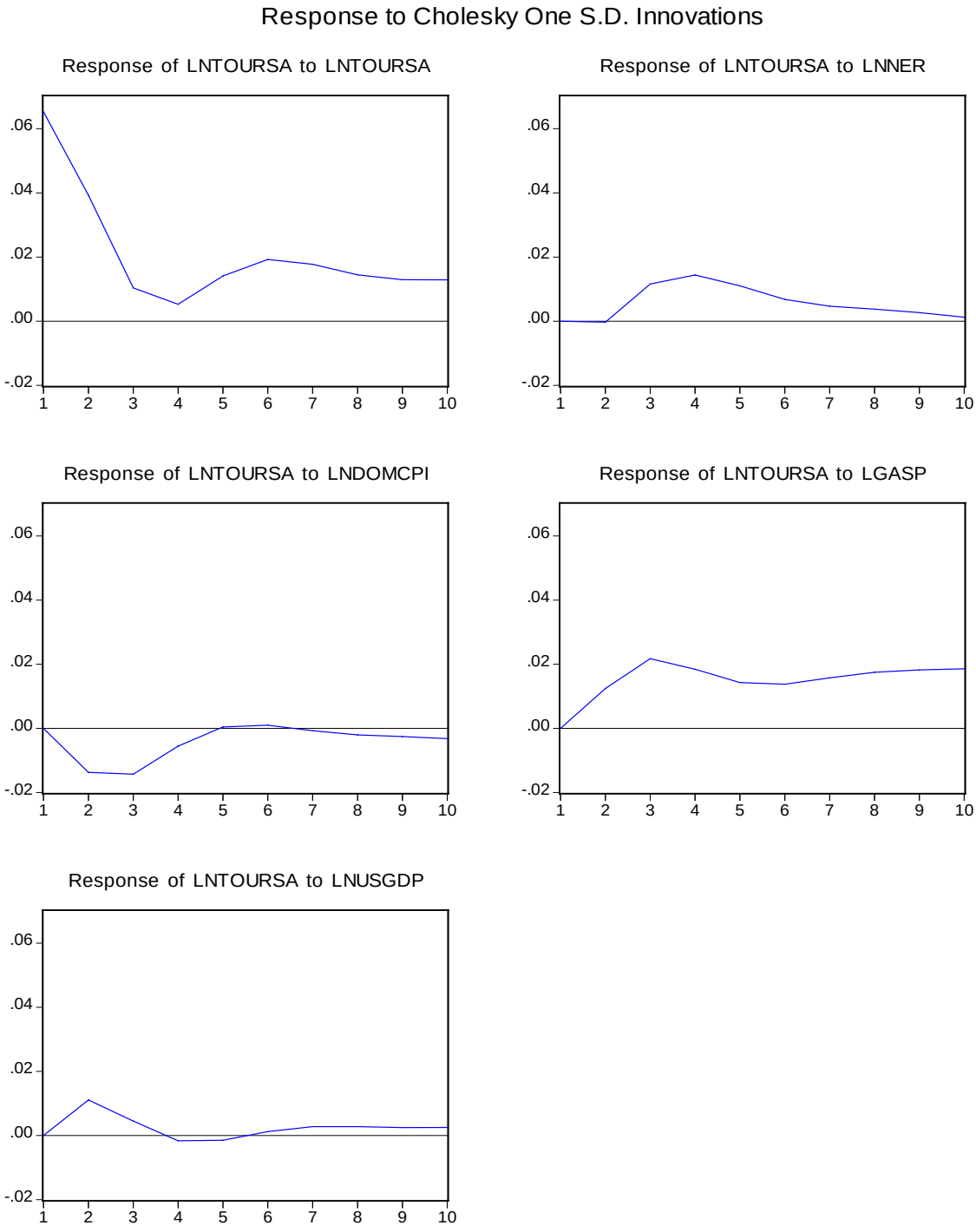
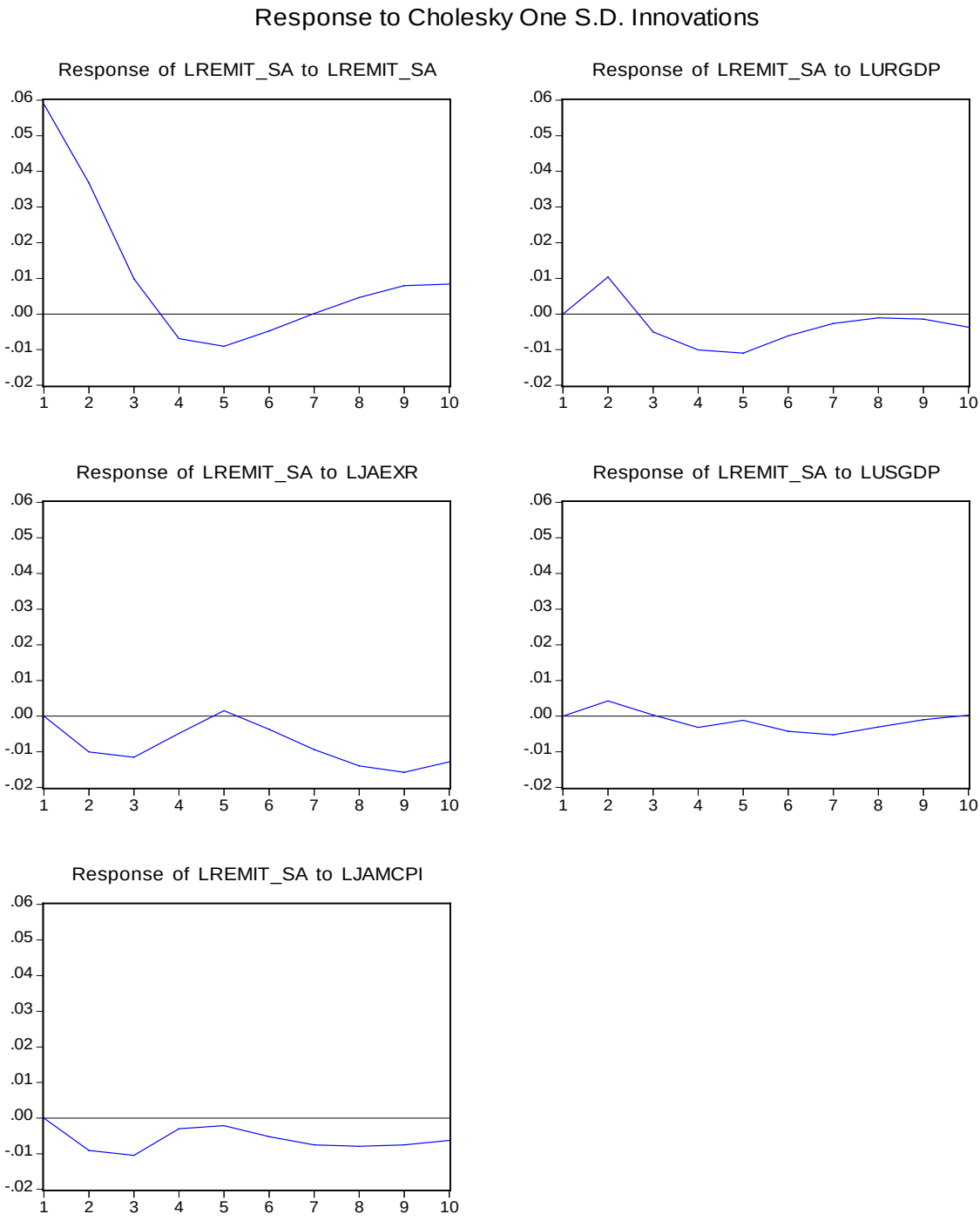


Figure 17: Impulse Response Functions –Remittances



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