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Fiscal sustainability: The case for Jamaica

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ABSTRACT

The paper assesses the sustainability of fiscal policy in Jamaica alongside a large public debt stock, albeit falling, in the context of an economic reform program. In addition, the paper examines the risks associated with the large public debt stock. Fiscal reaction functions are used to assess fiscal sustainability via an OLS, VAR, GMM and VECM models while the vulnerability of the public debt stock is evaluated using the IMF debt sustainability analysis (DSA) framework through shocks to real GDP, primary balance, interest rate, real exchange rate, and a combined shock. After the implementation of the country's economic reform program, the results show that fiscal policy in Jamaica is on a path to attain sustainability. However, after adjusting the sample to exclude the economic reform period, the findings show that fiscal policy in Jamaica is unsustainable. Further, the results indicate that in the long run a primary surplus of 4.8 per cent of GDP would be required to achieve a public debt-to-GDP ratio of 60 percent. The risk assessment of the public debt reveals that Jamaica's debt is most vulnerable to sharp exchange rate depreciations and that the overall risk to the public debt stock is high. Of note, the DSA results should be interpreted in the context within which the framework is created in that it does not account for all dynamics within the economy and therefore may overstate the extent of the impact. In light of the results and given that foreign currency debt accounts for approximately 60 percent of the public debt stock, it is critical to rebalance the debt portfolio in favour of domestic debt.

1. Introduction

Over the last two decades, Jamaica's public debt has increased consistently from 74.4 percent of GDP in 1998 to a maximum of 145.3 percent in 2013. The public debt fell to 94.4 percent of GDP in 2019.¹ The country's mammoth public debt, over the period, served to impair investor's confidence, which hindered economic development in Jamaica. For 1998 to 2018, Jamaica recorded fragile average annual growth of 0.4 percent. In addition, general macroeconomic conditions were weak, and in 2012 the country faced a potential balance of payments crisis.

In an attempt to arrest the public debt problem, the authorities embarked on a comprehensive and an aggressive economic reform program in 2013. The program consisted of a substantial and frontloaded reform agenda, one which was expected to engineer growth in the economy through a significant improvement in Jamaica's fiscal and debt positions (IMF 2013). The main objective of the economic reform program is to achieve a public debt-to-GDP ratio of 60.0 percent by 2026. The program was marketed as the platform on which fiscal sustainability will be engrained in Jamaica. In 2013, the International Monetary Fund (IMF) through a four-year Extended Fund Facility (EFF) supported Jamaica's reform agenda. To cement the macroeconomic benefits derived from the 4-year EFF as well as garner continued support for the country's reform agenda, in November 2016, Jamaica requested a precautionary

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¹ All years in this paper refer to fiscal years that starts in April and ends in March of the following year.

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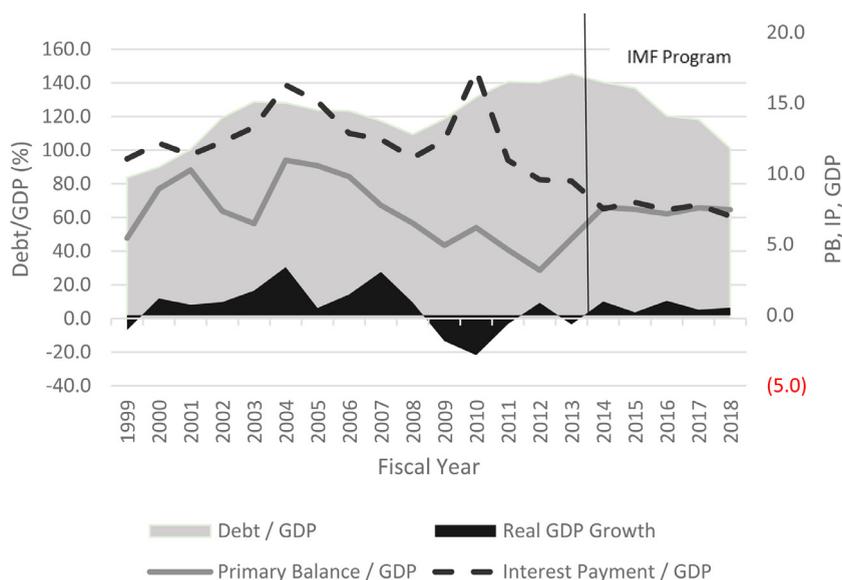


Fig. 1. Selected Fiscal Indicators – Jamaica

Source: Statistical Institute of Jamaica, Ministry of Finance & Public Service .

three-year Stand-By Arrangement (SBA) with the IMF and the cancellation of the EFF. Under the new arrangement, fiscal discipline and public debt reduction continued to anchor the country's reform program.²

To date, Jamaica's public debt has trended downwards from historic highs due to prudent fiscal policy, which resulted in improved investor confidence, weak but consistent economic growth, and a reduction in the country's sovereign risk premium. These factors facilitated a reduction in Jamaica's debt servicing cost (interest payment to GDP) as shown in Fig. 1. While the public debt level in Jamaica has fallen, it is important to ascertain the success of the economic reform program in achieving or facilitating fiscal sustainability in the country. In this regard, the paper assesses the sustainability of fiscal policy in Jamaica, and the risks associated with the public debt level.

The paper assesses the sustainability of fiscal policy via fiscal reaction functions in the method of Bohn (2007) and Burger et al. (2011). The risks associated with the debt stock is evaluated through a debt sustainability analysis framework fashioned by the IMF. The results show that fiscal policy in Jamaica is on a path to achieve sustainability due to the economic reforms that were implemented. In addition, in the long run a primary surplus of 4.8 percent is required to achieve a debt-to-GDP ratio of 60 percent. Further, the debt sustainability analysis (DSA) results show that Jamaica's public debt is most vulnerable to sharp exchange rate depreciations and that the overall risk to the public debt stock is high. Of note, the DSA results should be interpreted in the context within which the framework is created, in that, it does not account for all dynamics within the economy and therefore may overstate the impact. This is particular so if the impact on economic growth is not fully captured.

The understanding of fiscal sustainability conditions for Jamaica is also relevant for other countries, in particular, those in the Caribbean and Latin America as the group faces similar challenges. The analysis is particularly important to Barbados, Suriname and Costa Rica as those countries public debt to GDP ratios have been increasing progressively, over the last ten years, and have surpassed the psychological level of 60 percent of GDP. For Barbados, the debt to GDP ratio has increased from 61.3 percent in 2000 to 158.3 percent in 2017 while Suriname's debt has grown from 27.2 percent in 2014 to 78 percent in 2017.

The remainder of the paper is organised as follows. Section 2 looks briefly at fiscal policy and the public debt dynamics in Jamaica, while Section 3 reviews the literature on fiscal sustainability. Sections 4 and 5 provide the methodology and data used to assess debt sustainably. The results are contained in Section 6. The evaluation of the risk associated with the public debt stock is contained in Section 7. Section 8 and 9 contain the conclusion and further work.

2. Fiscal policy and public debt in Jamaica

Between 1999 and 2018, Jamaica recorded an average annual primary surplus-to-GDP ratio of 7.3 percent. The relatively high primary balances were necessary as the country amassed significant public debt over the period. In 2013, the public debt rose to 145.3 percent of GDP (see Fig. 1). The high primary balances facilitated the payment to service the public debt over the period. In 1999, a primary surplus ratio of 5.4 percent of GDP was recorded, this increased to 10.3 percent of GDP in 2001 in response to the

² International Monetary Fund, 'Request for Stand By Arrangement and Cancellation of the Current Extended Arrangement under the Extended Fund Facility- Press Release and Staff Report, Jamaica', November 2016

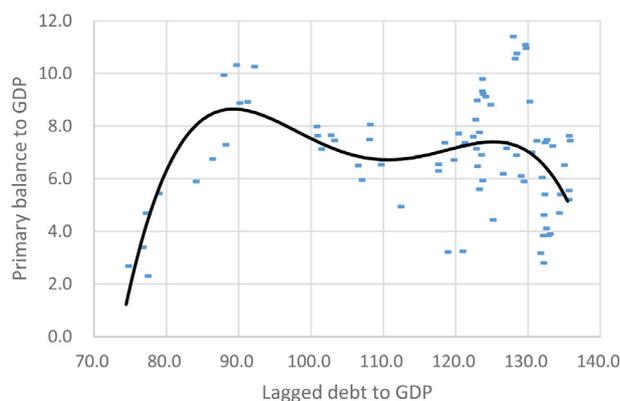


Fig. 2. Primary Balance & Lagged Debt (1998–2018)
Source: Bank of Jamaica Computation.

rise in the public debt ratio to 100.5 percent. As the public debt increased, the primary surplus to GDP ratio rose to a maximum of 11.0 per cent in 2004. In that year, the public debt ratio approached 128.1 percent of GDP. As a consequence, the cost to service the public debt escalated to 16.3 percent of GDP, an increase of 5.2 percentage points relative to the ratio in 1999. As it became increasingly challenging for the government to maintain the high primary balances, its ability to stabilize the debt to GDP ratio was constrained. The maintenance of high primary balances meant that the government would have to either implement further tax measures or postpone well needed social investments, or both. Accordingly, the primary surplus to GDP ratio fell steadily to 3.2 percent in 2012. The primary balance measures by the government suggested that the authorities reacted in a non-linear fashion to the increased public debt. This is highlighted in Fig. 2, which shows a scatter plot of the relationship between the primary balance and lagged public debt with a polynomial trend of order 4. This indicates the existence of fiscal fatigue in Jamaica, whereby the ability of the government to enact sufficiently large primary surpluses in response to the rising public debt, in an attempt to stabilise the debt, is limited due to critical non-debt obligations.

Macroeconomic conditions started to improve after the government embarked on the economic reform program in 2013 to stabilise the economy. The main pillars of the program were (i) structural reforms to boost growth and employment; (ii) actions to improve price and non-price competitiveness; (iii) upfront fiscal adjustment, supported by extensive fiscal reforms; (iv) debt reduction, including a debt exchange, to place public debt on a sustainable path, while protecting financial system stability; and (v) improved social protection programs.³ Structural reforms within the economic agenda focused, amongst others, on the strengthening of public financial management, introduction of fiscal rules through the Fiscal Responsibility Framework embedded in the Financial Administration and Audit Act, and reformation of the tax system.

3. Literature review

In the context of rising public debt levels over the last decade, the literature is rich on the assessment of fiscal sustainability in advanced and emerging economies. The earlier approaches used to assess sustainability ranged from an accounting framework to an intertemporal government budget constraint. In the former, sustainability is assessed as the long run primary surplus level that stabilizes the debt to GDP ratio to some goal (Buiter 1985) and in the latter fiscal policy is sustainability if, at any given period, the debt level is equal to the present value of the future primary surpluses (Blanchard et al., 1990). The intertemporal government budget constraint method has been criticized as constituting only a necessary condition for sustainability. Later studies have employed fiscal reaction functions whereby sustainability is achieved by a positive response of the primary balance to rising public debt, and which exceeds the financing cost of the debt (Ghosh et al. (2013) and Ganiko et al. (2016).

Bohn (1998) motivated the concept of fiscal reaction functions (FRF) in the 1990's, where he used ordinary least square (OLS) estimations to assess linear and non-linear FRF for the United States (US) from 1916 to 1995. His-hypothesis for sustainability is that there should always be a positive reaction of the primary balance to lagged debt. Controlling for war-time spending and for cyclical fluctuations in government spending, the results from Bohn (1998) showed that the US primary surplus is an increasing function of the debt to GDP ratio for the linear models and that the marginal impact of debt on the primary surplus is also increasing rather than decreasing with higher debt. The paper concluded that historically fiscal policy in the US was sustainable notwithstanding lengthy episodes of primary deficits. Ghosh et al. (2013) opined that Bohn (1998) sustainability condition was weak in the face of uninterrupted rising debt levels. Accordingly, Ghosh et al. (2013) contributed to the FRF literature by introducing a stricter sustainability condition, which states that the public debt, in principle, should converge to a finite proportion of GDP. Here, the reaction of the primary balance should be greater than the interest rate – growth rate differential. Accounting for fiscal fatigue, that is the inability of the government to enact sufficiently large primary surpluses to counter rising debt due to critical non-debt

³ International Monetary Fund, 'Request for an Extended Arrangement under the Extended Fund Facility, Jamaica', April 2013

obligations, the primary balance would react less to rising debt than the interest rate – growth rate differential. As such, there exists a finite debt limit. Ghosh et al. (2013) show that as the public debt moves toward this limit, financing cost will increase significantly to a prohibitive high interest rate within a narrow range of debt ratios. Using data from 1970 to 2007 for 23 advanced economies, Ghosh et al. (2013) find support for a cubic FRF, whereby at low levels of debt, there is no, or a slightly negative relationship between the primary balance and lagged debt. However, as debt increases, the primary balance rises accordingly, but the reaction subsequently weakens and then falls at high levels of debt.

General equilibrium analysis has also been used to assess fiscal sustainability through the evaluation of fiscal alternatives that will restore solvency. The advocates of this methodology promote the benefits of the general feedback of fiscal policy throughout the economy. This interaction influences critical macroeconomic variables, which may have an impact on the trajectory and long run level of debt. Sakuragawa and Hosono (2010) used a dynamic stochastic general equilibrium model to investigate fiscal sustainability in Japan. To assess sustainability, the authors tested whether the expected debt to GDP ratio stabilized or increased without bound. The simulated debt ratio was estimated from projected GDP growth rate, elasticity of intertemporal substitution, and intermediation cost as well as specified fiscal policy rule. The authors found that the public debt in Japan will be unsustainable if the fiscal policy rule taken over the last thirty years continued into the future. Other authors that have used this framework include Mendoza and Oviedo (2006) who developed a small open economy model to examine how macroeconomic shocks affect government finances and hence sustainability of the public debt.

While there have not been many studies on fiscal sustainability in Jamaica, Lewis (2004) evaluated the sustainability of the public debt in Jamaica from a risk management perspective. The author highlighted the role of stochastic factors, including contingent liabilities, on debt dynamics through the utilization of a VAR model. This model was used to simulate various debt paths based on the conditional means and variances of the reduced-form residuals. The sensitivity of the public debt burden was assessed via the construction of a risk measure, which was derived from the likelihood of the debt to GDP ratio exceeding a given threshold over a specific horizon. This, along with a stress-testing framework was used to identify the impact of debt dynamics on the portfolios of the financial sector. The sensitivity analysis indicated that a debt shock greater than 12.0 per cent of GDP along with a primary balance of 8.0 per cent of GDP would lead to unsustainable debt dynamics. The author indicated that there were many paths in which the debt to GDP ratio would be unsustainable. In general, Lewis (2004) found that changes in the primary deficit and the real interest rate had the greatest impact on the debt dynamics in Jamaica.

4. Methodology: fiscal reaction function

Jamaica has had its challenges with rising debt levels, which has elicited academic and professional discussions about the sustainability of fiscal policy. To assess the sustainability of public debt in Jamaica, the paper uses fiscal reaction functions in the fashion of Bohn (2007) and Burger et al. (2011). These functions model the reaction of the government’s policy to changing debt levels. Typically, fiscal reaction functions show the response of fiscal policy (proxied by the primary balance to GDP ratio) to changes in the previous year public debt (proxied by one-period lagged public debt to GDP ratio). The response is to ensure the achievement of a sustainable public debt position in the present, while controlling for other influences of the primary balance. To achieve sustainability, in the face of a rising debt level, the government should bring about a credible increase in the primary balance to offset the growth in the public debt. According to Ghosh et al. (2013), a sufficiently positive response ensures that a no-Ponzi-scheme rule is satisfied and that the public debt is repaid in the long run. This is explained in the budget constraint of the government as follows:

$$D_t = D_{t-1} + iD_{t-1} - B_t \tag{1}$$

where ‘D’ is public debt, ‘i’ is nominal interest rate on government bonds and ‘B’ is the primary balance.

Eq. (2) is derived from Eq. (1) by substituting forward and taking expectations:

$$D_t = \sum_{j=1}^{\infty} \rho_j E_t(B_{t+j}) + \lim_{j \rightarrow \infty} \rho_j E_t[D_{t+j}] \tag{2}$$

where: $\rho_j = \prod_{s=1}^j \beta_s$ and $\beta_s = 1/(1 + i_s)$

Applying the transversality condition, the second term in Eq. (2) approaches zero. This condition states that the present discounted value of debt will approach zero in the long run. This occurs as the transversality condition dictates that the growth rate of debt should be less than the average rates of interest on government debt in the long run. With this, the debt is prohibited from increasing exponentially.

For a sustainable equilibrium, the discounted value of future primary surpluses should sum to the current public debt level. To determine the level of primary balance that will stabilize the debt level, a debt stabilizing primary balance function is computed from Eq. (1) by making the change in the public debt level the subject of the equation (expressed as a percent of GDP) as follows:

$$\Delta(D/Y)_t = ((r - g)/(1 + g))(D/Y)_{t-1} - (B/Y)_t \tag{3}$$

where ‘r’ is real interest rate, ‘g’ is real GDP growth, and ‘Y’ is nominal GDP.

From Eq. (3), the debt stabilizing primary balance function is given as:

$$(B/Y)_t = ((r - g)/(1 + g))(D/Y)_{t-1} \tag{4}$$

Following Burger et al. (2011), to examine the policy actions of the government in response to facilitating sustainable debt levels, a fiscal reaction function corresponding to Eq. (4) is computed as follows:

$$(B/Y)_t^{Actual} = \alpha^*(D/Y)_{t-1}^{Actual} + \varepsilon_t \tag{5}$$

Where α^* is comparable, on average, to $(r - g)/(1 + g)$ and 'Actual' refers to the actual outcomes for the respective variables and ε_t is the residual.

It has also been shown by research that governments often pursue cyclical fiscal policy in the pursuit of stabilization in the short run. To account for this, Eq. (5) is enhanced by adding an output gap variable, calculated as real output minus potential output, $(Y - \hat{Y})$. In the fashion of Ganiko et al. (2016), a government expenditure gap variable is also included to capture temporary increases in government outlays. This is measured as government spending minus potential government spending, $(G - \hat{G})$. Following Burger et al. (2011), the lag of the primary balance to GDP ratio variable, $(B/Y)_{t-1}^{Actual}$, is incorporated to account for inertia in government's action. Given the above, the fiscal reaction function used in this paper is stated as:

$$(B/Y)_t^{Actual} = \alpha_1 + \alpha_2(B/Y)_{t-1}^{Actual} + \alpha_3(D/Y)_{t-1}^{Actual} + \alpha_4(Y - \hat{Y})_t + \alpha_5(G - \hat{G})_t + \varepsilon_t \quad (6)$$

From the above, fiscal policy is sustainable on the condition that $\alpha_3/(1 - \alpha_2) > \alpha^* = (r - g)/(1 + g)$. This is seen clearer from Eq. (3), when the growth in the public debt is expressed as a function of the past debt level, the interest cost on debt, the primary balance and real economy growth as follows:

$$(D/Y)_t = ((1 + r)/(1 + g))(D/Y)_{t-1} - (B/Y)_t \quad (7)$$

Therefore if the adjustment that the government makes in the primary balance in response to movements in the public debt, $\alpha_3/(1 - \alpha_2)$ from Eq. (6), is equal to (greater than) the financing cost of debt, $\alpha^* = (r - g)/(1 + g)$, the government will be attempting to stabilise (reduce) the public debt at (from) the previous level.

Against the background of the stationary concerns that are raised by Burger et al. (2011), four models are used to estimate Eq. (6). The concerns raised are that the standard stationarity tests may fail to reject the null hypothesis of a unit root for the debt and primary balance ratios if the financing cost coefficient is close in proximity to one. Burger et al. (2011) explain that in periods where the government increases its primary balance ratio in line with its financing cost in an attempt to stabilize the debt ratio, the affected variables would be first difference stationary, however, the variables would be stationary if the fiscal adjustment is greater. In this context, the public debt and primary balance variables are assumed to be stationary in the first three models estimated in this paper. That is, within the ordinary least square (OLS), generalized method of moment (GMM) and vector autoregressive (VAR) models. In the fourth model, the respective variables are presumed to be non-stationary and assessed using a vector error correction model (VECM). In the fashion of Burger et al. (2011), the VECM is not estimated directly from Eq. (6). The VECM is estimated from a model that contains Eqs. (8) and 9. Eq. (6) is then derived from equation 8.⁴

$$\Delta(B/Y)_t^{Actual} = c_{11} + \alpha_{11}((B/Y)_{t-1}^{Actual} - \beta_{12}(D/Y)_{t-1}^{Actual} - \beta_{13}) + \Gamma_{11}\Delta(B/Y)_{t-1}^{Actual} + \Gamma_{12}\Delta(D/Y)_{t-1}^{Actual} + \varphi_4(Y - \hat{Y})_t + \varphi_5(G - \hat{G})_t + \varepsilon_{11t} \quad (8)$$

$$\Delta(D/Y)_t^{Actual} = c_{21} + \alpha_{21}((B/Y)_{t-1}^{Actual} - \beta_{12}(D/Y)_{t-1}^{Actual} - \beta_{13}) + \Gamma_{21}\Delta(B/Y)_{t-1}^{Actual} + \Gamma_{22}\Delta(D/Y)_{t-1}^{Actual} + \varphi_4(Y - \hat{Y})_t + \varphi_5(G - \hat{G})_t + \varepsilon_{21t} \quad (9)$$

where $(B/Y)_{t-1}^{Actual} - \beta_{12}(D/Y)_{t-1}^{Actual} - \beta_{13}$ depicts the deviation from the long-run equilibrium in Eqs. (7) and 8, which is illustrated as:

$$(B/Y)_{t-1}^{Actual} = \beta_{12}(D/Y)_{t-1}^{Actual} + \beta_{13} \quad (10)$$

The VECM includes the output and the government spending gaps in the short run dynamics. The error correction term in Eq. (8), " α_{11} ", gives the fiscal response to the public debt level expressed as a function of GDP. This captures the reaction of fiscal policy to departures from the long run relationship shown in Eq. (10). Following Burger et al. (2011), Eq. (8) was reworked to represent a VAR in levels, which is used to derive a VECM that corresponds to Eq. (6) as follows:

$$(B/Y)_t^{Actual} = c_{11} + \alpha_{11}\beta_{13} + (1 + \alpha_{11} + \Gamma_{11})(B/Y)_{t-1}^{Actual} - \Gamma_{11}(B/Y)_{t-2}^{Actual} + (-\alpha_{11}\beta_{12} + \Gamma_{12})(D/Y)_{t-1}^{Actual} - \Gamma_{12}(D/Y)_{t-2}^{Actual} + \varphi_{11}(Y - \hat{Y})_t + \varphi_{12}(G - \hat{G})_t + \varepsilon_{11t} \quad (11)$$

The coefficients of Eq. (6) (FRF), " α_1 ", " α_2 " and " α_3 " are calculated from Eq. (11) by adding the parameter values over the lags, whereby $\alpha_1 = c_{11} - \alpha_{11}\beta_{13}$, $\alpha_2 = (1 + \alpha_{11})$ and $\alpha_3 = -\alpha_{11}\beta_{12}$. Where α_{11} represents the error correction term. The parameters are used to calculate the primary balance adjustment for the VAR in levels.

5. Data

The model uses annualized quarterly data from 1997:04 to 2018:04. The main variables are the primary balance to Gross Domestic Product (GDP) ratio and the public debt to GDP ratio. In regard to control variables, the paper uses the output gap, the government spending gap, inflation, openness, political stability index, and age dependency index. The output gap and the government spending gap are derived from logged GDP and logged government spending in billions of dollars, respectively. Inflation is calculated as the change in the consumer price index. Openness is computed as the sum of imports and exports of goods and services in billions of dollars expressed as a ratio of GDP. Dummy variables are also included to capture one off events during the period of assessment that may influence the paper's result. These include dummies to control for the 2008 global financial crisis, the 1998 domestic financial crisis, borrowing engagement with the IMF, and the implementation of fiscal rules by the government. The Hodrick-Prescott

⁴ For simplicity, it is assumed that the short run dynamics of the model contains one lag.

filter, with a smoothing parameter of 1600, is used to compute the output and government spending gaps.⁵⁶ The primary balance, government spending and public debt level are obtained from the Ministry of Finance and the Public Service while GDP, inflation and openness are acquired from the Statistical Institute of Jamaica. The political stability and age dependency indices are taken from the Global Economy web database. A list of the variables used in the paper is contained in Table A, Appendix 1.

Table B, Appendix 1, gives the results of the unit root tests while Table C, Appendix 1 examines the unit root properties of the primary balance and public debt ratios to GDP over different sample periods consistent with [Burger et al. \(2011\)](#). In general, the sub-samples represent the periods before and after the IMF program that Jamaica entered into under its economic reform agenda. While Table B reveals that the primary balance and public debt to GDP ratios are nonstationary over the full sample period, the result from Table C indicates that the targeted variables may be stationary over selected sample periods. This introduces inconclusiveness in the result. Accordingly, the four models are estimated as mentioned above. The model variables are logged and first differenced as necessary.

For the VECM, the Johansen Cointegration Test indicates the existence of a cointegrating relationship amongst the variables as shown in Table D, Appendix 1. Table E, Appendix 1 shows the pairwise causality result for the primary balance and the public debt.

6. Fiscal sustainability results

While Jamaica's public debt level has fallen due to the aggressive economic reform program, it is important to ascertain the success of the reforms in achieving or facilitating fiscal sustainability in the country. The results from the models are contained in Tables F, G and H in Appendix 1. Diagnostic checks indicate that the models residuals are normal, free of serial correlation and heteroskedasticity were appropriate (see Tables 1 & J, Appendix 1). Table F shows the results for the OLS, GMM, and VAR while Table G displays the findings from the VECM.⁷ Table H shows the coefficients for the VAR in levels that is derived from the VECM results. To capture the non-linear response of fiscal policy, most models include up to the fourth power for the debt to GDP ratio. Given this adjustment, fiscal policy is sustainable on condition that $(\alpha_{31} + \alpha_{32} + \alpha_{33} + \alpha_{34})/(1 - \alpha_2) > \alpha^* = (r + g)/(1 + g)$. Accordingly [Eq. \(6\)](#) is written as [Eq. \(6a\)](#) as follows:

$$(B/Y)_t = \alpha_1 + \alpha_2(B/Y)_{t-1} + \alpha_{31}(D/Y)_{t-1} + \alpha_{32}\left(\frac{D}{Y}\right)_{t-1}^2 + \alpha_{33}\left(\frac{D}{Y}\right)_{t-1}^3 + \alpha_{34}\left(\frac{D}{Y}\right)_{t-1}^4 + \alpha_4(Y - \hat{Y})_t + \alpha_5(G - \hat{G})_t + \varepsilon_t \quad (6a)$$

The results from all models are consistent.⁸ As expected, the various models show that in aggregate, the government responds in a positive manner to the debt level, which are statistically significant. In addition, the government respond to the public debt level in a non-linear manner. That is, the response of the primary balance to lagged debt depends on the level of debt. Table K, Appendix 1, using the results from the GMM estimation, shows that the rate of response is decreasing at low levels of debt but increasing at high levels of debt. This indicates the existence of fiscal fatigue, whereby the ability of the government to respond is limited as the public debt rises. The large and statistically significant coefficients for the lagged primary balance to GDP ratios from all models reveal that a high level of inertia exists in the behaviour of the Jamaican government when formulating fiscal policy, proxy by the primary balance to GDP ratio.

The findings for the control variables are consistent and statistically significant in most models. For the output gap, the positive response reveals that government policies are countercyclical in nature. The negative reaction to the government expenditure gap highlights that temporary increases in spending will have an offsetting impact on the primary balance. While the fiscal rule dummy is statistically significant, the negative coefficient may be explained by the various fiscal challenges faced by the government due to social obligations. This necessitated parliamentary approval for the postponement of some fiscal targets to facilitate spending on the government's social agenda. Similar to [Ostry et al. \(2010\)](#), the coefficient for the IMF program is negative and statistically insignificant. For the political stability index (the higher the index the more stable the economy), all models show negative coefficients that are statistically insignificant. While the age dependency coefficient is statistically insignificant, the negative coefficient goes against a prior expectation. The negative financial crisis coefficient was statistically significant as expected.

From the VECM, the results show that in the long run, an increase of 1.0 percent in the public debt to GDP ratio leads to an increase of 0.08 percent in the primary balance to GDP ratio. In addition, in the long run a primary surplus to GDP ratio of 4.8 percent is required to achieve a public debt to GDP ratio of 60.0 percent.

The results from the OLS, VAR and GMM models show that the government changes its primary balance today, $(\alpha_{31} + \alpha_{32} + \alpha_{33} + \alpha_{34})/(1 - \alpha_2)$, in response to the previous level of public debt by 1.9 percent, 2 percent and 5 percent, respectively.⁹ Comparing these results with the government's historic financing cost as shown in [Fig. 3](#), the country experienced episodes of fiscal unsustainability

⁵ Although [Hamilton \(2017\)](#) debates against the use of an HP filter given its end-point problems, which could result in spurious dynamics, [Drehmann & Yetman \(2018\)](#) while agreeing, argue that in the absence of clear theoretical foundations, all proposed gaps are but indicators. In this regard, they suggest that the matter is an empirical question and rests on the measure that performs the best.

⁶ While there is no agreement on the smoothing parameter for annual-frequency data, the paper uses the consensus smoothing parameter for quarterly data given the peculiarity of the dataset. That is, quarterly frequency that captures annual information.

⁷ The lag structure for the instrument variables for the GMM specification is (-1 to -6).

⁸ The fourth power of lagged debt is omitted from the OLS model as its inclusion resulted in the other powers being statistically insignificant.

⁹ Although predominantly statistically significant, the impact of the non-linear debt terms were miniscule.

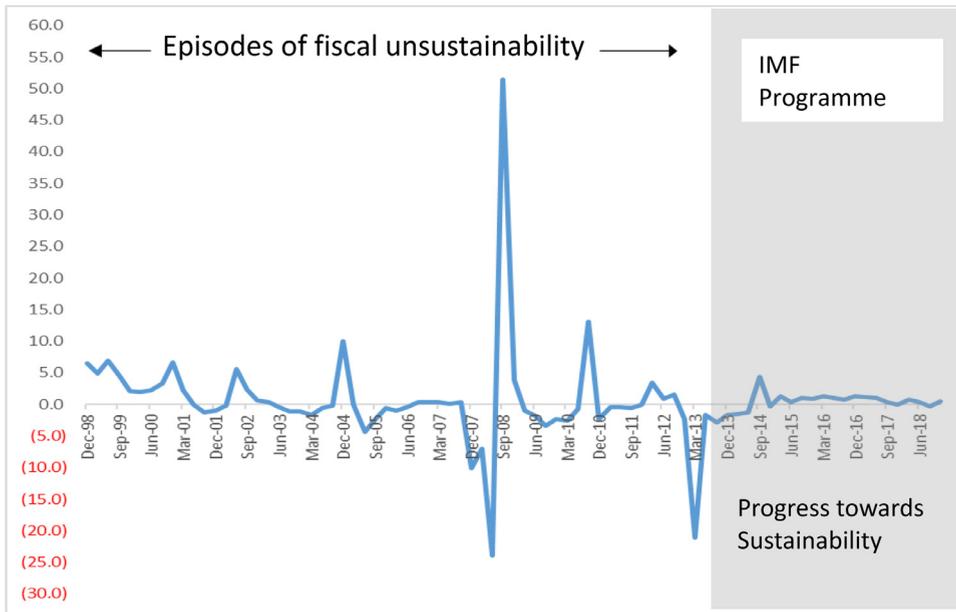


Fig. 3. $(r-g)/(1 + g)$ Ratio_Per cent.

over the sample period. However, continuous progress was made towards achieving sustainability near the end of the period when the government embarked on the economic reform program that was supported by the IMF.¹⁰

To assess whether fiscal policy in Jamaica is on a path to sustainability prior to the implementation of the economic reform program, the paper uses a rolling regression approach by excluding the years of the economic reforms. For the sample period 1997:04 to 2010:04, the results show that the adjustment coefficient for the GMM model is negative (−0.5 percent). On the other hand, the coefficients for the OLS and VAR models are positive, however, small at 0.1 percent and 0.1 percent, respectively. These results indicate that prior to the economic reform program, on average, fiscal policy in Jamaica was unsustainable.

7. Risk associated with the public debt stock

In assessing the risks associated with Jamaica’s public debt stock, the paper employs the International Monetary Fund debt sustainability analysis (DSA) framework for market access countries. The DSA derives the debt dynamics via the formula:

$$D_{(t+1)} = e_{(t+1)}/e_t * \left(1 + i_{(t+1)}^f \right) * D_t^f + \left(1 + i_{(t+1)}^d \right) * D_t^d - (T_{t+1} + G_{t+1} - S_{t+1}) + O_{t+1} + RES_{t+1}$$

where D_t^f represents the stock of foreign currency-denominated debt at the end of period t , D_t^d denotes the stock of local currency-denominated debt at the end of period t , and e_{t+1} is the nominal exchange rate (LC/USD) at the end of period $t + 1$. i_{t+1}^f represents the effective nominal interest rate on foreign currency-denominated debt in period $t + 1$, i_{t+1}^d captures the effective nominal interest rate on local currency-denominated debt in period $t + 1$, and T_{t+1} represents the total public sector revenues in local currency (LC) in period $t + 1$. G_{t+1} captures the total grants to the public sector in local currency (LC) in period $t + 1$, S_{t+1} denotes the public expenditures excluding interest payments in local currency (LC) in period $t + 1$, and O_{t+1} represents other identified debt-creating flows in period $t + 1$.¹¹ RES_{t+1} denotes the residual ensuring that the identity holds.

Using twelve years of historical data and six years of macroeconomic projections for Jamaica, which is taken from the Bank of Jamaica Quarterly Policy Model (QPM), the IMF DSA framework generates a baseline macro fiscal profile for the country.¹² The baseline forecast is presented in Table L, L1 and Fig. 4, Appendix 1. Shocks are then created to test the sustainability of the public debt profile. The paper assesses five risks to the public debt profile, namely shocks to real GDP, primary balance, real foreign exchange rate, and interest rate. The fifth risk combines the aforementioned shocks. The calibration for the shocks is outlined in Appendix 2.

¹⁰ The nominal interest rate that the government pays on its debts is calculated as total interest cost divided by the public debt stock.

¹¹ These are flows having an impact on the level of debt that are not captured by the public sector fiscal balance. They include items such as: (i) privatization receipts; (ii) recognition of contingent liabilities; (iii) debt relief; and (iv) other specific items such as bank recapitalization

¹² The Bank’s QPM is an applied DSGE semi structural open economy gap model that is updated every quarter to inform the Bank’s monetary policy action and communication.

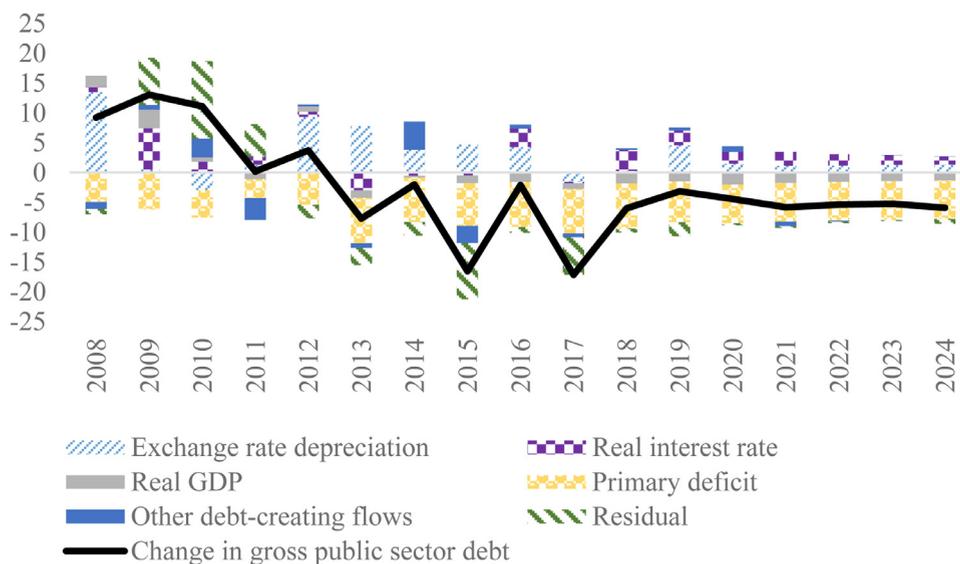


Fig. 4. DSA Debt-Creating Flows (in percent of GDP).

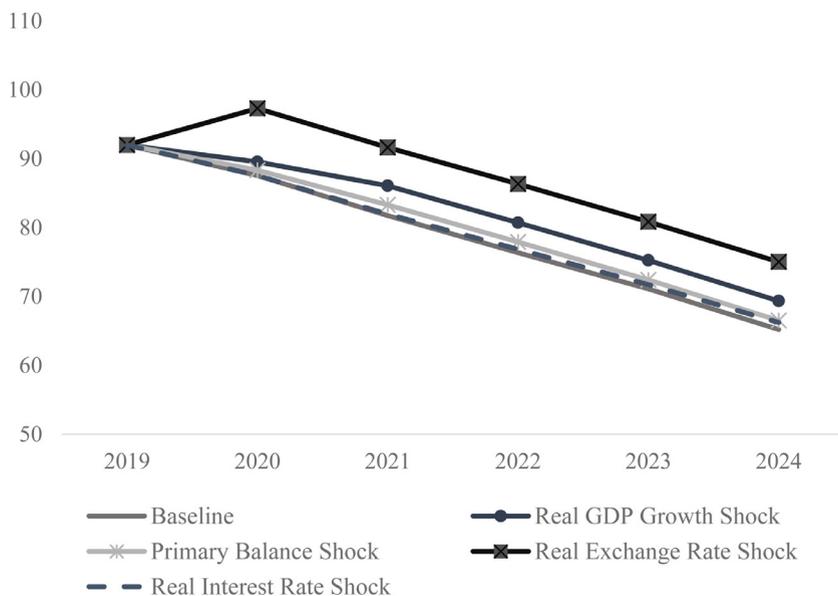


Fig. 5. Macro-Fiscal Stress Tests - Public Debt (in percent of GDP).

8. Results from risk simulations on the public debt stock

Jamaica is a small island state that is susceptible to many shocks, which have the potential to derail fiscal effects and fiscal targets as well as create instability within the economy. The risk assessment results are depicted in Figs. 5& 6, Appendix 1. Of note, the DSA results should be interpreted in the context within which the framework is created in that it does not account for all dynamics within the economy and therefore may overstate the extend of the impact. This is particular so if the impact on economic growth is not fully captured. The results reveal that a shock to real economic growth in Jamaica result in a higher debt to GDP ratio in the year of the shock by 4.4 percentage points (ppts), relative to the baseline projection. This translates to a deterioration of 0.4ppt and 0.8ppt in the primary balance in the year of and the year subsequent to the shock, respectively. For the primary balance shock, the debt to GDP ratio increases by 1.6ppts in 2020 when compared to the baseline projection. In regard to the foreign exchange shock, the public debt to GDP ratio rises rapidly by 9.7ppts in the year of the shock over the baseline projection. This relatively large impact is observed as foreign currency denominated debt accounts for approximately 60.8 percent of the public debt stock as at end-March 2019. Similar to the primary balance shock, the interest rate simulation has a marginal impact on the debt stock. In that, the debt to

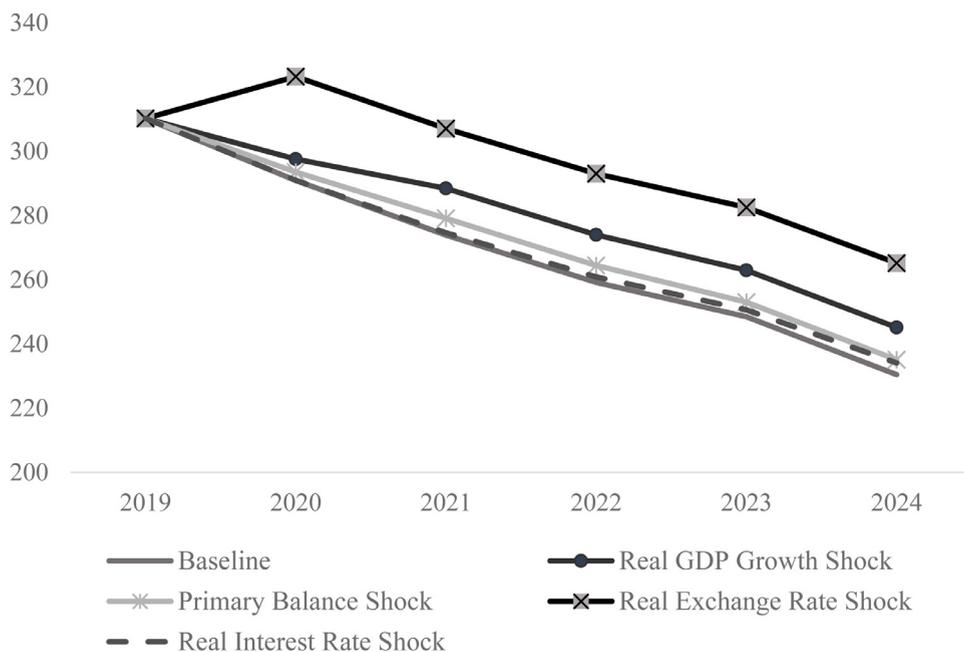
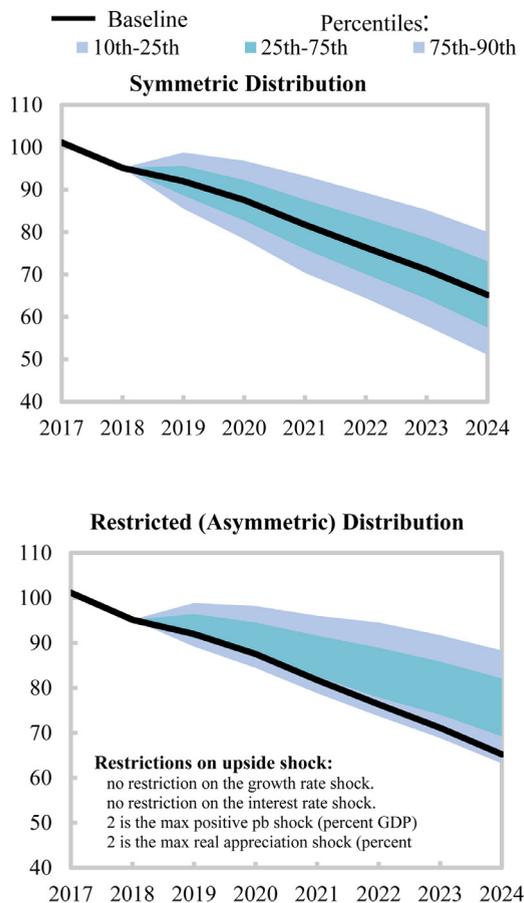


Fig. 6. Macro-Fiscal Stress Tests - Public Debt (in percent of Revenue).



Source: Bank of Jamaica

Fig. 7. Public Debt Risk Assessment Heat Maps.

GDP ratio rises by only 1ppt over the baseline project in 2024 although the effective interest rate increases by 70 bps. The interest rate impact is somewhat muted as fixed rate debt instrument accounts for approximately 68 percent of the debt stock. For the combined macro-fiscal shock, the public debt rises speedily by 18.9ppts and 23.9ppts over the baseline projections in 2020 and 2024, respectively.

The heat maps and the symmetric and asymmetric fan charts are shown in Table M and Fig. 7, Appendix 1, respectively. The results indicate that overall risk to the public debt stock remains elevated in Jamaica. The findings from the joint historical distribution of the main macroeconomic aggregates indicate that there is a 25 percent probability that public debt exceed 73.1 percent of GDP (7.9 percentage points of GDP higher than baseline projection) by 2025. Although, the result shows that a reduction in the primary balance has a relatively small impact on the public debt ratio, it is imperative that the government achieves its set target to ensure the continuation of investor's confidence in the economy.

Conclusion

The paper assesses the sustainability of fiscal policy in Jamaica in the midst of a rising public debt stock and an economic reform program. Further, the paper examines the risks associated with the public debt stock. Fiscal reaction functions are used to assess fiscal sustainability while the vulnerability of the debt stock is evaluated using the IMF debt sustainability framework via shocks to real GDP, primary balance, interest rate, real exchange rate and a combined shock.

With the implementation of the economic reform program, the results show that fiscal policy in Jamaica is on a path to attain sustainability. However, prior to these reforms, fiscal policy in Jamaica is unsustainable. Further, the findings indicate that in the long run a primary surplus of 4.8 percent is required to achieve a public debt to GDP ratio of 60 percent. The results from the DSA show that Jamaica's public debt is most vulnerable to sharp exchange rate depreciations, and that the overall risk to the public debt stock is high. Of note, the DSA results should be interpreted in the context within which the framework is created in that it does not account for all dynamics within the economy and therefore may overstate the extend of the impact. In light of the results, and given that the foreign currency debt accounts for approximately 60 percent of the public debt stock, the paper suggests that the debt portfolio be rebalanced in favour of domestic debt.

Against the current public debt developments in Barbados, Suriname and Costa Rica, these countries could use the Jamaican experience and the evidence presented in this paper as a possible example of how to deal with fiscal sustainability problems.

Further work

The assessment could benefit from an estimation of the optimal debt level for Jamaica. This level will indicate whether there is available fiscal space for the government to invest in public infrastructure that would provide the needed fillip to economic growth. In addition, the risk assessment could benefit from a more dynamic framework that models all fiscal interactions within the economy.

Declaration of Competing Interest

The views expressed in this paper are those of the author and does not necessarily reflect those of the Bank of Jamaica nor the Government of Jamaica

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.latcb.2020.100018](https://doi.org/10.1016/j.latcb.2020.100018).

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