Fiscal Sustainability and Proposal for Institutional Change: The Case for Jamaica

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i. Definition of Fiscal Sustainability

ii. Motivation/Scope

iii. Assessment Framework

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   b. Vulnerability of the debt stock: IMF DSA Framework

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Definition: Fiscal Sustainability

While there is no precise operational definition for fiscal sustainability, we will define it as:

"the ability of a government to sustain its current spending, tax and other policies in the long run without threatening government solvency or defaulting on some of its liabilities or promised expenditures. Wikipedia."

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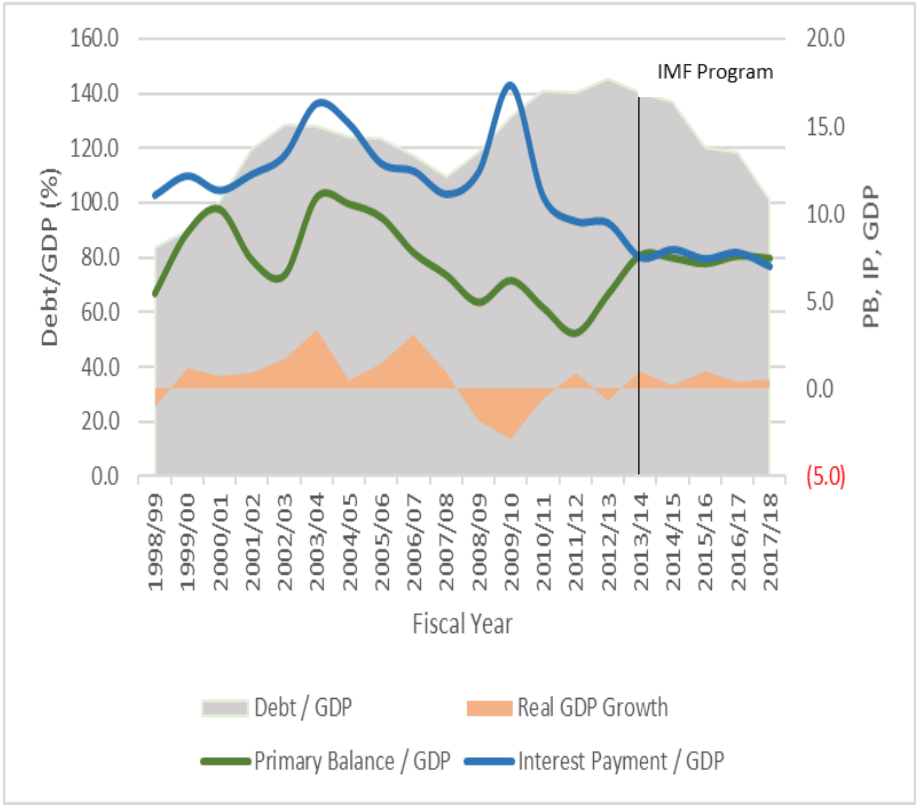
Historic High Public Debt and Low GDP Growth



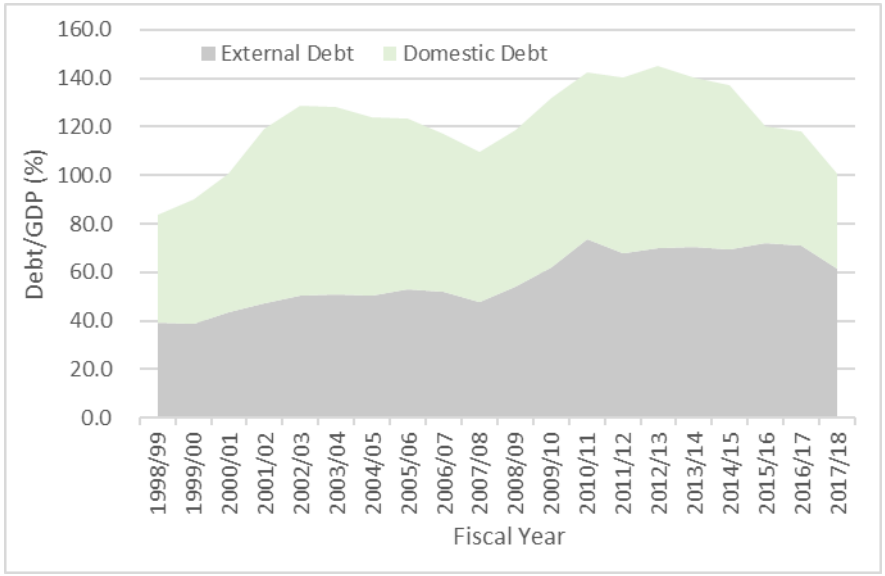
- Jamaica embarked on an aggressive economic reform program in FY2012/13 to arrest the growing public debt and instil growth.

- To date, public debt has trended downwards from historic highs since FY2012/13 due to prudent fiscal policy which has resulted in:
    i. Improved confidence;
    ii. Weak but consistent economic growth;
    iii. A reduction in the country's sovereign risk premium; and
    iv. A reduction in debt servicing.

IMF Programs:

a. 2013: 4-Year Extended Fund Facility.
b. 2016: 3-Year Precautionary Stand-By.
    - Ends in November-2019.

Is the Public Debt Sustainable and is there Fiscal Space?



I. While Jamaica's public debt level has declined, how successful was the aggressive economic reform program in achieving fiscal sustainability?

II. In this regard, there is a need to assess:
   a. The sustainability of fiscal policy in Jamaica;
   b. The vulnerability of the public debt;
   c. Institutions needed to entrench fiscal discipline and maintain confidence in the economy, particularly so with the impending end of the IMF Stand-By Arrangement with Jamaica in 2019; and
   d. The optimal debt level and available fiscal space.
      - That is, is there room for further spending by the Government or is there need for continued restrain?

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a. Fiscal Reaction Functions_Equation 1

- Fiscal reaction function in the fashion of Bohn (2007) and Burger et al. (2011):

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

Where $(B/Y)_t^{Actual}$ is the primary balance / GDP

$(D/Y)_t^{Actual}$ is the lagged debt / GDP

$(Y - \hat{Y})_t$ is the output gap

$(G - \hat{G})_t$ is the government expenditure gap

ε_t is the residual

N.B: Other economic, structural and institutional variables are included as needed. That is political stability index, international trade, age dependency, dummies for IMF programs, financial crisis, and fiscal rules.

a. Fiscal Reaction Functions (cont')

- Fiscal policy is sustainable on condition that:

$$\alpha_3/(1-\alpha_2) > (r-g)/(1+g)$$

Where the term on the right hand side represents the government financing cost whereby 'r' is real interest rate and 'g' is real GDP growth.

Unit Root Tests Results

Unit Root Tests

	Augmented Dickey Fuller Test (P Values)						*Phillips-Perron (P Values)*					*Dickey-Fuller GLS (t statistics)*			
Variable	**Constant**	**First Difference**	**Second Difference**	**Constant & Trend**	**First Difference**	**Second Difference**	**Constant**	**First Difference**	**Constant & Trend**	**First Difference**	**Second Difference**	**Constant**	**First Difference**	**Constant & Trend**	**First Difference**
Adjusted Period															
2008Q2 2013Q2															
Debt_GDP	0.385	0.002		0.018			0.385	0.002	0.907	0.005		-0.884	-2.734	-4.862	
PB_R	0.122	0.049		0.075			0.292	0.045	0.683	0.138	0.001	-2.223		-3.054	
2013Q3 2018Q4															
Debt_GDP	0.981	0.000		0.510	0.001		0.993	0.000	0.544	0.001		0.500	-5.145	-2.108	-5.843
PB_R	0.015			0.132	0.010		0.001		0.060			-1.949		-2.600	-4.077
2001Q2 2016Q4															
Debt_GDP	0.014			0.172	0.000		0.010		0.083			-1.023	-6.577	-1.641	-7.286
PB_R	0.105	0.000		0.315	0.002		0.217	0.000	0.566	0.002		-1.810		-2.471	-4.789
1999Q2 2007Q3															
Debt_GDP	0.225	0.001		0.973	0.001		0.241	0.001	0.969	0.001		-1.003	-4.689	-0.725	-5.393
PB_R	0.045			0.215	0.187	0.000	0.170	0.083	0.608	0.182		-2.160		-2.739	-2.901

I(0)

I(0) _ 10%

1(0) _5% & 10%

VECM_Burger et al. (2011)

$$\Delta(B/Y)_t^{Actual} = c_{11} + \alpha_{12}((B/Y)_{t-1}^{Actual} - \beta_{12}(D/Y)_{t-1}^{Actual} - \beta_{13}) + \Gamma_{11}\Delta(B/Y)_{t-1}^{Actual} + \Gamma_{12}\Delta(D/Y)_{t-1}^{Actual} + \varphi_4(Y - \hat{Y})_t + \varphi_5(G - \hat{G})_t + \varepsilon_{11t} \quad (2)$$

$$\Delta(D/Y)_t^{Actual} = c_{21} + \alpha_{13}((B/Y)_{t-1}^{Actual} - \beta_{12}(D/Y)_{t-1}^{Actual} - \beta_{13}) + \Gamma_{21}\Delta(B/Y)_{t-1}^{Actual} + \Gamma_{22}\Delta(D/Y)_{t-1}^{Actual} + \varphi_4(Y - \hat{Y})_t + \varphi_5(G - \hat{G})_t + \varepsilon_{21t} \quad (3)$$

Where $(B/Y)_{t-1}^{Actual} - \beta_{12}(D/Y)_{t-1}^{Actual} - \beta_{13}$ depicts the deviation from the long-run equilibrium in equations 2 and 3, which is illustrated as:

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

That is " α_{12}", gives the fiscal response to the public debt level expressed as a function of GDP (error correction term).

Equation 2 is rewritten to represent a VAR in levels, to derive a VECM that corresponds to equation 1 as follows:

$$(B/Y)_t^{Actual} = c_{11} - \alpha_{12}\beta_{13} + (1 + \alpha_{12} + \Gamma_{11})(B/Y)_{t-1}^{Actual} - \Gamma_{11}(B/Y)_{t-2}^{Actual} + (-\alpha_{12}\beta_{12} + \Gamma_{12})(D/Y)_{t-1}^{Actual} - \Gamma_{12}(D/Y)_{t-2}^{Actual} + \varphi_{11}(Y - \hat{Y})_t + \varphi_{12}(G - \hat{G})_t + \varepsilon_{11t} \quad (4)$$

VECM_Burger et al. (2011)

The coefficients of equation 1, "α_1", "α_2" and "α_3" are calculated from the VECM by adding the parameter values over the lags, whereby $\alpha_1 = c_{11} - \alpha_{12}\beta_{13}$, $\alpha_2 = (1 + \alpha_{12})$ and $\alpha_3 = -\alpha_{12}\beta_{12}$.

- Johansen Cointegration Test Summary:

Date: 08/05/19 Time: 00:05
Sample: 1997Q4 2018Q4
Included observations: 81
Series: PB R DEBT GDP
Exogenous series: DLAGGEDDEBT SQUARE DLAGGEDDEBT CUBE LOU...
Warning: Rank Test critical values derived assuming no exogenous series
Lags interval: 1 to 1

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	1	1	1	1
Max-Eig	2	1	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999)

a. Fiscal Reaction Functions – Results

Table 1: Fiscal Reaction Functions: OLS, GMM, VAR

	OLS		GMM		VAR	
PB_R(-1)	0.91	***	0.89	***	0.92	***
	[0.04]		*[0.02]*		*[0.04]*	
DEBT_GDP(-1)	0.16	***	0.60	***	0.17	***
	[0.03]		*[0.12]*		*[0.03]*	
DEBT_GDP(-1)^2	-0.003	***	-0.01	***	-0.003	***
	[0.00]		*[0.00]*		*[0.00]*	
DEBT_GDP(-1)^3	0.00001	***	0.0001	***	0.00001	***
	[0.00]		*[0.00]*		*[0.00]*	
DEBT_GDP(-1)^4			-0.000001	***	0.002	
			[0.00]		*[0.00]*	
LOUTGAP(-4)	0.0043				0.0002	
	[0.08]				*[0.08]*	
LOUTGAP			0.32	***		
			[0.05]			
LGOVGAP	-0.044	***	-0.06	***	-0.05	***
	[0.012]		*[0.00]*		*[0.01]*	
DINFLATION	0.118	***	0.06	***	0.12	***
	[0.027]		*[0.01]*		*[0.03]*	
DPSI	-2.58				-3.16	
	[1.99]				*[1.96]*	
DUM	-1.82	***			-1.56	***
	[0.59]				*[0.43]*	
CRISIS			-3.26	***	-0.63	
			[0.47]		*[0.51]*	
OPEN			-0.03	***		
			[0.01]			
RULE			-0.44	***		
			[0.12]			
Adjusted R-squared	0.93		0.90		0.93	

*Standard errors in parenthesis. Significance level : * 10%, **5%, *** 1%.*

Table 2: Fiscal Reaction Function: VECM

Cointegrating Equation:				
PB_R(-1)	*1.00*			
DEBT_GDP(-1)	-0.08	***		
	[0.01]			
Error Correction:	*D(PB_R)*		*D(DEBT_GDP)*	
CointEq1	-0.09	***	-0.46	***
	[-0.04]		[0.16]	
D(PB_R(-1))	*0.49*	***	*0.61*	
	[0.10]		*[0.42]*	
D(DEBT_GDP(-1))	0.01		-0.10	
	[0.03]		*[0.13]*	
D(DEBT_GDP(-1)^2)	-0.0004		0.01	
	[0.00]		*[0.01]*	
D(DEBT_GDP(-1)^3)	0.000003		-0.0001	
	[0.02]		*[0.00]*	
LOUTGAP(-4)	0.01		0.17	
	[0.07]		*[0.31]*	
LGOVGAP	-0.01		0.02	
	[-0.01]		*[0.05]*	
DINFLATION	0.10	***	-0.41	***
	[0.03]		*[0.12]*	
DUM	-0.10		11.17	***
	[0.43]		*[1.83]*	
DPSI	-0.27		-9.43	
	[2.12]		*[9.11]*	
DAGE	0.49		1.14	
	[0.40]		*[1.71]*	
IMF	-0.19		-2.09	***
	[0.15]		*[0.65]*	
DUM2	-1.46	***	10.77	***
	[0.74]		*[3.21]*	
Adj. R-squared	0.40		0.59	

*Standard errors in parenthesis. Significance level : * 10%, **5%, *** 1%.*

Table 3: VAR in levels from VECM

Parameters		Sum of Parameters	
PB_R (-1)	1.40	**PB_R**	0.91
Debt_GDP(-1)	0.02	**Debt_GDP**	0.01
PB_R(-2)	-0.49	**LOUTGAP**	0.01
Debt_GDP(-2)	-0.01		
LOUTGAP(-1)	0.01		

VECM:

i. In the LR, an increase of 1% in the debt/GDP ratio leads to an increase of 0.08% in the PB/GDP ratio.

ii. A long-run primary surplus of 4.8% is required to achieve a debt/GDP ratio of 60%.

Models:

Diagnostic checks showed that the models are free of serial correlation and heteroskedasticity were appropriate.

a. Fiscal Reaction Function: Results

Primary Balance & Lagged Debt (1998-2018)

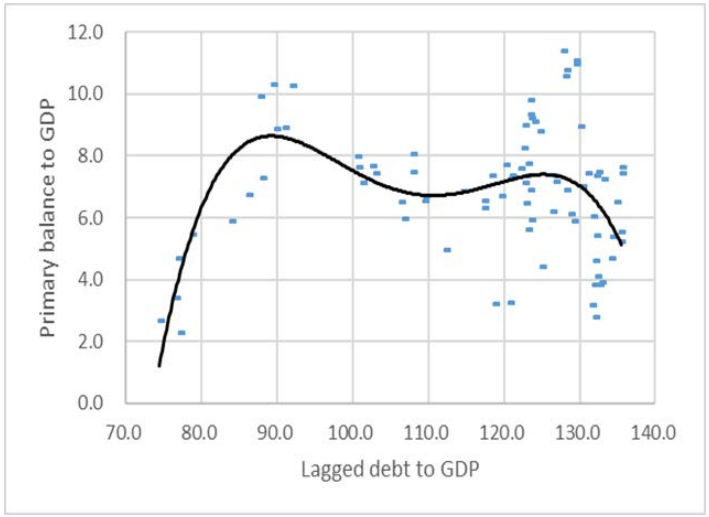
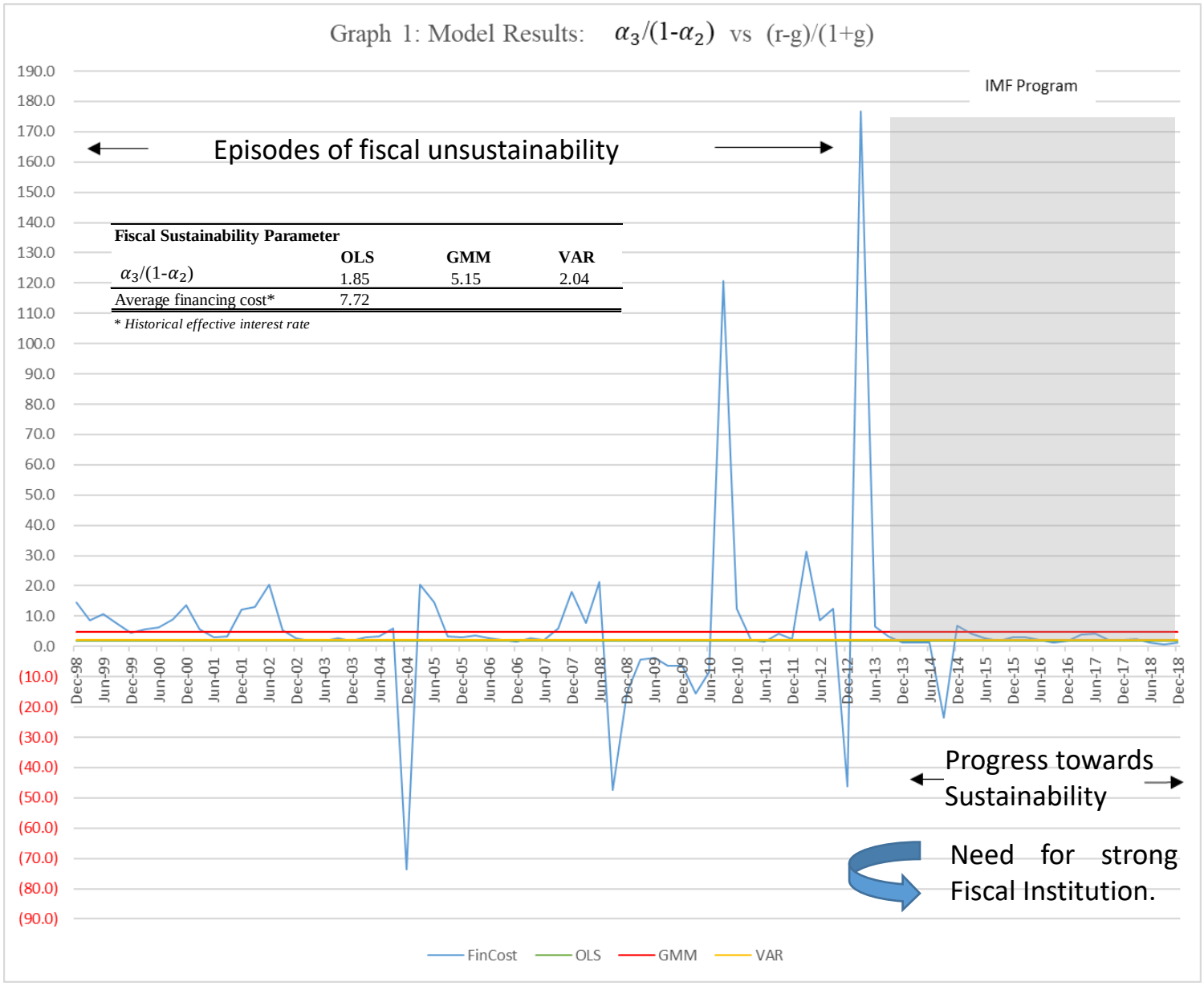


Table 4: Primary Balance Reaction to Lagged Debt

Debt	Chg in PB
70 - 80	-1.09
80 - 90	-0.85
90 - 100	-0.52
100 - 110	-0.18
110 - 120	0.12
120 - 130	0.32
130 - 140	0.35
150 - 160	-0.35

i. Response of primary balance (PB) to lagged debt depends on the level of debt.
   - The rate of response is decreasing at low levels of debt but increasing at high levels of debt.
     - However, as the debt gets too large the ability to respond is not forthcoming.

a. Fiscal Reaction Functions – Results



b. Vulnerability of the Debt Stock: IMF DSA

1. Debt Sustainability Analysis (DSA) is a risk based framework developed by the IMF to assess the stability of a country's debt position. The framework is applied to market access countries that:

   a. Have a current or projected debt-to-GDP ratio above 60% for an advanced economy (AE) and 50% for an emerging market economy (EM).
      - **Jamaica: FY2018/19_94.2% of GDP.**

   b. Have current or projected gross financing needs-to-GDP ratio above 15% for an AE or 10% for an EM.
      - **Jamaica: FY2018/19_5.3% of GDP**

   c. Have or are seeking exceptional access to Fund resources.
      - **Jamaica: Yes**

b. IMF DSA Framework & Assessment

1. Framework:
   a. The user inputs 12 years of historical data as well as forecasts for 6 years on selected fiscal and macroeconomic variables. The forecast is taken from the Bank's QMP model, which is an applied DSGE semi structural open economy gap model . This forms the basis of the debt sustainability assessment, however:
      a. The DSA forecast the debt stock as well as interest and amortization payments on debt issued after the first projection period.

   b. Based on the historical data, current country projections and imputed indicators, a macro fiscal profile is generated for the country.

   c. Shocks are then created to test the sustainability of the debt profile.

2. Risk Identification and Analysis:

   a. Realism of baseline assumptions.
   b. Vulnerability of the debt profile.
   c. Sensitivity to macro-fiscal risks.
   d. Contingent liabilities.

b. IMF DSA Framework

The DSA derives the debt dynamics via the formula:

$$\boldsymbol{D_{t+1} = \frac{e_{t+1}}{e_t} * (1 + i^{f}_{t+1}) * D^{f}_{t}) + (1 + i^{d}_{t+1}) * D^{d}_{t} - (T_{t+1} + G_{t+1} - S_{t+1}) + O_{t+1} + RES_{t+1}}$$

where:

- D_t^f = stock of foreign currency-denominated debt at the end of period t.
- D_t^d = stock of local currency-denominated debt at the end of period t.
- e_{t+1} = nominal exchange rate (LC/USD) at the end of period t+1.
- i_{t+1}^f = effective nominal interest rate on foreign currency-denominated debt in period t+1.
- i_{t+1}^d = effective nominal interest rate on local currency-denominated debt in period t+1.
- T_{t+1} = total public sector revenues in local currency (LC) in period t+1.

b. IMF DSA Framework

The DSA derives the debt dynamics via the formula:

$$\boldsymbol{D_{t+1} = \frac{e_{t+1}}{e_t} * (1 + i^{f}_{t+1}) * D^{f}_{t}) + \left(1 + i^{d}_{t+1}\right) * D^{d}_{t} - (T_{t+1} + G_{t+1} - S_{t+1}) + O_{t+1} + RES_{t+1}}$$

where:

- G_{t+1} = total grants to the public sector in local currency (LC) in period t+1.
- S_{t+1} = public expenditures excluding interest payments in local currency (LC) in period t+1.
- O_{t+1} = other identified debt-creating flows in period t+1.
    i. 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.
- RES_{t+1} = residual ensuring that the identity holds.
    - To minimize the residual the user should ensure that there is consistency between the definition of the stock and flow variables.

Jamaica Public Sector Debt Sustainability Analysis (DSA) - Baseline Scenario

-100 (in percent of GDP unless otherwise indicated)

Debt, Economic and Market Indicators [1/]

	Actual			Projections					
	2008-2016 [2/]	2017	2018	2019	2020	2021	2022	2023	2024
Nominal gross public debt	133.0	101.1	95.1	92.0	87.6	81.8	76.4	71.1	65.2
Of which: guarantees	8.9	6.3	5.5	5.1	4.8	4.5	4.2	4.0	3.7
Public gross financing needs	14.4	12.5	5.3	5.9	6.7	5.4	3.4	3.9	6.9
Real GDP growth (in percent)	-0.2	0.9	1.9	1.6	2.3	2.1	2.0	2.0	2.0
Inflation (GDP deflator, in percent)	8.0	6.9	3.3	4.6	4.6	4.2	4.5	4.7	5.0
Nominal GDP growth (in percent)	7.7	7.9	5.3	6.4	7.0	6.4	6.6	6.7	7.1
Effective interest rate (in percent) [4/]	9.0	6.8	7.1	7.5	6.9	7.1	7.1	7.0	7.1

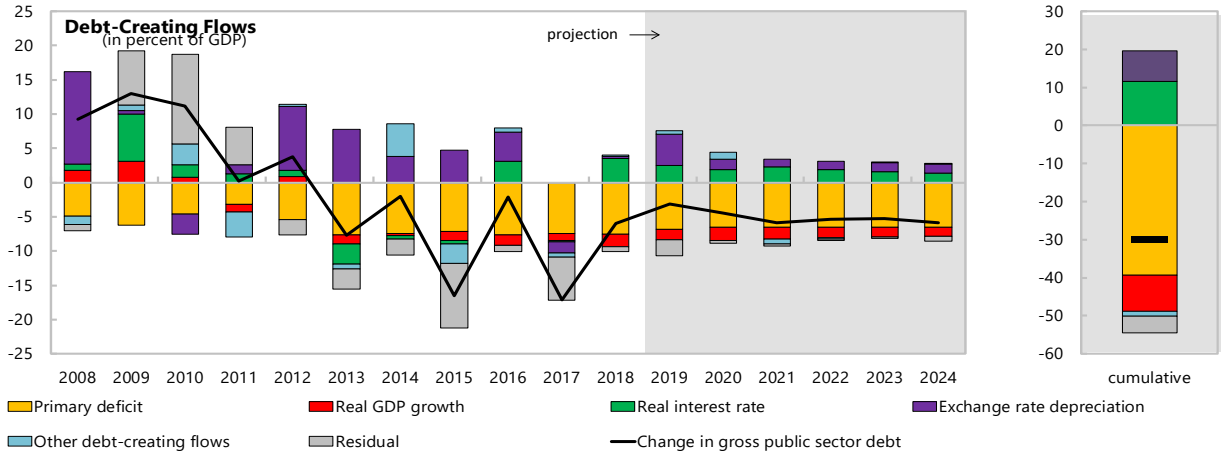
As of January 31, 2019

Sovereign Spreads	
EMBIG (bp) 3/	377
5Y CDS (bp)	n.a.

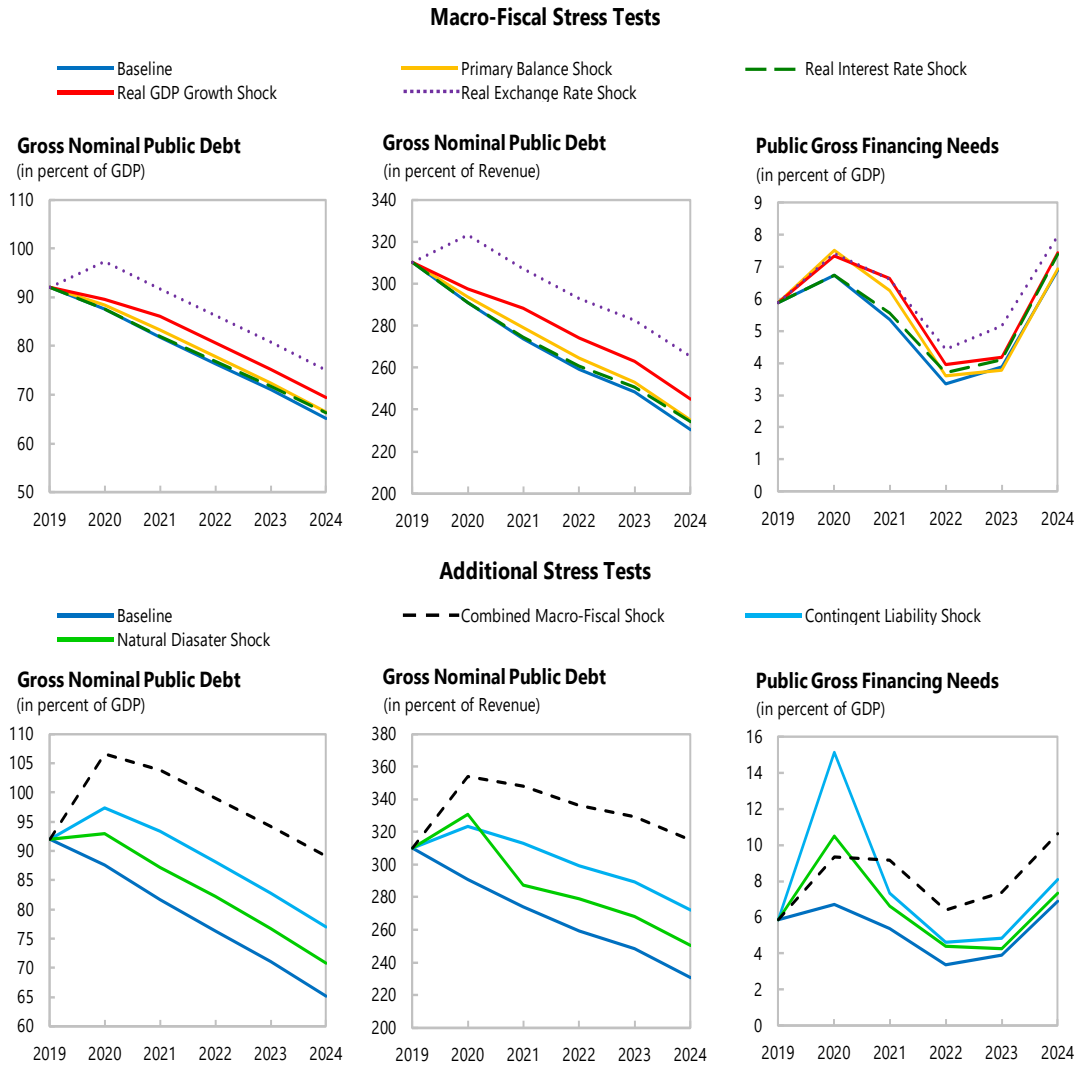
Ratings	Foreign	Local
Moody's	B3	B3
S&Ps	B	B
Fitch	B+	B+

Contribution to Changes in Public Debt

	Actual			Projections							
	2008-2016	2017	2018	2019	2020	2021	2022	2023	2024	cumulative	debt-stabilizing primary balance [9/]
Change in gross public sector debt	1.0	-17.1	-6.0	-3.1	-4.4	-5.8	-5.4	-5.2	-5.9	-29.9	
Identified debt-creating flows	0.1	-10.9	-5.3	-0.8	-4.1	-5.5	-5.1	-5.0	-5.1	-25.6	
Primary deficit	-6.0	-7.5	-7.6	-6.8	-6.5	-6.5	-6.5	-6.5	-6.5	-39.3	1.4
Primary (noninterest) revenue and grant	26.8	29.0	30.9	29.6	30.1	29.8	29.5	28.6	28.3	175.9	
Primary (noninterest) expenditure	20.8	21.6	23.4	22.8	23.6	23.3	23.0	22.1	21.8	136.6	
Automatic debt dynamics [5/]	6.0	-2.8	1.9	5.6	1.5	1.7	1.5	1.5	1.4	13.1	
Interest rate/growth differential [6/]	1.3	-1.2	1.7	1.0	0.0	0.6	0.3	0.2	0.1	2.2	
Of which: real interest rate	1.2	-0.2	3.5	2.5	1.9	2.3	1.9	1.6	1.4	11.6	
Of which: real GDP growth	0.1	-1.0	-1.9	-1.5	-2.0	-1.7	-1.6	-1.4	-1.3	-9.5	
Exchange rate depreciation [7/]	4.7	-1.6	0.3	...	...	...	...	...	...	...	
Other identified debt-creating flows	0.1	-0.6	0.3	0.5	1.0	-0.7	-0.2	0.0	0.0	0.6	
Compensatory flows from PCDF (negat	-1.0	-1.4	-1.4	-0.9	-0.3	-0.9	-0.2	0.0	0.0	-2.2	
Contingent liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Bank Recapitalization/Other	1.2	0.7	1.7	1.4	1.2	0.2	0.0	0.0	0.0	2.7	
Residual, including asset changes [8/]	0.8	-6.3	-0.6	-2.4	-0.4	-0.3	-0.2	-0.2	-0.8	-4.3	



Jamaica Public DSA - Stress Tests



Real GDP Risk: Lower growth by 1.4ppts in 2020 and 2021 (1std).

- *Debt increases to 80.7% in 2022, 4.4ppts higher than the baseline.*
- *Primary balance deteriorates by 0.4ppt and 0.8ppt, in the respective years.*

Fiscal Slippage: PB lower by 0.8ppt in 2020 and 2021 (BL minus 0.5std)**.**

- *Debt increases to 77.9% in 2022, 1.6ppts higher than the baseline.*

Foreign Exchange Risk: A one-off real depreciation of 20%.

- *Debt rapidly rises to 97.3% in 2020, 9.7ppts higher than the baseline.*
- *(FX denominated debt accounts for 60.8% of the public debt as at end-March 2019).*

Interest Rate Risk: Interest rate premium higher by 297 bps (Historical max minus avg. over forecast period)**.**

- *Debt increases to 66.2% in 2024, 1ppt higher than the baseline.*
- *Effective IR rises by 70bps in 2024.*
- *(Modest impact as fixed rate instrument accounts for 68% of debt.)*

Combined Macro-Fiscal Risk:

- *Debt rapidly rises to 106.5% and 89.1% in 2020 and 2024, respectively, 18.9ppts and 23.9ppts higher than the baseline.*

Jamaica Public DSA Risk Assessment

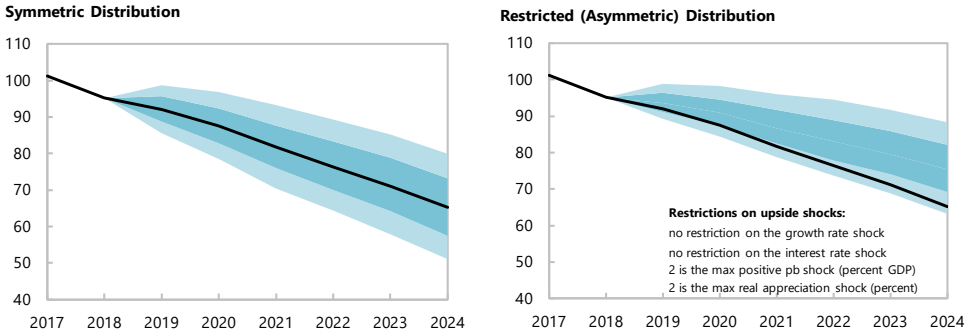
Heat Map

Debt level 1/	Real GDP Growth Shock	Primary Balance Shock	Real Interest Rate Shock	Exchange Rate Shock	Contingent Liability shock
Gross financing needs 2/	Real GDP Growth Shock	Primary Balance Shock	Real Interest Rate Shock	Exchange Rate Shock	Contingent Liability Shock
Debt profile 3/	Market Perception	External Financing Requirements	Change in the Share of Short-Term Debt	Public Debt Held by Non-Residents	Foreign Currency Debt

Evolution of Predictive Densities of Gross Nominal Public Debt

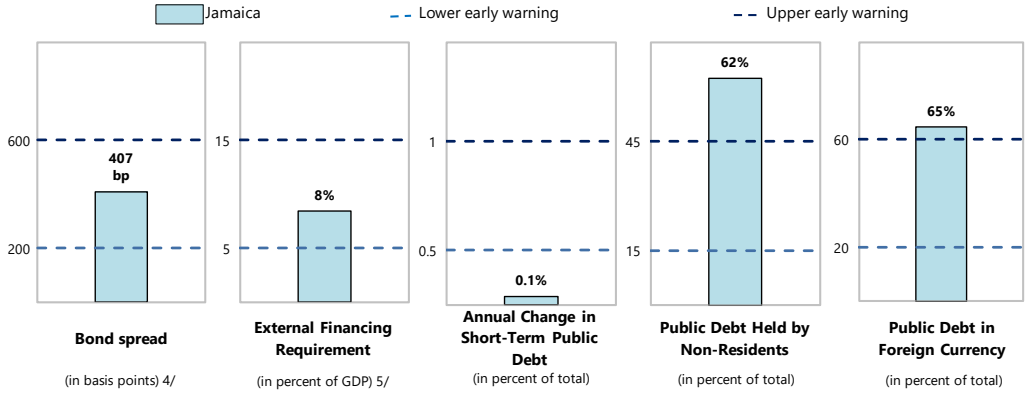
(in percent of GDP)

Baseline — Percentiles: 10th-25th, 25th-75th, 75th-90th



Debt Profile Vulnerabilities

(Indicators vis-à-vis risk assessment benchmarks, in 2018)



Overall risk to the debt remains elevated as shown in the symmetric and asymmetric fan charts:

- The findings from the joint historical distribution of the main macroeconomic aggregates (real GDP growth, interest rate, nominal exchange rate, and primary balance), indicate that there is a 25% probability that public debt would exceed 73.1% of GDP (7.9 percentage points of GDP higher than baseline projection) by FY2024/25.

Conclusion

I. After the aggressive economic reform program, fiscal policy in Jamaica is on a path to achieve sustainability.

II. A strong fiscal institution is required to monitor the Government's performance to ensure that the path to sustainability is maintained.

III. A long-run primary surplus of 4.8% is required to achieve a debt/GDP ratio of 60%.

IV. Jamaica's public debt is most vulnerable to sharp exchange rate depreciations. Foreign currency debt accounts for approximately 60% of public debt. It is therefore critical to rebalance the portfolio in favour of domestic debt.

V. Overall risk to the public debt stock is high.

Further Work:

I. Extend the DSA to FY2025/26.
   a. Jamaica's Fiscal Responsibility Framework targets a debt of 60.0% by FY2025/26.

II. Assessment of Jamaica's debt limit and fiscal space: Ghosh et al. (2013).