THE IMPLICATIONS OF CREDIT GROWTH FOR COUNTRIES FOREIGN EXCHANGE RESERVES THE CASE OF THE CARIBBEAN

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Abstract

Throughout the recent history of the Caribbean, Central Bankers and other policy makers have analyzed developments related to credit conditions in the domestic economy. Traditionally, credit growth, particularly increases which are linked to consumer loans and excessive borrowing by governments, have been of concern because of their potential link to import growth and consequently the level of foreign exchange reserves and the exchange rate. Additionally, in recent years, the level of credit extended by commercial banks has been carefully scrutinized by bank examiners as it is one indication of the level of soundness of an individual bank and the entire banking system.

This paper therefore seeks to explain and quantify the relationship between credit growth and its effect on the stability of Caribbean economies, as proxied by the level of international reserves. The study is especially pertinent for small open economies with fixed exchange rates, which usually use direct monetary policy instruments such as interest rate adjustments and moral suasion to influence credit conditions and by extension import demand, in order to protect their foreign exchange reserves.

[1.] The views expressed in this paper are those of the authors and do not necessarily represent the Central Bank of The Bahamas. The paper should be considered a work in progress and as such the authors would welcome any comments on the written text.

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SECTION I: INTRODUCTION

Throughout the recent history of the Caribbean, Central Bankers and other policy makers have analyzed developments related to credit conditions in the domestic economy. Traditionally, credit growth, particularly increases which are linked to consumer loan and excessive borrowing by government have been of concern because of their link to import growth and declines in the level of foreign exchange reserves, which may put pressure on the exchange rate. Additionally, in recent years, the level of credit extended by commercial banks has been carefully scrutinized by bank examiners as it is one indication of the level of soundness of an individual bank and the entire banking system.

This paper therefore seeks to explain and quantify the relationship between credit growth and its effect on the stability of Caribbean economies, as proxied by the level of international reserves. Reserves, as defined by the *International Monetary Fund Balance of Payments Manual, 5th Edition*, refers to external assets that are readily available to, and are controlled by monetary authorities for direct financing of external payments imbalances, and for indirectly regulating the magnitudes of such imbalances through intervention in exchange markets to affect the currency exchange rate, among other purposes. This study is especially pertinent for small open economies with fixed exchange rates, which typically use monetary policy instruments such as interest rate adjustments and moral suasion to reduce credit and by extension, import demand and hence protect the country's foreign exchange reserves.

Over the years, many reasons have been cited to justify countries holding foreign currency reserves. Historically, the most common reason given for maintaining foreign currency reserves is in support of the country's exchange rate regime. Foreign exchange market stability is one of the main reasons for holding reserves, since foreign exchange markets have the potential to become unstable or dysfunctional in the face of certain types of major economic shocks.

Accumulation of reserves is necessary in order to alleviate concerns about the level of the exchange rate. Reserves are held so as to support and maintain confidence in the policies for monetary and exchange rate management, including the capacity to intervene in support of the national currency. Further, holding reserves limits external vulnerability by maintaining foreign currency to absorb shocks during times of crisis or when access to borrowing is curtailed. Moreover, reserves provide a level of confidence to markets so that a country can meet its external obligations and demonstrate the backing of local currency by external assets, while assisting the government in meeting its foreign exchange needs and external debt obligations. Moreover, the possibility of widespread, expensive damage caused by natural disasters, such as major hurricanes and earthquakes is another reason to hold a stock of reserves.

However, of importance, is not only the holding of reserves but the management of reserves. According to the International Monetary Fund (September 2001), reserve management is a process that ensures that adequate official public sector foreign assets are readily available to and are controlled by the authorities for meeting a defined range of objectives for a country. Sound reserve management practices are necessary because they can increase a country's or region's overall resilience to shocks. Reserve managers, through their interaction with financial markets, acquire access to valuable information that keeps policy makers informed of market developments and views on potential threats. Experiences where weak or risky reserve management practices have restricted the ability of the authorities to respond effectively to financial crises, which may have accentuated the severity of these crises, have also highlighted the importance of sound practices.

The remainder of the paper is therefore organized as follows: Section II presents a review of literature relating credit growth and foreign exchange reserves, with emphasis on the specie-flow concept and the monetary approach to the Balance of Payments. Section III explains the data set, while the methodology employed for empirical testing is examined in Section IV. Section V analyses the empirical results and policy implications, while Section VI concludes the paper.

SECTION II: LITERATURE REVIEW

Dating back to the mercantilist era, several authors have attempted to examine the linkages between monetary variables such as domestic credit and interest rates and the balance of payments account. During the 1970's, two techniques, the "classical specie-flow mechanism and the "monetary approach to the balance of payments", predominated the literature relating to the topic. The "classical specie-flow mechanism", which was embraced by proponents such as David Hume (1752), posits that an exogenous increase in the money stock in a country causes the price level to rise. The increase in the price level then diverts the demand abroad, leading to a deficit in the balance of trade. Following, the trade deficit is financed through net monetary outflows, resulting in a fall in the money stock and hence prices, until international competitiveness is restored. It is only as the prices return to their original level, that the money stock will return to its initial level, implying that the expansions in the money supply have flowed abroad.

Therefore, the specie-flow-mechanism seems to depend on two restrictive assumptions. One, it assumes no international capital mobility, since it identifies a trade deficit with an outflow of money. Second, it assumes that an outflow of money will lead to a fall in the domestic money stock, which implies that the same currency is used for both domestic and international transactions. However, opponents such as Humphrey and Keleher (1982) rejected the specie-flow concept on the grounds that prices in the small open economies are determined in world markets and cannot deviate from world prices.

Consequently, the specie-flow mechanism was modified and formed the basis for the second model known as the "Monetary Approach to the Balance of Payments". The monetary approach to the balance of payments refutes the validity of the specie-flow mechanism in the case of small open economies operating under fixed exchange rates. Advocates such as Humphrey (1981) and Looney, (1991) viewed the monetary approach as a framework for analyzing how integrated open national economies eliminate their excess money supplies and demand in a fixed exchange rate regime. In the scenario of small open economies operating under fixed exchange rates, adjustment cannot occur through price level changes, since prices are determined exogenously. Adjustments, therefore take place through the balance of payments as domestic residents export money and import goods, or export goods and import money, in order to eliminate excess money supply.

More specifically, proponents of the monetary approach, in an attempt to explain how small open economies achieve monetary equilibrium, employed a simple expository model consisting of the following equations:

Money demand (M_d): $M_d = kPY$ (1)

Money supply (M_s): $M_s = C + R$ (2)

Law of one price (P): $P = EP_w$ (3)

Monetary equilibrium condition: $M_s = M_d$ (4)

The first equation (1) expresses the demand for money (M_d) as a stable function of the product of domestic prices (P) and the level of real output (Y), with the constant coefficient (k) representing the fraction of nominal income (PY) that people hold in the form of cash balances. The price level (P) is given since the small open economy cannot influence world prices and therefore is a price taker on world markets. Similarly, real output (Y) is taken as given on the assumption that the small open economy can sell all it wishes on the world market at given world prices and thus always produces at full capacity output level.

In equation two (2) money stock is defined in terms of the assets supporting it, namely domestic credit (C) extended by the banking system and foreign exchange reserves (R) garnered through the balance of payments. Of these two variables, only domestic credit is exogenous and under the control of the Central Bank. Conversely, the foreign reserve component is endogenous, responding passively to changes in money demand through the balance of payments.

Equation three (3) conveys the law of one price whereby the price equalizing effect of commodity arbitrage renders domestically traded goods prices (P) the same as world prices (P_w) converted into a common unit of account at the fixed exchange rate (E). World prices and the exchange rate are assumed to be given, meaning that domestic prices are determined on world markets and given exogenously to the small open economy.

Moreover, equation four (4) signifies the monetary equilibrium condition in which money supply (M_s) equals money demand (M_d) so that all money is willingly held and the market for cash balances clears. Equilibrium is attained via flow of money, that is, foreign exchange reserves, through the balance of payments. This relationship can be shown by substituting equations 1 through 3 into equation 4, which would be derived as follows:

$$R = kEP_wY - C \quad (5)$$

According to equation (5), under a fixed exchange rate regime, foreign exchange reserves (R) must adjust to offset changes in real output (Y), world prices (P_w) and domestic credit (C). Hence, the model implies that reserve flows through the balance of payments adjust to maintain monetary equilibrium in the face of autonomous shifts in the determination of money supply and demand. Thus, recognizing that the change in reserves (ΔR) is defined as the state of the balance of payments (B), the self-equilibrating role of reserve flows through the balance of payments can be summarized by the following expression:

$$B = \Delta R = b(M_d - M_s) \quad (6)$$

Equation (6) implies that the state of the balance of payments (B) and the associated change in reserves (ΔR) depend on the excess demand for money being positive when there is excess money demand, negative when there is excess money supply and zero in the absence of excess money supply and demand. Therefore, the key idea of the monetary approach is that when cash balances fall short of desired cash balances, people will correct the discrepancy by exporting domestic goods and securities in exchange for import of money.

Looney (1991) postulated that the basic proposition of the monetary approach related to the fact that the balance of payments is a mechanism that restores equilibrium between the supply of and demand for money. The monetary approach views the balance of payments problems as transitory and self-correcting, provided the authorities do not sterilize the effects of the changes in reserves by means of compensating the changes in domestic credit. Further, the monetary approach assumes that the domestic money supply is backed by only two components, that is, international reserves and credit, where the demand for money is a conventional function of prices, real income or output and interest rates, and it is always stable; the price level is determined in the world market according to the law of one price; the interest rate is determined in the international capital market, with international capital mobility, rates of return on function denominated in different currencies must be equal; a ‘small’ country by its own actions cannot influence world prices or interest rates; and real output is determined by real forces independent of the monetary factors or the balance of payments. Thus, this approach assumes and relies on a rapid market-clearing process.

Therefore, the monetary approach to the balance of payments can be characterized and identified by the price level exogeneity, which focuses on small open economies price taker status. There is also the characteristic of money stock endogeneity, whereby money supply adjusts to money demand via reserve flows through the balance of payments. There is also the money stock composition in which the monetary authorities control only the composition of the money stock. The total of the money stock, the price-to-money causality, whereby money adjusts to prices and not price to money, the absence of relative price effects and the direct expenditure effects are not under the management of the monetary authorities.

Aghevli and Khan (1977) tested the monetary approach to the balance of payments model using data for 39 developing countries and based on the highly significant results on a cross section basis, the authors conclude that the mechanism underlying the monetary approach to the balance of payments theory holds equally strongly for both the developed and less developed countries. More specifically, the Caribbean countries have different economic systems and as such, available evidence on the monetary approach to the balance of payments theory for the developing economies of the Caribbean appears mixed. Leon's (1988) empirical analysis of Jamaica did not reject the basic predictions of the monetary approach to the balance of payments. The writer from his findings concluded that an increase in the domestic component of the money balance does lead to an equivalent outflow of reserves, when the broad definition of money was used.

Watson (1990) also did a study of movements in Trinidad and Tobago's international reserves during the period 1965-1985. In his study he excluded the oil component of the country's GDP because the income variable of the monetary approach represents only domestic income and the oil sector output is mainly sold abroad. From his research, the author concluded that the monetary approach appears to offer a useful explanation of the balance of payments in Trinidad and Tobago.

According to Coppin (1994), who utilized data for Barbados to test the monetary approach to the balance of payments, fiscal expansion appears to better explain decreased holdings of foreign asset reserves in the Barbadian economy, than does expansionary domestic credit. The author further noted that, monetary policy variables became insignificant in the presence of fiscal policy, suggesting that attempts at autonomous monetary policy did not have detrimental consequences for the level of foreign reserves in Barbados, or that there was little or no autonomous monetary policy during the period that was under investigation (1972-1987). He also found that the openness variable was highly significant in influencing the holding of reserves, suggesting that the more open the economy, the greater the need to hold foreign reserves.

Howard and Mamingi (2002) in their study of the monetary approach to the balance of payments for Barbados confirmed that excessive credit expansion leads to balance of payments deficits and excessive loss of reserves in fixed exchange rate systems.

Therefore, since under a fixed exchange rate regime it is necessary to hold high levels of reserves in order to protect the exchange rate, borrowing from the Central Bank should be restricted.

In Civcir and Parikh (1995) analysis of the deterioration of reserves and bank credit for Turkey, the authors expounded that planned money demand is equal to planned money supply, and that *ex ante* reserves of the monetary authorities are determined endogenously in the long run while the domestic credit is exogenous or partly endogenous, that is public sector credit, and partly exogenous, private sector credit. According to these two authors, an important implication of the monetary approach to the balance of payments is that the money supply in an economy with fixed exchange rates will be endogenous. With fixed exchange rates, money supply adjusts to money demand through international flows of money via balance of payments imbalances. Conversely, with flexible exchange rates, money demand will be adjusted to a money supply set by the Central Bank via exchange rate changes. Hence, any change in the money supply resulting from the instruments of monetary policy can be offset by an equal and opposite change in the stock of international reserves of the Central Bank.

In general, the monetary approach to the balance of payments is a monetary phenomenon[1]. With the demand for money depicting a stable, long run relationship, the adjustment of domestic money supply to changes in the level of money demand will exude itself in a changing level of the international currency reserves, which encompasses a part of the monetary base of a given country. Consequently, an excess of money supply over money demand will give rise to an outflow of international reserves, while an excess demand for money will result in an inflow of foreign reserves into the domestic economy.

[1] Frenkel, J., & Johnson, H., (1976), *The Monetary Approach to the Balance of Payments*

SECTION III: DATA

The paper examined the relationship between the reserves and domestic credit for The Bahamas, Barbados, Jamaica and Trinidad & Tobago, using an approach similar to previous studies, which examined the monetary approach to the BOP; however there are a number of important differences between this study and previous approaches. To begin with, the depended variable used in the model was the foreign exchange reserves of the Central Bank, netted by the change in the level of central government's foreign debt. This transformation was conducted to minimize the effects of reserve shocks, which normally impact reserves when government borrows externally and deposits the proceeds with the Central Bank or alternatively when government withdraws funds directly from the Central Bank to repay external debt obligations. This stands in contrast to the private sector and to a lesser extent public corporations, whose external borrowings and debt repayments are usually earmarked for specific purposes and hence do not normally directly affect the foreign reserves of the Central Bank. Graph 1(a) and 1(b) in the Appendix 2 illustrates this point for two of the countries used in the study (The Bahamas and Barbados). Note that in The Bahamas from 1997 to 1999, there was a significant increase in the private sector's external loans, however the net effect on the country's foreign reserves was minimal. In contrast, in Barbados between 1999 and 2002, the significant increase in Central Government's external debt liabilities was accompanied by a similar advance in the foreign exchange reserves.

With regards to the exogenous variables, similar to previous studies conducted, the variables posited to impact the countries' foreign exchange reserves included: domestic credit, nominal GDP, the money supply, the fiscal stance of the government, the Central Bank's key policy rate and a measure of the cost of holding money balances proxied by the savings rate. The justification for including the fiscal deficit for the individual countries as an explanatory variable was noted by Coppin (1994), who stated that if the expansion to the monetary aggregates was as a result of government borrowing from the Central Bank to finance deficits, then it would be reasonable to investigate the impact of expansionary fiscal policy on the foreign reserves of Barbados. Moreover, the author noted that if domestic credit was primarily used to finance the deficit, then the inclusion of the fiscal deficit variable would result in the domestic credit variable being insignificant.

In general, domestic credit is cited as having an inverse relationship with foreign exchange reserves, while nominal GDP, government's fiscal policy, the Central Bank's discount rate, savings rate and the money supply are all expected to have a positive relationship with reserves.

Moreover, several variables were included in the analysis in order to take account of the specific characteristics of several of the economies. For example, the inclusion of a tourism index for The Bahamas was deemed necessary as the tourism sector is the dominant sector in the economy and contributes a significant portion of the foreign exchange inflows into the country. Barbados is also heavily dependent on tourism for foreign exchange inflows, hence long-stay tourist arrivals were used in the reserves equation. In addition, a variable was included to capture the degree of openness for each small economy. In the case of Barbados and Jamaica, which had relatively large export sectors, the openness variable used was the ratio of exports to GDP. With regards to Trinidad and Tobago, both the ratio of exports and imports to GDP were used as the openness variables, while for the Bahamas, the ratio of non-oil imports to GDP was used as the openness variable, since the export sector has been relatively small compared to the size of the economy. Appendix 1: Table 1 displays the variables used in the model along with the expected signs.

In computing the model the logarithmic form for all variables were used. As Coppin notes, estimating the variables in logs rather than levels, negate the ability to directly observe the so-called "offset coefficient" or the coefficient of the credit variable in the BOP formulation of the equation. The analysis period for the four countries examined differed due to the availability of data. As a consequence of data limitations, the following time periods were employed for each country: The Bahamas (1982 – 2003); Barbados (1976 – 2003); Jamaica (1982 – 2003) and Trinidad and Tobago (1982 –2003).

The data sets for the countries were sourced from the individual countries' Central Bank reports and the International Monetary Fund's database.

SECTION IV: GENERALIZED VAR METHODOLOGY

a. Co-integration

Several tests were conducted to determine the relationship between foreign exchange reserves and the selected independent variables. In order to investigate the long run relationship between reserves and other specific variables, it was necessary to test for co-integration. Traditional theory, states that the estimators obtained from regressions of variables were only valid, if the series being combined were stationary i.e. integrated of order zero or I(0). If the series being combined were non-stationary, for example integrated of order 1, then this would lead to the so-called "spurious regressions". In these spurious regressions, the OLS estimator does not converge in probability as the sample size increases, the *t* and *F* statistics do not have well defined asymptotic distributions, and the Durbin-Watson statistic converges to zero. In this case, no statistical inference based on the results is possible. There is one exception to this case, this occurs when time series which are non-stationary and are integrated of the same order, for example I(1) series, are combined to form a series which is stationary. When this happens, the series are said to be co-integrated.

Over the years, several methodologies have emerged to model time series data in order to test for co-integration. One of these is known as the Granger Representation theorem[2]. This states that if a set of variables is co-integrated, then there exists a valid error correction representation of the data. The major drawback of this methodology however, is that it only assumes that one co-integrating relationship exists among the data. This drawback has precipitated the use of Vector Autoregressive (VAR) models to model time series data.

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[2] For a thorough discussion of the Granger Representation theorem and its use in co-integration analysis see Verbeek (2000), pp. 285-289.

Since their introduction by Sims (1980), VAR models have grown in their use as tools in Macroeconomics. Their increasing prevalence is predicated on the belief that with these models, no assumptions have to be made about the endogeneity and exogeneity of variables before hand, unlike structural simultaneous equation models where all the variables that enter the system must be identified.

Vector Autoregressions are generally of the form, in which all the variables relevant to a model are estimated in equations, in which each variable is regressed on past values of the other variables. As an example, take the simple case of a two variable system. Suppose we have two variables y_t and z_t. To create a VAR system let the time path of y_t be affected by current and past realizations of the z_t sequence, and let the z_t sequence, be affected by current and past realizations of the y_t sequence. This therefore forms a bivariate system, and the two equations, constitute a first-order bivariate structural VAR model.

$$y_t = b_{10} - b_{12} z_t + \gamma_{12} z_{t-1} + \gamma_{11} y_{t-1} + \varepsilon_{yt} \quad (1)$$

$$z_t = b_{20} - b_{21} y_t + \gamma_{21} y_{t-1} + \gamma_{22} z_{t-1} + \varepsilon_{zt} \quad (2)$$

This system can be easily extended to include n- equations and p lags. Therefore an n-equation VAR model, can be written as:

$$\begin{bmatrix} x_{1t} \\ x_{2t} \\ .. \\ x_{nt} \end{bmatrix} = \begin{bmatrix} A_{10} \\ A_{20} \\ .. \\ A_{n0} \end{bmatrix} + \begin{bmatrix} A_{11}(L) & A_{21}(L) & .. & A_{1n}(L) \\ A_{21}(L) & A_{22}(L) & .. & A_{2n}(L) \\ .. & .. & .. & .. \\ A_{n1}(L) & A_{n2}(L) & .. & A_{nn}(L) \end{bmatrix} \begin{bmatrix} x_{1t-1} \\ x_{2t-1} \\ .. \\ x_{nt-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ .. \\ e_{nt} \end{bmatrix} \quad (3)$$

where: A_{i0} = the parameters representing the intercept term

A_{ij} = the polynomials in the lag operator

x_i = the variables in the var system

The individual coefficients of $A_{ij}(\mathrm{L})$ are denoted by $a_{ij}(1), a_{ij}(2),......$ because all the equations have the same lag length, all the polynomials $A_{ij}(\mathrm{L})$ are of the same degree. The terms e_{it} are white noise disturbances that may be correlated.

In the two variable first order VAR model given by equations one and two, the structure of the system incorporates feedback. To reduce the model to a more stable one[3], it is necessary to standardize it. In the standard form the model reduces to the following system:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}\begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix} \tag{4}$$

This further reduces to the expression:

$$Bx_t = \Gamma_o + \Gamma_1 x_{t-1} + \varepsilon_t \tag{5}$$

where:

$$B = \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}, \quad x_t = \begin{bmatrix} y_t \\ z_t \end{bmatrix}, \Gamma_0 = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix}$$

$$\Gamma_1 = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}, \varepsilon_t = \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix}$$

Pre-multiplying by B^{-1} allows one to obtain the vector autoregressive (VAR) model in standard form:

[3] This means a model with no feedback

$$x_t = A_0 + A_1 x_{t-1} + \varepsilon_t \qquad (6)$$

where:

$A_0 = B^{-1}\Gamma_0$

$A_1 = B^{-1}\Gamma_1$

$\varepsilon_t = B^{-1}\varepsilon_t$

b. Error Correction Models (ECM)

Following the long-run test, the next step involved the estimation of the short-run model. As Verbeek (2000) notes, according to the Granger Representation Theorem, if the variables are cointegrated, then there exists a valid error-correction representation of the data. Moreover, Roca (1999) states that the ECM provides a basis for analysing the dynamics of the movement from short-run to long term equilibrium. If we consider again Equations 1 and 2; provided the variables are co-integrated and the decision is made to normalize on the y term, then the ECM model can be written as:

$$\Delta y_t = \alpha_{10} - \alpha_{11}\varepsilon_{t-1} + \mu_{12}\Delta y_{t-1} + \rho_{13}\Delta z_{t-1} + \xi_t \qquad (7)$$

where Δ represents the first difference of the variable and ε_{t-1} the lagged error term which corrects for disequilibrium at each instant in time. This equation can easily be applied to the n variable case. Moreover, as Howard and Mamingi (2002) note, equation 7 is valid if $\alpha_{11} \neq 0$, hence a test for the validity of the ECM is also a test for the validity of cointegration.

c. Impulse Response Functions and Variance Decompositions

Due to the inherent complicated cross-equation feedback relationships which exist when estimating the coefficients in a VAR model, it was shown by Sims (1980) that a more insightful analysis can be obtained by analyzing the system's reaction to various shocks, this is the basis of the impulse response functions. According to Pesaran and Shin (1998), an impulse response function measures the time profile of the effects of shocks at a given point in time on the (expected) future values of variables in a dynamic system. Over the last decade, as VAR models have grown in popularity, tracing the response of the system to an innovation in one of the variables and decomposing the forecast error variances, have become standard for the purpose of economic analysis of time series data.

c(i).Generalized Impulse Response Functions

Since the publication of Sims 1980 paper entitled "Macroeconomics and Reality", the dynamic analysis of VAR models has been implemented using the so-called Orthogonalised Impulse Response functions. To understand the mechanisms behind the generation of impulse response functions return to equation six (6). This as was previously stated, is the standard form of the two variable first order VAR model. In the multivariate form, the standard VAR model can be written in the form:

$$x_t = A_0 + \sum_{p=1}^{m} A_p x_{t-p} + e_t \tag{8}$$

where:

x_t = an (n×1) vector containing each of the n variables included in the VAR, and x_{t-p} its p lagged value

A_0 = an (n×1) vector of intercept terms

A_p = an (n×n) matrix of coefficients

e_t = an (n×1) vector of error terms

By successive substituting on the right hand side of equation seven, the moving average representation of the data, can be obtained, this is:

$$x_t = \mu + \sum_{p=0}^{\infty} B_p \varepsilon_{t-p} \tag{9}$$

This transformation, expresses x_t as a linear combination of current and past one-step ahead forecast errors or innovations. The *i,jth* component of the matrix of coefficients, B_p shows the response of the *ith* markets in *p* periods after a unit random shock in the *jth* market and none in the other markets. However, it is important to note that in this model, the innovations are contemporaneously correlated, therefore they cannot be identified as independent shocks, coming from a single market, but rather, as a combination of many shocks. In order to observe the distinct response patterns that the VAR system may display, the error terms need to be transformed, by a procedure known as the Choleski decomposition. In this decomposition, a lower triangular matrix, for example V, is chosen, and then the orthogonalised innovations u from $\varepsilon = Vu$ are obtained. Note that $VV' = S$ where $S = E\varepsilon\varepsilon'$. With this transformation, equation nine, can be rewritten as

$$x_t = \mu + \sum_{p=0}^{\infty} B_p V u_{t-p} \tag{10}$$

therefore:

$$x_t = \mu + \sum_{p=0}^{\infty} \phi_p u_{t-p} \tag{11}$$

where ϕ_p is equal to $B_p V$, and is said to be the matrix of orthogonalised impulse responses. Therefore, now the *i,jth* component of ϕ_p represents the impulse response of the *ith* market in *p* periods to a shock of one standard error in the *jth* market.

In their seminal work Pesaran and Shin (1998) showed that the orthogonalised impulse response functions, are sensitive to the ordering of the variables in the VAR. The authors by decomposing the VAR model into an infinite moving average model show that for orthogonalised impulse response functions, the hypothesized vector of shocks is central to the properties of the impulse response function because the orthogonalised impulse response functions "..are not unique, they depend on the way the shocks in the underlying VAR model are orthogonalised and the results can also be influenced significantly by the order of entry of the variables or equations in the VAR model, which itself is a further reflection of the non-uniqueness problem". Pesaran and Shin (1998) therefore proposed an alternative called the Generalized Impulse Response function, which is invariant to the reordering of the variables in the VAR, and this function was used to analyze the data in this paper.

c(ii). Generalized Variance Decompositions

Another way to analyze the short-run dynamics of the VAR system, is the forecast error variance decomposition. The forecast error variance decomposition, tells the proportion of the movement in a sequence due to its own shocks versus shocks to the other variables. If for example, in the VAR system represented by equations 1 and 2, ε_{yt} shocks explain none of the forecast error variance of z_t at all the forecast horizons, then z_t is exogenous. It is important to note that the same limitations, which apply to the orthogonalised impulse response functions, also apply to the forecast variance decompositions namely the Choleski decomposition, which determines to a large extent the output of the variance decomposition procedure. As a result, Pesaran and Shin (1998) proposed the use of Generalised Forecast Error Variance Decompositions, which are insensitive to the ordering of the variables in the VAR model. This technique was therefore used in this study.

SECTION V: RESULTS ANALYSIS AND POLICY IMPLICATIONS

Following the work of Civcir and Parikh (1995), the relationship between the Central Bank's foreign exchange reserves and the explanatory variables was analyzed using a dynamic system. Due to the data limitations, the number of variables which could be utilized in each VAR model was reduced. Consequently, the optimal model chosen for each country was based on evidence of cointegration, and a valid error-correction model.
Prior to conducting the regression analysis, all of the variables for the various countries were tested for stationarity using the Augmented Dickey Fuller (ADF) and Philips Perron (PP) tests. The results showed that with only a few exceptions, most of the variables were integrated of order 1 (See Appendix 1: Tables 2 to 5).

Next the various models were tested for cointegration using the Johansen Co-integration Test. The number of cointegrating vectors (r) chosen was based on both the trace and maximum eigenvalue test[4]. Appendix 1, Tables 6 through 9 shows the chosen co-integration relationship for each country. The cointegration tests showed that for three of the countries there was only one cointegrating vector present in the system. The sole exception was Trinidad and Tobago, which exhibited two cointegration relationships. Hence the decision was made to normalize on the domestic credit variable as well[5].

Once co-integration was found to exist in the VAR, the error-correction models were constructed (See Appendix 1: Tables 11 to 14). The results for the final models showed, that the error correction coefficients were negative and significant. The results of the impulse response functions and the forecast variance decompositions are displayed in Appendix 2: Graphs 2 to 5.

The test conducted for four (4) of the main economies in Caricom revealed several important implications for monetary policy in the Caribbean. Firstly, for three of the four countries tested (The Bahamas, Barbados and Jamaica) there appeared to be a positive and significant relationship between the growth in credit and the expansion in net reserves in both the long-run and the short-run (See Appendix 1: Table 10). It is also important to note that although the long-run coefficient for domestic credit was negative for Trinidad and Tobago, it was not significant. One explanation cited for the positive correlation relates to the fact that total domestic credit as opposed to Central Bank credit was used in the regression. Authors such as Looney (1991) and Leon (1987), used the domestic component of the monetary base in their calculations, however from a Central Bank perspective, the main variable of interest is the total level of credit in the economy, since a reduction in Central Bank credit to Government will not for example, negate the public sector's ability to borrow from other domestic entities. Consequently, the results tend to support Worrel's (1996) analysis of the efficiency of monetary policy in the

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[4] For a full discussion of the Trace and Eigen Value Cointegration tests, see Verbeek (2000) p 295 – 297.

[5] This normalization, tested for the endogeneity of the domestic credit variable, however, the error correction term (not shown) was not significant, indicating that the short-run domestic credit model was not correct.

Caribbean. In the paper, the author posited that the banking system will extend credit up to the limits of its reserves to all credit worthy customers in order to increase profits and market share. Hence, banks have no natural incentive to change their interest rates in order to affect the demand for credit. Moreover, the potential for Central Banks to affect banks lending patterns is severely limited unless harsh adjustment measures such as sharp increases in interest rates or credit ceilings are introduced. The overall effect of the interest rate increases would also have spillover costs such as declines in output, investment, consumption and savings. This finding therefore implies indicates that in the long-run, Central Banks' attempts to restrain or even retard credit would negatively impact the ability of the countries to earn foreign exchange.

Further, it is interesting to note that the short-run dynamics indicated that shocks to the credit equation have in general, with the exception of the Bahamas, a negative effect on net reserve levels but the variance decomposition results revealed that changes in credit have only a small effect on reserves when compared to other macroeconomic variables[6].

Interestingly, the results indicated that a negative relationship existed between output and net reserves in the long-run for all of the countries except Jamaica. This outcome appeared contrary to the expected monetarist predictions; however, Bourne (1989)[7], indicated, that the negative relationship is not necessarily inconsistent, if the model is a sub-system of a more general model which includes both Keynesian and monetarist features. Moreover, Bourne also stated in his study that the reason for the negative GDP coefficient for Barbados was due to the fact that the positive Keynesian expenditure effect could be dominating the negative money demand effect, which could also be the case for The Bahamas. It is also important to note that in the short-run, changes in GDP had a positive effect on net reserves[8], while the short-run impulse responses indicated that GDP growth had a general positive effect on reserves, (with The Bahamas being the sole

[6] Note, as Pearson and Shin (1998) explained, because of the non-zero co-variance between the original (non-orthogonalised) shocks, in general, the sum of the variance decompositions will not equal 1.
[7] Borne's analysis was based on the findings of Frenkel, Gylfason and Helliwell (1980)
[8] The change in GDP variable was eliminated from the final specification of the short-run model for The Bahamas.

exception). Moreover, the variance decomposition results showed that GDP was significant in explaining reserve changes.

The negative relationship between the money supply and net reserves, noted in both the long-run and short-run for Jamaica, and the in the long-run for The Bahamas and Trinidad and Tobago, perhaps demonstrates the conclusion noted by Bourne (1989), who summarized that "if the nominal money stock increases faster than warranted by real economic growth, then the domestic price level will rise and the balance of payments will deteriorate, as revealed by either foreign reserves losses or foreign exchange rate depreciation". The short-run dynamics model showed that in general shocks to the money supply exhibited a positive effect on reserves for The Bahamas, Jamaica and Trinidad and Tobago, while in all three cases changes in the money supply explained a significant share of net reserves' forecast error variance.

Most of the country specific variables as well as the openness variables had the *a priori* signs in the long-run. The sole exception was observed for the openness variable for Jamaica, which indicated a negative relationship between the net reserves and the ratio of exports to GDP. The result could be linked to the fact that during the period of analysis the growth in exports was associated with a rise in imports; an ordinary least square regression for the period 1976 to 2003 revealed that in Jamaica, a 1% expansion in exports was occasioned by a 1.1% rise in imports. This development resulted in a deterioration in the trade deficit, and most likely explains the negative sign obtained for the exports to GDP variable. The sign of the variable remained negative in the short-run, however, the impulse response dynamics showed that overtime the net effect of an expansion in this variable would be an increase in net reserves.

Another interesting result was seen in the relationship between government's fiscal deficit and net reserves for Barbados. The coefficient indicated that an improvement in the deficit or an expansion in the surplus will lead to an expansion in reserves, a result consistent with the findings of Coppin (1991). In addition, Dalrymple (1996) noted that one of the reasons for the deterioration of Barbados foreign reserves during the 1980s and

1990 was due to the large fiscal deficits incurred by government and the Central Banks financing of the deficits, which contributed to the rise in credit and import demand. Moreover, Jordan, Skeete and Coppin (2005) found that an expansion in the fiscal deficit/GDP ratio for Barbados was a key indicator of an impending balance of payments crisis for that country. However, the results also showed that in the short-run an expansionary fiscal deficit had a positive impact on reserves but as the impulse response function revealed this impact turned negative within a few years.

SECTION VI: CONCLUSION

This study sought to use a variety of econometric techniques to examine the link between net reserves and domestic credit for the major economies in the Caribbean in both the long-run and short-run.

Based on the study conduced, indications are that credit growth in the banking system will positively impact reserves and hence measures undertaken by Central Banks to restrain credit in the long-term will most likely have a detrimental impact on reserve levels. Moreover, Central Banks should seek to monitor growth in the money supply to ensure that it is sustainable. Finally, Central Banks should maintain in the long-run monetary policies which encourage economic growth, especially in the productive sector. The monetary authorities can accomplish this through setting so-called "economically neutral" interest rates or having clearly defined and transparent monetary policy rules which are disclosed to the public. Indeed, the findings of this work are similar to the conclusions provided by Worrel, who indicated that for small open economies, monetary instruments will only be effective if they are used in appropriate circumstances for limited objectives and any sharp changes in monetary policy should only be applied for a few months.

APPENDIX TABLES & GRAPHS

APPENDIX 1

Table 1 Variable Names and Expected Signs		
Foreign Exchange Reserves (NETREVS) – Endogenous Variable		
Exogenous Variables	**Regressors**	**Expected Signs**
Domestic Credit	DOMCRE	Negative (-)
Nominal GDP	NOMGDP	Positive (+)
Government Deficit*	DEFICIT	Positive (+)
Central Bank Discount Rate	CBRATE	Positive (+)
Tourism Index	TOURISTS	Positive (+)
Export to GDP Ratio	EXPGDP	Positive (+)
Imports to GDP	IMPGDP	Negative (-)
Quasi-Money	QSMONEY	Positive (+)
Savings Rate	SAVRATE	Positive (+)

* The rational for assuming the relationship is positive for reserves related to the fact a contraction in the fiscal deficit or an expansion the surplus is expected to lead to an increase in reserves.

Table 2
Results of the ADF Tests for Presence of Unit Root
THE BAHAMAS

Variables	Intercept but not a Trend	Intercept and a Linear Trend
LTOURISTS	-0.40973	-1.9343
LNETREVS	-1.8528	-3.2658
LOILGDP	-0.8333	-1.8083
LNOMGDP	-2.4178	-2.4270
LTDOMCRE	0.35009	-2.2124
LQSMONEY	-0.32141	-2.9844
DLTOURISTS	-3.6699*	-3.6007
DLNETREVS	-4.3502*	-4.3577*
DLOILGDP	-2.7831^{+}	-2.6767^{+}
DLNOMGDP	-2.5032^{+}	-2.8122^{+}
DLTDOMCRE	-5.4544*	-5.1675*
DLQSMONEY	-3.6712*	-3.5278

- * Indicates significance at 5% critical value, i.e. series is I(0)
- + Indicates that ADF test results showed series was I(1); however, results of a Philips Perron test , which are available from the authors showed that the series was I(0)

Table 3 Results of the ADF Tests for Presence of Unit Root BARBADOS		
Variables	**Intercept but not a Trend**	**Intercept and a Linear Trend**
LNETREVS	-1.5039	-0.8751
LTOURISTS	-1.5634	-2.9544
LNOMGDP	-2.9575	-2.0069
LEXPGDP	-2.9575	-2.0069
DEFICIT	-2.0571	-2.1675
LTDOMCRE	-2.6160	-1.2430
DLNETREVS	-6.2395*	-8.9012*
DLTOURISTS	-4.4373*	-4.5114*
DLNOMGDP	-3.0374*	-4.3821*
DLEXPGDP	-3.0374*	-4.3821*
DDEFICIT	-6.2946*	-6.2240*
DLTDOMCRE	-2.9493	-3.8965*

- * Indicates significance at 5% critical value, i.e. series is I(0)
- + Indicates that ADF test results showed series was I(1); however, results of a Philips Perron test , which are available from the authors showed that the series was I(0)

Table 4
Results of the ADF Tests for Presence of Unit Root
JAMAICA

Variables	Intercept but not a Trend	Intercept and a Linear Trend
LNETREVS	-2.7817	-2.8353
LEXPGDP	-1.9572	-3.1012
LTDOMCRE	-0.39995	-2.4763
LQSMONEY	-0.3197	-2.3714
LNOMGDP	-0.65651	-2.4685
DLNETREVS	-4.8058*	-4.7115*
DLEXPGDP	-5.0854*	-4.9694*
DLTDOMCRE	-3.3662*	-3.2323
DLQSMONEY	-2.4129^{+}	-2.3293^{+}
DLNOMGDP	-2.7729^{+}	-2.6972^{+}

- * Indicates significance at 5% critical value, i.e. series is I(0)
- + Indicates that ADF test results showed series was I(1); however, results of a Philips Perron test , which are available from the authors showed that the series was I(0)

Table 5
Results of the ADF Tests for Presence of Unit Root
TRINIDAD & TOBAGO

Variables	**Intercept but not a Trend**	**Intercept and a Linear Trend**
LNETREVS	-2.5045	-2.6236
LTDOMCRE	-1.9375	-2.9054
LEXPGDP	-2.2153	-2.9309
BRATE	-1.5288	-0.8273
LNOMGDP	-2.4868	-3.0387
LIMPGDP	-1.5236	-0.9680
DLNETREVS	-4.7062*	-4.7368*
DLTDOMCRE	-5.3882*	-5.3021*
DLEXPGDP	-5.2223*	-5.4780*
DBRATE	-3.3067*	-3.3572^{+}
DLNOMGDP	-2.4209^{+}	-2.6834^{+}
DLIMPGDP	-3.4348*	-3.5843^{+}

- * Indicates significance at 5% critical value, i.e. series is I(0)
- + Indicates that ADF test results showed series was I(1); however, results of a Philips Perron test , which are available from the authors showed that the series was I(0)

Table 6			
THE BAHAMAS CO-INTEGRATION TEST RESULTS			
Maximal Eigenvalue Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r = 1	38.6897*	29.95
r <= 1	r = 2	18.2789	23.92
Trace Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r >= 1	76.1922*	59.33
r <= 1	r >= 2	37.5024	39.81
* Indicates significance at 95% critical value			

Table 7			
BARBADOS CO-INTEGRATION TEST RESULTS			
Maximal Eigenvalue Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r = 1	60.2889*	29.95
r <= 1	r = 2	14.8852	23.92
Trace Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r >= 1	87.0771*	59.33
r <= 1	r >= 2	26.7882	39.81
* Indicates significance at 95% critical value			

Table 8 JAMAICA CO-INTEGRATION TEST RESULTS			
Maximal Eigenvalue Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r = 1	57.4643*	33.64
r <= 1	r = 2	26.8386	27.42
Trace Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r >= 1	111.4427*	70.49
r <= 1	r >= 2	53.9785*	48.88
* Indicates significance at 95% critical value			

Table 9 TRINIDAD & TOBAGO CO-INTEGRATION TEST RESULTS			
Maximal Eigenvalue Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r = 1	75.0577*	29.95
r <= 1	r = 2	40.7383*	23.92
r <= 2	r = 3	16.6086	17.68
Trace Test			
Null	Alternative	Statistics	95% Critical Value
r = 0	r >= 1	143.2997*	59.33
r <= 1	r >= 2	68.2420*	39.81
r <= 2	r >= 3	27.5037*	24.05
* Indicates significance at 95% critical value			

Table 10 LONG RUN RESULTS*

The Bahamas

Eq. (11)

$$LNETREVS = -0.47219 LOILGDP - 0.024123 LNOMGDP + 4.7549 LTDOMCRE - 5.6430 LQSMONEY$$

(0.16425) (0.060241) (0.51892) (0.57099)

Barbados

Eq. (12)

$$LNETREVS = 0.89471 LTOURISTS - 4.9978 LNOMGDP + 0.003813 DEFICIT + 3.0813 LTDOMCRE$$

(0.2558) (1.0964) (0.0013) (0.8084)

Jamaica

Eq. (13)

$$LNETREVS = -4.44811 LEXPGDP + 2.9128 LTDOMCRE - 8.2678 LQSMONEY + 6.1225 LNOMGDP$$

(2.4418) (1.5918) (11.5343) (10.5025)

Trinidad & Tobago

Eq. (14)

$$LNETREVS = -0.73456 LTDOMCRE - 0.72986 LNOMGDP - 4.3309 LIMPGDP$$

(7.3768) (6.5982) (2.4333)

Eq (15)

$$LTDOMCRE = 0.11073 LNETREVS - 0.34510 LNOMGDP - 0.73978 LQSMONEY$$

(0.056925) (0.74539) (0.84496)

* Values in brackets represent the standard errors associated with the coefficients

Table 11 Results of Error Correction Model THE BAHAMAS		
Dependent Variable = DLNETREVS		
Regressor	**Coefficient**	**Probability**
DLOILGDP	-0.46182	0.132
DLTDOMCRE	-3.3199	0.007
DLQSMONEY	4.6919	0.003
DDLQSMONEY	1.4106	0.096
ECM (-1)	-0.0189	0.062

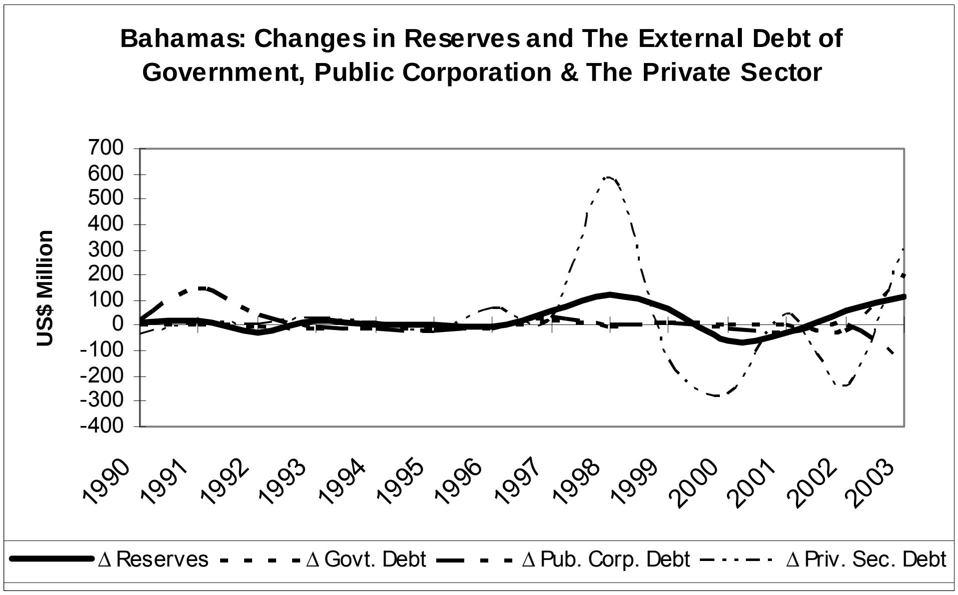
Table 12 Results of Error Correction Model BARBADOS		
Dependent Variable = DLNETREVS		
Regressor	**Coefficient**	**Probability**
DLTOURISTS	-1.1856	0.291
DLNOMGDP	0.6416	0.652
DDEFICIT	0.0022	0.845
DLTDOMCRE	0.4924	0.649
DDLTOURISTS	-0.9585	0.417
DDLNOMGDP	1.7878	0.247
DDDEFICIT	-0.0071	0.460
DDLTDOMCRE	-1.6963	0.142
DDLNETREVS	-0.3379	0.125
CONSTANT	2.0069	0.003
ECM (-1)	-0.1517	0.002

Table 13 Results of Error Correction Model JAMAICA		
Dependent Variable = DLNETREVS		
Regressor	**Coefficient**	**Probability**
DLEXPGDP	-9.1162	0.003
DLTDOMCRE	4.6257	0.086
DLQSMONEY	-8.6562	0.357
DLNOMGDP	7.6118	0.412
CONSTANT	-7.6757	0.002
ECM (-1)	-0.8743	0.005

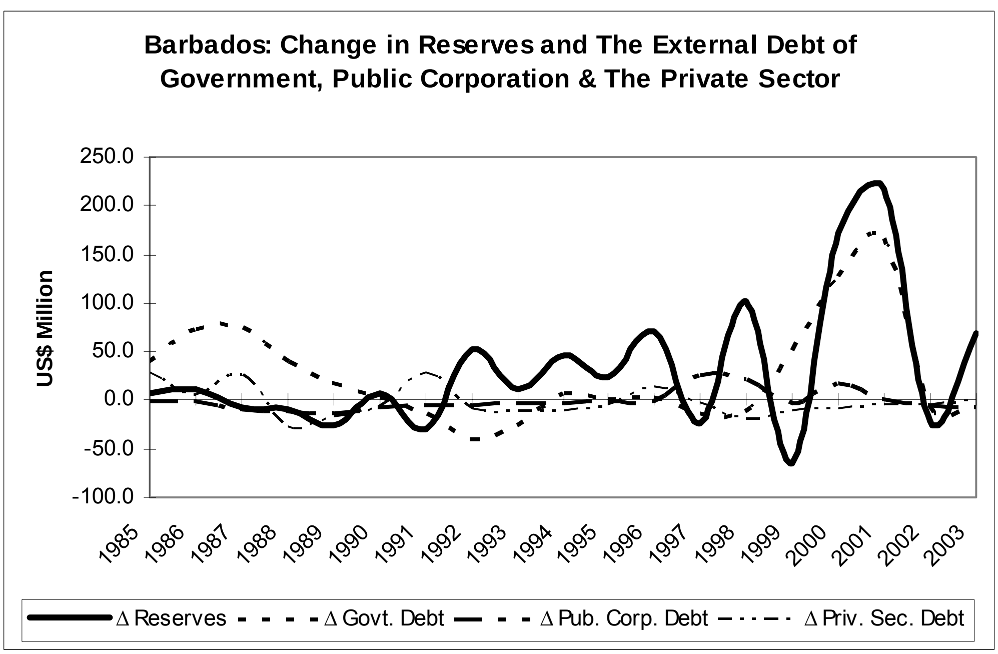
Table 14 Results of Error Correction Model TRINIDAD & TOBAGO		
Dependent Variable = DLNETREVS		
Regressor	**Coefficient**	**Probability**
DLTDOMCRE	0.4849	0.591
DLNOMGDP	9.9329	0.168
DLIMPGDP	-3.9329	0.064
CONSTANT	0.6877	0.468
ECM (-1)	-0.3749	0.063

APPENDIX 2

Graph 1(a)



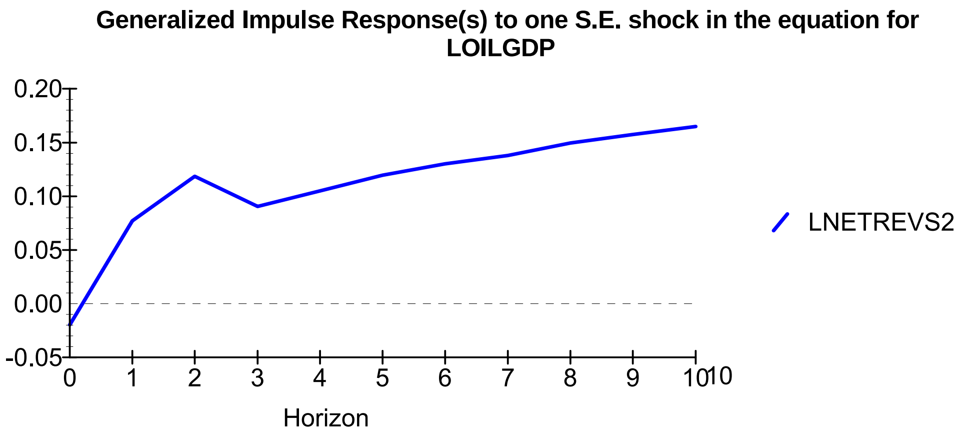
Graph 1(b)



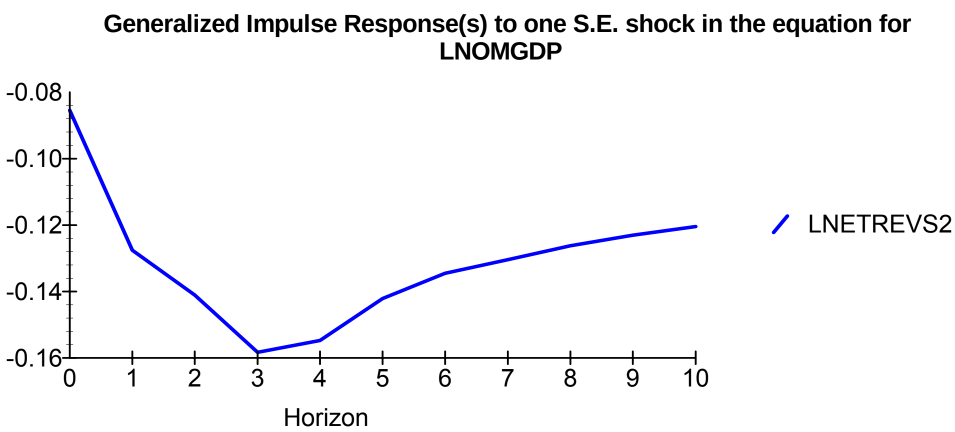
Graph 2

The Bahamas Generalized Impulse Response(s)

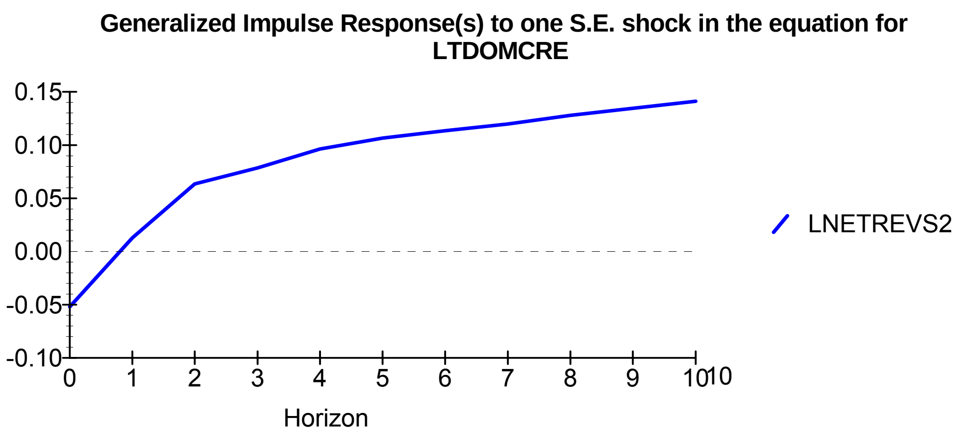
2(a)



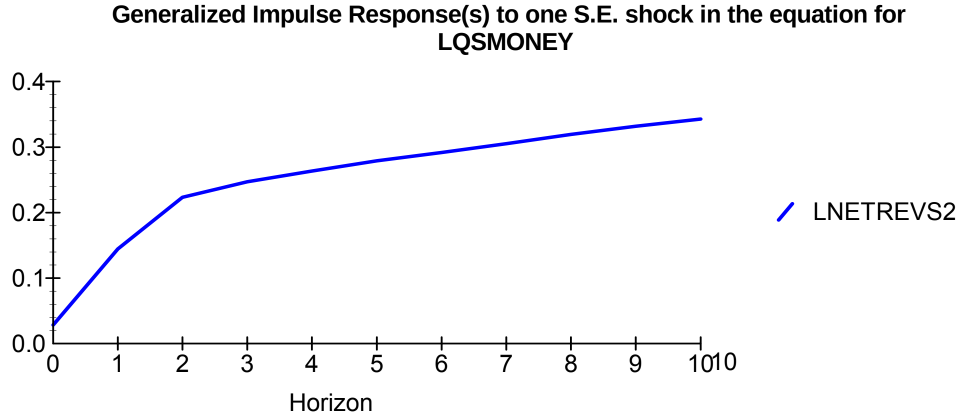
2(b)



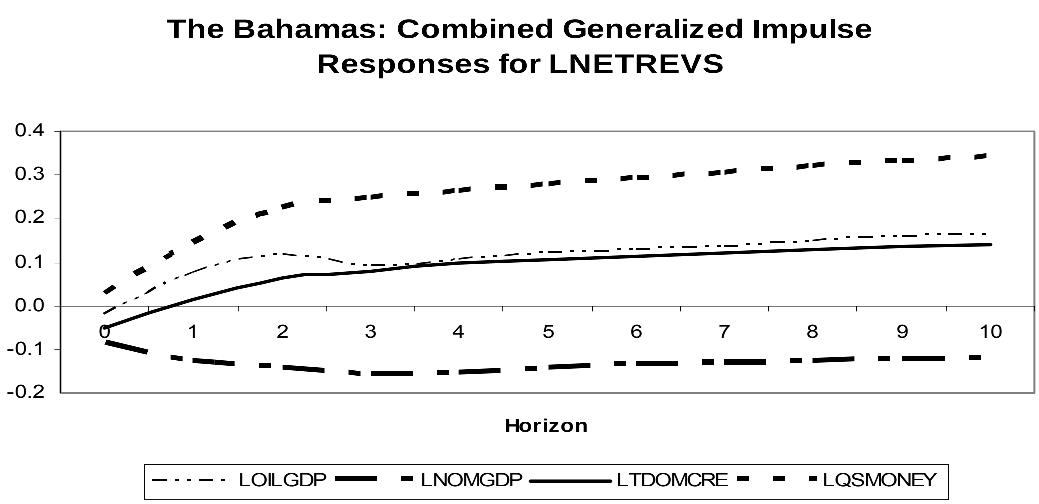
2(c)



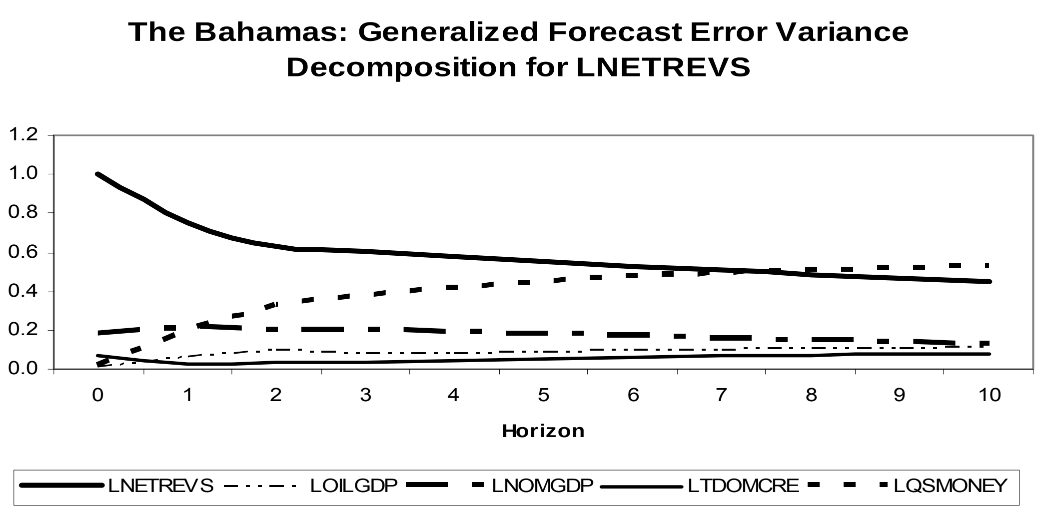
2(d)


Generalized Impulse Response(s) to one S.E. shock in the equation for LQSMONEY
0.4
0.3
0.2
0.1
0.0
0 1 2 3 4 5 6 7 8 9 10 10
Horizon
LNETREVS2

2(e)


The Bahamas: Combined Generalized Impulse Responses for LNETREVS
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
0 1 2 3 4 5 6 7 8 9 10
Horizon
LOILGDP
LNOMGDP
LTDOMCRE
LQSMONEY

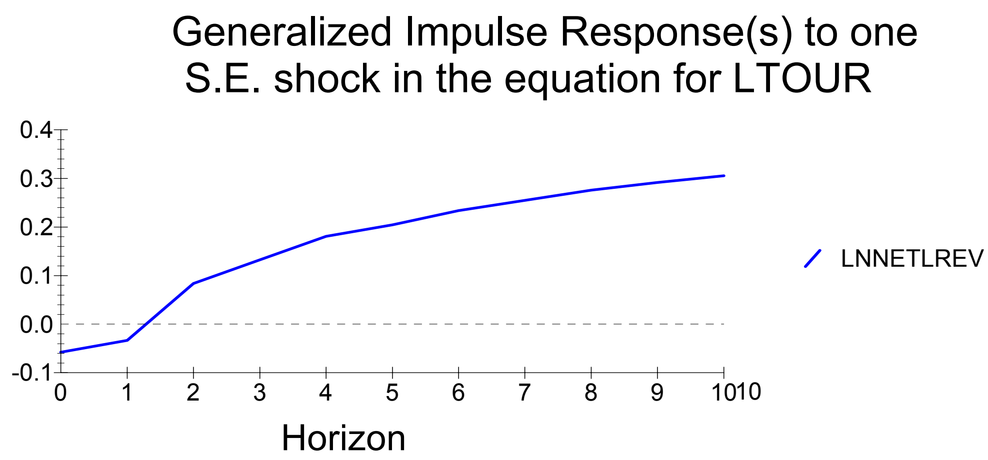
2(f)


The Bahamas: Generalized Forecast Error Variance Decomposition for LNETREVS
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0 1 2 3 4 5 6 7 8 9 10
Horizon
LNETREVS
LOILGDP
LNOMGDP
LTDOMCRE
LQSMONEY

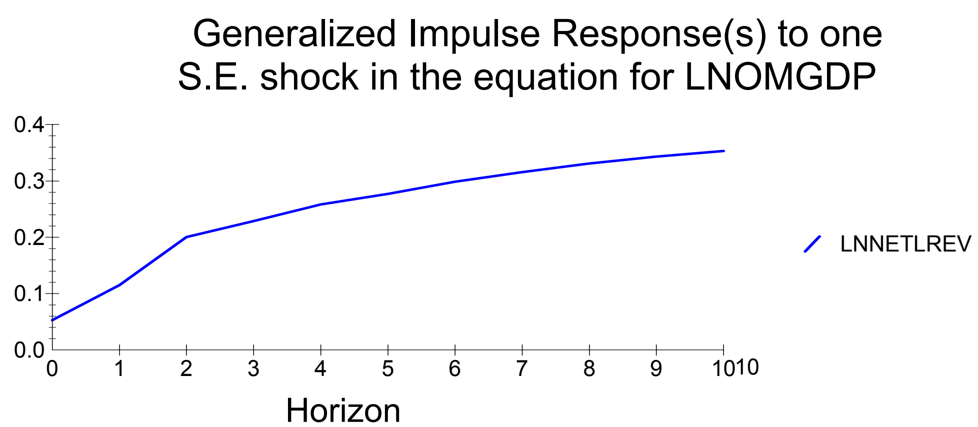
Graph 3

Barbados Generalized Impulse Response(s)

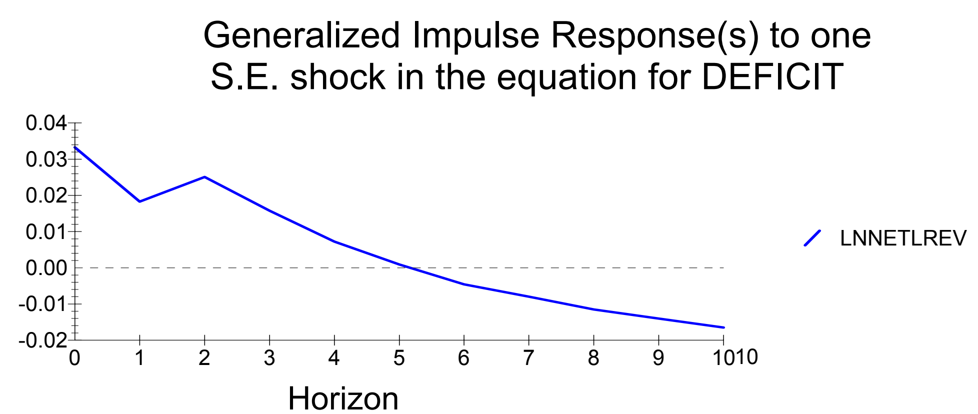
3(a)



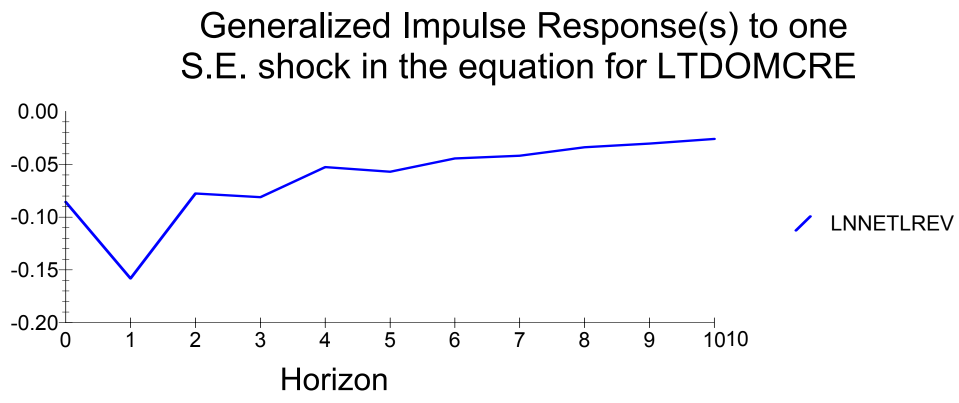
3(b)



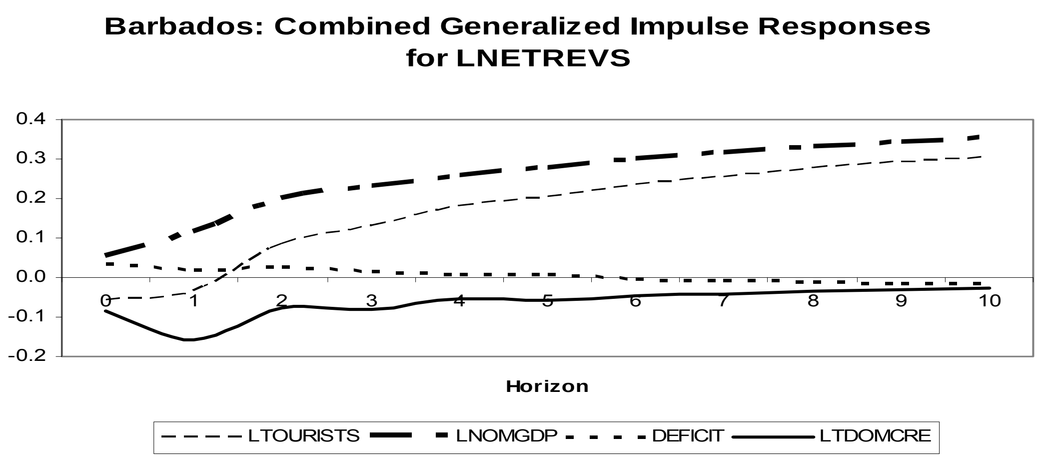
3(c)



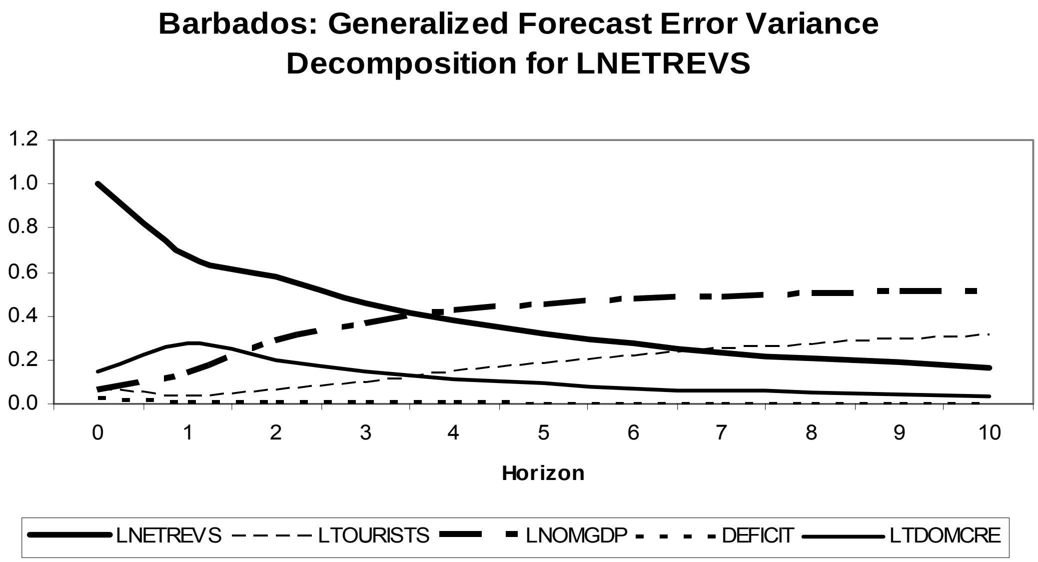
3(d)


Generalized Impulse Response(s) to one
S.E. shock in the equation for LTDOMCRE
0.00
-0.05
-0.10
-0.15
-0.20
0
1
2
3
4
5
6
7
8
9
1010
Horizon
LNNETLREV

3(e)


Barbados: Combined Generalized Impulse Responses
for LNETREVS
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
0
1
2
3
4
5
6
7
8
9
10
Horizon
LTOURISTS
LNOMGDP
DEFICIT
LTDOMCRE

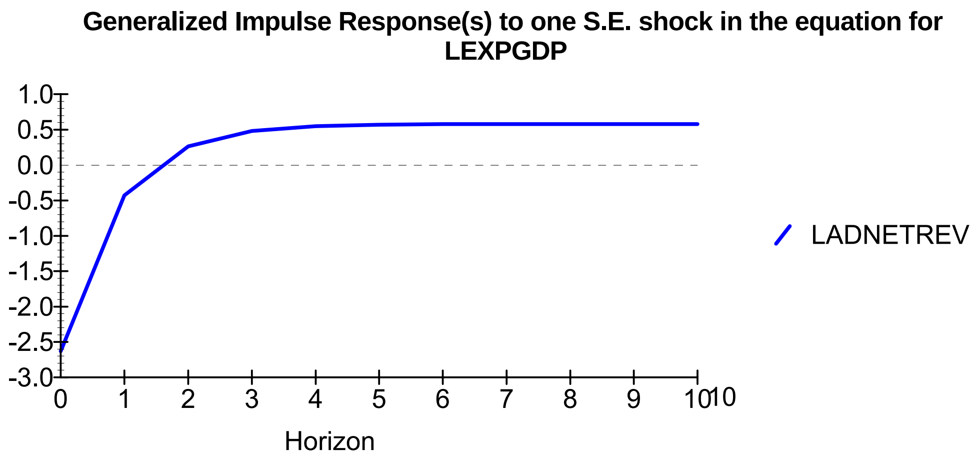
3(f)


Barbados: Generalized Forecast Error Variance
Decomposition for LNETREVS
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
7
8
9
10
Horizon
LNETREVS
LTOURISTS
LNOMGDP
DEFICIT
LTDOMCRE

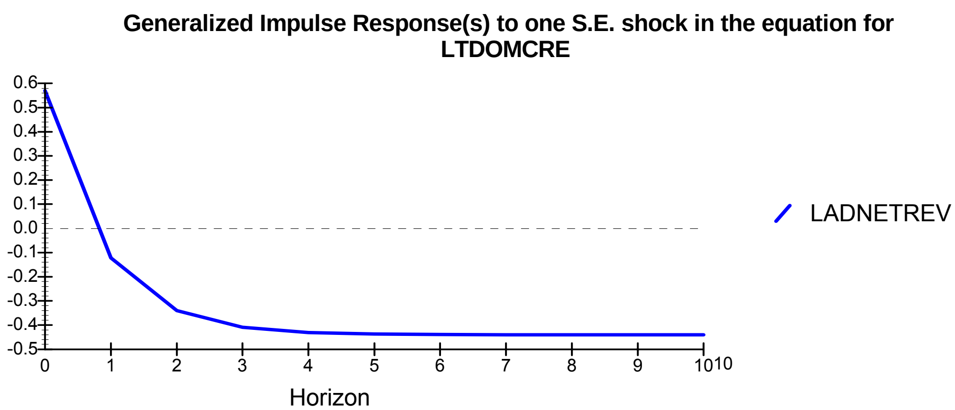
Graph 4

Jamaica Generalized Impulse Response(s)

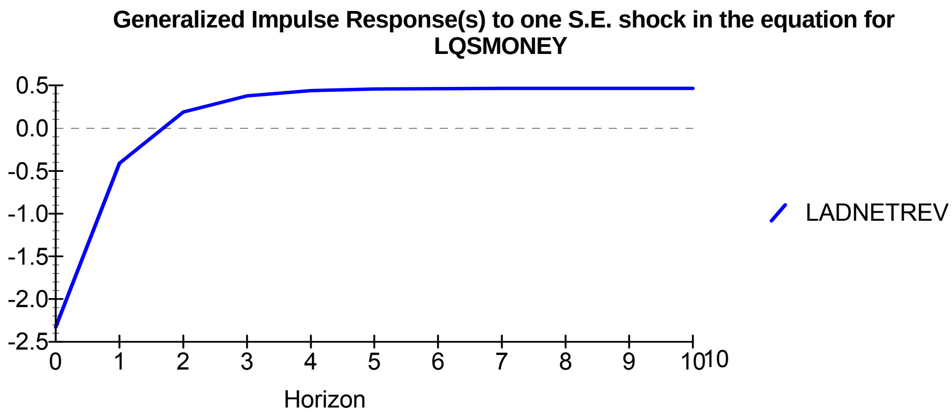
4(a)



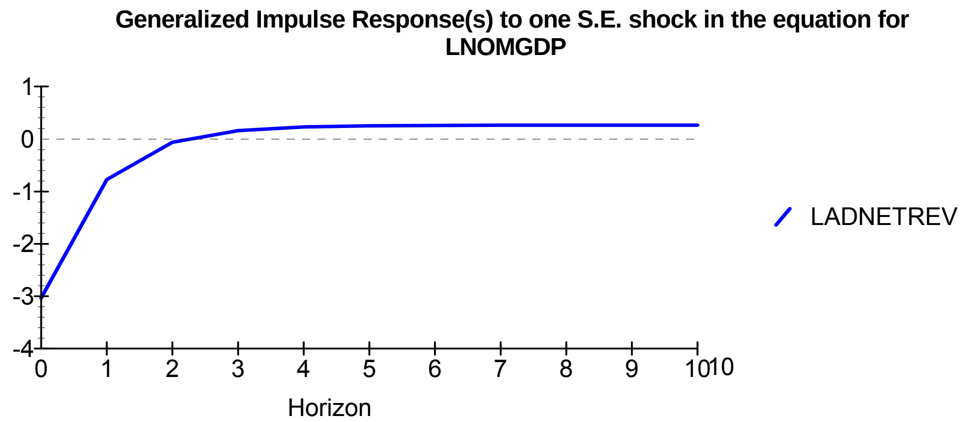
4(b)



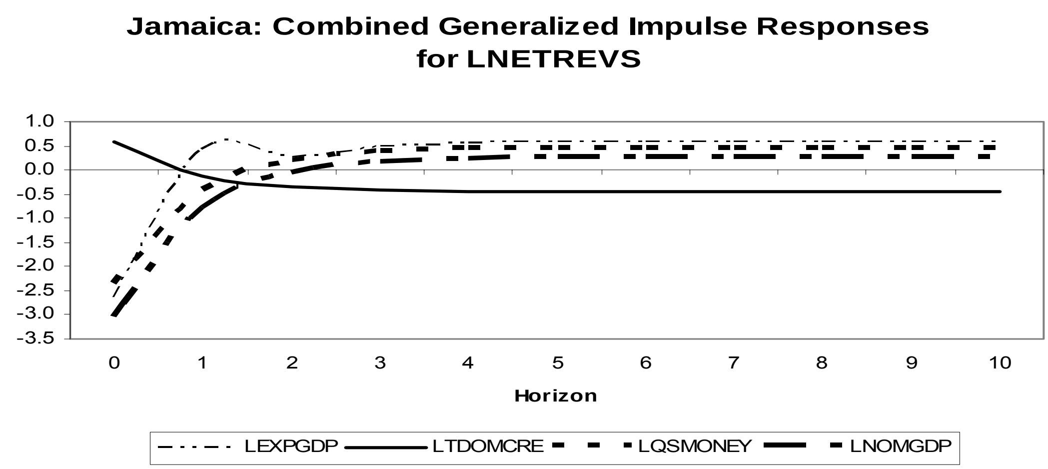
4(c)



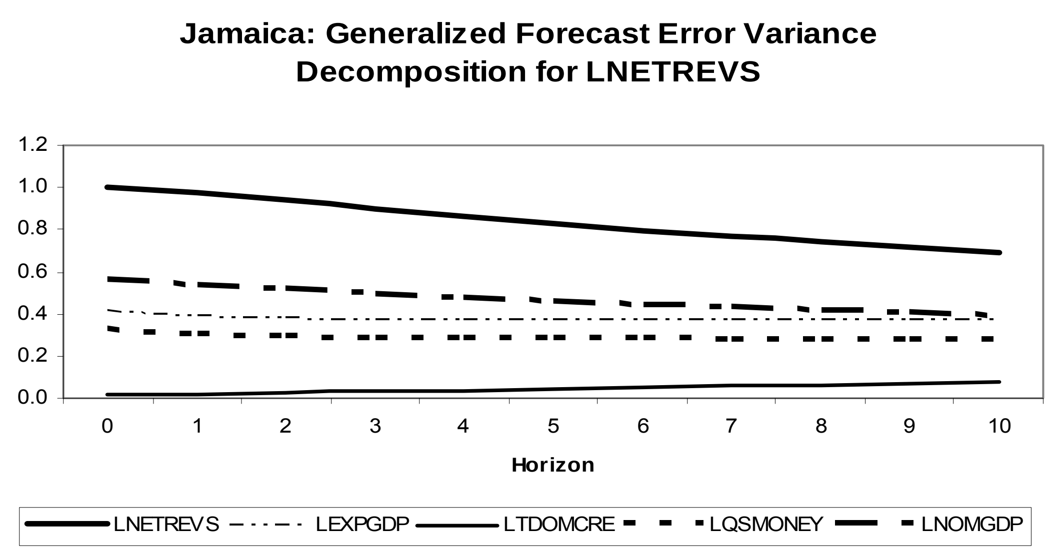
4(d)


Generalized Impulse Response(s) to one S.E. shock in the equation for LNOMGDP
1
0
-1
-2
-3
-4
0
1
2
3
4
5
6
7
8
9
1010
Horizon
LADNETREV

4(e)


Jamaica: Combined Generalized Impulse Responses for LNETREVS
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
0
1
2
3
4
5
6
7
8
9
10
Horizon
LEXPGDP
LTDOMCRE
LQSMONEY
LNOMGDP

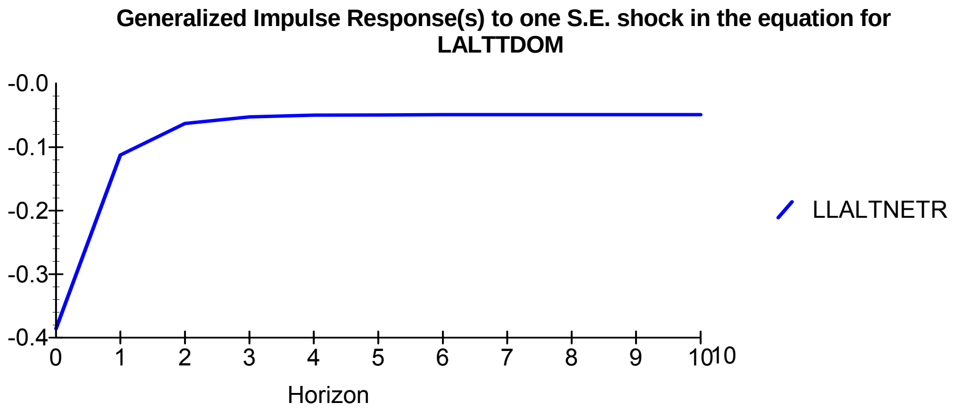
4(f)


Jamaica: Generalized Forecast Error Variance Decomposition for LNETREVS
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0
1
2
3
4
5
6
7
8
9
10
Horizon
LNETREVS
LEXPGDP
LTDOMCRE
LQSMONEY
LNOMGDP

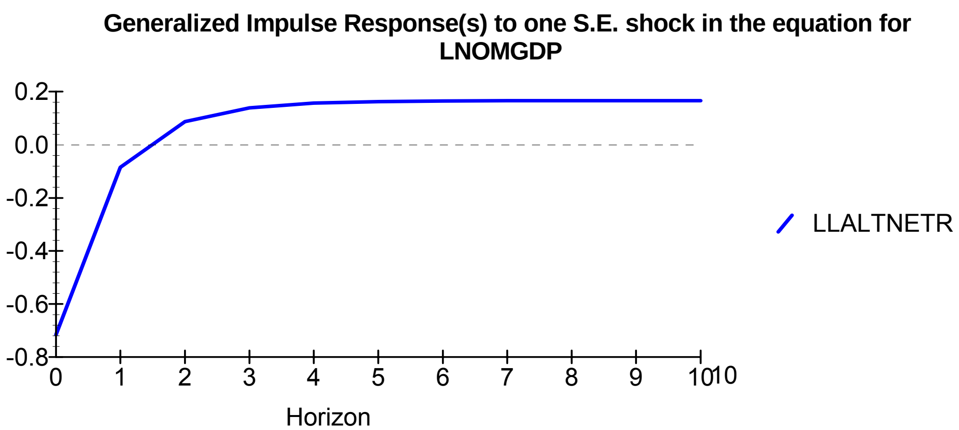
Graph 5

Trinidad & Tobago Generalized Impulse Response(s)

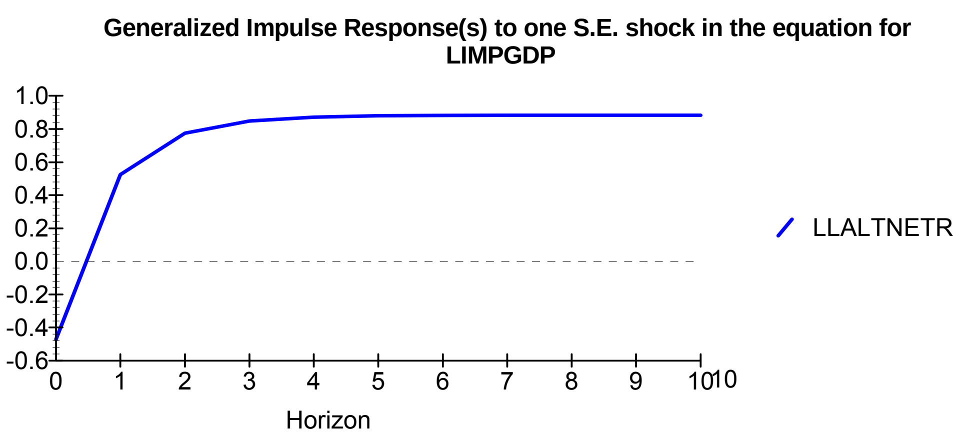
5(a)



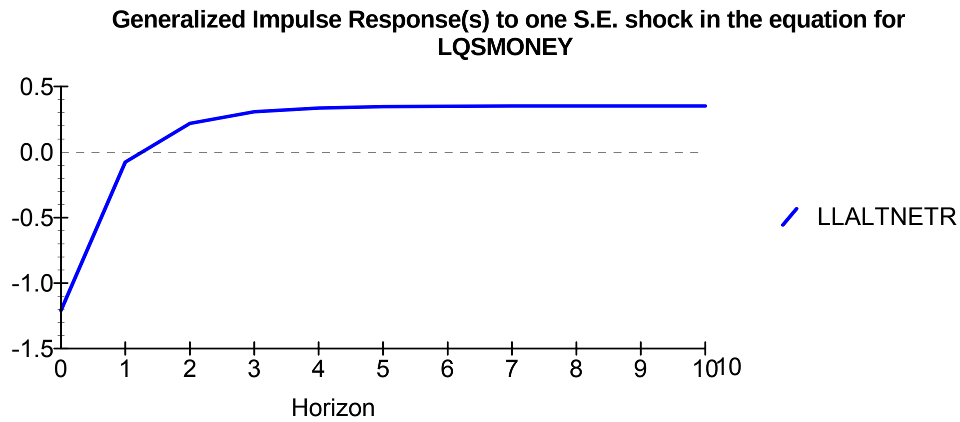
5(b)



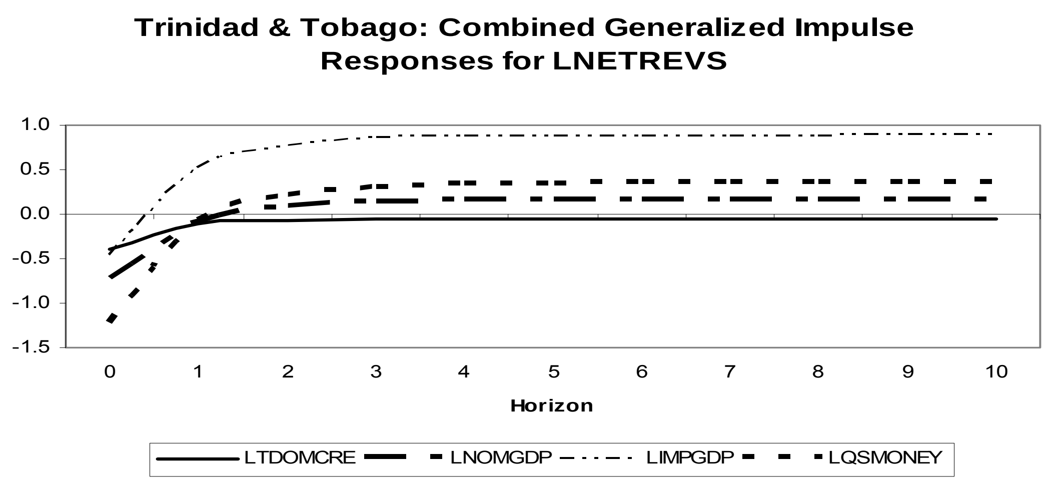
5(c)



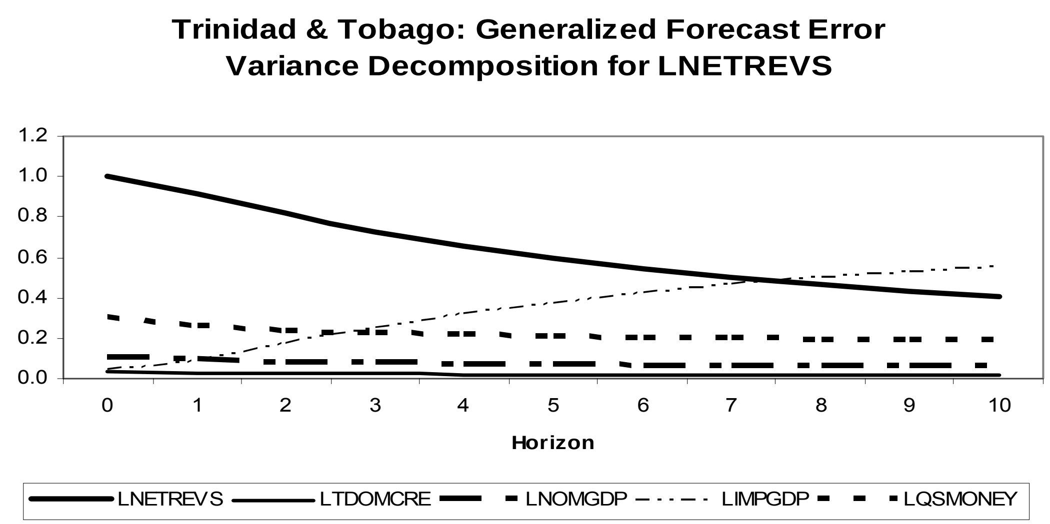
5(d)


Generalized Impulse Response(s) to one S.E. shock in the equation for LQSMONEY
0.5
0.0
-0.5
-1.0
-1.5
0 1 2 3 4 5 6 7 8 9 10 10
Horizon
LLALTNETR

5(e)


Trinidad & Tobago: Combined Generalized Impulse Responses for LNETREVS
1.0
0.5
0.0
-0.5
-1.0
-1.5
0 1 2 3 4 5 6 7 8 9 10
Horizon
LTDOMCRE
LNOMGDP
LIMPGDP
LQSMONEY

5(f)


Trinidad & Tobago: Generalized Forecast Error Variance Decomposition for LNETREVS
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0 1 2 3 4 5 6 7 8 9 10
Horizon
LNETREVS
LTDOMCRE
LNOMGDP
LIMPGDP
LQSMONEY

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