Working Paper

Exploring the Contribution of Temporary and Permanent Shocks to the Real Effective Exchange Rate on the Current Account Imbalance in Jamaica

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Abstract

This paper reviews the relationship between the real effective exchange rate (REER) and current account imbalances, with a view to determining the proportion of the Jamaican current account imbalance that can be corrected with a REER adjustment. Most studies have failed to identify a positive and significant relationship between the REER and the Jamaican current account. This study contends that this may reflect the differing sources of shocks to the variables. Using the Blanchard and Quah (1989) methodology, results indicate that temporary shocks have a larger role in explaining the variation in the REER, while permanent shocks play a larger role in the explanation of the Jamaican current account. Variance decomposition results indicate that only a negligible portion of the current account imbalance could be corrected through a REER depreciation. In this regard, achieving a sustainable current account balance requires a positive permanent (productivity) shock.

Keywords: Real effective exchange rate, structural shocks, SVAR

JEL Classification codes: F12, F32, F41

[1] The views expressed are those of the author and do not necessarily reflect those of the Bank of Jamaica.

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1.0 Introduction

While the role of real exchange rates in the determination of current account balances constitutes an essential component of the theoretical framework of both traditional and modern approaches to international macroeconomics, very limited empirical evidence has been produced that explicitly focuses on this relationship. This, according to Stockman (1978), may be attributed to the fact that most studies that try to link the real effective exchange rate (REER) to the current account usually find anomalous results. He noted that this may reflect the fact that flexible exchange rates have exhibited significant volatility and its relationship with prices has deviated from the purchasing power parity (PPP) theory. He further contends that changes in the exchange rate have also failed to resemble contemporaneous changes in relative price levels in either magnitude or direction. Against this background, much research has been centred on understanding the determinants of the REER and the current account in an effort to determine the reasons behind anomalous results being obtained..

According to the Mundell-Fleming model, an appreciation in the REER and hence a decline in a country's competitiveness position, leads to a worsening trade balance or "external imbalance" and, ultimately a worsening current account balance (Kwalingana et al., 2009). It therefore holds that a depreciation of the REER should restore balance or equilibrium given that the Marshall-Lerner condition holds.[2] This REER depreciation can be achieved either by a depreciation of the trade-weighted exchange rate (obtained through a depreciation of the nominal exchange rate) or by a decline in relative inflation. Similar to results from Stockman (1978), Lee and Chinn (2002) argued that much empirical evidence to support this relationship between the current account and the REER has failed to be forthcoming. This, they attributed to the differing sources of shocks that drive the REER and the current account. Rogers (1998) and Lee and Chinn (2005), contend that temporary shocks are synonymous with monetary shocks, while permanent shocks are largely interpreted as productivity shocks. In this context, the role of monetary

[2] The Marshall-Lerner condition states that for a currency devaluation to have a positive impact on the trade balance, the sum of price elasticity of exports and imports (in absolute values), must be greater than 1. If exported goods are elastic to price, their quantity demanded will be proportionately more than the decrease in price, and total export revenue will increase. Similarly, if the goods imported are price elastic, then total import expenditure will decrease. Both will then improve the trade balance.

adjustments and changes in output, play a role in the determination of the exchange rate and the current account and consequently their anticipated relationship. As a result, it is expected that a correction in the current imbalance may be facilitated by a REER adjustment given that both variables are largely driven by similar shocks.

Conventional theory holds that the transmission mechanism from changes in the REER to an adjustment in the current account includes a real depreciation of the domestic currency. This is generally seen as leading to a less-than-proportionate increase in the prices of exports which are measured in domestic currency, which means that export prices would fall when measured in terms of the foreign currency, thus making exports more competitive. The net effect is an increase in the volume of exports. Similarly, a real depreciation in the exchange rate causes the price of imports measured in the domestic currency to rise, thus reducing demand for these goods and lowering import volumes. As long as the volume responses of imports and exports to the relative price shifts are sufficiently large to outweigh the negative terms-of-trade shift that arises because export prices rise less than import prices, the trade balance and hence the current account balance will improve. It must be noted that this approach assumes that the inflationary process induced by the lower exchange rate does not act to completely offset the initial change in relative prices thus facilitating a real depreciation.

Lee and Chinn (2002) concluded that most of the movements in the real exchange rate in G-7 countries were related to permanent shocks whose effect on the current account was negligible or in the opposite direction to the temporary shocks. They later decomposed the current account balances of the three largest economies (US, Japan and the Euro Area) to determine how much of the current account balance was attributable to either temporary or permanent shocks. They determined that in 2003 and 2004, nearly two per cent of the US current account deficit as a percentage of GDP was found to be influenced by temporary shocks. As a result, a correction of that amount of the current account deficit would go hand in hand with depreciation in the US real exchange rate. For Japan and the Euro area, however, a small portion of their current account surpluses were driven by temporary shocks, which would be accompanied by an appreciation in the

respective currencies. Notably, Gauthier and Tessier (2002) also determined that a permanent shock induced an improvement in the current account balance, coupled with an appreciation of the real exchange rate. Therefore, the expected relationship as posited by the Mundell-Fleming model was not fully observed.

McDonald (1998) explored four different approaches to analyzing the importance of temporary shocks relative to permanent shocks in driving changes in the exchange rate by incorporating the Blanchard and Quah (1989) identification methods. He determined that the systematic component of the real exchange rate was related to permanent factors such as productivity, net foreign asset accumulation, national savings imbalances and terms of trade effects. Cavallari (1999) analyzed the effect of both temporary and permanent shocks on the current account across G-7 countries where it was determined that in general, at very short horizons, current account fluctuations were largely attributed to temporary shocks while permanent shocks were increasingly found to affect the variance of the current account in the longer horizons, particularly after a year. In particular, results from the UK, Italy, France and Canada indicated that a negative temporary shock caused the current account to go into surplus while in the US, Germany and Japan, the current account initially deteriorated and slowly improved, albeit not always significantly. Zhang (2009) later illustrated that temporary shocks accounted for a substantial fraction of the terms of trade fluctuations and were also quantitatively important for the real exchange rate movements. Contrary to Cavallari (1999), there was no evidence showing that temporary shocks played any significant role in the current account fluctuations of major economies except for those that were seen in Japan, Germany, and the US.

In the context of the foregoing, it is evident that mixed results have been obtained in relation to the source of shocks to the REER and the current account and the effect of these shocks on their expected relationship. The aim of this paper is to therefore determine the extent to which temporary and permanent shocks have influenced these variables in the Jamaican context and, based on the results, a better understanding of their relationship may be garnered. This will be done by utilizing a variation of the Blanchard

and Quah (1989) model to determine which shocks largely influence each variable. Results from correlation and cointegration tests suggest that the REER has been largely driven by temporary shocks while the current account has been largely influenced by permanent shocks. Indeed approximately 1.0 per cent of the portion of the current account imbalance attributed to temporary shocks could be corrected by depreciation in the real exchange rate that is also caused by a temporary shock.

2.0 Stylized Facts: Current Account and the REER

Over the past decade, Jamaica has consistently run a current account deficit along with significant depreciations in the exchange rate relative to our major trading partners. This has not only been observed in developing economies such as Jamaica and Mexico but also in advanced economies such as the USA and the UK (see Figures 1a and 1b, Appendix). For Jamaica, the current account deficit has been largely driven by persistent merchandise trade deficits. The resulting negative trade balance has largely reflected the country's dependency on imports (see Figure 2, Appendix). Data over the period, April 1995 to December 2009, indicate that *Raw Material* imports accounted for 41.1 per cent of total imports, followed closely by consumer goods and capital goods imports which accounted for 39.8 per cent and 19.2 per cent of total imports, respectively. The major source of export earnings have emanated from the major traditional export crops of sugar, bauxite and alumina. Over the review period, this has constituted approximately 65.2 per cent of total exports, of which alumina earnings comprised 51.9 per cent.

In general, the current account deficit as a percentage of GDP has displayed an upward trend (see Figure 3, Appendix).[3] For the first five years of the sample period (1996 to 2000) the current account deficit averaged 3.2 per cent of GDP compared to an average of 12.4 per cent from 2005 to 2009. This largely reflected the widening trade deficit during the period. The years 2008 and 2009 represented the highest trade deficit to be recorded in the economy where imports exceeded exports by 275.0 per cent and 333.8 per cent, respectively. This was in the context of a 42.5 per cent increase in oil prices in 2008

[3] The figures represent the absolute values of the current account deficit.

and a fall off in mining exports due to the closure of three alumina plants in 2009.[4] Exports, remained relatively constant during the period, with significant increases of 29.5 per cent, 11.1 per cent and 14.9 per cent only being observed from 2006 to 2008.[5] There was also a complete cessation in banana exports since 2007 due to the termination of export activities attributed to the impact of hurricanes.

Apart from goods exports, the main source of foreign exchange earnings is services exports, primarily earnings from tourism. Notably, stop-over tourist arrivals grew at an average annual rate of approximately 3.0 per cent between 1996 and 2009 while visitor expenditure increased by an annual average rate of 4.7 per cent. Foreign currency inflows through remittances, which fall under the Current Transfers sub-account, is another major earner of foreign currency, which has grown at an annual average rate of 12.7 per cent over the period and has represented an average of 13.3 per cent of GDP.

In relation to the path of Jamaica's REER index, Williams (2008) outlined that Jamaica's REER index has largely moved in line with macro-economic fundamentals. This was determined using the Equilibrium Real Exchange Rate (ERER) approach which utilized multilateral exchange rates (REER), the ratio of Jamaica's net foreign assets (NFA) to GDP, the short term interest rate differential, Jamaica's relative labour productivity, the terms of trade, trade restrictions measured by implicit tariff price and government consumption as a ratio to GDP. Despite the relatively stable level of competitiveness observed over the period there has been significant depreciation in the nominal exchange rate by approximately 155.7 per cent from end-December 1996 to end-December 2009. This depreciation in the nominal exchange rate was particularly evident in 2003 and 2008

[4] Oil prices averaged US$94.10 per barrel in 2008 compared to a five-year average of US$47.50 during 2003 to 2007. The closure of the alumina plants occurred in the context of low demand stemming from the global economic downturn since 2008.

[5] The increase in export earnings in 2006 and 2007 was due to significant increases in alumina prices of 16.8 per cent and 19.3 per cent, respectively, while non-traditional exports increased by over 45.0 per cent during 2008.

when the weighted average selling rate (WASR) depreciated by 15.9 per cent and 12.2 per cent, respectively.[6]

In terms of the relationship between the current account and the REER, Figure 4 Appendix, indicates that the two variables moved together over the period. It has been observed that as the REER index increased (referred to as a REER appreciation); there was a similar worsening of the current account deficit. According to Henry and Longmore (2003), the literature does not suggest that the current account adjustment to changes in the REER must be instantaneous. In a dynamic setting, the improvement on the current account in a particular year may be associated with depreciation in the REER in prior periods and the possible exposure of these variables to external shocks. As a result, it may be difficult to make firm conclusions from Figure 4. This therefore points to the need for more rigorous empirical work to ascertain the relationship between the two variables.

3.0 Econometric Framework

To understand the trend-cycle movements in macroeconomic variables and the sources of shocks, univariate measures such as that put forward by Beveridge and Nelson (1981) indicated that macroeconomic variables could be disaggregated into their stationary and non-stationary components. These components, they denoted as the temporary and permanent components, respectively. The temporary component represents the predictable part of the data, which dissipates with time as the series tends to its permanent level. The permanent component comprises a random walk with the same rate of drift as in the original data as well as a disturbance term proportional to that of the original data. De Silva (2007) utilized the Beveridge-Nelson vector innovation structural time series

[6] The depreciation in 2003 was attributed to a decline in market confidence triggered by a confluence of factors, including deterioration of the fiscal and balance of payments accounts, and the related downgrade of the outlook of Jamaica's sovereign debt by Standard and Poor's (S&P). This was facilitated by the high level of Jamaica dollar liquidity. Most of the depreciation in 2009 occurred in the first quarter, where the dollar lost J$7.80 (10.0 per cent) which was largely due to a contraction in net private capital inflows. This stemmed from the temporary removal of credit lines in the context of the global economic crisis which started in the December quarter of 2008.

framework to decompose the GDP of Australia, America and the UK into their temporary and permanent components. It was shown that this specification was simpler than conventional state space and cointegration approaches while also showing how to model inter-series dependencies between the variables. However, the univariate approaches of decomposition have been criticized by Nelson (2006) who determined that the widely used univariate trend-cycle decompositions employed in macro-econometric analysis were ineffective in predicting economic activity in real time. He added that only the modest momentum growth captured by the Beveridge-Nelson cycle estimates, account for some level of predictability. As a result, the bivariate approach such as that proposed by Blanchard and Quah (1989) had the advantage over the Beveridge-Nelson decomposition by giving a unique decomposition for the series in question and making use of the additional information contained in the other variable (Erlat and Erlat, 1998).

Consistent with the findings by Erlat and Erlat (1998), Keating and Nye (1998) argued that multivariate methods are generally preferable because they employ information from several time series to construct statistical decompositions and they identify a set of independent empirical shocks that may be given structural interpretations. In this regard, a widely used modeling technique for the bivariate and multivariate decomposition of temporary and permanent shocks is the statistical model introduced by Blanchard and Quah (1989). A bivariate vector autoregression (VAR) involving the unemployment rate and output was employed where they decomposed real output into shocks that have permanent and temporary effects on output.[7] Following their pioneering work, long-run relationships have been used to identify structural shocks in open economies (see Lastrapes (1992), Clarida and Gali (1994), Wang (2004) and Zhang (2009)). Central to their methodology is the assumption that all shocks buffeting the economy may be classified into either the class of supply or demand shocks, as well as the use of a bivariate structural framework. This has been found to be both an advantage and a limitation. According to Gottschalk and Zandweghe (2001), the low-dimension of bivariate models has certain advantages which include the simple implementation of the

[7] The Blanchard and Quah (1989) framework has also been used to determine the source of real exchange rate fluctuations since the inception of floating exchange rates, and also to unravel the relative importance of real and nominal shocks.

model which still produces intuitive results. However, they pointed out that the problem with low-dimension bivariate models is that even if shocks are classified into demand or supply components, which are central to the Blanchard and Quah methodology, there are still many different types to these shocks which may be overlooked. They further shed some light on the sources of business cycle fluctuations through the investigation of the efficacy of the Blanchard and Quah model. They determined that, the model allows for the analysis of the response of output to aggregate demand and supply disturbances through impulse responses and the forecast error variance decomposition showed the contribution of structural shocks to fluctuations in output, using different forecast horizons. The final benefit of the Blanchard and Quah methodology was historical decompositions of output series that disaggregate the output series into a demand and supply component.

A similar approach will be employed in this paper with a variation of the Blanchard and Quah (1989) model being utilised in the analysis. The variation model replaces the unemployment rate with the change in the REER, using the same long-run restrictions as Blanchard and Quah to identify temporary and permanent shocks to the current account. It is anticipated that the results will uncover the level of structural disturbances that influence these variables and reveal whether the REER may be used as a corrective factor for Jamaica's persistent current account imbalance.

4.0 Identification Strategy

The initial imposition of contemporaneous structural restrictions in a structural vector autoregression (SVAR) model to estimate structural parameters as advocated by Sims (1986), Bernanke (1986) and Blanchard and Watson (1986) was built on the premise that the shocks had temporary effects. However, an alternative approach advanced by Blanchard and Quah (1989) has demonstrated that temporary and permanent restrictions can be identified by employing long-run restrictions on a bivariate model. To do this, a SVAR model is estimated where one variable is stationary and the other contains unit root. Unlike the identification obtained by the Choleski factorization that assumes a lower triangular $B(0)$ matrix, the permanent and temporary shocks identified here should not

necessarily be interpreted as shocks to the current account and the exchange rate, respectively. Instead, the estimated innovations to both variables are considered as having temporary and permanent effects because of the non-zero off-diagonal elements of the matrix. These shocks are then treated as exogenous variables. The two variables in the bivariate SVAR are the current account as a percentage of GDP, Δb_t in first difference, and the REER, q_t. Both variables can be expressed in vector notation as:

$$X_t = \begin{bmatrix} q_t \\ \Delta b_t \end{bmatrix} \tag{1}$$

The vector ε_t represents the structural shocks, which are permanent and temporary, denoted as:

$$\varepsilon_t = \begin{bmatrix} \varepsilon_t^P \\ \varepsilon_t^T \end{bmatrix} \tag{2}$$

where ε_t^P and ε_t^T represent the permanent and temporary shocks, respectively. Given that both variables are now I(0), the vector moving average process of the theoretical model may be expressed as:

$$\begin{bmatrix} q_t \\ \Delta b_t \end{bmatrix} = \sum_{i=0}^{\infty} L^i \begin{bmatrix} \gamma_{11,i} & \gamma_{12,i} \\ \gamma_{21,i} & \gamma_{22,i} \end{bmatrix} \begin{bmatrix} \varepsilon_t^P \\ \varepsilon_t^T \end{bmatrix} \tag{3}$$

or in linear form as

$$X_t = \gamma_0 \varepsilon_t + \gamma_1 \varepsilon_{t-1} + \gamma_2 \varepsilon_{t-2} + \gamma_3 \varepsilon_{t-3} + \ldots = \sum_{i=0}^{\infty} L^i \gamma_i \varepsilon_t \tag{4}$$

where γ contains the four elements of the second matrix in (3) and $\sum_{i=0}^{\infty} L^i \gamma_i$ denotes the matrix polynomial in the lag operator. The impulse responses of the shocks to the elements of X_t are captured in the matrix γ_i. According to Morales (2003), the key

element in the Blanchard and Quah procedure is to assume that one of the shocks have only a temporary effect on the non-stationary variable in the system. It is postulated that one of the two fundamental shocks, the temporary shock, has no permanent effect on the current account. In other words, it is assumed that temporary shocks have no long-run cumulative impact on the current account. Given that the REER is stationary in levels, shocks to the exchange rate have no permanent impact on the current account. Therefore, if the current account is to be unaffected by the temporary shock in the long run, it must be the case that the cumulated effect of these temporary shocks must be zero in the long run. It is this dichotomy between the temporary and permanent effects that allows for the complete identification of the structural innovation from an estimated VAR (Enders, 1995). This restriction can be formally imposed on the model by requiring that

$$\sum_{i-0}^{\infty} \gamma_{21,i} = 0 \qquad (5)$$

Given that the shocks are not explicitly observed, they must be recovered from VAR estimation. Both variables are now stationary and as such there exists a VAR representation of the form

$$\begin{bmatrix} q_t \\ \Delta b_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} q_{t-1} \\ \Delta b_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \qquad (6)$$

or in a more compact notation,

$$x_t = A(L)x_{t-1} + e_t \qquad (7)$$

where *A* represents the estimated coefficients and the residuals from the VAR are composites of the structural disturbances, e_{1t} and e_{2t}. As a result, from the bivariate moving average representation, the one-step ahead forecast error of q_t and Δb_t is $e_{it} = c_{i1}(0)e_{it} + c_{i2}(0)e_{2t}$ where *i = 1, 2*. Given that they are equivalent, we get

$$\begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} = \begin{bmatrix} c_{11}(0) & c_{12}(0) \\ c_{21}(0) & c_{22}(0) \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{8}$$

Equation (8) implies that with the help of identifying restrictions, the structural shocks ε_t may be recovered from the estimated reduced form disturbances, e_t as well as the structural impulse responses γ_i from the estimated reduced form VMA coefficients, A_i. Blanchard and Quah showed that the relationship between (6) and (8), as well as the long-run restriction outlined in (5) provide exactly four restrictions to identify four coefficients. These long-run restrictions facilitate the recovery of the underlying structural disturbances which are used to obtain the impulse responses as well as the variance decompositions which facilitate the analysis of the dynamic responses of both variables to the different shocks. Two of these restrictions are normalizations that define the variance of the structural shocks ε_t^P and ε_t^T.

Restriction 1: $\text{var}(e_{1t}) = c_{11}(0)^2 + c_{12}(0)^2$ (9)

Restriction 2: $\text{var}(e_{2t}) = c_{21}(0)^2 + c_{22}(0)^2$ (10)

Restriction 3: $\text{cov}(e_{1t}, e_{2t}) = c_{11}(0)c_{21}(0) + c_{21}(0)c_{22}(0)$ (11)

Restriction 4: $\left[1 - \sum_{k=0}^{\infty} \gamma_{22}(k)\right] c_{11}(0) + \sum_{k=0}^{\infty} \gamma_{12}(k) c_{21}(0) = 0$ (12)

The third restriction comes from the assumption that the structural shocks are orthogonal, while the final restriction is the long-run restriction in (5). This produces the empirical model:

$$\sum_{i=0}^{\infty} L^i \begin{bmatrix} A_{11,i} & A_{12,i} \\ A_{21,i} & A_{22,i} \end{bmatrix} \begin{bmatrix} \gamma_{0,11} & \gamma_{0,12} \\ \gamma_{0,21} & \gamma_{0,22} \end{bmatrix} = \begin{bmatrix} . & . \\ 0 & . \end{bmatrix} \tag{13}$$

5.0 Data

The series of the current account as a percentage of GDP and the REER for Jamaica are obtained from the Bank of Jamaica (BOJ) database at the quarterly frequency for the period 1997 Q1 to 2009 Q3. The current account was seasonally adjusted, denominated in millions of US dollars and converted to a percentage of the annual nominal GDP. The series for the REER consists of a weighted average of the local currency relative to a basket of other currencies of Jamaica's major trading partners, adjusted for the effects of inflation. The change in the REER was employed in the paper.

The REER was calculated as follows.

$$REER = \left(\frac{r}{r^*}\right) \times \left(\frac{p}{p^*}\right) \tag{14}$$

where r is the domestic exchange rate, r^* is the composite of trading partners' exchange rates, p is the domestic price index and p^* is the foreign price index. The base year used in the REER calculation is 2006.

In the implementation of the Blanchard and Quah methodology, one lag was chosen based on all criteria except the Schwarz Information Criterion (SIC) that chose zero lags. Both variables in the model were tested for the presence of unit roots, using the Augmented Dickey Fuller and Phillips-Perron tests. Unit root test results indicate that the REER was stationary in levels while stationarity in the current account was achieved after first differencing (see Table 1, Appendix). Henceforth, a positive temporary shock is defined as a decline in the policy rate (180-day Treasury bill rate) which would result in an increase in the demand for foreign currency causing the real exchange rate to depreciate followed by an improvement in the current account. A positive permanent shock is defined as a permanent increase in the productive capacity of the domestic economy thus facilitating an increase in home exports, which would result in an improvement in the current account balance. As a result, both temporary and permanent shocks are assumed to have an expansionary impact on the domestic economy.

6.0 Correlations and Cointegration Tests

To determine the historical contribution of temporary and permanent shocks to the REER and the current account, correlation and cointegration tests were conducted. The assumption is that if a significant relationship exists between the variable and the associated shock, then it is indicative that the REER and the current account are driven by the proposed underlying disturbances. Under the assumption that temporary shocks are largely monetary shocks and permanent shocks are productivity innovations, the relationship between the REER and the 180-day Treasury bill (T-bill) rate (proxy for temporary shock) and the current account and GDP (proxy for permanent shock) was observed to test for the presence of a long-run relationship between the variables. Table 1 below shows the statistical correlation between the variables and their associated shocks.

Table 1: Correlations

Covariance Analysis: Ordinary
Included Observations: 51
Sample: 1997Q1 2009Q3

Correlation t-Statistic Probability	*REER*	*T-bill rate*
REER	1 ----- -----	
T-bill rate	-0.365972 -2.752774 0.0083*	1 ----- -----
	Current Account	*GDP*
Current Account	1 ----- -----	
GDP	0.583563 5.0303 0.0000*	1 ----- -----

*Significant at the 1.0%, 5.0% and 10.0% level.

Consistent with expectations, the REER and the T-bill rate are negatively correlated with a correlation coefficient of -0.366 (see Figure 5, Appendix). This indicates moderate correlation between the variables and the direction suggests that a positive shock to the interest rate will result in an opposite movement in the REER. Regarding the correlation between the current account and permanent shocks, proxied by changes in GDP, a positive correlation of 0.584 was obtained, indicating that movements in these variables are unidirectional. This suggests that as GDP has persistently decreased over the years under review, the current account deficit has steadily increased (see Figure 6, Appendix). For robustness checks, the variables with their associated shocks were tested for cointegration. Keele and Boef (2004) posited that cointegration implies that the two integrated series never drift far apart from each other indicating that they maintain equilibrium. Tables 2a; 2b Appendix, show the results of the Johansen cointegration tests. Results from the Trace and Max-eigenvalue tests indicate that the REER and current account are cointegrated with the respective shocks suggesting that the REER and the T-bill rate are related in the long-run implying that the REER has been largely driven by temporary shocks while the current account has been largely driven by permanent shocks. The evidence purported by the above tests lead us to assert that the REER and current account have been largely driven by temporary and permanent shocks, respectively. Given this assertion, impulse response analysis is conducted to determine the forecast direction that the REER and the current account will take in reaction to a positive shock.

7.0 Impulse Responses

Impulse responses trace out the response of current and future values of each of the variables to a one unit increase in the current value of one of the VAR errors, assuming that this error returns to zero in subsequent periods and that all other errors are equal to zero. The responses of the variables to a unit positive innovation in each of the shocks were examined. By incorporating structural decompositions to examine the effects of both shocks, it was evident that temporary and permanent shocks to both the REER and the current account partially resulted in the anticipated relationship (see Figure 7, Appendix). Under temporary shocks, the REER appreciated within the first quarter and returned to equilibrium by the third quarter. This appreciation in the REER was

accompanied by a contemporaneous negligible increase in the current account deficit as a per cent of GDP, consistent with the restrictions imposed in the SVAR. This relationship between the REER and the current account is consistent with the traditional Mundell-Fleming theory in the context of an appreciation of the real exchange rate resulting in a subsequent worsening of the current account deficit. Under the assumption that current account adjustments to changes in the REER are instantaneous, it should be noted that an appreciation in the REER is associated with a nominal appreciation in the currency, which based on theory, results in a loss in competitiveness. This would therefore contribute to the increase in the current account deficit.

The relationship between the REER and the current account under permanent shocks was inconsistent with the traditional Mundell-Fleming theory. Based on the monetary transmission mechanism, an increase in GDP (positive productivity shock) would result in an initial increase in inflation in the domestic economy. This heightened inflation would cause interest rates to rise to offset the excess liquidity, resulting in a nominal depreciation in the exchange rate. This depreciation in the exchange rate would then result in an improvement in the current account deficit as based on the Marshall-Lerner condition, the increase in the volume of exports would outweigh the relative price shifts resulting from the depreciation. However, a one standard deviation positive productivity shock, resulted in the REER depreciating by approximately 1.0 per cent in the first quarter and gradually approached equilibrium by the fourth quarter. This change in the REER was synonymous with a contemporaneous deterioration of the current account deficit which returned to equilibrium by the fourth quarter. This was inconsistent with conventional wisdom as it is expected that a depreciation in the REER should be accompanied by an improvement in the current account deficit. This intuition is based on the Marshall-Lerner condition being held where it is assumed that exports are elastic goods which would result in an adjustment being observed contemporaneously. It must be noted, however, that empirical studies have shown that goods tend to be inelastic in the short-run as it takes time for consumer preferences to change. Therefore the Marshall–Lerner condition was not met, and a depreciation may worsen the current account initially but improve in the long term, as consumers adjust to the new prices.

A similar model was conducted on data for Trinidad and Tobago for the same review period. Figure 8, Appendix shows that under temporary shocks to the REER, the exchange rate appreciated for the first three quarters where it then began to depreciate until returning to equilibrium in the seventh quarter. The impact of a temporary shock induced a gradual decline in the current account surplus until the ninth quarter where the temporary shock had a zero effect. This outturn was consistent with the Mundell-Fleming theory as a negative correlation between both the REER and the current account surplus was observed. A positive permanent shock to both variables however, did not display the expected negative correlation. An increase in the productive capacity of the economy caused the REER to appreciate while the current account surplus increased. This deviation from theory was similar to that observed in Jamaica where a negative correlation was observed between the REER and the current account when influenced by a permanent shock. One explanation put forward by Lee and Chinn (2005) may be due to the stationary nature of the current account for Trinidad and Tobago, which would result in the effect of the permanent shock decaying over time.

It must be noted, however that the temporary and permanent shocks to the variables may not account for all of the deviation of the actual variables from their long-run equilibrium values. As recognized by Blanchard and Quah (1989), their model is limited by its ability to identify only at most as many types of distinct shocks as there are variables. This suggests that the variables may be affected by other external shocks which are not captured in the model.

8.0 Variance Decompositions

Results from the forecast error variance decomposition indicate how much of the forecast variation in one variable (for example the current account) departs from its true value due to variations in the current and future values of the innovations in the other variable (for example the REER). It therefore indicates the fraction of the forecast error variance at various horizons that can be attributed to each shock in the model. Table 2 below shows that at the first horizon, permanent shocks account for 99.1 per cent of the forecast error

variation in the current account, suggesting that the temporary component accounts for the remaining 0.9 per cent. Intuitively, after the first forecast horizon, shocks to current account explained most of its forecast error variation (99.1 per cent), however, after the second forecast horizon, the REER played a relatively higher role in explaining the forecast error variation in the current account. Most of the forecast error variation in the REER is largely explained by its own shocks accounting for approximately 87.0 per cent within the first forecast horizon and accounting for approximately 83.0 per cent in the long-run. These results suggest that only approximately a 1.0 per cent correction of the current account imbalance may be obtained from a real depreciation in the REER in the first horizon with a correction of 1.7 percentage points being obtained in the long-run.

Table 2: Blanchard-Quah Variance Decomposition: Jamaica

Periods Ahead	**REER**			**Current Account**		
	Temporary Shock	*Permanent Shock*	*Standard Errors*	*Temporary Shock*	*Permanent Shock*	*Standard Errors*
1	86.71	13.29	2.86	0.88	99.12	1.06
2	82.76	17.24	3.02	1.70	98.30	1.10
3	82.80	17.20	3.02	1.70	98.30	1.11
4	82.78	17.22	3.02	1.70	98.30	1.11
5	82.78	17.22	3.02	1.70	98.30	1.11
6	82.78	17.22	3.02	1.71	98.29	1.11
7	82.78	17.22	3.02	1.71	98.29	1.11
8	82.78	17.22	3.02	1.71	98.29	1.11

These results, though consistent with expectations, stand in contrast to those obtained by Lee and Chinn (2002; 2005). In countries such as Canada, France, and Italy, the movement of the current account has been largely attributed to temporary shocks given that the current account has largely been a stationary variable, while the real exchange rate has been characterized by permanent shocks. The result also suggests that in most cases a positive and significant relationship between the REER and the current account will only be found by controlling for permanent shocks to the current account. Indeed Henry and Longmore (2003), who looked at the short and long-run responses between both variables, in the Jamaican context, found that the REER could not be used as a tool for correcting current account imbalances.

Based on the results, the question may arise in relation to the level at which the Jamaican current account deficit may then be sustained. Research has indicated that persistent current account imbalances are unsustainable and pointed to the need for current account adjustments and even reversals. Rochester (2009) used seven approaches to evaluate the sustainability of the Jamaican current account. Five out of the seven measures of sustainability suggested that the Jamaican current account was unsustainable and showed the need for imminent adjustments in macroeconomic and structural policies. Dean and Koromzay (1987) posit that current account adjustments can occur mainly through two mechanisms. The first is based on the determinants of current account transactions, essentially incomes and relative prices. This, they argue, focuses on rates of growth in domestic and foreign demand as they influence imports and exports respectively. The other approach is based on the premise that the current account is identical to the difference between national saving and investment or the difference between total domestic demand and output. From this perspective a current-account adjustment can be analyzed in terms of the determinants of savings and investment behaviour.

9.0 Conclusion and Policy Recommendations

An empirical analysis was conducted on the relationship between the REER and the current account to determine if a current account adjustment may be facilitated by changes in the REER. Based on the traditional Mundell-Fleming theory and a broad class of intertemporal macro models, the current account imbalance should be corrected by depreciation in the real exchange rate given that they are both driven by similar shocks.

The Jamaican current account has exhibited persistent current account deficits, which have been largely driven by persistently low GDP growth. Similarly, significant depreciation in the exchange rate has been observed. Despite the considerable depreciation, a major correction of the current account imbalance has not been observed, which indicates the need for structural changes in the economy. Cointegration analysis and variance decompositions indicated that temporary shocks played a larger role in explaining the variation in the REER, while the current account was largely driven by

permanent shocks. It has been argued that persistent current account imbalances are unsustainable and an adjustment deemed necessary. Over the past decade, the real sector in the Jamaican economy has not been able to facilitate the necessary adjustment that should take place from the REER to the current account. It has also been proven econometrically that the relatively small significance of the temporary component in the current account, suggests that a significant adjustment of the current account would not occur through a REER adjustment. We therefore conclude that this adjustment in the current account imbalance may not be entirely achieved through the manipulation of monetary variables such as interest rates but rather through enhancing the macroeconomic environment to increase productivity. Under the assumption that the Marshall-Lerner condition holds, a boost to productivity would cause exports to increase and the demand for imports to fall. In this regard, policy should be more geared towards creating a macro-economic environment that can facilitate the increase in exports resulting in a boost in external competitiveness which would then cause a correction in the current account imbalance.

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APPENDIX

Figure 1a: Current Account as Per Cent of GDP - Advanced Economies

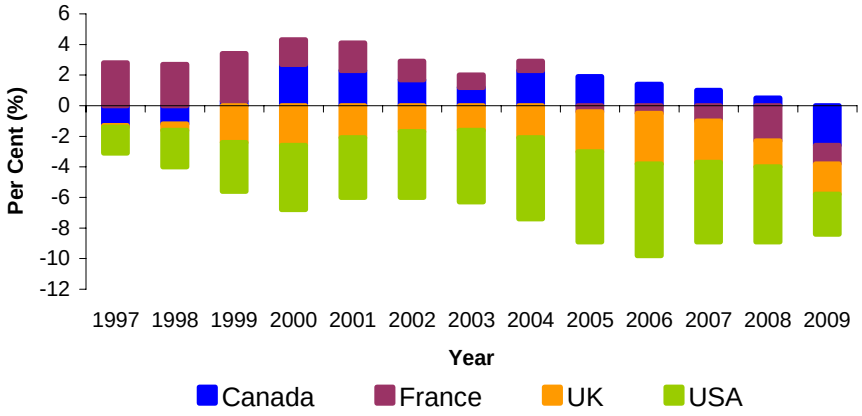

Figure 1b: Current Account as Per Cent of GDP - Developing Economies

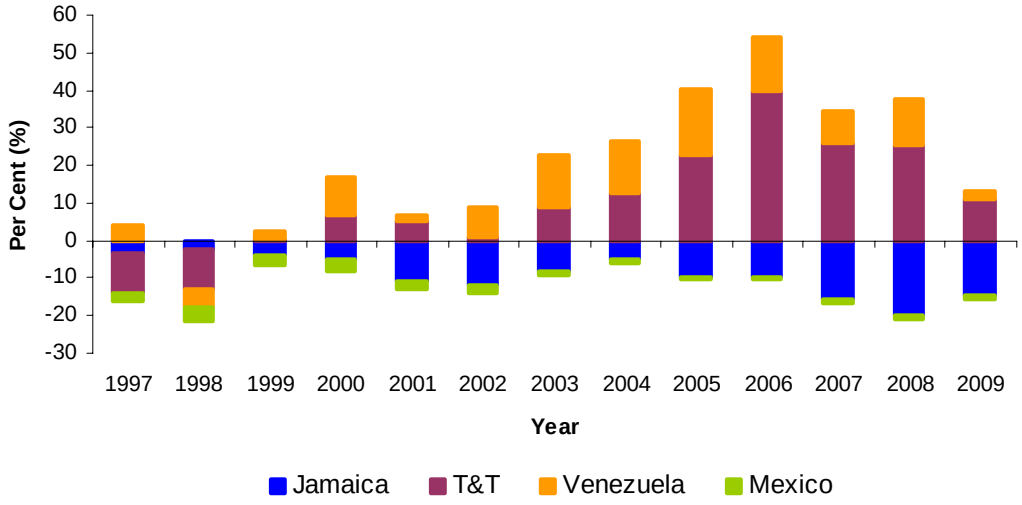

Figure 2: Jamaica's Trade Balance

Figure 3: Jamaica's Current Account as a Per Cent of GDP

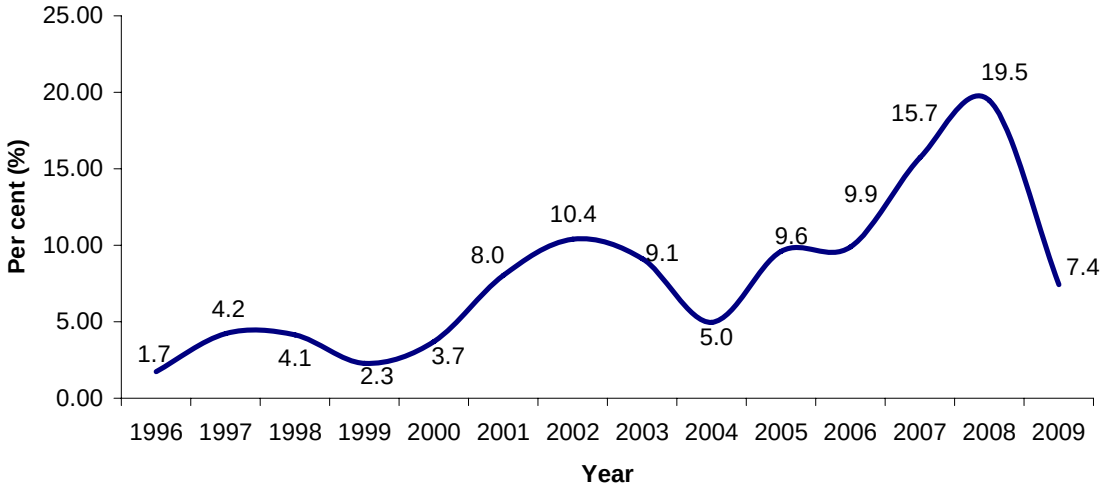

Figure 4: Jamaica's REER Index and Current Account as a Percentage of GDP

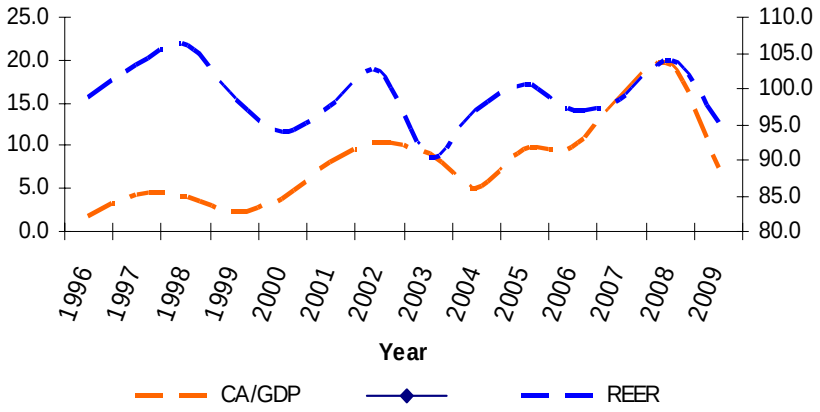

Table 1: Unit root Tests

	ADF*		Phillips-Perron*	
Variables	*Level*	*First Difference*	*Level*	*First Difference*
CAGDP	-2.85	-9.00	-2.81	-9.00
REER	-5.11	-7.29	-4.86	-22.05

* Without trend

Critical values: 1% 3.57
5% 2.92

Figure 5: REER and 180-day T-bill Rate

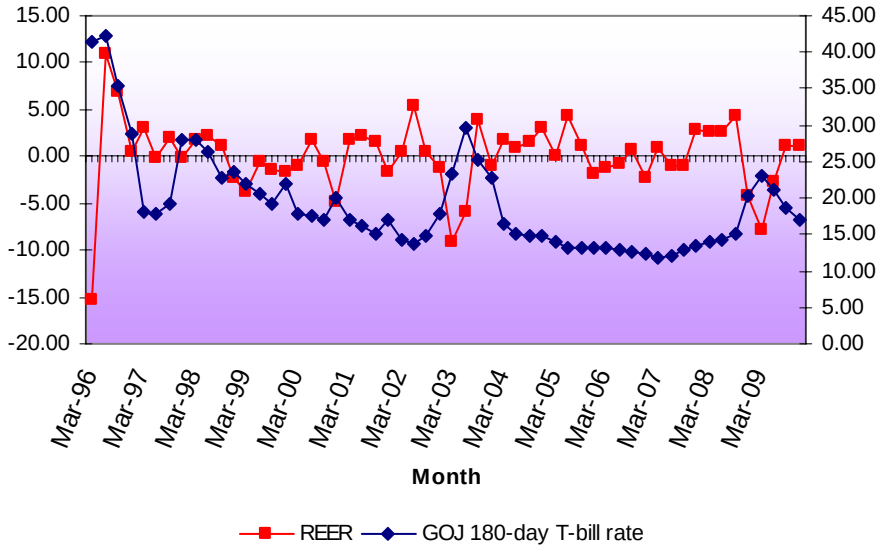

Figure 6: Current Account and GDP

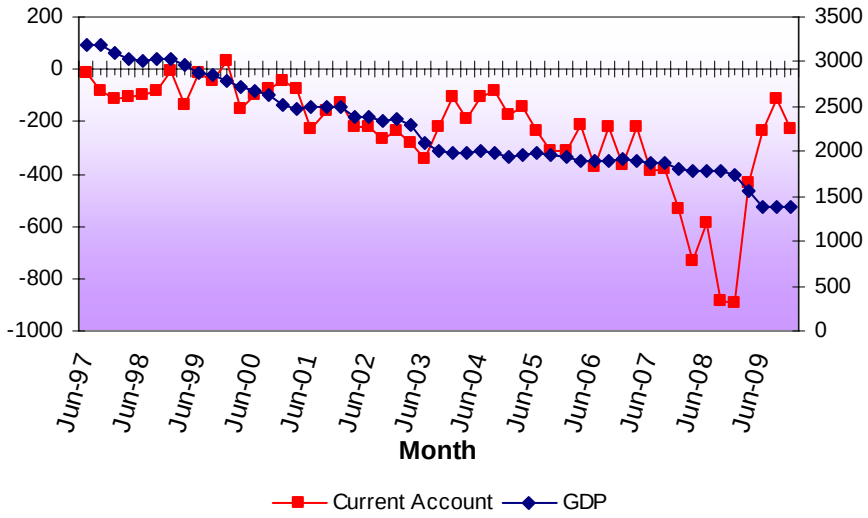

Table 2a: Johansen Cointegration Test (REER and T-bill rate)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.372154	23.10612	12.32090	0.0006
At most 1	0.006075	0.298584	4.129906	0.6462

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.372154	22.80754	11.22480	0.0003
At most 1	0.006075	0.298584	4.129906	0.6462

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Table 2b: Johansen Cointegration Test (Current Account and GDP)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.276062	19.41643	12.32090	0.0028
At most 1	0.070589	3.587015	4.129906	0.0691

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.276062	15.82941	11.22480	0.0073
At most 1	0.070589	3.587015	4.129906	0.0691

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Figure 7: Response to Structural One S.D. Innovations: Jamaica

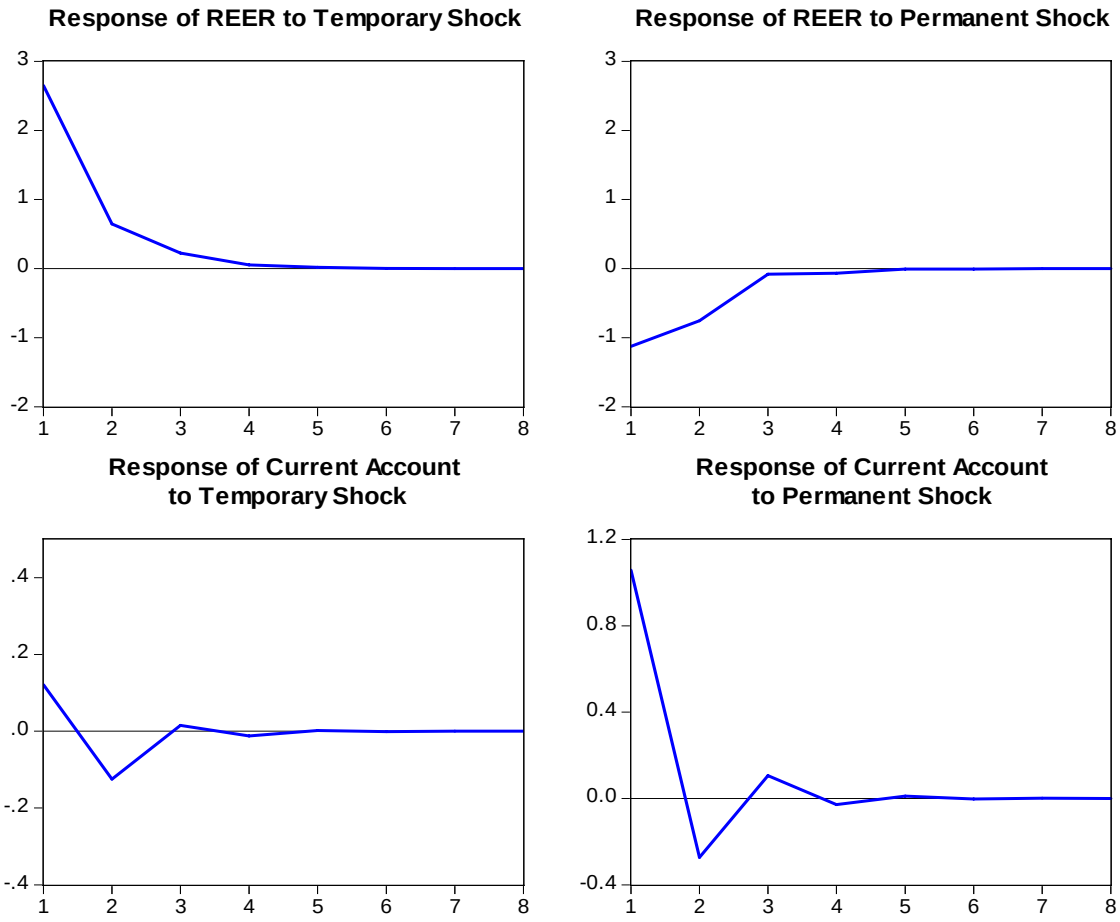

Figure 8: Response to Structural One S.D. Innovations: Trinidad and Tobago