



## Exploring the Link between Fiscal Policy and Inflation in Jamaica

Working Paper

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Abstract

The relationship between budget deficits and inflation remains one of the most widely debated topics among economists, central bankers and policy makers in both developed and developing countries. Several theorists have argued over the years that inflation is a monetary phenomenon and as such fiscal policy plays a weak role in determining inflation. On the other hand, other theorists argued that fiscal policy affects inflation via its ability to stimulate money supply and aggregate demand. This paper seeks to investigate the importance of fiscal policy (via the fiscal balance) in inflation determination in Jamaica. The paper which employs an auto-regressive distributed lag (ARDL) model finds that there is a positive relationship between the fiscal deficit and inflation in Jamaica, both in the short and long run. The paper also finds that this link occurs indirectly via the fiscal deficit impact on money supply.

**JEL Classification:** H62 E62 and D50

**Keywords:** Fiscal Deficit, Inflation, Auto Regressive Distributive Lag Model

\*The views expressed in this paper are not necessarily those of the Bank of Jamaica.

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## **I. Introduction**

The connection between budget balance and inflation has been explored extensively for emerging market and developed economies, often with mixed or contending results. Researchers have argued that high inflation materializes when governments incur large and persistent deficits, financed through money creation, suggesting that inflation is a fiscal driven monetary phenomenon (Lozano, 2008). Some countries with high inflation, especially developing nations, have large budget deficits, which suggest a link between budget deficits and inflation. Yet, for developed countries with comparatively low inflation, there is little evidence of a relationship between deficit spending and inflation.

Exploring this relationship becomes even more critical in a context where the Bank of Jamaica (BOJ) is moving towards inflation targeting (IT), in an effort to manage inflation expectations and achieve low and sustainable inflation (Gordon, 2010). The BOJ signalled its intention back in 2010 to fully implement an IT regime. The view is that an inflation-targeting regime will enable the Bank to respond to changes in the probability of vast swings in future inflation, by adjusting the policy rate. Jamaica's current agreement with the International Monetary Fund requires the BOJ to fully implement an IT framework by March 2017. It has been argued by some researchers that "fiscal dominance, in conjunction with heavy reliance on seigniorage, the lack of capital market depth and the fragility of the banking system, have all hampered the ability of central banks to conduct an independent monetary policy and achieve low inflation" (Jahan, 2012). This is in a context where inflation targeting requires the monetary authorities to pursue an independent monetary policy and establish a quantitative framework that links monetary policy instruments to inflation (Jahan, 2012). As a consequence, the conduct of monetary policy under an IT framework should not be dictated to or constrained by public sector borrowing from the central bank and additionally, it requires that domestic financial markets have enough depth to absorb placements of public debt instruments (Douglas, 2004). As Jamaica advances towards the adoption of an inflation-targeting regime, this paper seeks to explore and identify the link between fiscal policy (via fiscal deficits) and monetary policy (via inflation and money supply growth) and as such aid the IT process. Of note, this paper does not intend to determine the causes of inflation in Jamaica but it seeks to explore the relationship between fiscal deficit and inflation in Jamaica.

## II. Literature Review

There are two key theories that identify the link between budget deficit and inflation. The Monetarists theory which states the government budget deficit affects money supply and inflation through the financing methods. It further states that government budget deficits are inflationary because they lead to higher money growth. “This occurs when the government spends more than it takes in as revenue, and finances the deficit by borrowing in the private marketplace (selling government securities)” Hein (1981). “The increased demand for credit in financial markets, if not offset by a reduction in credit demand elsewhere or an increase in credit supply, naturally puts upward pressure on all market interest rates”. Supporters of this view argue that the monetary authorities may then attempt to prevent the rise in interest rates from taking place. To do this, the monetary authorities will buy government securities, thus monetizing part of the public debt by increasing the level of reserves Hein (1981). This will result in a larger money stock or high-powered money and, other things equal, a subsequently higher rate of inflation. Consequently, there is an indirect channel via the response of the monetary authorities to higher interest rates by which deficits can influence the inflation rate (Hein (1981) and Sill (2005)).

In the literature, a few studies that tested this theory found results that were largely consistent. Chang (1994) found that fiscal deficits caused slight inflation due to the issue of public bonds in Taiwan. In addition, Chaudhary and Ahmad (1995) found that domestic financing of the budget deficit, particularly from the banking system, was inflationary in the long run. Nachegea (2005) also found strong and statistically significant long-term relationships between budget deficits and money growth and between money creation and inflation. Vegh et al. (2002) classified a sample of 94 countries into high-inflation and low-inflation countries, and found that for high-inflation countries, a worsening fiscal balance was much more likely to be accompanied by an increase in seigniorage than is the case in low-inflation countries. They also found that fiscal deficits led to high inflation when the government depends on revenue from seigniorage to finance debt.<sup>1</sup> The results also suggest that for high-inflation countries, a 10 percentage point reduction in the fiscal

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<sup>1</sup> According to the Bank of Canada (2013), seigniorage is the revenue earned from the issue of money or the opportunity cost of base money, or a form of tax (inflation tax) levied on the holders of currency.

balance (i.e., deficit) as a fraction of GDP was associated with, on average, a 4.2 per cent increase in seigniorage. For low-inflation countries, there was no significant link between deficits and seigniorage. Also, when high-inflation countries experience episodes of low inflation, the link between deficits and inflation weakens dramatically (Vegh et al., 2002).

The second theory that supports the link between budget deficit and inflation, also called the 'strong-form of fiscal theory', as in Carlstrom and Fuerst (2000), was introduced by the work of (Leeper, 1991), (Sims, 1994) and (Woodford 1994 & 1995). The main message of the theory is that the price level is determined merely by fiscal variables i.e. government debt, present and future revenue and spending plans. In this regard, monetary factors play no role in price determination. Price levels adjust to ensure the government's inter-temporal budget constraint is met and the adjustment is driven by individuals' wealth effect (Ekanayake, 2012). Basically, the strong-form fiscal theory argues for non-Ricardian equivalence and as a result, when there is a fiscal deficit, individuals consider it to be increasing their wealth. This, in turn, raises aggregate demand thereby creating inflation and leaving no role for the monetary authority (Ekanayake, 2012). In contrast, the Ricardian equivalence hypothesis proposed by Barro (1989) postulates that an increase in budget deficit does not affect aggregate demand, interest rate or price level.

Ekanayake (2012) examined the link between fiscal deficits and inflation in Sri Lanka, through the use of ARDL model and found that a one percentage point increase in the ratio of fiscal deficit to narrow money was associated with an 11 percentage point increase in inflation. Cheah et al. (2011) found that there is a long-run relationship between the budget deficit and inflation in 13 Asian developing countries. Using quarterly data from 1990 and 2008, Samini and Sajad (2011) found that budget deficits have a positive and significant impact on inflation in Iran. Oladipo and Akinbobola (2011) studied the nature and direction of causality between the fiscal deficit and inflation in Nigeria. They found a strong unidirectional causality between fiscal deficits and inflation with the causality running from fiscal deficit to inflation at 5 per cent level of significance (Oladipo and Akinbobola, 2011). Metin (1998) also found that fiscal deficits have a positive impact on inflation in Turkey. Metin (1995) analyzed inflation in Turkey using a general framework of sectoral relationships and found that fiscal expansion was a determining factor for inflation and that excess demand for money affects inflation positively, but only in the short-run.

Ichihashi and Devapriya (2012) found that budget deficits and inflation have a positive relationship in Sri Lanka. In addition, they found that there was bi-directional causal structure between budget deficits and inflation in Sri Lanka. Using OLS methodology and the Keynesian model of price determination, the findings of Choudhary and Parai (1991) strongly suggested that the growth rates of money supply and budget deficits have a positive impact on inflation in Peru. Catao and Terrones (2003) investigated the relationship between fiscal deficit and inflation for 107 countries between 1960 and 2001, using ARDL approach. They found mixed results as their study suggested a strong positive relationship between the fiscal deficit and inflation among developing countries with high inflation but not in low inflation, advanced nations (Catao and Terrones, 2003). For example, their results showed that for developing countries a 1 per cent reduction in the ratio of the budget deficit to GDP lower inflation by 8.75 per cent. In contrast, they did not find any positive statistical relationship between deficit and inflation for advanced countries with low inflation (Catao and Terrones, 2003).

On the other hand, Imobighe (2012) found that fiscal deficits and credit to the Federal Government were not significant in explaining inflation in Nigeria. A similar conclusion was drawn by Hondroyiannis and Papapetrou (1994) who found no direct impact of the budget deficit on inflation in Greece. Barnhart and Darrat (1988) investigated the causal linkage between budget deficits and money growth in seven major OECD countries using multivariate Granger-causality tests combined with Akaike's AIC criterion. They found that a fiscal deficit does not Granger-cause positive long-run changes in money growth. Their results also suggest that monetary and fiscal policies are set independently in each of the OECD countries. Similarly, Protopapadakis and Siegel (1987) in a study of several developed economies found no relationship between fiscal deficit and money creation and inflation.

### **III. Inflation Targeting**

This section explores the concept of IT as a policy option for central banks. IT is a monetary policy strategy that is characterized by an announced numerical inflation target. The strategy is thought to bring a high degree of transparency and accountability (Svensson, 2010). In this framework, a central bank estimates and makes public a projected, or "target" inflation rate and then attempts to steer actual inflation toward that target, using such tools as interest rates (Jahan,

2012). The difference between the forecast and the target determines how much monetary policy has to be adjusted (Jahan, 2012).

A major advantage of IT is that “it combines elements of both “rules” and “discretion” in monetary policy” (Jahan, 2012).. This “constrained discretion” framework combines two distinct elements: a precise numerical target for inflation in the medium-term and a response to economic shocks in the short-term. Rather than focusing on achieving the target at all times, the approach emphasizes achieving the target over the medium-term, typically over a two to three-year horizon (Jahan, 2012). This allows policy to address other objectives, such as smoothing output over the short-term. Thus, IT provides a rule-like framework within which the central bank has the discretion to react to shocks. It requires a medium-term focus and as such policymakers need not feel compelled to do “whatever it takes” to meet targets on a period-by-period basis (Jahan, 2012).

IT requires two conditions – the first is that a central bank is able to conduct monetary policy with a great degree of independence (Jahan, 2012). No central bank can be entirely independent of government influence, but it must be free in choosing the instruments to achieve the desired rate of inflation. Fiscal policy considerations cannot dictate monetary policy (Jahan, 2012). Secondly, monetary policy independence under an IT framework also requires the absence of any firm commitment by the authorities to target the level or path of any other nominal variable such the level of employment and especially the exchange rate (Jahan, 2012). Consequently, in a context where the inflation target is the main policy objective, central banks are required to refrain from making strong commitments about the expected or desired level of the nominal exchange rate (Douglas, 2004). To adhere to these requirements, the reliance on seigniorage or monetizing of fiscal deficits should be low to non-existent. The extensive use of seigniorage is perhaps one of the most common indicators of fiscal dominance (Douglas, 2004).

#### **IV. Overview of Fiscal Policy Developments and Inflation**

Between 1993 and 2013, on average, Jamaica recorded a fiscal deficit of 3.9 per cent of GDP (see Figure 1). The country experienced fiscal surpluses for the first three years, however, recorded deficits thereafter which were attributed to a multitude of factors. The country’s fiscal

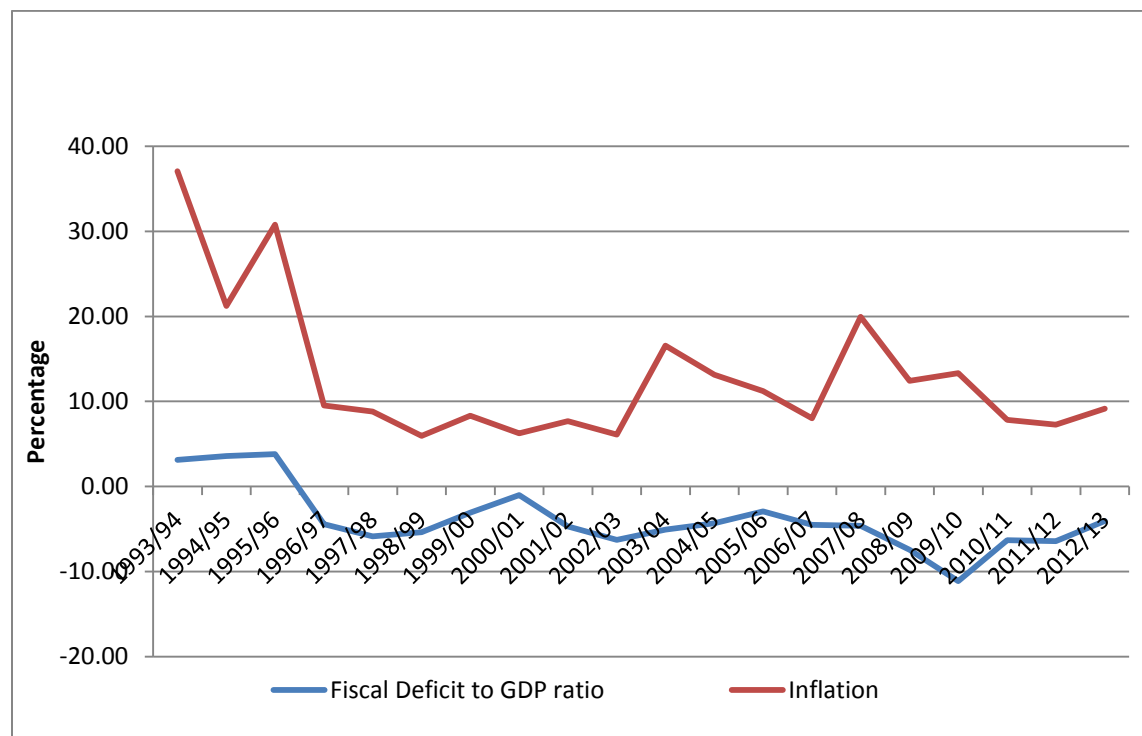
surpluses were largely due to robust economic growth experienced in the mid to late 1980's. During the late 1990's the country experienced a financial crisis, the cost of which was largely absorbed by the Government so as to reduce the adverse impact on the cost of financial crisis. Later in 2008, the country was severely impacted by the international financial crisis which contributed to the persistent contraction in economy growth through to 2013. In this regard, the fiscal deficit widened from 4.5 per cent of GDP in FY2006/07 to 11.2 per cent in FY2009/10. Against the background of the economic and fiscal challenges brought about by the world financial crisis, Jamaica signed a Memorandum of Understanding with the International Monetary Fund in 2010. In this context, Jamaica's fiscal deficit improved to 4.1 per cent of GDP in FY2012/13 attributed in part to the implementation of several structural reforms geared at fiscal and debt sustainability.

The Jamaican economy was marked by high inflation in the early 1990's attributed to depreciation in the exchange rate. In an effort to control inflation the Central Bank conducted tight monetary policy during the 1990's. Consequently, the inflation rate decreased from a high of 37.1 per cent in FY1993/94 to 6.1 per cent in FY2002/03. The country subsequently recorded double digit inflation in FY2003/04 due mainly to depreciation in the exchange rate and the impact of administered price increases (Bank of Jamaica, 2005). The inflation rate remained high during FY2004/05 and FY2005/06, attributed in part to the impact of natural disasters and increases in international oil prices on the country's price level. The rise in inflation in FY2007/08 was partly due to increases in international commodity prices, in particular energy and food prices. Notably, adverse weather conditions on domestic agriculture continued to have a positive impact on inflation. Inflation, however, moderated between FY2010/11 and FY2012/13 attributed to stable supply conditions in the agriculture sector, non-repetition of significant administered price increases, a stable foreign exchange market and weak domestic demand conditions (Bank of Jamaica, 2012).

The ratio of fiscal deficit to GDP and inflation seem to exhibit some similar pattern over the period 1993 to 2013 (see Figure 1). In FY2009/10, annual inflation was 13.2 per cent, and also the ratio fiscal deficit to GDP was 11.1 per cent, one of its highest.



Figure 1: Fiscal Balance and Inflation Developments in Jamaica



## V. Methodology

This paper uses an ARDL approach to analyse the relationship between the fiscal deficit and inflation in Jamaica. Other than being prominent in the literature, this approach allows inclusion of dynamic variables to mitigate the impact of the endogeneity of the explanatory variables (Ekanayake (2012)). Furthermore, the general to specific modeling procedure provides consistent estimators even when the variables under concern are of different orders of integration. This minimises the possibility of estimating spurious relations, while retaining long-run information (Ekanayake (2012)). Additionally, in the case of a finite sample, this methodology provides precise estimators and valid  $t$  statistics (Pesaran, et al. 2001). Another advantage of working with ARDL specification is that given that all the independent variables enter the equation with a lag, this mitigate any contemporaneous causation from dependent to the independent variables, which could bias the estimates (Catao and Terrones 2003). However, ARDL approach employs only a

single reduced form equation and therefore it becomes necessary to avoid bi-directional causality between the main variables of concern (Ekanayake, 2012). In this regard, this study carries out Granger causality tests to determine the causality between variables.

This paper uses the theoretical structure that was employed by Catao and Terrones (2003) and Ekanayake (2012), which defines the relationship between inflation and the fiscal deficit as follows:  $\pi = \alpha \frac{FD}{M}$ . Where  $\pi$  is quarterly inflation, FD is the fiscal deficit; M is narrow money (M1) and  $\alpha$  is a positive parameter.

The study quantifies the long-run relationship between the fiscal deficit and inflation in Jamaica by nesting the above theoretical specification into the ARDL model where dependent and independent variables enter the right-hand side with lags of order p and q, respectively.

$$\pi_t = \beta_0 + \sum_{k=1}^p \delta_k \pi_{t-k} + \sum_{l=0}^q \gamma_l X_{J,t-l} + \varepsilon_t \dots \dots \dots (E1)$$

In the model, the dependent variable  $\pi_t$  (which is measured by the change in the Jamaica Consumer Price Index) and explanatory variables  $X_J$  (which include the fiscal deficit to narrow money variable (fiscal deficit to GDP), import price index and narrow money (M1)) enter the ARDL regression with lag of order p and q, respectively.

Equation (1) can be re-parameterized and written in terms of a linear combination of variables in levels and first differences:

$$\Delta \pi_t = \beta_0 + \phi \pi_{t-1} + \theta X_{J,t-1} + \sum_{k=1}^p \delta_k^* \Delta \pi_{t-k} + \sum_{l=0}^q \gamma_l^* \Delta X_{J,t-l} + \varepsilon_t \dots \dots \dots (E2)$$

Where:  $\phi = -(1 - \sum_{k=1}^p \delta_k)$ ,  $\theta = \sum_{j=0}^p \gamma_j$ ,  $\delta_k^* = -\sum_{m=j+1}^p \delta_m$ ,  $\gamma_l^* = -\sum_{m=l+1}^q \gamma_m$

With  $j=1,2,\dots,p-1$ , and  $l=1,2,\dots,q-1$ .

In other words  $\phi\pi_{t-1}, \theta X_{J,t-1}$  are the dependent and independent variables in levels (log) respectively, and  $\sum_{k=1}^p \delta_k \Delta \pi_{t-k}, \sum_{l=0}^q \gamma_l \Delta X_{J,t-1}$  are the dependent and independent variables at first difference, respectively. By grouping variables in levels, this can be rewritten as:

$$\Delta \pi_t = \beta_0 + \phi(\pi_{t-1} + \omega X_{J,t-1}) + \sum_{k=1}^p \delta_k^* \Delta \pi_{t-k} + \sum_{l=0}^q \gamma_l^* \Delta X_{J,t-1} + \varepsilon_t \dots \text{ (E3)}$$

Where:  $\omega = -\phi^{-1}\theta$  defines the long run relationship between the variables involved and  $\phi$  is the speed at which inflation adjusts towards its long run equilibrium following a given change in  $X_t$ .

The study estimates two models in order to analyze the relationship between inflation and the fiscal deficit. The first model has inflation as a dependent variable while the vector X consists of several variables which include the main independent variables defined as the ratio of fiscal deficit to narrow money. The other independent variables include M1 and Import Price Index. In the second model, the only change is that the main independent variable is defined as the ratio of fiscal deficit to GDP. This study also seeks to capture the nature of the impact of fiscal deficits on inflation in Jamaica. In this regard, this study estimated four ARDL models with M1 as the main dependent variable and the ratio of fiscal deficit to GDP as the main independent variable. The other independent variables in the model are real interest rate and real GDP. In addition, a series of Granger Causality test was conducted on the fiscal deficit variables discussed previously and the money supply variables M1 and M2\*.

## VI. DATA

The study utilizes quarterly time series data from 1993 to 2013<sup>2</sup>. Inflation is measured by movements in Jamaica's Consumer Price Index (CPI). The explanatory variables include: the ratio of the fiscal deficit to M1; the fiscal deficit to GDP; narrow money (M1) (which is defined as currency in circulation plus demand deposits); M2\* (defined as the sum of M1, savings deposits, time deposits and foreign currency deposits); real interest rate (which is defined as 90-day Treasury Bill rate minus inflation); real GDP; and the import price index for Jamaica<sup>3</sup>.

<sup>2</sup> Data were obtained from the Ministry of Finance, the Statistical Institute of Jamaica and the Bank of Jamaica.

<sup>3</sup> There was no data from 1993 to 1994 for this variable; as a result the missing values were interpolated.

Narrow money was chosen given its relationship with inflation as well as the fact that it was the variable of choice for several cited research papers such as Ekanayake (2012) and Catao and Terrones (2003). Import price index was chosen given the evidence presented in Bourne and Persaud (1977) and Downes et al. (1997), which suggests that import prices contribute significantly to inflation in Jamaica.

Two dummy variables that control for structural breaks for the period 1994 to 1998<sup>4</sup> (Dummy 1) and 2008 to 2009<sup>5</sup> (Dummy 2) were included in the model.<sup>6</sup> A third dummy variable that controls for periods of high and low inflation (Dummy 3) was also included. All variables were logged and first differenced. Given the fact that the fiscal balance variable had both negative and positive values it could not be logged. A constant was therefore added to the variable to make the series positive and to allow for the transformation (Wicklin, 2011). The Augmented Dickey-Fuller Test for unit root revealed that most of the variables in the model were I(1) while the others were in levels (see Table 1). In addition, all variables at first difference were normal distributed based on the Jarque-Bera test.

In order to test the existence of a long-run relationship between the variables under investigation a Wald test was employed (i.e.  $H_0: \beta_1 = \beta_2 = \beta_3 = 0$ ). The Wald test statistic was compared with the bound test critical values tabulated by Pesaran, et al. (2001). The Wald F test statistics for all models exceeded the upper bound critical value and therefore, the null hypothesis was rejected, confirming a long-run relationship among the variables of interest (see Table 2 and 3).<sup>7</sup>

## VII. Results

Equation E3 was estimated to analyze the relationship between the fiscal deficit and inflation in Jamaica. Model 1 was estimated first with dependent variable CPI and independent variables

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<sup>4</sup> During this period Jamaica had a financial sector crisis.

<sup>5</sup> During this period Jamaica was experiencing the effects from the world economic crisis.

<sup>6</sup> These dummy variables were not significant and thus they were excluded.

<sup>7</sup> If the Wald test statistics were greater than the upper bound of the critical value, the null hypothesis can be rejected to conclude that there exists a long run relation between the variables of concern. If it was smaller than the lower bound critical value, the null hypothesis cannot be rejected. Finally, if it falls within the lower and upper bound, the results become inconclusive (Pesaran, et al., 2001).

fiscal deficit to narrow money (M1), import price index and narrow money (M1). In Model 2, the fiscal deficit to narrow money was replaced with fiscal deficit to GDP. The results from both estimated models suggest that the fiscal deficit has a positive and significant impact on inflation in Jamaica. Specifically, a one per cent increase in the ratio of fiscal deficit to narrow money raised inflation by 0.04 per cent in Jamaica, while for a one per cent increase in the fiscal deficit to GDP resulted in inflation being higher by 0.12 per cent. Notwithstanding these results, the R-squared for these models were relatively low and as such a dummy variable (Dummy 3) that controls for periods of high and low inflation and a real interest rate variable were included in the models. The results were the same as in the previous models. Specifically, the results showed that a one per cent increase in the ratio of fiscal deficit to narrow money raised inflation by 0.02 per cent in Jamaica, while a one per cent increase in the fiscal deficit to GDP ratio raised inflation by 0.05 per cent.

The primary concern of this study is with the long-run relationship between the main variables (see Table 4). The estimated coefficient for the error correction term was negative and strongly significant in all models, indicating that the economy needs more than a year to adjust to a deviation from long-run equilibrium following a shock. The results show that in the long-run there was a positive and significant impact of fiscal deficit on inflation in Jamaica. Specifically, the long-run elasticity of the ratio of fiscal deficit to narrow money on inflation was 0.27, which means that a one per cent increase in the ratio of fiscal deficit to narrow money increases inflation in Jamaica by 0.27 per cent in the long-run. Similarly, the long-run elasticity of the ratio of fiscal deficit to GDP on inflation was 0.77, suggesting an even greater impact on inflation in the long run (see Table 4a). These results were more significant when Dummy 3 and real interest rate variables were included in the models. Specifically, the long-run elasticity of the ratio of fiscal deficit to narrow money and fiscal deficit to GDP on inflation was 0.33 and 0.83 per cent, respectively. This means that a one per cent increase in the ratio of fiscal deficit to narrow money and fiscal deficit to GDP increases inflation in Jamaica by 0.33 per cent and 0.83 per cent, respectively, in the long-run.

To further examine the link between the fiscal deficit and inflation in Jamaica, a Granger casualty test was conducted between the main variables of interest. The result shows that the

ratio of fiscal deficit to M1, Granger caused inflation in Jamaica (see Table 6). The results did not suggest that inflation Granger caused the ratio of fiscal deficit to MI in Jamaica. These results were consistent with the findings of other researchers, including Ekanayake (2012) and Catao and Terrones (2003), who found that there was a positive relationship between fiscal deficit and inflation in developing countries.

The study also estimated the relationship between the fiscal deficit and money supply in Jamaica. Model 5 was estimated with the dependent variable M1 and the main independent variable was the ratio of fiscal deficit to GDP, respectively. The other independent variables were real interest rate and real GDP. The results from the estimated model suggest that fiscal deficit has a positive and significant impact on money supply in Jamaica (see Table 5). The long-run elasticity of the ratio of fiscal deficit to GDP on M1 was 1.49 (see Table 5a).

A Granger causality test was also conducted on the fiscal deficit and money supply variables to ascertain if there was an indirect link between fiscal deficit and inflation in Jamaica. The fiscal deficit variable used was the ratio of fiscal deficit to GDP. The money supply variables used were M1 and M2\*. Three lags were selected for all the models based on the lag selection of the Akaike Information and Schwarz Information criteria tests. The results showed that the ratio of fiscal deficit to GDP Granger caused the money supply variables at the 5 per cent level of significance. In addition, the results showed that the money supply variables did not Granger cause the ratio of fiscal deficit to GDP at the 5 per cent level of significance.

The above results suggest that fiscal deficits have an indirect impact on inflation in Jamaica largely via its role in increasing money supply. This increase in money supply may have occurred through the government financing sources. As explained by Hein (1981), Sill (2005) and Ekanayake (2012), when the government finances its deficits via the domestic market, the end result is an increase in money supply and higher inflation. This occurs because the “fiscal deficit increases the demand for credit by Government in the private market place. If this demand is not met by an increase in credit supply, this naturally puts upward pressure on all market interest rates. To prevent this rise in interest rates, the monetary authorities will buy government securities, thus monetizing part of the public debt by increasing the level of reserves. This will

result in a larger money stock and, other things equal, a subsequently higher rate of inflation”. Consequently, there is an indirect channel via the response of the monetary authorities to higher interest rates. As can be shown in Figure 1 below, from 1993 to 2012 the Government of Jamaica largely financed its deficit through domestic borrowing.

Of note, external financing may also be inflationary if it is not sterilized by the monetary authorities. However, in the case of Jamaica, a large portion of external loans received by the Jamaican Government is used to pay down foreign currency denominated debt. Furthermore, if these external loans are used to make Jamaica Dollar payments, the liquidity is usually sterilized by the Bank of Jamaica via its open market operations. Therefore, external financing is not likely to have any impact on money supply and hence inflation in Jamaica.

Fiscal deficits could also have an impact on inflation in Jamaica via the Government’s use of seigniorage to finance its debt payments or deficit. The use of seigniorage to finance the fiscal deficit or debt refinancing can lead to inflation because it increases money supply. This argument was supported by Vegh et al. (2002) who found in their study on 94 countries that fiscal deficits led to high inflation when the government depends on revenue from seigniorage to finance debt. In addition, Douglas (2004) argues that government’s reliance on seigniorage often stems from its inability to raise and collect revenues from traditional sources. She further noted that developing countries are more likely to rely heavily on seigniorage due to a number of structural problems, such as poor tax collection procedures, unstable sources of tax revenues and evasion of taxes. Of note, in her study, she found that for Jamaica, central bank seigniorage for the period 1994 to 1998 was on average about 2.5 per cent of GDP relative to a benchmark of 1.0 per cent of GDP. In addition, McLeod (2010) noted that gross seigniorage in Jamaica for the period FY2004/05 to FY2009/10 was on average about 1.7 per cent of GDP. Douglas (2004) noted that this “provides a source of financing for the government particularly in light of the worsening state of the fiscal accounts, which moved from a surplus of 2.0 per cent of GDP in 1994 to a deficit of 7.0 per cent of GDP in both 1997 and 1998”.

Figure 2

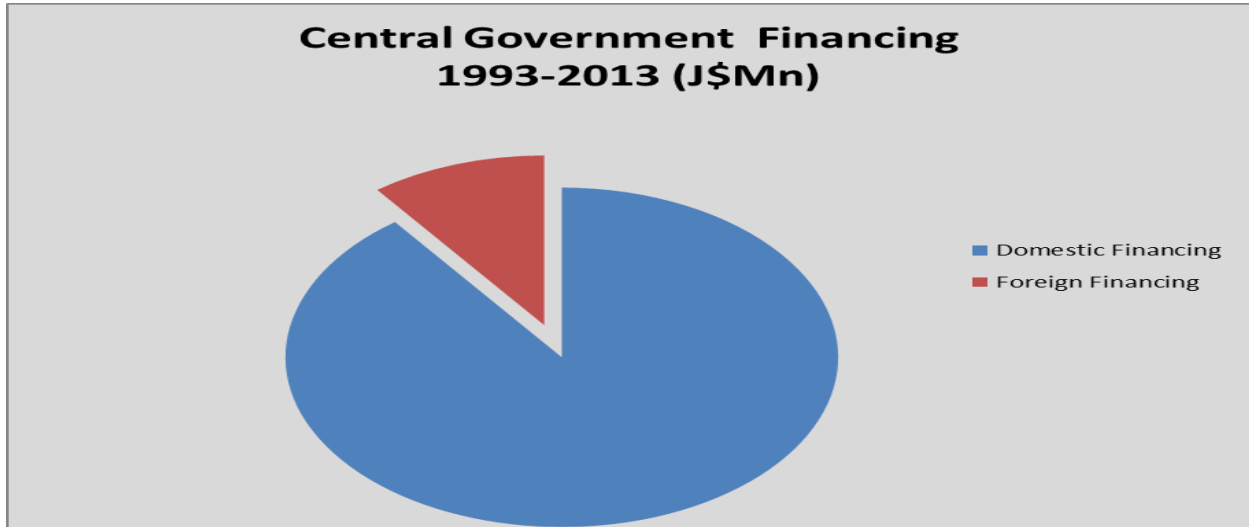
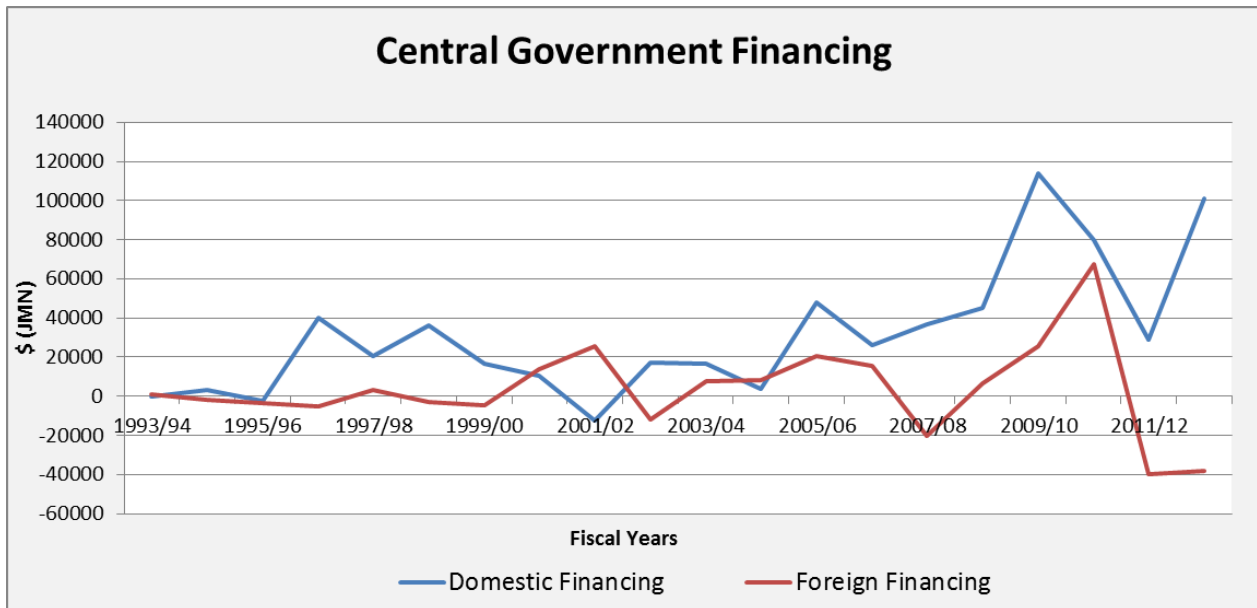


Figure 3

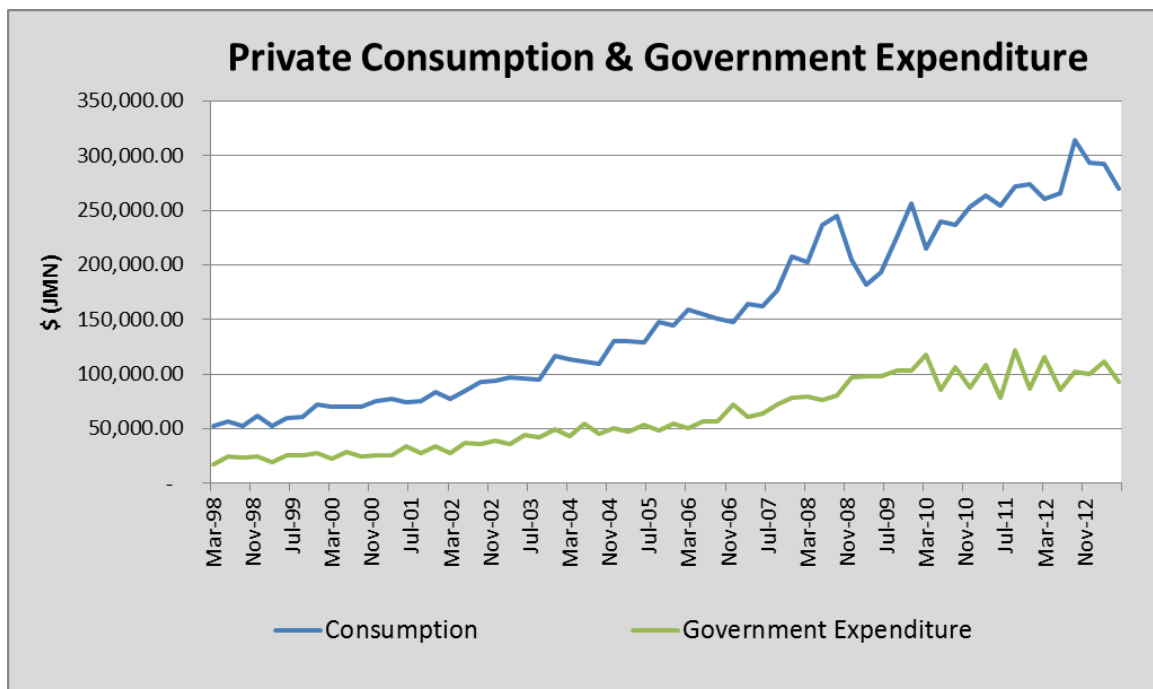


As discussed, another avenue through which the Government's fiscal deficit can impact inflation is through aggregate demand. Central Government wages and Government domestic interest



payments (excluding payments to the Central Bank and Public Bodies) could provide the impetus to increase consumption of goods and services and, as a consequence increase inflation<sup>8</sup>. Government consumption in Jamaica, as can be observed in the Figure 3 below, has increased steadily over the period 1998 to 2012. Hence, this increasing trend could have stimulated additional demand in the economy.

Figure 4



### Robustness Checks

All of the ARDL models employed in this paper were normal distributed based on the Jarque-Bera test. Similarly, none of the ARDL models were found to have serial correlation based on the Breusch-Godfrey Serial Correlation LM test. Finally, none of the ARDL models were found to have heteroskedasticity based on the White and Harvey test (see Table 4 and 5).

<sup>8</sup> This study was intended to determine the effects of Government wages and interest expenses on inflation in Jamaica, however, both these variables were not normally distributed.

## **VIII. Conclusion**

This study explored the relationship between fiscal deficit and inflation in Jamaica from 1993 to 2013 using an ARDL approach and Granger Causality test. The results indicate that there was a positive and significant impact of fiscal deficit on inflation in Jamaica in both the short and long-run. The findings were robust based on the standard normality, heteroskedasticity and serial correlation test. The findings were consistent with results from other studies, specifically those related to developing countries including Ekanayake (2012), Cheah et al. (2011) and Metin (1998). The results also showed that fiscal deficits in Jamaica affect inflation via its impact on money supply.

Given the potential inflationary impact of fiscal deficits, the implementation of sound fiscal policy is essential. In this regard, government should expeditiously seek to implement structural reforms geared towards fiscal consolidation, public sector reform and tax reform, which are necessary for economic expansion as well as fiscal and debt sustainability. In addition, the implementation of inflation targeting without fiscal discipline is likely to be challenging. In this regard, the implementation of fiscal rules, as outlined in the Government medium-term macroeconomic programme will be critical.

Due to the limited scope of the study, there are some areas that warrant further investigation. A much larger data set could facilitate further research and as a result improve the accuracy of the above results.

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## Appendix

Table 1: Unit Root Test

Variables	Augumented Dickey Fuller test				
	Level			1st Difference	
	Test Statistic	Critical Values		Test Statistic	Critical Values
log Fiscal deficit/M1	-3.200	-2.901	**	-4.520	-3.523 ***
log Fiscal deficit/GDP	-1.404	-3.523		-4.816	-3.523 ***
log CPI	-3.079	-4.078		-5.635	-4.078 ***
log M1	-4.808	-4.077	***	-9.218	-4.082 ***
Real Interest Rate	-3.126	-2.898	**	-10.264	-3.516 ***
Log Real GDP	-1.186	-3.519		-4.275	-3.519 ***
log Import Price Index	-3.096	-4.078		-7.758	-4.080 ***
log M2*	-4.320	-3.514	***	-8.289	-3.516 ***

Notes: \*, \*\*, \*\*\* are Mackinnon critical valves for the rejection of the null hypothesis of a unit root at the 10%, 5% and 1% levels respectively.

Table 2: Bound test results

Model	Wald test F statistic	
Model 5	11.39416	**
Model 6	10.61927	**
Model 7	12.32049	**
Model 8	10.45042	**

Notes: Critical Value for Bound Test (Pesaran et, al 2001, p 300)  
intercept and no trend( k=3) :[ 5.315, 6.414] at 1% and [4.066, 3.63] at 5%  
intercept and no trend( k=4) :[ 4.617, 5.786] at 1% and [3.539, 4.667] at 10%  
\*\*\* and \*\* indicate significance at 1% and 5%,respectively

Table 3: Bound test results

Model	Wald test F statistic	
Model 5	10.61927	**

Notes: Critical Value for Bound Test (Pesaran et, al 2001, p 300)  
intercept and no trend( k=3) :[ 5.315, 6.414] at 1% and [4.066, 3.63] at 5%  
intercept and no trend( k=4) :[ 4.617, 5.786] at 1% and [3.539, 4.667] at 10%  
\*\*\* and \*\* indicate significance at 1% and 5%,respectively

Table 4: Results of the General to Specific ARDL Models

Variables	Model 1		Model 2		Model 3		Model 4	
L CPI (-1)	-0.1592 (0.03759)	***	-0.151916 (0.03516)	***	-0.08398 (0.02683)	***	-0.086503 (0.02785)	***
L fiscal Deficit/M1 (-1)	-0.0434 (0.02171)	**			-0.027397 (0.01510)	*		
L Fiscal deficit/GDP (-1)			-0.116631 (0.05451)	**			-0.072056 (0.04087)	*
L M1 (-1)	0.027694 (0.01103)	**	0.028662 (0.01097)	**	0.014126 (0.00796)	*	0.017332 (0.00888)	*
log Import Price Index (-1)	0.067221 (0.01836)	***	0.061886 (0.01654)	***	0.037517 (0.01252)	***	0.03398 (0.01174)	***
DL CPI (-1)	0.3484 (0.10766)	***	0.328887 (0.10583)	***	0.400045 (0.08148)	***	0.389749 (0.08346)	**
DL fiscal Deficit/M1 (-1)	-0.0370 (0.01325)	***			-0.024196 (0.00927)	**		
DL Fiscal deficit/GDP (-4)			-0.117241 (0.03745)	***			-0.050076 0.02679	*
DL Import Price Index (-2)	-0.061406 (0.02601)	**	-0.063335 (0.02555)	**				
Growth rate Real Interest rate (-1)					-0.000288 (0.00004)	***	-0.000278 (0.00004)	***
Trend	0.002267 (0.00058)	***	0.00203 (0.00053)	***	0.001186 (0.00041)	***	0.001139 (0.00041)	***
Dummy 3					0.022427 (0.00369)	***	0.021401 (0.00387)	***
R-Square	0.43435		0.45119		0.72921		0.72409	
Jargue-Bera Prob Value	0.42225		0.27683		0.11269		0.22123	
White Heteroskedasticity Test			1.10588					
Breusch-Godfrey Serial Correlation Test	0.70484		1.08129		0.23900		0.26660	
Harvey Test	1.66404				0.16670		0.69330	

White-Heteroscedasticity Robust Standard Errors are in Parenthesis (.)

Note: Level of Significance: \*---10% Level of Significance: \*\*---5% Level of Significance: \*\*\*---1%

Dependent Variable: DL CPI



Table 4a: Results of the Long Run Coefficients ARDL Models

Variables	Model 1	Model 2	Model 3	Model 4
L fiscal Deficit/M1 (-1)	-0.2726 (0.02171)		-0.3262 (0.01510)	
L Fiscal deficit/GDP (-1)		-0.7677 (0.05451)		-0.8330 (0.04087)
log M1 (-1)	0.1739 (0.01103)	0.1887 (0.01097)	0.1682 (0.00796)	0.2004 (0.00888)
log Import Price Index (-1)	0.4222 (0.01836)	0.4074 (0.01654)	0.4467 (0.01252)	0.3928 (0.01174)

White-Heteroscedasticity Robust Standard Errors are in Parenthesis (.)

Table 5: Results of the General to Specific ARDL Models

Variables	Model 5	
Log M1 (-1)	-0.472802 (0.10177)	***
LogM2 (-1)		
Log Fiscal deficit/GDP (-1)	-0.707899 (0.23547)	***
Log GDP (-1)	0.408384 (0.08258)	**
Real Interest rate (-1)	-0.007519 (0.00165)	***
DL M1(-1)	-0.328957 (0.10583)	***
DL fiscal Deficit/M1 (-2)		
DL Fiscal deficit/GDP (-2)	-0.490502 (0.15484)	***
DL GDP (-3)	0.798576 (0.32724)	**
Growth rate Real Interest rate (-1)	-0.00053 (0.00025)	**
Trend	0.008928 (0.00267)	***
R-Square	0.49514	
Jargue-Bera Prob Value	0.41135	
White Heteroskedasticity Test		
Breusch-Godfrey Serial Correlation Test	0.23750	
Harvey Test	0.73110	

White-Heteroscedasticity Robust Standard Errors are in Parenthesis (.)

Note: Level of Significance: \*---10%    Level of Significance: \*\*---5%    Level of Significance: \*\*\*---1%  
 Dependent Variables: M1

**Table 5a: Results of the Long Run Coefficients ARDL Models**

Variables	Model 5
Log Fiscal deficit/GDP (-1)	-1.4972 (0.23547)
Real Interest rate (-1)	-0.0159 (0.00165)
Log GDP (-1)	0.8638 (0.08258)

White-Heteroscedasticity Robust Standard Errors are in Parenthesis (.)

**Table 6: Granger Causality Test**

	Prob. Value
DLCPI does not Granger Cause DL Fiscal Deficit/M1	0.3720
DL Fiscal Deficit/M1 does not Granger Cause DL CPI	0.0499
DL M1 does not Granger Cause DL Fiscal Deficit/GDP	0.1626
DL Fiscal Deficit/GDP does not Granger Cause DL M1	0.0152
DL M2* does not Granger Cause DL Fiscal Deficit/GDP	0.5801
DL Fiscal Deficit/GDP does not Granger Cause DL M2*	0.0134