Measuring Fiscal Space in Small Open Financially Integrated Economies

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November 1, 2017

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1.0 Introduction

This paper proposes a measure of fiscal space, applicable to small open economies with modern financial systems integrated into world markets (SOFIEs), which overcomes many of the shortcomings of conventional measures. The concept of fiscal space has been especially useful to policy makers in countries adversely affected by the global financial crisis of 2007-8. For countries experiencing recessions brought on by the crisis, the question was whether Government had room to undertake expansionary policies, in order to counter the adverse effects of recession. The conventional approach to answering that question uses the ratio of government debt to GDP as a starting point to measure fiscal space. If debt was low relative to GDP it seemed reasonable to infer that there was room to increase debt further, in order to provide economic stimulus. On the contrary, if debt was very high, there was no fiscal space.

The weakness of this approach lies in the practical difficulty of finding an optimal level of debt, beyond which an increase has harmful consequences. In the next section of this paper, we review the conventional approaches to estimating the optimal debt level, none of which is entirely satisfactory.

There may be harmful effects from identifying the optimal level at too low a ratio in relation to GDP. Governments which find themselves with levels of debt well in excess of this low "optimum" find themselves under pressure from lending institutions at home and abroad to impose draconian measures in order to attain a fiscal surplus, so as to bring down the debt ratio within a feasible horizon. Too often governments in such circumstances resort to cuts in spending on essential services, a buildup of arrears, debt defaults or coercive debt restructurings, all of which may aggravate economic recession and bring on a threat of systemic financial failure.

On the other hand, identifying an optimal debt to GDP ratio that is too high may open the door for excessive fiscal expansion, which may alarm financial markets and undermine the credibility of fiscal policy. As we shall see, fiscal deficits that are large may precipitate financial and balance of payments crises, particularly if they are financed by newly created money.

The approach to measuring fiscal space offered in our paper has a different point of departure, focussed on the size of government's deficit and how that deficit is financed, rather than on the debt to GDP ratio. In SOFIEs there is a strong and direct relationship between the balance of payments, and the size and financing of government's deficit. Whenever government's deficit is financed by an increase in central bank credit there is a deterioration of the balance of external payments and a fall in foreign reserves and/or a depreciation of the exchange rate. The level of foreign reserves is the most closely watched variable in all open economies. This is because of the high import content of all expenditure in the open economy; imports have to be paid for in foreign currency, whereas central bank finance is in local currency. This local currency is used to buy

foreign currency from the central bank's reserves in order to pay for imports, a process which depletes the foreign reserve stock.

This relationship between money-financed government deficits and the level of foreign reserves provides us an alternative measure of fiscal space that is practical, intuitive and unambiguous. In every open economy there is a minimum level of foreign reserves which agents in the financial market expect the central bank to maintain at all times. The minimum varies from country to country, and depends on the nature of the exchange regime, the country's history of foreign exchange volatility, and the recent incidence of balance of payments and financial crises, among other factors. What is common to most countries is that the minimum level is known and agreed among all influential financial market institutions, even though it is not often announced officially. The minimum is therefore a readily observable statistic. Armed with knowledge of the market-defined minimum foreign reserve level, the amount of fiscal space may be measured as the distance between the actual fiscal deficit, and the deficit whose financing by central bank would depress foreign reserves to the minimum level. In the third section of this paper we describe a model that may be used to measure this space.

The fourth section of our paper is devoted to empirical measures of fiscal space for ten SOFIEs, to illustrate the use of our methodology. The SOFIEs are chosen to be representative of different regions of the globe and different levels of economic development.

2. Literature review

The literature on fiscal space has burgeoned in recent years. In the approach used by some authors (Perotti, 2007) fiscal space combines the intertemporal government budget constraint and the sustainability of public finance. At the limit of fiscal sustainability government expenditure in one sector can be increased only if there is a cut in expenditure in other sectors, an increase current or future taxes, or by inflating away the government debt (for instance by printing money). In the same vein, Heller (2005, p. 3)) defines fiscal space as: "the availability of budgetary room that allows a government to provide resources for a desired purpose without any prejudice to the sustainability of a government's financial position". Perotti and Heller agree that the notion of fiscal space emerged from the pressures on governments to relax the budgetary rules so as to leave room for productive investments that would generate future paybacks. Initially, such investments focused on the accumulation of physical capital (infrastructure projects), but as time went on new calls were raised to apply the same rationale to investment in human capital (mainly education and health) since, it was argued, these investments too would pay for themselves over the long term.

Recently other authors (Roy and Heuty, 2009, pp.7 and 33) have argued that the concept of fiscal space should take account of all possible interdependencies between the different funding opportunities and the development processes of a country. They define fiscal space as "concrete

policy actions for enhancing domestic resource mobilization and the reforms necessary to secure the enabling governance, institutional and economic environment for these policy actions to be effective". This alternative approach suggests that the term "fiscal space" is used in two rather different senses: macroeconomists and policy makers use it in a narrow sense, as a definition of prudent fiscal rules, while development economists use the term in a broader sense as a full-blown set of policy actions for development. For our purposes, the narrower concept is the relevant one.

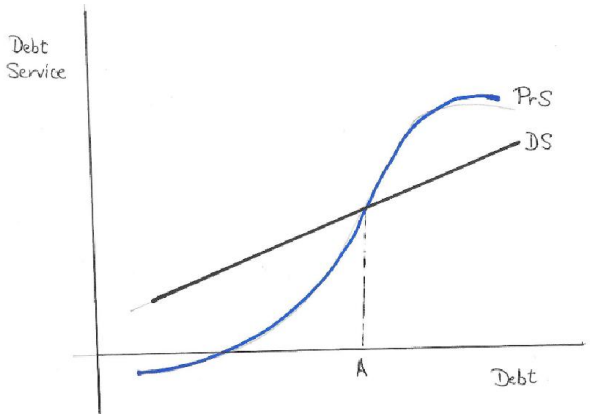
In the empirical literature, Bohn (1998, 2008) analyses the dynamics of US debt-to-GDP data to determine the space between the actual and an optimal ratio. In this approach fiscal space can either be zero or infinite, depending on the reaction of the primary fiscal balance to public debt in the past (controlling for other determinants of the primary balance). It is infinite if the reaction of the primary balance is suffi ciently strong and zero otherwise, assuming a linear relationship for any amount of debt. This definition of fiscal space has been extended by Ostry et al. (2010) and Ghosh et al. (2013)1 , by taking into account the work of Abiad and Ostry (2005), and Mendoza and Ostry (2008), which propose to use squared and cubic debt terms when calculating the response term.

Others have chosen a different approach by calculating the fiscal space on the basis of various measures of tax revenues (including potential, maximum or structural tax revenues). Aizenman and Jinjarak (2010) define fiscal space as the number of years of tax revenues that are necessary to repay a country's debt, i.e. the public debt divided by the de facto tax base of a country. Brun et al. (2006) calculate fiscal space as the ratio of the current level of revenues to potential tax revenues, based on structural indicators such as GDP per capita and income sectors. Similarly, Bi (2012) uses a general equilibrium model to derive dynamic Laffer curves of taxation and create country specific (depending on size and degree of countercyclical policy responses) stochastic fiscal limits as a measure of the ability and willingness of governments to service their debts. Park (2012) employs a (standard neoclassical) model to generate a Laffer curve of public revenues. He defines fiscal space as the distance between current tax revenues and the peak of the Laffer curve (i.e. the maximum tax revenues possible) and investigates how population aging trends affect fiscal space. A third stream of the literature links fiscal space to implicit liabilities, such as ageing costs. Mario (2013) uses the S1 indicator2 , which captures the required fiscal adjustment to reach a debt level of 60% of GDP by 2030. A more short-term definition of fiscal space is given by Schick (2009, 2012). He defines fiscal space as the financial resources available to the government for fiscal policy, namely growth-enhancing investment in physical and human capital that governments can finance with borrowed funds without prejudicing the long-run sustainability of its fiscal position.

The IMF is often the most influential voice in debates as to whether a country has space for fiscal expansion, or whether there is a need for tighter fiscal policy and a strategy for debt reduction. The Fund is therefore a good source for a description of the conventional approach. A recent IMF paper on the measurement of fiscal space, Ostry et al (2010)[1] offers a useful explanation of the conventional approach to fiscal space, based on the dynamics of government debt. The paper gets around the challenge of identifying a single optimal debt to GDP ratio applicable to all countries, or to countries in a particular region or category of development. Instead the authors' approach focusses on each country's debt history, and makes inferences about future debt evolution, and the ability to service that debt, based on that history. The starting point is "the observation that governments typically behave responsibly, generally increasing the primary surplus in response to rising debt service so as to stabilize the debt ratio at a reasonable level".

That behavior is represented in Figure 1. As the debt rises, the cost of servicing rises along the DS line; government takes measures to generate a primary surplus along the PrS line. In this scenario the primary surplus is insufficient for debt servicing needs below Point A, and therefore a responsible government will adopt measures to generate a primary surplus that is larger than debt servicing requirements beyond Point A, so as to compensate for the earlier deficiency. However, if there is a major event that causes a sudden large increase in debt – such as a rescue package in a national financial crisis – the effort needed to generate a primary surplus large enough to prevent explosive debt dynamics is so demanding that it becomes "politically infeasible", in the words of the paper by Ostry et al. A debt default is likely when government balks at the cost of undertaking "extraordinary fiscal adjustment". This point is considered the debt limit, and the distance from the current debt ratio to that limit is a measure of the available fiscal space.

Figure 1. Debt and debt service



[1] Ostry, Jonathan, et al., "Fiscal space," IMF Staff Position Note, September 1, 2010, *www.imf.org*.

Ostry et al is a sophisticated, dynamic approach which is much more appealing than the naïve methods that depend on a notion of an optimum level of debt. There are numerous studies published which try to estimate an optimum debt level for individual countries, all countries, countries in a particular region or countries with particular characteristics.[2] The Osty et al approach avoids self-fulfilling prophecies of this kind by focusing on the evolution of debt service costs over time, anchoring the analysis on historical experience, and incorporating the political context in each case.

However, it is evident from the description above that the Ostry et al approach involves a number of imponderables. The most problematic is pinpointing the level of debt at which the cost of servicing is so high that it becomes "politically unfeasible", and government defaults. A second weakness, perhaps less obvious, is that the evolution of debt is derived from historical experience, which means that the most problematic events, those that are truly without precedent, are not captured. Any forecast methodology which is based on historical data is bound to fail when it is most needed, when there is nothing in the historical record that bears a sufficiently close resemblance to the new crisis.

The most serious defect which the Ostry et al methodology shares with conventional approaches, however, is that it does not produce a solution for the limit of government local debt by a country that issues its own currency. In theory and in practice, government may always service local currency debt by issuing more local currency. In extremis, the result will be hyperinflation, but there is never a compulsion to default on the servicing of debt denominated in the currency that the country itself issues.

There is a limit on the extent of money creation in the open economy, however. It arises because the expenditure that is funded by newly created money sucks in imports which have to be paid for in foreign money. The more open is the economy, the larger the deterioration in the balance of payments and the bigger the loss of foreign reserves and deterioration of the currency. For open financially integrated economies liable to capital flight, currency depreciation is the main avenue through which inflation is felt.

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[2] Berg, Andrew and Berkes, Enrico and Pattillo, Catherine A. and Presbitero, Andrea Filippo and Yakhshilikov, Yorbol, Assessing Bias and Accuracy in the World Bank-IMF's Debt Sustainability Framework for Low-Income Countries (March 2014); IMF Working Paper No. 14/48.
Chalk, Nigel and Richard Hemming, "Assessing fiscal sustainability in theory and practice," IMF WP/00/81, April 2000.
IMF "Debt Sustainability in Low-Income Countries: Further Considerations on an Operational Framework and Policy Implications," Prepared by the Staffs of the IMF and World Bank September 10, 2004.
Tanner, Evan C., Fiscal Sustainability: A 21st Century Guide for the Perplexed (April 2013). IMF Working Paper No. 13/89.
Greenidge, Kevin, Craigwell, Roland, Thomas, Chrystol and Drakes, Lisa, Threshold Effects of Sovereign Debt: Evidence from the Caribbean (June 2012). IMF Working Paper No. 12/157.

The approach to fiscal space which is described in the next section of this paper uses the link between money-financed deficits and the balance of payments as its point of departure. The fiscal limit is reached when the extent of the resulting demand pressure on the foreign exchange market is so great that it violates the official target of foreign exchange management. That target may be a fixed peg, protected by foreign reserves that market participants consider adequate, or it may be a limit to the volatility of the exchange rate, engineered through foreign exchange intervention, using the foreign reserve stock. The target may be explicitly stated as an official policy, or it may be something that financial market participants infer from the behaviour of the central bank, or the evolution over time of the exchange rate and the level of foreign reserves.

3. The model

The basic relationship needed for our estimate of fiscal space is the effect of money-financed fiscal deficits on the demand for foreign exchange. Any standard macroeconomic model may be used for this exercise. We choose to employ a model from the popular text by Agenor and Montiel[3]; it appears on Pages 303-305 of their book. It is an IS-LM model of a small economy that is integrated into international financial markets, and is subject to domestic and international shocks. The model contains equations for aggregate demand, domestic supply, wage determination, uncovered interest parity and money market equilibrium. In the model the supply of money is subject to random shocks, whose impact depends on the nature of the exchange regime:

$$m = -\delta s + u^{ms} \qquad (1)$$

where m is the supply of money, s is the exchange rate, δ is a parameter which defines the exchange regime and u^{ms} is a white noise shock. To modify the model for our purposes we replace the white noise shock with the impact of money created to fund the government deficit:

$$m = -\delta s + \eta b \qquad (2)$$

where b is the (log of the real) increase in the net domestic assets (NDA) of the central bank. We assume that increase is entirely due to financing of the government deficit by newly created money; that is almost always the case in practice. Our interest is in increases in NDA that create pressure on the foreign exchange market. We therefore specify ΔNDA as positive values only:

$$b = log(\Delta NDA/p) \text{ for } \Delta NDA/p > 0,\ b = 0 \text{ otherwise} \qquad (3)$$

The money market equilibrium equation in the Agenor-Montiel model provides a relationship between money supply and output:

$$i = -\lambda m + \lambda p + \gamma y \qquad (4)$$

[3] Agenor, Pierre-Richard and Peter Montiel, *Development Macroeconomics*, Third Edition, Princeton and Oxford: Princeton University Press, 2008.

where i is the nominal interest rate, p is the price of output and y is real domestic output.

All that remains for our purposes is to add an import equation:

$$n = \mu y + \psi(s + p^* - p) \qquad (5)$$

where n is the amount of real imports and p^* is the foreign price of foreign goods.

The system of equations comprising Equations 2, 4 and 5 may be estimated empirically in recursive fashion as follows. First estimate the supply of money as:

$$Log(TML/p) = \alpha_0 + \alpha_1 log(s) + \alpha_2 log(\Delta NDA) \qquad (6)$$

where *TML* are the total monetary liabilities of the banking sector. Then estimate domestic output as:

$$Log(y) = \beta_0 + \beta_1 log(TML/p) + \beta_2 log(p) + \beta_3(i) \qquad (7)$$

Finally, estimate the import demand from:

$$Log(NOMIMP/p^*) = \varepsilon_0 + \varepsilon_1 log(y) + \varepsilon_2(log(s) + log(p^*) - log(p)) \qquad (8)$$

where *NOMIMP* is the nominal value of imports.

This system may be used to input values of ΔNDA and derive estimates of the impact on imports. Fiscal expansion does not increase the supply of foreign exchange, and therefore the additional imports must be financed through a drawdown of foreign reserves. How far this process of increasing the NDA can continue before reserves fall to the minimum that market participants expect the central bank to hold, provides our definition of the available fiscal space. To illustrate this, we test whether the available fiscal space is as much as 2 percent of GDP and 5 percent of GDP, for each year of the in-sample period, for each of the countries selected for the empirical section. We compare the resultant foreign reserve levels with a notional minimum level. For simplicity, this minimum is taken to be the equivalent of 12 weeks of imports, but in practice a reading would have to be taken by surveying market participants in each of the countries.

4. Estimation of the Fiscal Space

The objective of this section is to measure fiscal space during a recent historical period, for selected open financially integrated economies. So far we have completed estimates of equations 6, 7 and 8 using yearly data for all variables covering the period 1990-2016 for Barbados, Trinidad and Tobago, and Jamaica. The observations were collected from the International Monetary Fund (IMF), the Central Bank of Barbados (CBB) and the Central Bank of Trinidad and Tobago (CBTT).

Three sets of results are reported in this section. The first shows the unit root test (Table 2). The other grouping of results displays the descriptive statistics for each series (Table 3). The third sets out our results of the estimates of the model from the ordinary least square regressions (Table 4). Table 1 below details how each variable of the study is measured and the corresponding data source.

Table 1: Description of Variable

Variable	Definition	Source
TML/P	Total monetary liabilities as a share of GDP deflator	CBB, CBTT, IMF Statistics Monetary Data in millions
s	Real exchange rate	IMF Statistics exchange rates in units
ΔNDA	Net domestic assets that are owned by foreigners	IMF Statistics Monetary Data in millions
$P*$	US GDP deflator	IMF Statistics GDP and Components in millions
Y	GDP at Market prices	CBB, CBTT, IMF Statistics National Accounts
i	imports of goods	CBB, IMF Statistics Trade in Goods
$NOMIMP$	Nominal value of imports in national currency	CBB, IMF Statistics Trade in Goods

The exchange rate variable was omitted in equation 6 for Barbados given that the value has not changed over the time period.

The ADF unit root tests suggest that all variables of study are I(1) with the exception of exchange rates (Table 2).

Table 2: Unit Root Test ADF

Unit Root Test	**Variables**						
Barbados	$\boldsymbol{TML/P}$	$\boldsymbol{s}$	$\boldsymbol{\Delta NDA}$	$\boldsymbol{P*}$	$\boldsymbol{Y}$	$\boldsymbol{i}$	$\boldsymbol{NOMIMP}$
Level	-0.16		-1.39	-0.19	-1.43	1.07	0.98
1st Difference	-3.85**		-2.14**	-3.06**	-2.632**	4.86**	3.96**
Jamaica	TML/P	s	ΔNDA	$P*$	Y	i	$NOMIMP$
Level	- 0.32	-4.26**	-0.19	-0.19	-0.68	-1.01	0.74
1st Difference	-1.74**		-4.14**	-3.06**	1.75**	-3.45**	-5.41**
Trinidad & Tobago	TML/P	s	ΔNDA	$P*$	Y	i	$NOMIMP$
Level	-0.956	-3.25**	-1.83	-0.19	-0.82	-1.30	-1.172
1st Difference	-3.358		-4.87**	-3.06**	-5.81**	-4.85**	5.10**

Notes: H_0: Unit root process for ADF;** refers to the rejection of H_0 at .05 significance level; number of lags selected according to modi. AIC.

The R^2 values of models 6 and 7 may indicate that these equations have reasonable explanatory power, and the Durbin Watson (DW) statistics indicate an absence of serial correlation .

Table 3: Descriptive Statistics

	Equation 6	
	R^2	DW
Barbados	0.76	1.56
Jamaica	0.89	1.92
Trinidad and Tobago	0.92	1.79
	Equation 7	
	R^2	DW
Barbados	0.96	1.34
Trinidad and Tobago	0.96	2.0
Jamaica	0.99	2.0

The results of the regression model are displayed in Tables 4A-4C. In Table 4A there is a statistically significant negative relationship between change in net domestic assets (NDA) and changes in monetary liabilities in Barbados. This implausible result may be as a result of low levels of money creation in Barbados over the estimation period. We will revisit this equation, possibly using the relationship between net foreign assets and the money supply to infer a relationship for net domestic assets. The relationship between money creation and broad money is significant and substantive in Trinidad and Tobago and Jamaica.

Table 4A: Money Supply

$Log(TML/p) = \alpha_0 + \alpha_1 log(s) + \alpha_2 log(\Delta NDA)$				
		α_0	s	**Dlog*NDA***
Barbados	Coefficient	9.27		-0.06
	t-statistics			-1.85
Jamaica	Coefficient	6.8	0.1	0.07
	t-statistics		1.66	1.55
Trinidad & Tobago	Coefficient	-28.8	5.37	0.5
	t-statistics		6.3	1.9

Notes: d represents first differencing

The coefficient of interest in Table 4B is β_1, which measures the impact of a change in money supply on output. We find the expected positive impact for Barbados, but the estimated coefficient for Jamaica and Trinidad and Tobago is negative. This is a puzzle we will need to resolve before going further.

Table 4B: Money and Output

$Log(y) = \beta_0 + \beta_1 log(TML/p) + \beta_2 log(p) + \beta_3(i)$					
		β_0	$d(log(TML/p))$	**dlog*P***	**Dlog*i***
Barbados	Coefficient	**7.10**	**0.10**	-0.56	**0.36**
	t-statistics		1.6	1.56	2.0
Jamaica	Coefficient	8.7	-0.03	1.01	0.15
	t-statistics		-1,7	4.3	3.2
Trinidad & Tobago	Coefficient	0.71	-0.25	-1.52	0.92
	t-statistics		1.25	2.15	7.9

The findings in Table 4C indicate that there is a statistically significant negative relationship between national income (GDP), domestic and foreign prices and nominal imports as a share of foreign prices. As it relates to Barbados, the result indicates that a 1 unit increase GDP would result in a 3.0 unit increase in the real value of imports. However, the results for Jamaica and Trinidad-Tobago, which indicate an inverse relationship between income and real imports, are counterintuitive, and these equations are to be further explored.

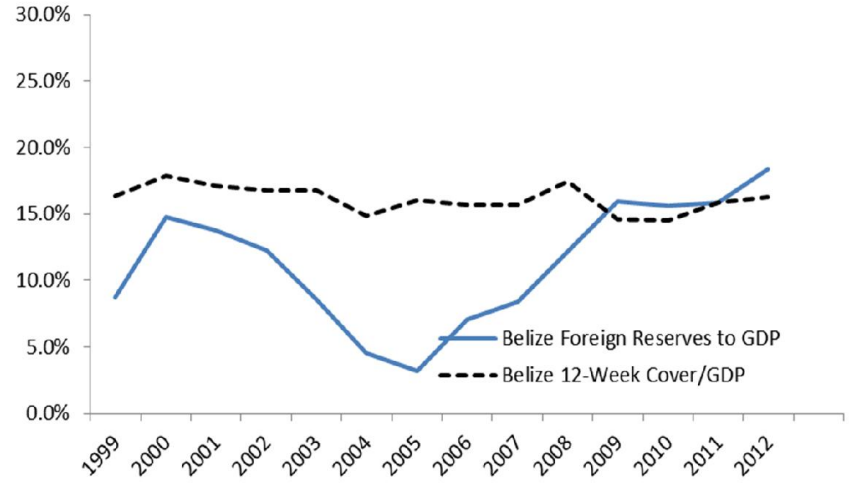
Table 4C: Fiscal Space Model 3

$Log(NOMIMP/p^*) = \varepsilon_0 + \varepsilon_1 log(y) + \varepsilon_2(log(s) + log(p^*) - log(p))$					
		ε_0	$d(log(y)$	$log(s)$	$log(p^*) - log(p))$
Barbados	Coefficient	**-3.0**	**1.05**		**-0.78**
	t-statistics		-3.0		-5.9
Jamaica	Coefficient		-0.25		-1.17
	t-statistics		4.1		2.3
Trinidad & Tobago	Coefficient	-1.05	-0.91		-0.87
	t-statistics		3.5		4.3

*** significant at 5% level

Our next step, once we have obtained plausible results for the coefficients of interest, i.e α_2, β_1 and ε_1, is to prepare charts along the lines of Figure 2, which is borrowed from Worrell et al (2015).

Figure 2. Worrell et al (2015), Page 132



When completed our paper will provide measures of fiscal space for ten SOFIEs, defined as the amount of room Government has to increase spending that is financed by domestic money creation, before the resulting exchange market pressure leads to a balance of payments crisis. We will estimate this fiscal space over the historical estimation period, and compare with the country's actual experience, to see whether our measure of fiscal space anticipates correctly the balance of payments crises that did occur.