

IMF Working Paper

Public Debt Targeting

An Application to the Caribbean

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IMF Working Paper

Fiscal Affairs Department

**Public Debt Targeting
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August 2011

Abstract

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This paper proposes a fiscal policy framework we call Public Debt Targeting. The framework seeks to smooth primary spending over the business cycle while remaining consistent with public debt sustainability. Under the proposed framework, a government announces a commitment to a public debt band trajectory over the medium term, while sequentially announcing primary expenditures for the next budget cycle, which are determined recursively based on the history of shocks. Public debt targeting differs from a structural balance rule in that it internalizes the effect of the deterioration in creditworthiness from fiscal deficits and public debt accumulation, which tend to affect sovereign spreads, interest rates, exchange rates, and economic activity. The proposed framework is applied to Caribbean economies, which in general show high levels of public debt and procyclical primary expenditure.

JEL Classification Numbers: F34; F37; H6

Keywords: Procyclical spending, public debt sustainability, fiscal rules.

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¹ We are thankful to Abdel Senhadji and Emanuele Baldacci for insightful comments and suggestions. We also thank all other participants at the seminar presentations in the Fiscal Affairs Department at the International Monetary Fund.

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I. INTRODUCTION

It is a well established fact in the international finance literature that developments in international financial markets can be a source of instability, and can amplify real shocks.² The channels include the direct impact of capital flows on aggregate demand, including through domestic financial markets, and also the multiplication effect from its impact on the government access to financing and borrowing costs. In countries with high public debt, negative real or financial shocks can deteriorate creditworthiness, perhaps to the point in which the sovereign's ability to honor its debt obligations is perceived to be at risk. At that point, a second round of indirect effects can sink an economy into a negative spiral of high interest rates, credit crunch, and recession.

Under the logic above, it is clear that the stock of public debt is a critical *state variable* of the economy, not just in terms of determining its sustainable level of consumption and public sector spending in the long term, but also in terms of affecting the business cycle dynamics in the short term. A sovereign debtor subject to financial markets' swings might (a) be forced into procyclical expenditure, if access to financing becomes too costly or just unavailable in low states, further amplifying business cycle fluctuations (Box 1), and (b) might need additional self-insurance against loss of access to financing, as opposed to using public debt and access to financing as a source of insurance against macroeconomic shocks. Moreover, the financial contagion literature indicates that the negative dynamics described above can take place even if direct channels and change in fundamentals do not necessarily warrant the financial markets reaction outlined.³ Points (a) and (b) above imply that keeping public debt at sufficiently low levels is a form of self-insurance, as it allows expenditure smoothing over the business cycle by permitting access to financing without jeopardizing creditors' perceptions about a sovereign's ability to honor debt commitments.

This paper proposes a fiscal framework that, based on the reasoning above, seeks to smooth primary expenditure over the business cycle by providing financial creditors sufficient assurance that public debt obligations will remain within a preannounced band with high probability. The use of a public debt band is critical, as it allows for primary balance flexibility and, as a result, avoids the need for large fiscal consolidations in bad states of the cycle, which would undermine credibility⁴. Operationally, the fiscal framework proposal consists of the announcement of four intermediate parameters that pin down the primary expenditure envelope for the next budget cycle, which is set so that public debt remains below a pre-announced threshold in the medium term with a specified probability. Empirical simulations for a sample of Caribbean countries show that allowing debt to move within a relatively narrow band allows for large improvements in terms primary expenditure

² See, for example, Kaminsky, Reinhart, and Vegh (2004).

³ See, for example, Kaminsky and Reinhart (2000).

⁴ This would be the case, for example, with a binding debt ceiling rule.

Box 1. Empirical Literature on Procyclical Fiscal Policy

The documented procyclical character of fiscal policy in most middle and low income economies is regarded as one of the main reasons exacerbating macroeconomic volatility and reducing welfare:

- Talvi and Vegh (2000) show that the cyclical components of output and government consumption are positively correlated in every region, with the only exception of G7 countries. The same holds true for fiscal revenues.
- In a panel estimate including 54 developed and developing countries, Braun (2001) shows that real output growth leads to a decline in the government expenditure/GDP ratio in OECD countries. However, this same relation is statistically insignificant in developing countries. Furthermore, Braun shows that the increase in the primary surplus as a result of higher GDP growth is three times higher in OECD countries than in developing countries.
- Kaminsky, Reinhart and Vegh (2004) show that the cyclical component of government expenditure and output are positively correlated in non-OECD countries for six alternative measures of government spending and several filtering methods. In addition, these authors show that the procyclical result is not driven by the existence of crises in their sample. On the contrary, procyclicality seems to be stronger during tranquil times.
- Balassone and Kumar (2007) find that discretionary fiscal policy has generally been procyclical in good times in both industrial and developing countries. They also find that it has adversely affected economic growth and fiscal sustainability.

smoothing in the business cycle, in some cases better than those obtained under a structural balance rule. This is a tough test for the proposal, as these economies are typically highly indebted, very open, undiversified, and subject from significant real and financial shocks.

The framework has desirable features: (i) it balances the direct impact of countercyclical government spending on aggregate demand vis-à-vis the indirect feedback effect of excess public sector deficit and public debt accumulation, as these can affect sovereign risk and interest rates; (ii) it can enhance credibility as reputation builds over time; (iii) it does not need a potential output estimation for the current year; (iv) it is state-contingent, therefore permitting some overall balance flexibility; and (v) it forces the use of a consistent medium term macroeconomic framework for budgeting. The framework is applied to Caribbean economies, which, as will be shown in Section IV, in general show high levels of public debt and procyclical primary expenditure.

The paper is organized in six sections. Section II describes the public debt targeting proposal. Section III positions the proposal in the context of fiscal rules. Section IV illustrates the workings of the proposal in practice for a sample of Caribbean countries. Section V analyzes the quantitative implications over the business cycle for the Caribbean sample. Section VI discusses limitations. Section VII concludes and presents some discussion about the proposal's application.

II. THE PROPOSAL: PUBLIC DEBT TARGETING

We propose a fiscal framework under which a government commits to keep debt within a specified band with high probability. The policy entails two main parameter announcements: a trajectory of public debt and its probabilistic band, and a primary expenditure budget envelope for the next budget cycle. The two main announcements are linked by four intermediate technical parameters, which are also announced: (i) a medium-term horizon in years, (ii) a public debt upper threshold at the end of the medium term horizon, (iii) a notional spending trajectory that maps next years' primary expenditure announcements to debt trajectories over the medium term, and (iv) a probability value attached to debt remaining below the upper threshold.

Operationally, under the public debt targeting framework, a government is asked to set primary spending budget envelopes for the next year according to probabilistic public debt outcomes over the medium term. Concretely, in year t , a government would announce a primary spending budget for the year $S(t)$ (budget envelope), such that if primary spending for the following T years (medium term horizon) were to remain at the same level in real per capita terms (spending trajectory), public debt would take a level $D(t+T)$ percent of GDP or lower (debt upper threshold) with probability $P(t+T)$ (probability). In year $t+1$ the government would repeat the same announcement, choosing a level of spending $S(t+1)$ such that after T years public debt takes at most a level of $D(t+T+1)$ with probability $P(t+T+1)$, and so on.

The proposed framework is recursive in nature. Budgets are adjusted every year for a given choice of targets and thresholds after the impact of shocks on last years' deficit and public debt has been observed. For example, if a negative shock results in lower revenues in year t compared to the budget projection, then, for a given $S(t)$ budget, the deficit and the amount of debt accumulation would be higher than originally expected. This, *ceteris paribus*, would result in a lower $S(t+1)$ budget envelope relative to the one that would have been determined by the framework without the negative shock, for a given set of medium-term debt target threshold, probability value, and horizon length. In this way, the proposal explicitly tackles the issue of the trade-off between expenditure smoothing over the business cycle and the need to avoid sharp increases in public debt, as the need for expenditure adjustment is averaged away over a sequence of periods.

The rationale of the proposal is that public debt indicators are critical factors affecting business cycle dynamics, in addition to government spending. It is assumed that at sufficiently high public debt levels, marginal government deficits and debt accumulation can trigger second round negative effects (often nonlinear), including interest rate spikes, foreign exchange markets' instability, capital outflows, asset deflation, credit crunch, and uncertainty about taxation (including the inflation tax). These non-Keynesian effects amplify the depth of economic cycles for a given initial shock, potentially in a severe way. Under this logic, and for highly indebted economies, adopting a fiscal framework that provides sufficient

assurances that public debt will remain on a non-increasing trend with sufficiently high probability can be argued to be an aggregate demand smoothing device.

The proposal can, more generally, be expanded to accommodate a pre-announced degree of discretionary expenditure. The spending trajectory can be set up in terms of an acyclical notional trajectory, as in the example above, or expanded with additional procyclical or countercyclical impulses around the primary spending level in real per capita terms. The simulations to be presented below show an example in this regard.⁵ In the example, we simulate a discretionary spending space such that, if real GDP growth is higher (lower) than population growth, a specified share can be spent (saved) in the current budget period. This discretionary stimulus or expenditure impulse can be set to be countercyclical or pro-cyclical, as deemed appropriate. For example, the possibility of a countercyclical impulse would find its rationale in Keynesian arguments for aggregate demand smoothing, such as from nominal rigidities. However, given the underlying logic of the proposed framework, a procyclical discretionary impulse could in some cases be appropriate, particularly if it helps contain the non-Keynesian effects of public debt accumulation.

The proposal has several desirable properties in terms of fiscal policy management:

1. ***Credibility***. The fact that the commitment to a public debt band is anchored on a specific framework that sets government spending according to projected debt trajectories is a critical feature in terms of building credibility. For example, negative shocks that reduce GDP and revenues and result in a larger deficit and public debt relative to budget projections would be less likely to trigger expectations of public debt entering an unsustainable path, as a strategy for a compensating consolidation is automatically in place. Budget announcements acknowledge up front the possibility of shocks and the resulting deviations, but at the same time they are clear about the mechanism by which public debt will be brought back on track. As a government abides by its policy framework announcements, reputation can build up, making access to financing in bad times more fluid and at better terms. In addition, the fact that the framework proposal sets primary spending on a smooth trajectory also contributes to increase the credibility of the debt band announcement. This is because it significantly reduces the need for unrealistically large primary spending consolidation in bad states, as government deficits and debt accumulation are averaged away over a sequence of budget cycles. By construction, the framework avoids the need for sharp primary spending consolidation measures, which would be socially and politically contentious, and dampening the government's ability to actually deliver on its announcement.
2. ***Primary expenditure-smoothing***. As debt thresholds are set according to medium-term economic paths deficits can be larger than budgeted if revenues turn out lower than

⁵ Notice that as the framework is set in terms of primary spending, automatic stabilizers on revenues and interest expenditures are allowed to play in full.

projected while primary expenditure remains at the budget level. The focus on primary spending, as opposed to total expenditure, is not a shortcoming of public debt targeting. First, for a given tax framework in place, primary expenditures are the relevant expenditure aggregate in terms of assessing debt sustainability. Second, interest expenditure tends to be largely predetermined. Excluding interest expenditure from the spending announcement implies that shocks to interest costs (for example, from interest rates or exchange rates) are accommodated. Expenditure smoothing would reduce macroeconomic fluctuations from the direct impact of spending on aggregate demand (direct effect). Moreover, the framework can reduce the amplification/multiplier effect mentioned above when governments' creditworthiness deteriorates (non-Keynesian or indirect effect). Box 2 summarizes some of the main arguments why fiscal policy tends to be procyclical in developing countries.

3. ***Flexibility.*** The proposed framework is not a spending rule. Under public debt targeting, the government is not committing to keep primary spending constant in real per capita terms, that is just a notional spending trajectory used as an intermediate technical parameter to pin down primary expenditures for the next budget, jointly with the other intermediate technical parameters outlined above. Each year primary spending is recalculated recursively, as explained above. The fact that the framework is set in terms of primary expenditures implies that automatic stabilizers on revenues and interest expenditures are allowed to play in full. Public debt targeting is flexible, primary expenditures remain as originally budgeted while allowing primary surpluses/deficits to take their level as per the state of the cycle. This implies that budgets would need to include sufficient contingent allocations in case primary expenditure stabilizers are triggered. The most relevant example is an unexpected increase in the demand for social insurance in bad states of the cycle.

4. ***Medium-term macroeconomic framework.*** Public debt targeting requires fiscal projections over the medium term, as determined by its various parameter choices. Probabilistic projections need to be determined according to a relatively agnostic representation of the economy (a "model"), which is fully disclosed and can therefore be subject to scrutiny. This implies that public debt targeting forces medium-term budget planning. Institutional mechanisms to ensure independence from political influence and stability of the representation are likely needed. At a minimum, the framework requires minimizing the space for arbitrary and unreasonable macroeconomic parameters in the budget and in medium-term projections.

A key input is therefore an economic model that can be used to produce consistent macroeconomic forecasts incorporating the possibility of shocks. The model should be capable of providing stochastic forecasts for the variables relevant to make probabilistic public debt projections, although other variables considered important determinants of the business cycle should also be included. Indeed, the range of possible economic scenarios given the possible range of shocks is a crucial feature of the framework. For example, *ceteris paribus*, if an economy is more vulnerable to shocks and more volatile, it would need more conservative framework parameters, such as a higher primary surplus target or a higher

Box 2. Selected Economic Theory on Procyclical Fiscal Policy

A procyclical fiscal policy stance contradicts all normative fiscal policy prescriptions. It is in opposition with the Keynesian fiscal policy paradigm, which prescribes that fiscal policy should be countercyclical, so as to smooth costly economic fluctuations. It also contradicts tax-smoothing policies that followed the ideas of Barro (1979) and Lucas and Stockey (1983), according to which fiscal policy should remain neutral relative to the state of the cycle.

Existing theories trying to explain procyclical fiscal policy can be categorized in two groups:

1. ***Political economy explanations.*** To this group belong theories based on special interest pressures for spending of fiscal surpluses, common pool problems and segmented fiscal policymaking, and institutional distortions.
 - Talvi and Vegh (2000) assume a cost function of running primary fiscal surpluses. They interpret this assumption as the existence of special interest groups that pressure the government to spend in wasteful allocations.
 - Cole and Kehoe (1992) present a common pool problem explanation for procyclical fiscal policy. They develop a static model of public expenditure in a context of special interests' pressures for spending, and show that expenditure is higher when income is high.
 - Velazco (1998) develops a dynamic version of the special interests model with debt accumulation, and shows that public debt grows continuously until it reaches an upper bound. This indicates that special interests pressures for spending can also generate excessive government spending and unsustainable fiscal finances.
 - Roubini (1991) and Grilli, Masciandaro, and Tabellini (1991) analyze institutional distortions affecting the decision horizon framework of government officials
2. ***Financial markets' lending behavior along the business cycle.*** The possibility of unsustainable government finances highlights the importance of incorporating financial markets considerations into the argument.
 - Gavin et al. (1996) propose an explanation of procyclical fiscal policy based on financing constraints. The argument is based on the observation that interest rates offered to governments tend to be high in low states of the cycle and low during booms.

probability value, in order to reach a similar level of assurance to creditors comparable to that of a less vulnerable economy and achieve the same benefits of aggregate demand smoothing from the indirect effects as a less volatile economy.

III. PUBLIC DEBT TARGETING AND STRUCTURAL BALANCE RULES

Kopits and Symansky (1998) define fiscal rules as numerical constraints set on the budget on a permanent basis. If we take this definition, then the proposal in this paper is not a rule: what is stable over time is the framework, as determined by the choices of the four intermediate medium-term parameters involved and the economic model of choice, but not the actual numerical targets. Under public debt targeting, primary expenditure and debt levels change in

every budget cycle, as the budget envelope for the following year is recalculated after observing the impact of shocks on public debt.⁶

Besides definitional issues, the framework compares favorably to some alternatives. Numerical constraints, particularly on the fiscal balance—as in the Maastricht Treaty in the EU—have the advantage of their simplicity. This could be argued to be important if public scrutiny is considered necessary when special interests or other political economy pressures for spending are strong. However, by their nature, such constraints would not necessarily suffice to avoid procyclical spending or excessive debt accumulation, the two main objectives typically sought.⁷

This is why proponents of fiscal rules prefer to focus on the structural or cyclically-adjusted balance rules. These are based on measures of the structural or non-cyclical components of revenues and expenditures, and therefore account for the transitory impact of business cycle fluctuations on the budget and other transitory or one-off factors. By their nature, provided structural balance targets are set at an appropriate level, these should be consistent with both debt sustainability and a nonprocyclical stance. However, there are disadvantages or limitations often attached to these rules: (a) difficulty in discriminating permanent versus transitory changes in revenues and expenditures, which can undermine transparency and credibility, (b) insufficiency of GDP to assess in full the state of the cycle, and (c) do not allow space for discretionary fiscal policy.

Not all usual limitations (a)-(c) above are necessarily fair, as refinements can be introduced to improve structural balance rules' application in practice⁸. Regardless, public debt targeting would not have these limitations. First, the identification of permanent and transitory output components is not necessary⁹. Instead, spending levels are determined based on projected public debt dynamics, which is simpler and more transparent as these are anchored around

⁶ However, if rules are more generally defined as institutional mechanisms aimed at supporting fiscal credibility and discipline, then the proposed framework could be considered a rule.

⁷ Balassone and Kumar (2007) show, for a sample of developed and developing countries, that the overall balance behavior over the business cycle is asymmetric, as these tend to be relatively more negative in bad times than they are positive in good times.

⁸ For example, mechanisms can be introduced for an ex-post compensation for miscalculations about the state of the cycle, as for example in Switzerland. Also, a broader set of variables could be used to determine structural vs. cyclical components of revenues or expenditures, in addition to GDP. Discretionary expenditure could also be included, provided this introduction is attached to an over-the-cycle compensatory mechanism. See Bornhorst et. al. (2011).

⁹ This is not referring to the technical aspects and multiple methodologies available to identify cycle and trend. It refers to the fact that available methodologies are weak in identifying the trend position at end-sample points, which results in large practical miscalculations that can undermine credibility, even when the methodology remains unchanged. See Bornhorst et. al. (2011).

the debt accumulation identity. Second, given the wider set of indicators needed to produce debt projections, the methodology forces the use of a broader set of variables to determine appropriate primary spending levels, which are also crucial in determining the state of the business cycle, such as interest rates and real exchange rates.¹⁰ Third, the proposed framework tackles the impact of debt sustainability concerns on the business cycle in the most direct way possible, given the commitment to public debt thresholds and the announcement of a debt trajectory band. Fourth, as explained above, the framework can be designed to allow for a cyclical space for discretionary primary spending, possibly including state-contingent additional primary expenditure component (set to be either procyclical or countercyclical, as deemed appropriate), but without necessarily allowing full discretion.

In our view, however, the most promising application of public debt targeting is as a transition framework towards the adoption of a structural balance rule when public debt is high and marginal deficits and public debt accumulation can impact sovereign spreads. Expenditure smoothing over the business cycle requires the ability to finance fiscal deficits, and therefore relies on the assumption that markets would tolerate deterioration in creditworthiness in bad states. To the extent public debt targeting is an intermediate step that seeks to reduce debt within certain bounds consistent also with expenditure smoothing, then it can be a suitable framework that can be used in a transition towards lower indebtedness. The use of a debt band, as it results from the framework proposal in this paper, balances out the objective to smooth primary expenditures over the business cycle with the need to avoid sharp increases in public debt.¹¹

IV. AN APPLICATION TO CARIBBEAN COUNTRIES

The Caribbean economies are good candidates for the proposal in this paper, given high public debt levels and procyclical primary expenditure. The empirical evidence to be presented below is indicative of financial developments being associated to this behavior.

¹⁰ For example, the IMF's 1998 World Economic Outlook show that, for a sample of Asian countries, exchange rates and commodity prices are more important in assessing the cyclical components of revenues and expenditures than GDP fluctuations.

¹¹ On the other extreme of the spectrum, simple debt rules may not be credible either, as they might be difficult to comply with under tail risks. For example, a simple commitment to reduce public debt within a specified deterministic path (for example, a debt ceiling) might prove politically and socially difficult as it implies a commitment to adjust negative shocks in full within the current year, forcing a strongly pro-cyclical fiscal stance. This difficulty can undermine their credibility.

A. The Conduct of Fiscal Policy in the Caribbean Countries: Some Stylized Facts

We start by establishing some stylized facts that are indicative of the relevance of the policy proposal for Caribbean countries:

- ***High public debt-to-GDP ratios.*** Between 2008 and 2009 the median public debt-to-GDP ratio increased from 81 percent to 98 percent. In 2009 public debt showed a magnitude of about 4 times the size of total revenues (Figure 1). For almost all countries the 2010 estimates show a further increase in the public debt-to-GDP ratio (Figure 2).
- ***Procyclical primary expenditure.*** The median cyclical components of real output, primary expenditures and total revenues show positive co-movement over the last 15 years (Figure 3). The cyclical components' median correlation of primary expenditures with both total revenues and real GDP is about 50 percent. This is a general pattern across the developing world (Box 1).
- ***Strong cross-country synchronization of GDP, government revenues and primary expenditures, suggesting that common external factors are important.*** Virtually all countries show a positive correlation of the real output, total revenue and primary expenditure cycles with the cross-country median fluctuations (Figure 4).
- ***Strong cross-country correlation of domestic financial and foreign exchange markets, possibly corresponding to the state of the US business cycle.*** Every country's GDP cycle is positively correlated with that of the US; and there is evidence of cross-country correlation in interest rates, real exchange rates and net capital inflows (Table 1). This suggests that external financial developments are an important channel of transmission of external real and financial shocks.
- ***Financial variables explain a substantial share of the variation in primary expenditures.*** Net capital inflows, real exchange rate depreciation and interest rates jointly explain $\frac{1}{2}$ of the average forecast-error variance of primary expenditures (Figure 5).¹² The statement assumes that a significant share of variation in financial indicators have an external (exogenous) source, as suggested by the real and financial cross-country correlations.

¹² Individual-country forecast variance decompositions are derived from a two-lag six-variable VAR featuring annual observations of the output growth rate, a short-term interest rate, the growth rate of the real exchange rate, the change in net capital inflows, the total revenue growth and the primary expenditure growth, respectively.

Panel 1. Fiscal Behavior and the Business Cycle

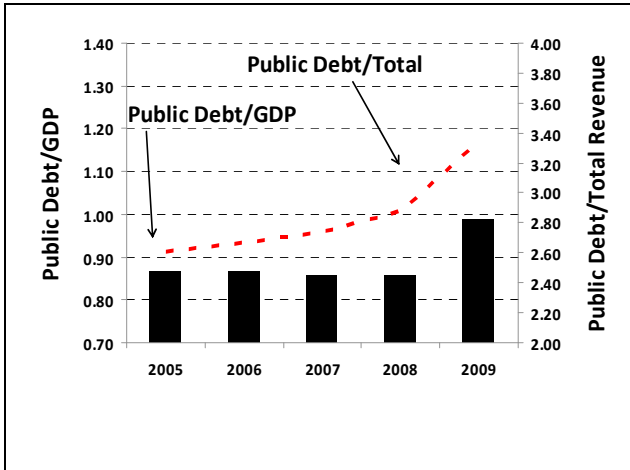


Figure 1. Public Debt-to-GDP and Public Debt-to-Total Revenue (cross-country medians).

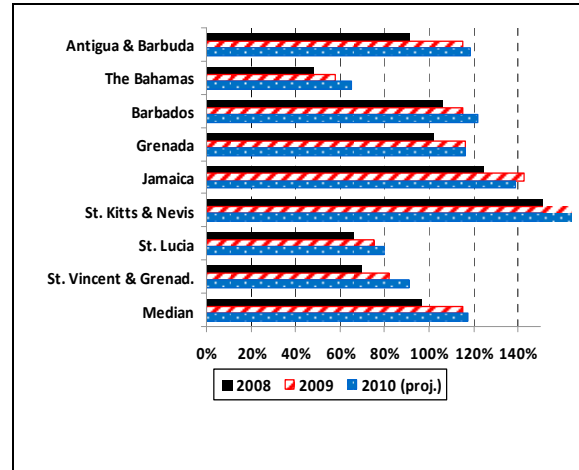


Figure 2. Public Debt-to-GDP ratios by country.

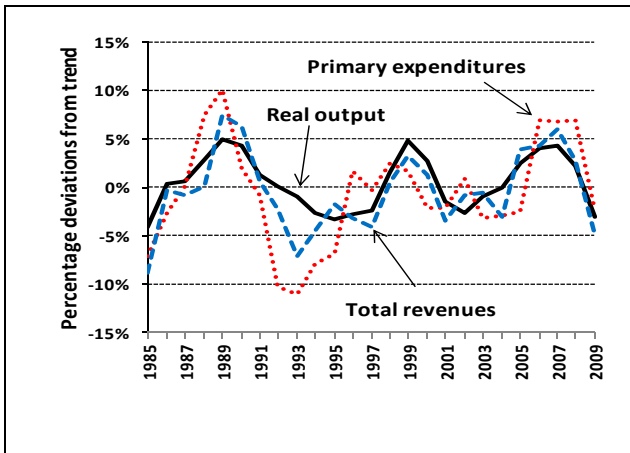


Figure 3. Median Percentage Deviations from Trend of Real Output, Primary Expenditures and Total Revenues (HP trend assumed; annual data).

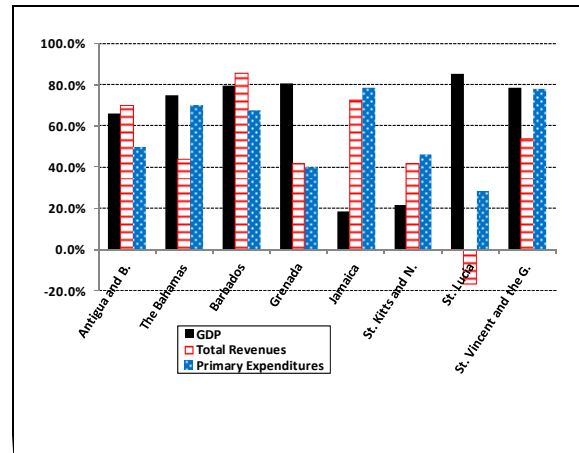


Figure 4. Correlation Coefficients between Country-Specific Cyclical Components and Cross-Country Median of Real Output, Total Revenues and Primary Expenditures (HP trend assumed; annual data).

	Net Capital Inflows	RER depreciation	Interest rate	US GDP
Antigua and Barbuda	19.4%	38.9%	74.6%	49.9%
The Bahamas	48.9%	32.1%	58.9%	70.3%
Barbados	35.2%	46.8%	59.7%	67.5%
Grenada	49.0%	61.2%	26.1%	39.8%
Jamaica	45.1%	6.2%	29.0%	78.4%
St. Kitts and Nevis	67.0%	15.9%	38.0%	46.2%
St. Lucia	-18.8%	49.6%	62.5%	28.6%
St. Vincent and the Grenadines	35.7%	68.9%	61.3%	78.1%

Table 1. Correlation Coefficients between Country-Specific Financial Variables and Cross-Country Medians.

Source: Country authorities and authors' estimates and projections.

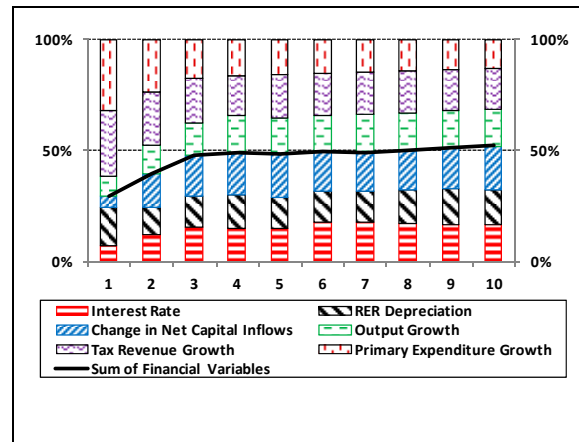


Figure 5. Cross-Country Average Forecast-Error-Variance Decomposition of Primary Expenditure Growth.

B. Simulation

The starting point of the simulation is the public debt accumulation identity. We decompose public debt-to-GDP into: (i) the commercial component denominated in the domestic currency; (ii) the commercial component denominated in foreign currency;¹³ (iii) the official bilateral/multilateral fraction of public debt (usually denominated in US dollars). Let d_t^j be the annual public debt-to-GDP component of type j (e.g. the component denominated in local currency). d_t^j evolves according to

$$d_t^j = \frac{(1+i_t^j)}{(1+g_t)(1+\pi_t)} d_{t-1}^j - \alpha_t^j b_t, \quad (1)$$

where i_t^j , g_t , π_t , α_t^j , and b_t represent the interest rate paid on a government debt of type j , the real GDP growth rate, the annual inflation rate, the share of primary balance servicing public debt of type j , and the primary balance-to-GDP ratio, respectively. b_t is given by the difference between total revenues and primary (non-interest) expenditures divided by GDP. The sum of all types of public debt-to-GDP must yield the total debt-to-GDP ratio for a given year:

$$d_t = \sum_j d_t^j. \quad (2)$$

Appendix A provides a full description of how we have computed and decomposed public debt-to-GDP in the simulations.

This decomposition allows a more realistic evaluation of the sensitivity of debt indicators to interest rate and exchange rate shocks than simply maintaining the assumptions of fixed shares, which imply that debt is continuously re-balanced by recurrent debt repurchase and reissuance. The interest rate specification used in (1) is the implicit or average rate for the debt category, and not the marginal rate. These are approximated by taking the moving average of the marginal interest rate in year t and the previous $M-1$ years, where M is the average maturity of the debt category measured in years.

Model and Estimation. The inputs to produce debt simulations according to (1) and (2) are obtained from stochastic simulations that capture the volatility, correlation and persistence of the required inputs and other variables considered important to determine the state of the business cycle. Simulations are produced by fitting historical data to a VAR model, and then using the coefficients to produce a large number of stochastic projections. We specify the VAR as

$$X_t = A(L)X_{t-1} + Bt_t^* + \varepsilon_t, \quad (3)$$

¹³ We abstract from cross foreign currency parity changes. This is not a significant simplification as most countries' foreign currency debt used in the sample are denominated in US dollars, if not exclusively so.

where $X_t = (g_t \ i_t^d \ \eta_t \ m_t \ \tau_t \ s_t)^T$ is a (6×1) vector of endogenous variables containing real output growth, a short-term market-determined domestic interest rate, the change in the bilateral real exchange rate (versus the US dollar), the change in real net capital inflows, the percentage change in total revenues, and the percentage change in primary expenditures, respectively. i_t^* is the US federal funds rate; $A(L)$ is a polynomial in the lag operator of degree ranging from 1 to 4, depending on the country estimation output. B is a vector of coefficients; and ε_t is a vector of well-behaved error terms: $\varepsilon_t \sim N(0, \Omega)$. Employing growth rates has the advantage of dealing with stationary variables and avoiding any explicit assumption on trends.

VAR models for stochastic simulations of debt-to-GDP dynamics have already been adopted in the literature.¹⁴ The main differences in our specification relative to previous work are (i) the explicit introduction of financial variables, such as net capital inflows and the foreign interest rate, that play a substantial role in explaining the volatility of macro variables in the Caribbean countries as illustrated in Section II A; and (ii) the distinct treatment of total revenues and primary expenditures. In fact, in the stochastic simulations, the primary balance is computed as a second step starting from the simulated growth rates of total revenues and primary expenditures. Keeping revenues and expenditures separated allow us to simulate the feedback effects of expenditure-smoothing policies described in Section III.¹⁵

Monte Carlo Simulation. We use the fitted VAR model to simulate the effect of expenditure-smoothing fiscal policies (active). For comparison purposes, we also simulate primary expenditure using the VAR-fitted equation for primary expenditures (passive). The passive simulations provide an agnostic diagnosis of the prevailing public debt sustainability conditions.

The simulations are computed by generating a sequence of random vectors $\hat{\varepsilon}_{t+1}, \dots, \hat{\varepsilon}_T$ such that $\forall \omega \in [t+1, T]$, $\hat{\varepsilon}_\omega = Wv_\omega$, where $v_\omega \sim N(0,1)$ and W is the Choleski factorization of $\Omega = W'W$. At every forecast period we draw 2000 random vectors $\hat{\varepsilon}_\omega$ while the VAR produces joint dynamic responses of all elements in X .¹⁶ As noted in Garcia and Rigobon (2005), in the passive simulation, the method is not sensitive to the ordering of variables in

¹⁴ Examples of works along these lines are, among others, Garcia and Rigobon (2005), Celasun, Debrun and Ostry (2006), Penalver and Twaites (2006), Tanner and Samake (2008).

¹⁵ The simulation results need to be taken with caution. Any VAR approach to policy simulation is inherently subject to the Lucas critique. In fact, when policies change, the behavior of market participants might change as well, possibly affecting the estimated coefficients. This limitation can be addressed using a general equilibrium model.

¹⁶ For the purposes of the simulations we also use assumptions on the US Federal Funds rate, the Libor on the U.S. dollar and U.S. inflation in line with the WEO (2010) and we fit the domestic consumer price index to a simple pass-through equation in order to project the domestic inflation rate.

the VAR as stochastic simulation results are shaped by the variance-covariance matrix of reduced-form errors Ω , which is unique. However, the active simulations are sensitive to ordering. By setting primary expenditures last in ordering, we minimize the contemporaneous (within year) feedback from primary expenditures to the rest of the economy.

Computing the simulations for the fiscal policy framework proposed in this paper requires two inputs. First is the starting point of the primary expenditure path. The resulting level of primary expenditure represents the primary expenditure envelope for the next budget cycle. Second, a specification of primary expenditure pattern going forward, necessary to calculate public debt projections over the medium term. For this, we use the assumption that primary expenditure remains constant in real per-capita terms (see equation 4 below). This exercise is performed for each of the 2000 random draws using the debt accumulation identity, which results in a distribution of public debt outcomes at each projected horizon. The starting level of primary expenditure is then pinned down iteratively by backward induction, after the desired debt upper threshold, horizon length and probability have been chosen. In this way, the next budget's primary expenditure envelope is consistent with a debt-to-GDP upper threshold \bar{d} to be met T years ahead with probability p , where \bar{d} , T and p are parameter choices of the policymaker. We denote \tilde{s}_{t+1} the primary expenditure level that is consistent with $d_{t+T} \leq \bar{d}$ with probability p .

Notice that setting $p = 0.5$ is, by construction, the level of primary expenditure that stabilizes public debt to GDP in expected terms over the medium-term. A higher p implies that the policymaker is seeking additional primary expenditure consolidation, and, as a result, they are choosing to set public debt to GDP on a downward trend in expected terms. A higher probability is therefore a more prudent choice, as it ensures that debt will remain within low bounds with a higher probability.

The choice of the medium-term horizon length, T , is also important. In this case, for a given debt threshold and probability choices, a longer horizon (high T) increases the smoothness of the primary expenditure path, as the need for adjustment is averaged away over more years. Too long a horizon, however, could undermine the credibility of the framework.

We propose a specification for the forward-looking primary expenditure-smoothing path according to

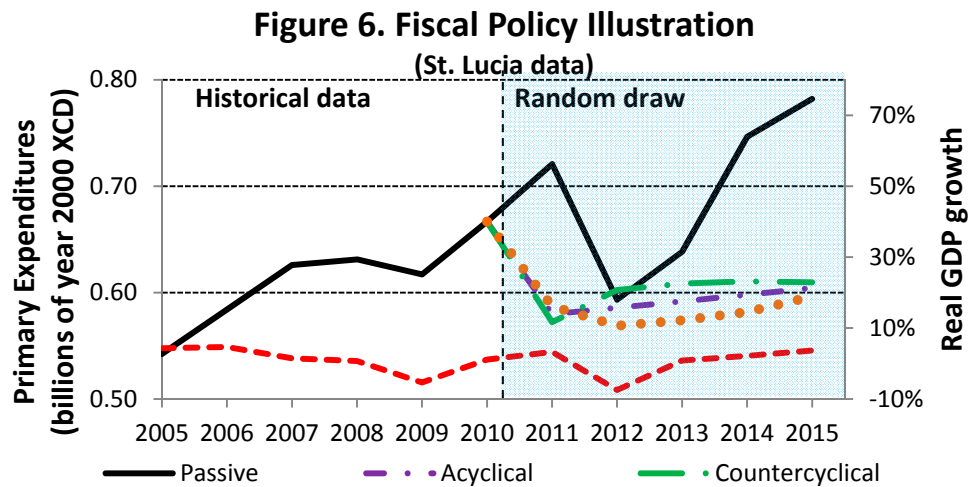
$$s_{\omega} = \tilde{s}_{\omega} - \kappa(g_{\omega} - \bar{g}), \quad \forall \omega \in [t+1, T], \quad (4)$$

where \bar{g} is a "trend" growth rate of real GDP, which we set equal to the average population growth rate; g_{ω} is the simulated growth rate of real GDP, κ is a parameter representing the responsiveness of the primary expenditure growth rate to deviations of real GDP growth from trend growth, \tilde{s}_{t+1} represents the consolidation (if $\tilde{s}_{t+1} < 0$) of primary expenditures at time $t+1$, while $\tilde{s}_{\omega} = \bar{g}$, $\forall \omega \in [t+2, T]$.

Setting $\kappa = 0$ corresponds to running no discretionary expenditure impulse: it implies that primary expenditure is projected to remain constant in real per-capita terms after the initial consolidation occurring in year $t + 1$. In other words, for $\kappa = 0$, the primary expenditure level at $t+1$ is set so that, if primary expenditure remains constant in real per capita terms for T years, public debt will remain below the chosen upper threshold \bar{d} with probability p in year $t+T$. A positive κ represents a countercyclical fiscal policy impulse, as it would result on additional primary expenditure growth of opposite sign to that of real per capita GDP growth. Analogously we take a negative κ to represent a procyclical fiscal policy impulse.

C. An Example

In Figure 6 we illustrate the implications of setting the budget based on the simulation described above for the case of St. Lucia. In the left side we plot historical observations, while in the right side we plot a random draw extracted from the 2000 stochastic simulation pool. In the extracted case, the simulated random shock negatively affects real GDP growth and the passive fiscal policy clearly shows a procyclical behavior observed in historical data. We then show three alternative active paths of expenditure smoothing based on equation (4), for $\kappa = \{0; 0.5; -0.5\}$.



In this example, the policymaker choices are set as follows: the horizon T is set at 5 years, the upper public debt threshold at 70 percent (the estimated debt to GDP in 2010 is 80 percent), and the probability is set at $p=0.7$. This parameter choice, by construction, ensures debt will remain on a declining path with relatively high assurance.

With this parameter choice, the level of primary expenditure consolidation required in the next budget cycle ranges from 1.7 percentage points of GDP under the pro-cyclical choice, to 3.4 percentage points of GDP under the counter-cyclical choice, with the acyclical impulse

choice in between. These three primary expenditure patterns are illustrated by the three dotted lines in Figure 6.

D. Results

Table 2 shows the results of our simulations exercises for a sample of Caribbean economies. For illustrative purposes, we set the proposal to a medium-term horizon of five years. Maximum debt threshold announcements for 2015 are purely illustrative. In the last three columns we show the primary expenditure consolidation in the 2011 budget in percentage points of GDP that would be necessary in order to maintain the debt-to-GDP ratio below the illustrative threshold with probabilities of 50 and 70 percent.

Among the countries reported, Jamaica is the only one that does not show a particular need for further consolidation in 2011. This result is probably due to the consolidation program that the government has already undertaken since 2009. In fact, under the passive behavior, debt-to-GDP is predicted to decline from 139 percent in 2010 to 117 percent in 2015. In 70 percent of the simulated cases, Jamaica meets the target of a debt-to-GDP ratio below 100 percent if it follows an acyclical (primary expenditure constant in real per capita terms) or moderately procyclical or countercyclical rules even in the case of a small expenditure increase in 2011.

Table 2. Fiscal Framework Proposal Simulation for Caribbean Countries

	Estimated debt/GDP in 2010	Estimated primary balance/GDP in 2010	Expected debt/GDP in 2015 under "passive" behaviour	Illustrative debt/GDP threshold in 2015	Probability debt/GDP < threshold	Required consolidation of primary expenditures in 2011		
						Acyclical (k = 0)	Countercyclical (k = 0.5)	Procyclical (k = -0.5)
(in percentage of GDP)								
Antigua and Barbuda	119%	-1.8%	160%	120%	50%	8.3	9.1	7.6
					70%	10.3	11.1	9.4
The Bahamas	65%	-3.9%	79%	60%	50%	0.8	1.1	0.4
					70%	1.9	2.4	1.3
Barbados	122%	-1.2%	137%	130%	50%	7.8	7.6	7.9
					70%	10.3	10.4	10.2
Grenada	116%	0.3%	135%	110%	50%	1.3	0.7	1.4
					70%	3.7	3.2	3.7
Jamaica	139%	7.6%	117%	100%	50%	-4.2	-4.0	-4.4
					70%	-0.7	-0.7	-0.7
St. Kitts and Nevis	184%	-1.9%	205%	180%	50%	11.1	11.7	10.5
					70%	13.6	14.3	13.1
St. Lucia	80%	-3.2%	87%	70%	50%	0.7	1.3	0.1
					70%	2.5	3.4	1.7
St. Vincent and the Grenadines	91%	-1.4%	115%	90%	50%	6.1	5.8	6.4
					70%	7.7	7.5	7.9

Source: Country authorities' and authors' estimates and projections

For the remaining countries, our simulations predict an upward trend for debt-to-GDP ratios in the next five years under the passive primary expenditure behavior. For the Bahamas, Grenada and St. Lucia a primary expenditure consolidation of around 2 to 3 percentage

points of GDP in 2011—together with acyclical or moderately procyclical or countercyclical primary expenditure rules—would be enough to maintain debt-to-GDP in 2015 below the level predicted for 2010 in 70 percent of the simulated cases. For Antigua and Barbuda, Barbados, St. Kitts and Nevis, and St. Vincent and the Grenadines the framework signals a significant need for consolidation in the 2011 budget, in excess of 7 percentage points of GDP.

Figure 7 provides a series of public debt fan charts that underlie the results explained above, based on the simulation exercise. Notice that the fan charts for the policy simulations correspond to the underlying calculations that are used to pin down the 2011 budget cycle, and do not capture the dispersion of public debt when the policy is applied in successive years. The application of the policy in practice results in different fan charts, which capture each budget's adjustments based on observed shocks and implied public debt developments in the previous year. The simulations with a year-by-year application of the proposal are presented in Section V.

V. PUBLIC DEBT TARGETING IN THE BUSINESS CYCLE: A QUANTITATIVE ASSESSMENT

In order to illustrate the quantitative implications of the proposal over the business cycle, we proceed to simulate the proposed policy for a sequence of periods. The parameter choices remain the same as in previous sections. To this end, we perform recursive simulations, mimicking what would happen in practice as the public debt targeting framework is applied over subsequent annual budget cycles. First, we calculate the primary expenditure envelope for the next budget cycle (2011) using the same parameter choices as in Table 1, while allowing the VAR to generate the remaining vector variables for 2011. With the simulations for 2011, we compute the implied end-2011 public debt stock using the debt accumulation identity (equation 1). Notice that as each of the 2000 simulations in the Monte Carlo experiment is subject to a random shock, the deficits and debt stocks for the period will vary across simulations, despite the use of the same framework for all of them. Then, for each simulation, we recalculate the primary expenditure for the 2012 budget period consistent with the same proposed framework parameters, allow the VAR to simulate the remaining variables, and calculate the public debt stock as of end 2012. We proceed in this way until the 2015 budget period.

For reference, we compare these results with the following two alternatives: (a) primary expenditure trajectory under the historical behavior, as obtained from the unrestricted VAR, and (b) for the structural primary balance rule that targets the same public debt-to-GDP ratio for comparability,¹⁷ with elasticities of real levels of revenues and primary expenditures to

¹⁷ Also, the simulations under the structural balance rule are based on the same long-term GDP growth and real interest rate assumptions.

Figure 7. Public Debt Simulations under Alternative Primary Expenditure Assumptions

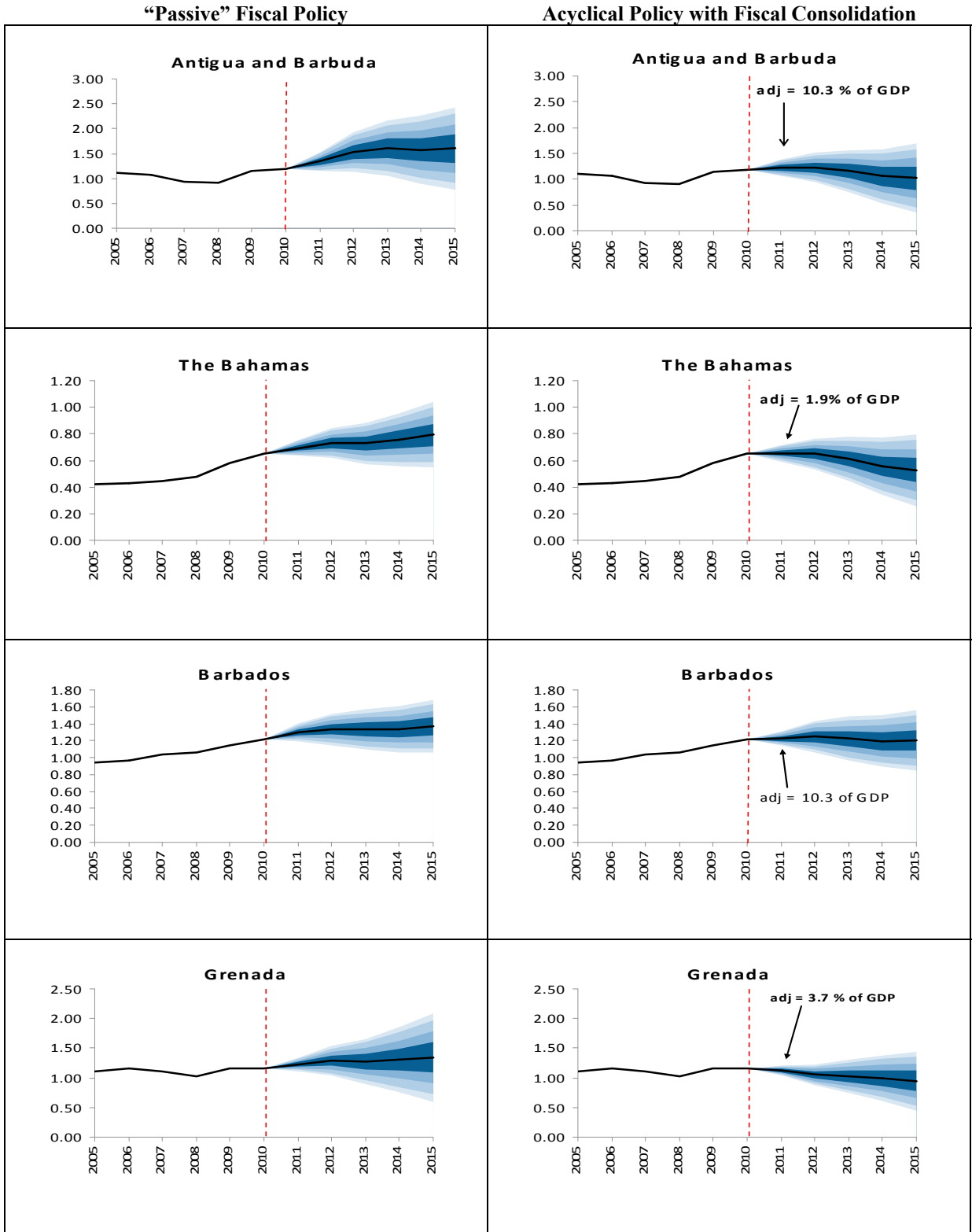


Figure 7. Fan Charts of Public Debt-to-GDP ratios under “passive” and acyclical policy with country-specific initial consolidations consistent with illustrative debt threshold.

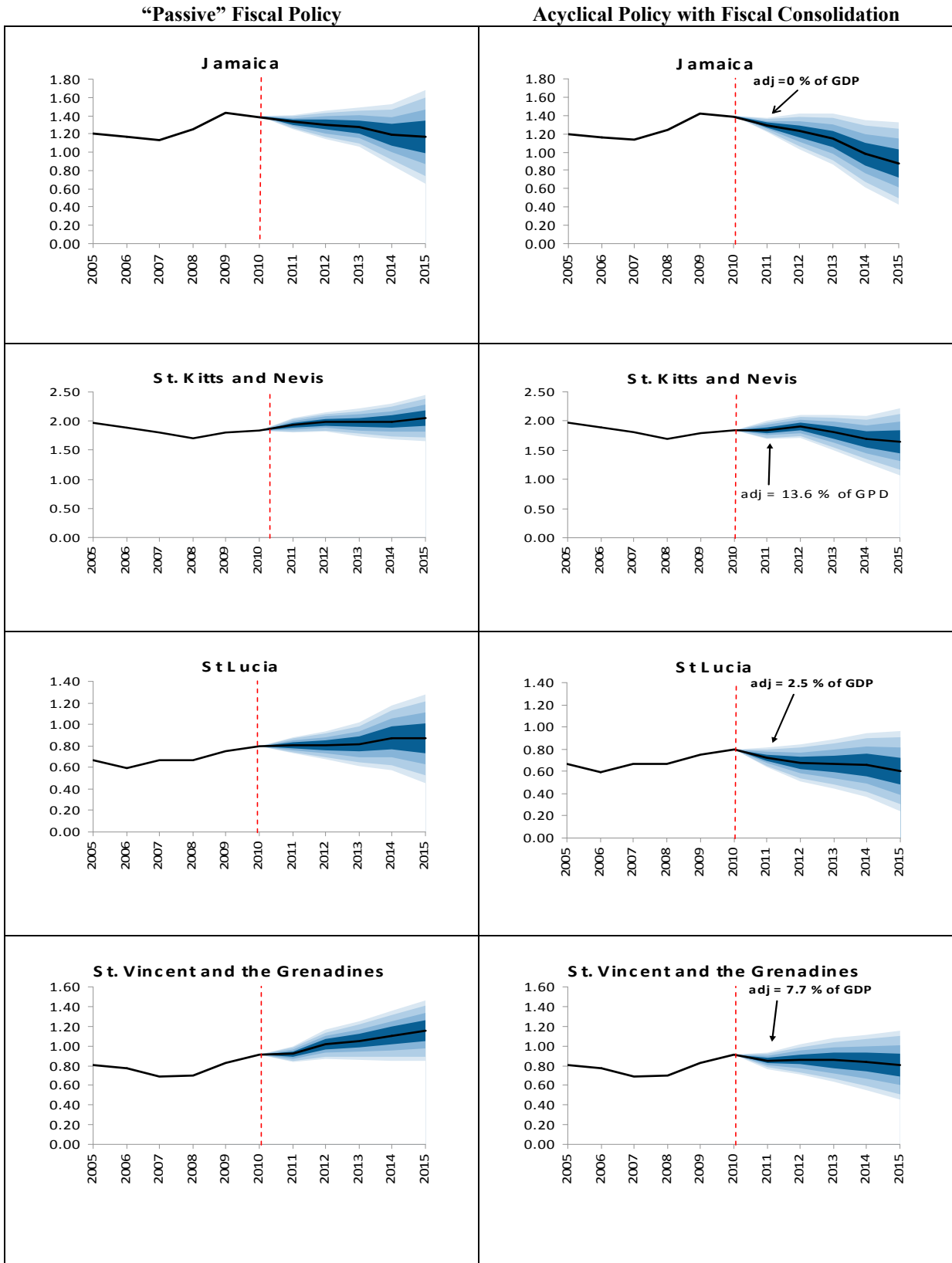


Figure 6 (continued). Fan Charts of Public Debt-to-GDP ratios under “passive” and acyclical policy with country-specific initial consolidations consistent with illustrative debt thresholds.

Source: Country authorities’ and authors’ estimates and projections

the output gap of 1 and 0, respectively.¹⁸ GDP gaps are estimated using the Hodrick-Prescott filter trend as a measure of potential GDP. We obtain quantitative measures for three different set of results considered of interest: (i) the degree of primary expenditure smoothing; (ii) the cyclical properties of primary expenditure vis-à-vis GDP and revenues; and (iii) the public debt-smoothing properties.

A. Primary Expenditure Smoothing

The simulations show that the primary expenditure smoothing properties of public debt targeting compare favorably relative to a structural balance rule for this sample of countries. As an indicator of variability over time, we compute the growth rate of simulated real primary expenditures over the simulation years (2011–15) and the standard deviation of these growth rates for each of the 2000 simulations. Then we calculate the coefficient of variation (CV) as the standard deviation scaled by the average growth rate over 2011–15, and average it over the 2000 simulations. The results are presented in Table 3. The coefficient of variation of the growth rate of primary expenditures under public debt targeting is in general lower than under a structural balance rule¹⁹. Under this particular parameter choice, only for two out of eight country cases the CV under public the debt targeting framework proposal is higher than under a comparable structural balance rule, but not very significantly so.²⁰

¹⁸ The primary expenditure under a structural balance rule is calculated as structural revenues minus the primary surplus that targets the same public debt to GDP target as in the framework proposal, for comparability. Structural revenues are calculated as the simulated revenues times the output gap (computed as the ratio of the GDP trend using the Hodrick Prescott filter with $\lambda = 100$ divided by the GDP level).

¹⁹ The calculations of the CV reported in Table 3 exclude the growth rate of primary expenditures in 2011 as, for both fiscal policy choices, it captures the initial consolidation required to set public debt on a sustainable path.

²⁰ Notice that this is not a horse race between the two methodologies, as the results are conditional on the set of parameter choices for each.

Table 3. Smoothing Properties of the Fiscal Framework Proposal:
Coefficient of Variation of Simulated Real Growth Rates of Primary Expenditures 1/

	Historical	Structural	Public
	behavior	balance rule	Debt Targeting
	2/	3/	4/
Antigua and Barbuda	25.7	17.6	3.4
The Bahamas	1.5	1.3	2.3
Barbados	3.3	1.3	1.9
Grenada	91.9	5.8	2.7
Jamaica	2.3	2.2	1.7
St. Kitts and Nevis	1.5	3.0	2.7
St. Lucia	3.5	2.2	1.5
St. Vincent and the Grenadines	6.1	2.4	1.8

1/ Ratio of the standard deviation to the mean of the average real growth rate of simulated primary expenditures. Mean and standard deviation computed from a Monte Carlo experiment based on the VAR simulation. The simulations for the structural balance rule and the policy framework proposal are based on the same parameters and public debt target levels. In absolute terms.

2/ Primary expenditure simulations based on the estimated VAR coefficients.

3/ Primary expenditure simulations based on a structural primary balance with output gap elasticities of revenues and primary expenditures of 1 and 0, respectively.

4/ Primary expenditure simulations based on the policy proposal in this paper. All parameters are set as in Table 2.

Source: Country authorities' and authors' estimates and projections

Cyclically-adjusted primary balances also show that the cycle-smoothing properties of the debt targeting proposal are comparable to those of a structural balance rule. Table 4 reports the coefficient of variation (CV) of cyclically-adjusted primary balances, both for the structural balance rule and public debt targeting. The CV are computed as the standard deviation of the cyclically-adjusted primary balances across the 2000 simulations, and then scaled by the year average, for each year of the simulation period 2011–15. The results show that for five out of eight cases, the structural balance rule has more variability in cyclically-adjusted primary balances under a structural balance rule, in principle signaling more shock absorbing capacity compared to public debt targeting.

However, notice that these calculations are based on the same simulations as in Table 3, which in general showed a more stable primary expenditure pattern for the public debt targeting framework. This means that, from consolidating the results in Tables 3 and 4, it is possible to conclude that (i) revenues are, in general, also more stable under public debt targeting (numerator of the CV effect), and/or (ii) average (or trend) real growth rates of revenues, GDP and primary expenditures are also higher under debt targeting (denominator of the CV effect), resulting in lower coefficients of variation. This means that the stabilization impact of accounting for the indirect effects under public debt targeting appears to more-than-offset the direct impact of a structural expenditure rule, which allows more primary balance variability to cushion shocks.

The simulation results on expenditure smoothing confirm the key conceptual difference between public debt targeting vis-à-vis structural balance rules. A structural balance rule

does not take into account the indirect non-keynesian feedback to the rest of the economy. In other words, it implicitly assumes fiscal policy credibility is very high, in the sense that sovereign spreads, interest rates, foreign exchange markets and capital flows are not perturbed by deficits and debt accumulation. It therefore remains appropriate for countries with full credibility (not the ones we are focusing on in this paper), or for cases in which the credibility problems are resolved by the sole implementation of a structural balance rule consistent with debt sustainability. However, if a country is such that the mere announcement

Table 4. Coefficient of Variation of Cyclically- Adjusted Primary Balances 1/
Monte Carlo based simulations 2011-2015

	2011	2012	2013	2014	2015	Average 2011-15
Antigua and Barbuda						
Structural balance rule 2/	0.65	1.61	0.56	0.27	0.34	0.69
Public debt targeting 3/	0.41	0.53	0.55	0.40	0.62	0.50
The Bahamas						
Structural balance rule 2/	7.26	2.83	2.82	0.76	1.32	3.00
Public debt targeting 3/	1.32	1.53	0.79	0.59	1.20	1.09
Barbados						
Structural balance rule 2/	0.86	0.94	4.37	0.64	0.72	1.51
Public debt targeting 3/	0.34	3.52	0.90	2.27	9.12	3.23
Grenada						
Structural balance rule 2/	0.24	0.24	0.24	0.22	0.30	0.25
Public debt targeting 3/	0.35	0.20	0.21	0.30	0.39	0.29
Jamaica						
Structural balance rule 2/	0.53	0.71	0.58	0.20	0.28	0.46
Public debt targeting 3/	0.18	0.10	0.32	0.19	0.37	0.23
St. Kitts and Nevis						
Structural balance rule 2/	0.35	1.26	0.69	0.25	0.33	0.58
Public debt targeting 3/	0.82	0.91	1.02	1.26	6.52	2.10
St. Lucia						
Structural balance rule 2/	0.56	3.22	2.73	6.88	13.24	4.94
Public debt targeting 3/	0.41	0.94	0.38	0.74	1.80	0.85
St. Vincent and the Grenadines						
Structural balance rule 2/	1.15	0.66	0.61	1.47	3.23	1.43
Public debt targeting 3/	0.33	0.34	0.67	0.60	2.31	0.85

1/ The cyclically adjusted primary balances are calculated as revenues scaled by the output gap, minus primary expenditures, and then the difference is divided by potential GDP. The potential GDP and the output gap calculations are based on the HP filter. The coefficients of variation are calculated as the standard deviation of the cyclically-adjusted primary balances over the 2000 simulated series, divided by the average.

2/ Primary expenditure simulations based on a structural primary balance with output gap elasticities of revenues and primary expenditures of 1 and 0, respectively.

3/ All parameters are set as in Table 2.

Source: Country authorities' and authors' estimates and projections.

B. Cyclical Properties of Primary Expenditures

Primary expenditures show, in general, a similar degree of co-movement with GDP as a structural balance rule, for the set of parameter choices in this experiment. We illustrate this point by computing the correlations of the real growth rates of primary expenditures with the real growth rates of GDP and government revenues for each of the 2000 simulations. The average correlation is then displayed in Table 5. The correlations with GDP of both the

structural balance rule and the framework proposal are, as expected, significantly lower than under the historical behavior. Moreover, the correlations with GDP of public debt targeting are higher than under the structural balance rule for five out of eight country cases, but in three of the five cases the difference in correlation is small.²¹

Table 5. Cyclical Properties of Primary Expenditures
Correlations of growth rates of primary expenditures with GDP and revenues 1/

	Correlations of real growth rates of primary expenditures and GDP			Correlations of real growth rates of primary expenditures and revenues		
	Historical behavior	Structural balance rule	Debt Targeting	Historical behavior	Structural balance rule	Debt Targeting
	2/	3/	4/	2/	3/	4/
Antigua and Barbuda	-0.01	0.12	0.28	0.09	0.87	0.70
The Bahamas	0.36	-0.45	0.29	-0.15	0.64	0.37
Barbados	0.33	0.04	0.17	0.03	0.84	0.32
Grenada	0.15	0.01	-0.08	0.65	0.96	0.46
Jamaica	0.08	0.08	0.44	0.30	0.94	0.56
St. Kitts and Nevis	0.78	0.00	0.02	0.49	0.94	0.66
St. Lucia	0.70	-0.41	-0.43	-0.14	0.94	0.77
St. Vincent and the Grenadines	0.25	-0.05	-0.16	0.52	0.94	0.32

1/ Correlation within each simulation's real growth rates of primary expenditure with GDP and revenues, then averaged for the 2000 simulations. For each country, the first row is the average correlation, and the second row is the standard deviation of the correlation.

2/ Primary expenditure simulations based on the estimated VAR coefficients.

3/ Primary expenditure simulations based on a structural primary balance with output gap elasticities of revenues and primary expenditures of 1 and 0, respectively.

4/ Primary expenditure simulations based on the policy proposal in this paper. All parameters are set as in Table 2.

Source: Country authorities' and authors' estimates and projections

The correlation between the real growth rates of primary expenditures and revenues under public debt targeting is high, however. The average correlation for the country sample is 52 percent for the parameter choice explained. This is not necessarily a limitation of the proposal, as the framework parameters can be set to increase the smoothness of spending (for example, by extending the medium-term horizon beyond five years). In fact, a positive correlation between revenues and expenditures implies that there is a need for a degree of pro-cyclical adjustment, which prevents public debt from growing above the markets' comfort zone. This is therefore a concrete feature of the framework proposal, as it forces the policymaker to acknowledge and to make a choice on the trade-off between some degree of pro-cyclical expenditure consolidation (so as to avoid too large of a deficit and debt accumulation in bad states of the cycle) vs. public debt volatility.²²

²¹ These correlations include the initial adjustment for the 2011 budgets reported in Table 2.

²² Notice, that the simulation experiment also shows that the average correlation between revenue and GDP growth rates for this sample of countries is 88 percent under a structural balance rule, very high. However, this
(continued...)

C. Public Debt Smoothing

The points made above raise the issue of the volatility of public debt outcomes when the proposed framework is applied in practice, as an indicator of the change in the sovereign's creditworthiness. To illustrate the quantitative implications in terms of debt smoothing, we compute the dispersion of debt outcomes out of the simulation exercise when the policy framework is applied over a sequence of periods. The results are summarized in Table 6. The first observation is that the volatility of the debt-to-GDP ratio by 2015 under the framework proposal appears to be less than $\frac{1}{2}$ of that under historical behavior. In addition, the parameter choice also implies lower average volatility in debt outcomes than under a structural balance rule, with the coefficient of variation being on average about $\frac{3}{4}$ of that for the structural balance rule.

Notice that there are two opposite forces at play behind this result. On the one hand, smoother expenditures can result in larger fiscal imbalances and, therefore, higher public debt volatility, for a given pattern of revenues (direct or Keynesian effect). On the other hand, if expenditure smoothing results in smoother macroeconomic outcomes, including not just GDP but also other critical variables such as real exchange rates and interest rates, the volatility of the debt to GDP ratio might actually be lower (indirect or non-Keynesian effect). The simulation results appear to indicate that, as per the parameter estimates in the VAR, the second effect is relatively stronger: the proposed framework generates both smoother primary expenditures and lower volatility of public debt (Figure 8).

Table 6. Expected Public Debt Level and Dispersion by 2015 1/

	Historical behavior 2/			Structural balance rule 3/			Public debt targeting 4/		
	Expected	Std. Dev.	CV	Expected	Std. Dev.	CV	Expected	Std. Dev.	CV
Antigua and Barbuda	160.4	42.3	0.26	120.9	18.0	0.15	114.3	11.0	0.10
The Bahamas	79.4	12.5	0.16	64.3	6.7	0.10	60.9	5.3	0.09
Barbados	136.8	15.9	0.12	125.6	12.8	0.10	125.3	10.8	0.09
Grenada	134.6	37.9	0.28	108.9	7.9	0.07	111.3	6.4	0.06
Jamaica	116.9	26.0	0.22	139.1	11.3	0.08	110.9	5.4	0.05
St. Kitts and Nevis	205.3	19.9	0.10	174.7	12.7	0.07	170.7	19.7	0.12
St. Lucia	87.1	21.1	0.24	84.0	8.4	0.10	79.8	5.7	0.07
St. Vincent and the Grenadines	115.0	15.7	0.14	105.2	6.5	0.06	94.9	4.3	0.05

1/ Public Debt and standard deviation of public debt are presented in percent of GDP. Calculated based on a Monte Carlo experiment with 2000 simulations. CV is the coefficient of variation, calculated as the standard deviation of the debt to GDP ratio divided by the mean.

2/ Primary expenditure simulations based on the estimated VAR coefficients.

3/ Primary expenditure simulations based on a structural primary balance with output gap elasticities of revenues and primary expenditures of 1 and 0, respectively.

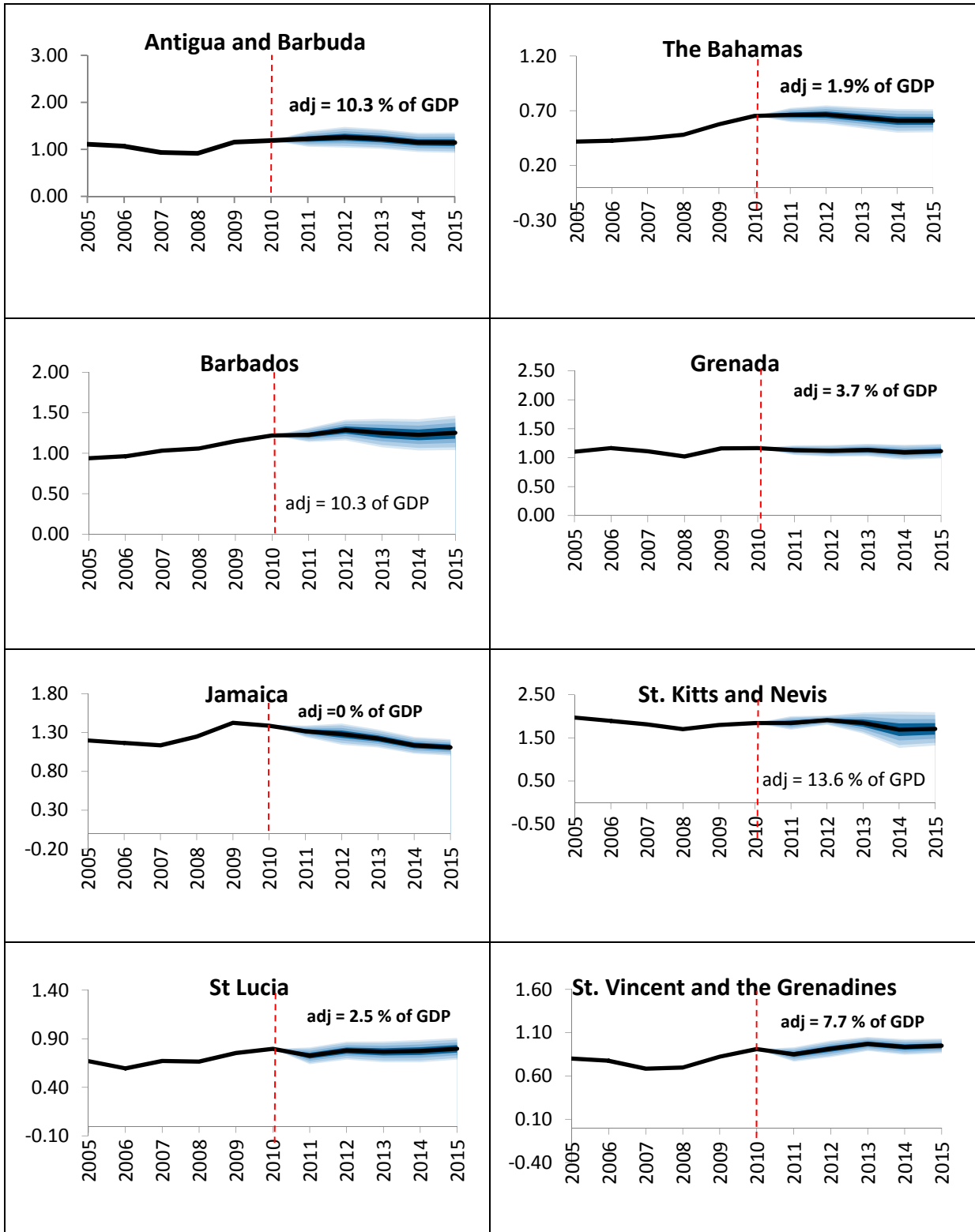
4/ Primary expenditure simulations based on the policy proposal in this paper. All parameters are set as in Table 2.

Source: Country authorities' and authors' estimates and projections

The fan charts in Figure 8 are the main policy announcement under public debt targeting, together with the primary expenditure budget envelope for the next budget cycle. They show the projected trajectory of public debt and its potential dispersion from economic shocks.

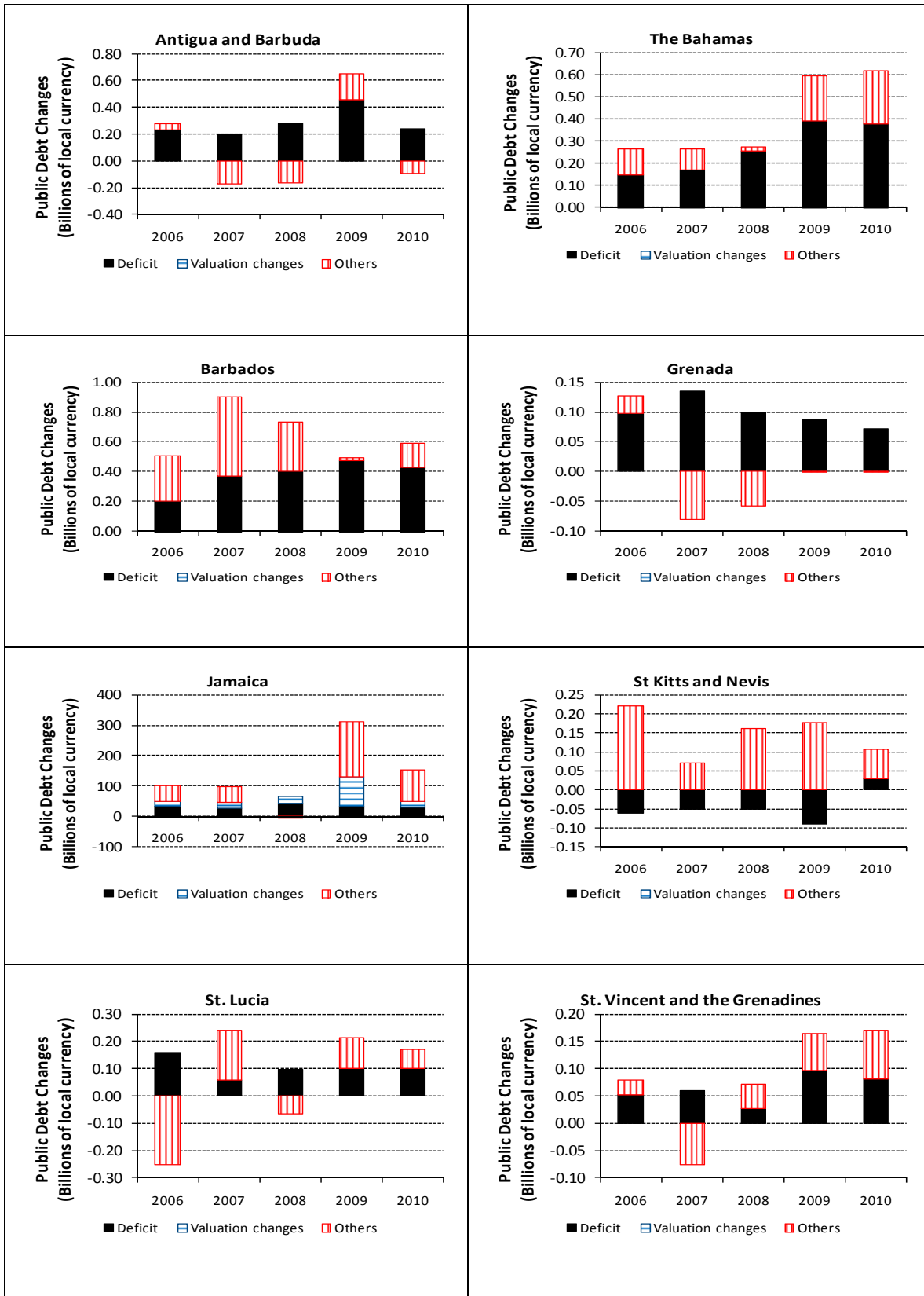
is only the result of a simplistic identification strategy of cyclical revenues, based only of output gap measures with a unit revenue elasticity as explained above.

Figure 8. Public Debt Dispersion with Public Debt Targeting Applied Over a Sequence of Periods



Source: Country authorities' and authors' estimates and projections.

Figure 9. Debt Creation Outside Central Government



Source: Country authorities' and authors' estimates and projections.

This analysis emphasizes the importance of including a measure of debt volatility under public debt targeting. It is possible to develop a similar framework without the use of probabilistic outcomes to assess public debt dynamics (including if necessary an additional primary balance surplus amount for prudential purposes). However, such framework would not capture the impact of shocks on debt dynamics in an appropriate way. This is because, under public debt targeting, the degree of primary surplus reset required after every year's shocks are observed is not only a function of the parameter choice but also a function of the sensitivity of public debt dynamics to shocks, and also of the volatility, persistence and correlation of the main variables affecting debt dynamics. Furthermore, the trade offs in terms of debt structure are explicitly brought to play a critical role in determining the appropriate fiscal stance (for example, *ceteris paribus*, requiring more expenditure consolidation if a large share of public debt is denominated in foreign currency). This implies that the economic consideration that is at the heart of the proposal, namely the trade-off between expenditure smoothing vs. debt smoothing, would otherwise not be accounted for appropriately without some measure of dispersion in public debt outcomes.

VI. LIMITATIONS

The main limitation of the public debt targeting proposal is that it requires a sufficiently strong political and societal commitment to fiscal prudence. This limitation is shared with fiscal rules and numerical constraints. Without a strong willingness and capacity to contain special interests, distributional conflicts, or other political economy pressures, the mere adoption of the framework cannot be expected to deliver the intended results. In other words, we take the view that the causality goes from societal commitment to the adoption of a fiscal framework or rule—either the one proposed here or any other—and not the other way around.

Moreover, even if such societal agreement exists, the framework application requires some more technical preconditions. Fiscal institutions necessary to appropriately monitor and control the budget, (budget processes, fiscal accounting and auditing practices, public financial management, etc.) need to be sufficiently developed. In particular, it is critical that public debt creation outside the government level used in the framework formulation is addressed in order for the policy to be credible. For example, Figure 9 shows that, for all Caribbean countries in the sample, the observed changes in central government debt has been significantly larger than the reported central government deficit and valuation changes can account for. This suggests that other sources of debt creation have been important.²³ Ideally,

²³ In a strict sense, there are other factors that can explain the residual increase in debt related to debt management, such as pre-financing, or changes in government deposits. The high magnitude and consistent positive value of this discrepancy in all cases, however, suggests that debt takeovers or deficits inherited from other public sector activities and bodies outside the budget are important.

and unlike in the examples in this paper, the framework should be applied to the consolidated government finances, or at least to the most aggregated government definition possible. The budget process and institutions would need to be effective limiting factors to the universe of public entities and bodies, particularly when they can be sources of public debt and contingent liabilities.

In addition, budgets would need to include sufficient provisions for unforeseen spending. For example, in the case of Caribbean countries, natural disasters, such as hurricanes and flooding, usually damage public infrastructure and private property, and typically require government expenditure in excess of budget. For the framework to work in such environment, budgeted primary expenditures should include allocations for such contingencies. Otherwise, the framework's objective of enhancing credibility would be weakened, as it would result from the need to compensate the additional spending needs with either lower current or capital spending in other areas. Expanding the proposal with a specific counter-cyclical component in case of natural shocks could be a possibility in this regard.

The relative technical complexity of public debt targeting could be considered a limitation. It could be argued that market participants would need to be sufficiently sophisticated so as to be able to affect the formation of expectations sought in the proposal. However, we do not believe that this is a major limitation. Indeed, the main two announcements are clear, easy to understand, objective, and practical operationally: a debt trajectory within narrow probabilistic bands, and next years' primary expenditure budget envelope. The four intermediate technical parameters, which play the role of mapping the two main announcements, are the complicated part. The need is therefore not necessarily for a framework that allows every taxpayer or bondholder to understand the mechanics of the framework, but the existence of independent and technically able institutions (private and public) that can assess the consistency of the announcement and inform the public.

This is why an independent institutional body (such as a "Fiscal Council") could be an important complement to a debt targeting framework. It could assess consistency and keep the public informed. External institutions could play a role in assisting with the assessment when deemed necessary. In addition, institutional arrangements would need to be set so that the framework is stable over time, in the sense that changes in the key framework parameters such as the horizon, and the debt threshold level and probability do not change from one budget cycle to the next arbitrarily.

VII. CONCLUSION

This paper proposes a fiscal policy framework to set primary expenditure budget envelopes consistent with probabilistic debt sustainability outcomes. The proposal has as main characteristic that, by design, it asks a policymaker to balance out the need to smooth

primary expenditures with the need to avoid sharp variations in public debt, which can be risky during low states of the cycle. These are two core fiscal policy outcomes we consider to be important in terms of achieving the broad objective of smoothing the business cycle. First, avoiding the procyclical fiscal policy bias observed in most of the developing world has a direct impact on smoothing aggregate demand. However, eliminating altogether the procyclical fiscal policy bias may not necessarily be optimal in terms of smoothing aggregate demand. This is because countries with sufficiently high public debt (such that marginal increases in public debt have a first order impact in affecting investors' perception of sovereign risk) might find it optimal to pursue some degree of fiscal consolidation during recessions to minimize the resulting deterioration in creditworthiness, which can result in an increase in sovereign spreads and domestic interest rates, and all the associated collateral damage. If public debt is already sufficiently high, excessive deficit and debt accumulation in low states can drag an economy into a negative spiral of high interest rates, credit crunch, and output decline.

The proposal is based on the policymakers' announcement of two main indicators: a medium term debt trajectory with the corresponding probability bands, and a budget envelope for primary expenditures in the next budget cycle. These two announcements are easy to communicate and simple to understand for the general public. The two main indicators are linked according to the choice of four intermediate technical parameters: an upper threshold of public debt to GDP over the medium term, a medium term horizon length measured in number of budget cycles, a probability value attached to the public debt ratio remaining below the threshold, and a notional trajectory of primary expenditure through the time horizon of choice to map the next budget envelope into medium-term public debt levels. The four technical parameters are to be chosen by the policymaker, so as to calibrate the debt targeting framework to the preferred trade-off on the degree of public debt reduction over the medium term, expenditure smoothing, and dispersion of debt outcomes.

The logic of the framework is to anchor expectations about the sovereign remaining in a fiscally sustainable path (as implied by having a declining debt trajectory that is resilient to shocks) while also avoiding the need for sharp expenditure consolidation in bad states of the cycle, which would also undermine fiscal sustainability prospects given possible social and political resistance. Overall, the framework proposal puts a premium on the need to ensure financial markets about fiscal sustainability as key to smooth the business cycle by taking into account the indirect (non-Keynesian) effects from deterioration in government's creditworthiness, as opposed to focusing only on the direct impact of fiscal policy on aggregate demand.

Monte Carlo simulations for a sample of Caribbean economies show that, for a set of plausible parameter choices, the public debt targeting framework can significantly reduce primary expenditure's pro-cyclical bias while at the same time it can also reduce the volatility of public debt. These results appear broadly comparable to the ones one would

obtain with a structural balance rule. In fact, the simulation results for the Caribbean economies in the sample indicate that public debt targeting achieves even more stabilization of primary expenditures than a structural balance rule, despite a more pro-cyclical primary expenditure stance by design. This is explained by the reduction in the indirect impact of excessive deficits and debt accumulation explained above. Empirically, for the Caribbean countries in the sample and within a VAR methodology, these indirect effects more than offset the direct impact of the pro-cyclical adjustments required to avoid excessive debt accumulation on aggregate demand.

Public debt targeting can be used as a transitional framework towards the adoption of a structural balance rule. Implicitly, a structural balance rule assumes there are no significant sovereign debt or credibility problems that can trigger the indirect non-Keynesian effects: expenditures are determined in relation to potential GDP and structural government revenues (consistent with public debt sustainability targets over the long term). The cyclical movements in revenues are not considered critical, and any resulting cyclical deficits can be covered with debt issuance. Implicitly, this assumes that a government is fully credible, in the sense that it can commit not to default on public debt regardless of the state of nature, and therefore faces an infinitely elastic financing supply at low risk premium regardless of the circumstances. As this is not a realistic assumption for most countries, a fiscal policy framework that seeks to smooth the business cycle needs to incorporate the indirect effects from deterioration of the sovereign's creditworthiness.

If public debt is high, such access to financing maybe too costly at the time it is needed the most (or just unavailable) and could have destabilizing indirect effects on the rest of the economy through increases in sovereign interest premiums and on credit and foreign exchange markets more generally. In the public debt targeting framework, these indirect effects are accounted for explicitly, and the choice of the technical intermediate parameters allows the best compromise between avoiding sharp changes in government expenditure vis-à-vis avoiding sharp changes in public debt. As the public debt targeting is consistently applied and public debt declines to sufficiently low levels, indirect effects are likely to eventually become less important and countries could adopt structural balance rules.

The proposal also has some operational advantages relative to a structural balance rule. First, possible transparency issues related to discerning permanent from transitory shocks are eliminated. Instead, spending levels are determined based on projected public debt dynamics, which is simpler and more transparent as these are anchored around the debt accumulation identity. Second, the methodology forces the use of a broader set of variables to determine appropriate primary spending levels and the state of the business cycle, given the wider set of indicators needed to produce debt projections, such as interest rates and real exchange rates. Third, the proposed framework tackles the impact of debt sustainability concerns on the business cycle in the most direct way possible, given the explicit commitment to public debt thresholds and a debt trajectory band. Fourth, the framework can be designed to allow for a

cyclical space for discretionary primary spending, possibly including state-contingent additional primary expenditure component, but without necessarily allowing full discretion.

Some final clarifications are important. First, the fact that the proposal finds its rationale in the constraints imposed by financial markets does not imply that the impact of political economy factors on fiscal performance is minimized in any way. On the contrary, the proposal takes as a fact the existence of political economy factors as perhaps the main underlying reason for fiscal sustainability problems and excessive debt accumulation, and recognizes that financial markets end up setting the limit by increasing borrowing costs on marginal debt issuances when debt is already high, or, in more extreme cases, by denying financing. Second, the existence of a sufficiently high level of political and social consensus about the value of a sustainable fiscal stance is a core precondition if this proposal is expected to be effective. Moreover, even if social consensus is already sufficiently high, institutional (formal or informal) incentives might distort decisions away from the desired collective objective.

The political economy incentives need to be taken into account. A fiscal council appropriately independent and empowered can be an important enhancement in support of this policy. In general, typical political economy pressures are difficult to contain when budget coverage is not sufficiently broad; institutional arrangements create common pool problems over fiscal resources; powers and penalties to enforce the budget are insufficient; or risk taking leveraged on expectations of a government bailout is excessive (moral hazard), in both public and private sectors.

APPENDIX I. SOVEREIGN DEBT DYNAMICS

Debt-to-GDP dynamics takes into account that the government issues both bonds denominated in local currency and bonds denominated in foreign currency, as well as it borrows from bilateral and/or multilateral lenders (which we call for simplicity official debt). Thus, the stock of debt at the end of period t , denoted by D_t equals the sum of the debt denominated in domestic currency, D_t^d ; the debt denominated in foreign currency (typically US dollars), D_t^f , converted in domestic currency at the existing nominal exchange rate, e_t (units of domestic currency per unit of foreign currency); and the official debt (also denominated in US dollars) D_t^o : $D_t = D_t^d + e_t D_t^f + e_t D_t^o$. This relationship can be converted in terms of ratios to GDP by dividing both sides by nominal GDP (expressed in local currency), Y_t :

$$d_t = d_t^d + d_t^f + d_t^o, \quad (\text{A.1})$$

where $d_t^d = \frac{D_t^d}{Y_t}$, $d_t^f = \frac{e_t D_t^f}{Y_t}$, $d_t^o = \frac{e_t D_t^o}{Y_t}$.

The dynamics of the domestic-currency-denominated debt is described by the government's flow budget identity $D_t^d = (1 + i_t)D_{t-1}^d - \alpha_t B_t$, where i_t is the interest rate on local-currency denominated government debt whose maturity is at time t , B_t is the primary balance, and $\alpha_t \in [0,1]$ is the fraction of primary balance used to service the domestic debt exposure. The primary balance is defined as $B_t = T_t - G_t$, where T_t is the revenue collected and G_t represents the non-interest public spending. The budget identity can be expressed in terms of ratios to GDP by dividing both sides by Y_t :

$$\frac{D_t^d}{Y_t} = \frac{Y_{t-1}}{Y_t} \frac{D_{t-1}^d}{Y_{t-1}} (1 + i_t) - \alpha_t \frac{B_t}{Y_t},$$

$$d_t^d = \frac{1 + i_t}{1 + y_t} d_{t-1}^d - \alpha_t b_t,$$

where y_t is growth rate of nominal GDP and b_t is the ratio of primary balance to GDP. Deflating the nominal growth rate by the inflation rate, π_t , the flow of budget identity can be expressed in terms or real growth rate, g_t :

$$d_t^d = \frac{(1 + i_t)}{(1 + \pi_t)(1 + g_t)} d_{t-1}^d - \alpha_t. \quad (\text{A.2})$$

Analogously, the dynamics of the foreign-currency-denominated debt is described by the following first-order difference equation: $D_t^f = (1 + i_t^f)D_{t-1}^f - \beta_t \frac{B_t}{e_t}$, where i_t^f is the nominal interest rate paid on government bonds denominated in foreign currency whose maturity is at time t , and $\beta_t \in [0,1]$ is the fraction of primary balance used to service the

foreign commercial debt exposure. Multiplying both sides by e_t and dividing through by Y_t yields the following:

$$\frac{e_t D_t^f}{Y_t} = \frac{e_t}{e_{t-1}} \frac{Y_{t-1}}{Y_t} \frac{e_{t-1} D_{t-1}^f}{Y_{t-1}} (1 + i_t^f) - \beta_t \frac{B_t}{Y_t},$$

$$d_t^f = \frac{(1 + \epsilon_t)(1 + i_t^f)}{(1 + y_t)} d_{t-1}^f - \beta_t b_t,$$

where ϵ_t represents the nominal exchange rate depreciation. By deflating both the nominal growth factor and the nominal exchange rate factor by the domestic inflation rate, the above expression can be expressed in terms of the real growth rate g_t , the real exchange rate depreciation η_t , and the real interest rate paid on foreign commercial debt $(1 + i_t^f)/(1 + \pi_t^*)$:

$$d_t^f = \frac{(1 + \eta_t)(1 + i_t^f)}{(1 + g_t)(1 + \pi_t^*)} d_{t-1}^f - \beta_t b_t. \quad (\text{A.3})$$

The dynamics of the official debt-to-GDP ratio is analogous to the one above. A substantial difference is that typically the interest rate applied by bilateral or multilateral lenders, i_t^o , is lower than the market rate:

$$d_t^o = \frac{(1 + \eta_t)(1 + i_t^o)}{(1 + g_t)(1 + \pi_t^*)} d_{t-1}^o - (1 - \alpha_t - \beta_t) b_t. \quad (\text{A.4})$$

Another difference across different components of sovereign debt is that the average maturity of each class of debt differs. We take these differences into account when we compute the interest rate paid in every period. Let m^d , m^f , and m^o be the average maturities of domestic, foreign and official debt respectively, and i_t^d , i_t^f and i_t^o the one-period government bond rate for the aforementioned classes of sovereign debt, then:

$$i_t^d = \frac{1}{m^d} \sum_{n=1}^{m^d} i_{t-n}^d, \quad i_t^f = \frac{1}{m^f} \sum_{n=1}^{m^f} i_{t-n}^f, \quad i_t^o = \frac{1}{m^o} \sum_{n=1}^{m^o} i_{t-n}^o.$$

The nominal interest rate paid on one-period commercial bonds denominated in foreign currency, i_t^f , can be computed as the sum of an international risk-free rate, i_t^* , and a spread σ_t^f representing the country's sovereign risk: $i_t^f = i_t^* + \sigma_t^f$. Similarly, $i_t^o = i_t^* + \sigma_t^o$, where typically the spread paid to multilateral and bilateral lenders, σ_t^o , is lower than the one paid to international financial markets, σ_t^f .

Finally, as information on the fraction of primary balance servicing each component of debt is not available, we assume that at time t the fraction of primary balance that services a certain component of debt is proportional to the existing share of debt of a particular type over the total:

$$\alpha_t = \frac{d_{t-1}^d}{d_{t-1}}, \quad \beta_t = \frac{d_{t-1}^f}{d_{t-1}}.$$

Summing up equation (A.2) to (A.4) yields the initial equation (A.1).

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