Fiscal Policy Sustainability: A Basic Framework

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Abstract

The main purpose of this paper is to provide a simple analytical framework that can guide the development of indicators of fiscal policy sustainability in economies which operate in a highly volatile macroeconomic environment. To this effect, the paper first lays out the basic fiscal accounting framework and defines a "true" indicator of fiscal sustainability (i.e., an indicator of intertemporal solvency). To become operational, however, this indicator would require an amount of information usually not available to policymakers. The paper then proceeds to suggests two alternative indicators, which substantially reduce the data requirements. The first one, proposed by Blanchard (1990), is based on the "true" indicator. The second one is based on a "macro-adjusted deficit," which is defined as the level of the primary deficit which would prevail under "normal" macroeconomic conditions. The paper then discusses the pros and cons of these indicators and shows that they are necessary but not sufficient to assess sustainability of fiscal policy.

Foreword

This paper was written as a conceptual overview of the six country studies that were part of the Regional Research Network project on "Fiscal Sustainability in Latin America," sponsored by the Inter-American Development Bank. The countries included in the project were Argentina, Brazil, Colombia, Peru, Uruguay, and Venezuela.

The purpose of the project was threefold. First, to develop a new set of fiscal indicators useful to evaluate fiscal sustainability in volatile economies. Second, to use this new set of indicators to evaluate both the recent fiscal history and the current fiscal situation in each of the six countries. Third, to evaluate the usefulness of these indicators as a tool for economic policy decision-making.

The six country studies, which have been published in the OCE Research Network Working Paper Series, are the following:

- "La sostenibilidad de la política fiscal en América Latina: El caso argentino," R-315, 1998. Oscar Cetrangolo, Mario Damill, Roberto Frenkel y Juan P. Jimenez (CEDES).
- "Delaying Public Sector Reforms: Post-Stabilization Fiscal Strains in Brazil," R-321, 1998. Afonso S. Bevilaqua y Rogério L. F. Werneck. (PUC-RIO)
- "Sostenibilidad de la política fiscal en America Latina. El caso de Colombia," R-319, 1998. Julio César Alonso, Mauricio Olivera, Israel Fainboim Yaker. (FEDESARROLLO)
- "La sostenibilidad de la política fiscal en el Perú: 1970-2005," R-316, 1997. Luis A. Arias, Elmer Cuba y Raul Salazar. (MACROCONSULT)
- "La sostenibilidad de la política fiscal en Uruguay," R-320, 1998. Michael Borchardt, Isabel Rial, Adolfo Sarmiento. (CERES)
- "La sostenibilidad de la política fiscal en Venezuela R-317," 1998. Gustavo Garcia Osio, Rafael Rodriguez Balza, Luis Marcano, Ricardo Penfold, Gustavo Sanchez. (IESA)

As the project's coordinators, we are grateful to Michael Gavin and Ricardo Hausmann who were part of the selection committee, participated in the project seminars held in Mexico (October 1996) and Caracas (June 1997), and reviewed many of the country studies. We also thank Raquel Gomez and Alejandro Grisanti who provided valuable assistance at various stages of the project. Our greatest debt is to Norelis Bentancourt, coordinator of the Regional Research Network at the Office of the Chief Economist of the IDB. Without her excellent organizational skills, this project would have not been possible. Finally, we thank all the authors of country studies for their effort and hope that this project will prove valuable not only to macroeconomists in the region but also to anyone interested in public policy in Latin America.

1 Introduction

Can current fiscal policies be sustained for the foreseeable future? Or will they lead to a painful fiscal adjustment in the form of higher taxes, reduced public spending, or outright default? Such questions on fiscal sustainability take center stage in macroeconomic policy discussions, quite apart from the effects of fiscal policy on resource allocation and aggregate demand.

The design of indicators of fiscal policy sustainability thus constitutes a key endeavor in applied economic analysis. The OECD, for example, has devoted considerable effort to construct appropriate indicators of fiscal policy sustainability. The OECD has typically relied on the cyclically-adjusted (or full-employment) deficit to assess — among other aspects of fiscal policy — the sustainability of current fiscal policies. Recent work has focused on improving the usefulness of the cyclically-adjusted deficit as a sustainability indicator by making heavier use of forecasts and incorporating other predictable changes in the budget (see Blanchard (1990)).

The design of sustainability indicators is particularly relevant for Latin American countries — and other developing countries for that matter — which operate in a highly volatile macroeconomic environment. As illustrated in Table 1, real GDP growth in Latin America is twice as volatile as in the OECD, while private consumption and the real exchange rate are almost three times as volatile. As documented by IDB (1995), this higher degree of volatility has been reflected in longer and deeper recessions. During 1970-1992, for example, the average recession in Latin America lasted for nearly two years (compared to around one year for the OECD) and the cumulative output decline from peak to trough was almost eight percent (compared to two percent for the OECD).

Fiscal aggregates have been equally volatile. As shown in Table 1, fiscal revenues and expenditures have been around three times as volatile as in the OECD, while the primary surplus has been more than twice as volatile. The high volatility of fiscal policy is explained not only by the volatility of the underlying economic environment — as reflected, say, in terms of trade shocks and fluctuations in international interest rates — but also by the procyclical nature of fiscal policy in Latin America, which has exacerbated the underlying volatility. Indeed, Talvi and Végh (1998) have argued that, unlike in the G-7 countries, fiscal policy in developing countries in general – and Latin America in particular – has tended to be expansionary in good times and contractionary in bad times. For instance, the average correlation

between (the cyclical components of) government consumption and GDP for the 1970-1994 period was 0.53 for Latin American countries and -0.02 for the G-7 countries.[1]

In such a volatile environment, current figures for revenues, expenditures, and the fiscal surplus will convey a rather misleading picture of the underlying fiscal situation. Consider, for example, a temporary appreciation of the real exchange rate. In a country with a large foreign debt, the real appreciation may improve the current fiscal situation by reducing debt service in terms of non-tradable goods (i.e., in terms of public sector wages). In contrast, in an economy whose main source of fiscal revenue is a tradable good — such as oil —the real appreciation may well deteriorate fiscal accounts by reducing revenues in terms of non-tradable goods. Hence, in the presence of large temporary fluctuations in the real exchange rate, a reading of the fiscal situation based on current fiscal indicators may lead to a severely distorted assessment of fiscal sustainability. This suggests the need to develop alternative fiscal indicators, which may provide a more reliable picture of the underlying sustainability of current fiscal policy.

In this context, the main purpose of this paper is to provide a simple analytical framework that can guide the development of indicators of fiscal policy sustainability in volatile economies and thus set the stage for the country studies that were part of this project. Section 2 lays out the basic fiscal accounting framework. Within this framework, Section 3 defines a sustainable fiscal policy as one which ensures that the government is intertemporally solvent. This definition implies a "true" indicator of fiscal sustainability, whose main properties are analyzed in Section 4 with the help of some numerical examples. To become operational, however, this indicator would require unreasonable amounts of information. Hence, Section 5 suggests two alternative indicators, which substantially reduce the data requirements. The first one, proposed by Blanchard (1990), is based on the "true" indicator. The second one is based on a "macro-adjusted deficit," which is defined as the level of the primary deficit which would prevail under "normal" macroeconomic conditions. Section 6 extends the definition of sustainability to allow for the presence of credit constraints. It is shown that the indicators of sustainability developed in the previous sections are necessary but not sufficient to assess sustainability. In light of the conceptual framework, Section 7 highlights the

[1]For additional evidence on procyclical fiscal policy in Latin America, see Gavin *et al* (1996) and Gavin and Perotti (1998).

main issues raised by the six country studies that constitute the core of this project. Section 8 concludes.

2 Basic fiscal accounting

This section uses basic fiscal accounting to introduce some relevant concepts, which will set the stage for the ensuing discussion.

Consider the government's budget constraint in nominal terms:[2]

$$B_t = (1+i)B_{t-1} + M_{t-1} - M_t + G_t - Z_t, \tag{1}$$

where B_{t-1} denotes the stock of public debt at the end of period $t-1$, M_{t-1} is the monetary base at the end of period $t-1$, G_t is government spending during period t, Z_t are total revenues during period t, and i is the (constant) nominal interest rate between period $t-1$ and t.

Deflating the flow constraint (1) by the price level, P_t, we obtain:

$$b_t = (1+r)b_{t-1} + g_t - z_t + \frac{m_{t-1}}{1+\pi} - m_t, \tag{2}$$

where lower case letters denote real variables, the inflation rate (assumed constant) is defined as $\pi = P_t/P_{t-1} - 1$, and the real interest rate is defined as $r = (1+i)/(1+\pi) - 1$. Revenues from money creation, z_t^m, are given by $z_t^m = m_t - \frac{m_{t-1}}{1+\pi}$. If real money balances are constant over time (and equal to m), then $z_t^m = m\frac{\pi}{1+\pi}$. Therefore, as one would expect, revenues from money creation are the product of the tax base, m, and the inflation tax rate, $\frac{\pi}{1+\pi}$. The latter has the dimension of a tax rate since, for $\pi \geq 0$, the expression $\frac{\pi}{1+\pi}$ varies between zero and one.

To express (2) in terms of GDP, divide all terms by real GDP in period t (y_t) to obtain:

$$\tilde{b}_t = \left(\frac{1+r}{1+\theta}\right)\tilde{b}_{t-1} + \tilde{g}_t - \tilde{z}_t - \tilde{z}_t^m, \tag{3}$$

where a tilda denotes variables expressed as a proportion of GDP and θ is the (constant) rate of GDP growth. Notice that revenues from money creation as a percent of GDP now include the resources that accrue to the government as a result of economic growth; that is, $\tilde{z}_t^m = \tilde{m}_t - \frac{\tilde{m}_{t-1}}{(1+\pi)(1+\theta)}$. To see this,

[2] For our purposes, the government comprises both the fiscal authority and the monetary authority.

note that if $\pi = 0$ and real money balances, $\tilde{m}_t$, are constant over time, then revenues from money creation collapse to $\frac{\theta}{1+\theta}\tilde{m}$.

We now introduce some basic definitions. The real primary deficit as a proportion of GDP, $\tilde{d}_t$, is defined as

$$\tilde{d}_t \equiv \tilde{g}_t - \tilde{z}_t. \tag{4}$$

The (economically relevant definition of the) operational deficit as a proportion of GDP, $\tilde{d}^o_t$, comprises the primary deficit plus real interest payments on public debt (both as a proportion of GDP); that is: [3]

$$\tilde{d}^o_t \equiv \left(\frac{r-\theta}{1+\theta}\right)\tilde{b}_{t-1} + \tilde{d}_t. \tag{5}$$

With these definitions, and using (3), the change in the stock of debt can be expressed as

$$\tilde{b}_{t+1} - \tilde{b}_t = \tilde{d}^o_t - \tilde{z}^m_t. \tag{6}$$

The stock of net debt, as a percent of GDP, will be growing over time if the operational deficit exceeds revenues from money creation.

In this context, it is worth pointing out that, as commonly measured, the fiscal deficit differs from the operational deficit defined above, which is the economically relevant measure. To see this, let us ignore revenues from money creation, and rewrite (1) as

$$B_t - B_{t-1} = iB_{t-1} + G_t - Z_t. \tag{7}$$

In practice, the fiscal deficit is computed by deflating equation (7) by nominal GDP, $P_t y_t$, to obtain:

$$\frac{B_t - B_{t-1}}{P_t y_t} = \frac{iB_{t-1}}{P_t y_t} + \tilde{d}_t. \tag{8}$$

or, equivalently,

$$\frac{B_t - B_{t-1}}{P_t y_t} = \frac{i}{(1+\pi)(1+\theta)}\tilde{b}_{t-1} + \tilde{d}_t. \tag{9}$$

[3] In practice, the operational deficit is typically computed ignoring the impact of growth. However, the effect of growth should be taken into account since the relevant measure of debt is as a proportion of GDP. Of course, if the rate of growth is zero (i.e.,$\theta = 0$), both measures coincide.

The right-hand side of equation (9) is thus the fiscal deficit, as often measured in practice. To see how it differs from the operational deficit, as defined in equation (5), substract (5) from (9) to obtain (assuming, for simplicity, that $\theta = 0$)

$$\frac{B_t - B_{t-1}}{P_t y_t} - \tilde{d}_t^o = \frac{\pi}{1+\pi}\tilde{b}_{t-1}. \tag{10}$$

It follows that, whenever $\pi > 0$, the measured deficit overestimates the operational deficit by the term $\frac{\pi}{1+\pi}\tilde{b}_{t-1}$.[4] The reason is that the latter represents an amortization of outstanding debt, which compensates government debt holders for the erosion in the real value of government debt due to inflation. Clearly, this should not be computed as part of the deficit.

3 The "true" indicator of fiscal sustainability

Having reviewed the basic fiscal accounting, we proceed to define the concept of fiscal policy sustainability and derive an indicator which renders this definition operational. We first compute the intertemporal budget constraint for the government. To this effect, suppose that the current period is period t and rewrite equation (3) for period $t+1$, solve for b_t, and substitute the resulting expression into (3) to obtain b_{t+1} as a function of period $t+1$ and period t variables and the initial stock of debt, $b_{t-1.}$ Repeating the same procedure, we can express b_{t+n} as

$$\left(\frac{1+\theta}{1+r}\right)^n \tilde{b}_{t+n} = \left(\frac{1+r}{1+\theta}\right)\tilde{b}_{t-1} + \sum_{s=0}^{n}\left(\frac{1+\theta}{1+r}\right)^s (\tilde{d}_{t+s} - \tilde{z}_{t+s}^m). \tag{11}$$

For a large n, intertemporal solvency requires that

$$\lim_{n\to\infty}\left(\frac{1+\theta}{1+r}\right)^n \tilde{b}_{t+n} = 0. \tag{12}$$

Under the assumption that $r > \theta$ (which ensures that the discount factor, $\frac{1+\theta}{1+r}$, is less than one), condition (12) says that government debt must be equal to zero in a present value sense.[5] This implies that, ultimately, government

[4] See, for instance, Siegel (1979).

[5] Strictly speaking, for solvency to be satisfied, equation (12) should hold as a weak inequality (that is, the left-hand side should be less or equal than zero). This would imply, however, that the government is not using all available fiscal resources.

debt as a proportion of GDP cannot growth at a rate higher than the effective real interest rate on government debt, given by $\frac{1+r}{1+\theta} - 1$.

For a large n, and imposing the solvency condition (12), equation (11) may be rewritten as

$$\tilde{b}_{t-1} = \sum_{s=0}^{\infty} \left(\frac{1+\theta}{1+r} \right)^{s+1} (\tilde{z}^m_{t+s} - \tilde{d}_{t+s}). \tag{13}$$

Equation (13) thus says that the present discounted value of net revenues, given by the right-hand side, must equal the initial stock of government debt.

A sustainable fiscal policy is thus a path of $\{\tilde{g}_t,\ \tilde{z}_t,\ \tilde{z}^m_t\}$ which satisfies equation (13). To derive an indicator which makes this definition operational, let us first define the permanent primary deficit, $\tilde{d}^*_t$, as the constant level of the primary deficit whose present discounted value as of period t is equal to the present discounted value of the path of actual primary deficits:[6]

$$\sum_{s=0}^{\infty} \left(\frac{1+\theta}{1+r} \right)^{s} \tilde{d}^*_t = \sum_{s=0}^{\infty} \left(\frac{1+\theta}{1+r} \right)^{s} \tilde{d}_{t+s}. \tag{14}$$

Solving for $\tilde{d}^*_t$, we obtain

$$\tilde{d}^*_t = \frac{r-\theta}{1+\theta} \sum_{s=0}^{\infty} \left(\frac{1+\theta}{1+r} \right)^{s+1} \tilde{d}_{t+s}. \tag{15}$$

Combining equations (13) and (15), we get

$$-\tilde{d}^*_t = \left(\frac{r-\theta}{1+\theta} \right) \tilde{b}_{t-1}, \tag{16}$$

which says that, if fiscal policy is sustainable, the permanent primary surplus $(-\tilde{d}^*_t)$ must equal the effective real interest payments on the initial stock of government debt.

The "true" indicator of fiscal sustainability, I^*_t, may now be defined as

$$I^*_t \equiv \left(\frac{r-\theta}{1+\theta} \right) \tilde{b}_{t-1} + \tilde{d}^*_t. \tag{17}$$

If $I^*_t = 0$, fiscal policy as of period t is sustainable. If $I^*_t > 0$, then the *planned* (i.e., ex-ante) path of $\{\tilde{g}_t,\ \tilde{z}_t\}$ violates the intertemporal budget constraint

[6] To simplify the presentation, we assume henceforth that $\tilde{z}^m_t = 0$. Alternatively, one can think of the primary deficit as including revenues from money creation.

because the planned use of net resources is positive. If $I_t^* < 0$, then the planned path of $\{\tilde{g}_t, \tilde{z}_t\}$ does not violate the intertemporal budget constraint and is therefore sustainable. In this case, however, the government is underutilizing resources (i.e., it is either spending too little or taxing too much).

It is worth stressing that I_t^* is an *ex-ante* concept. Of course, *ex-post*, the intertemporal budget constraint (13) must hold since credit markets will not be willing to keep lending to a government which is spending beyond its resources (in a present discounted value sense). Hence, something will need to occur — an unplanned (as of period t) reduction in government spending, increase in taxes or inflation, or outright default — to ensure that the intertemporal budget constraint is satisfied *ex-post*.

4 The true indicator of sustainability: numerical examples

In practice, computing I_t^* would require an amount of information — such as the future path of government spending and revenues — which is simply not available to policymakers. Before tackling this problem in Section 5, and in order to gain insights into the properties of I_t^*, it shall prove useful to construct examples which will assume that policymakers have at their disposal all the required information.

Example 1 We begin with an example in which fiscal policy is sustainable; that is, $I_t^* = 0$ for all t. Assume that $r = 0.05$, $\theta = 0$, $\pi = 0$, and $b_{-1} = 0.326$. In addition, the path of $\tilde{g}_t$ is constant over time and given by

$$\tilde{g}_t = 0.3, \qquad t \geq 0. \tag{18}$$

Revenues, $\tilde{z}_t$, are given by

$$\tilde{z}_t = 0.315 + 0.03 \sin(t), \quad t \geq 0. \tag{19}$$

This formulation is intended to capture cyclical variations in tax revenues, due to the underlying business cycle. More specifically, we have in mind situations in which the relevant tax base (typically income or consumption) fluctuates over the business cycle, thus inducing corresponding fluctuations in tax revenues. As illustrated in Figure 1, Panel A, tax revenues at $t = 0$ are 31.5 percent of GDP, reach a peak of 34.5 percent of GDP after two years,

and then decline until reaching a trough of 28.5 percent of GDP at $t = 5$.[7] The complete cycle lasts six years. The path of the primary deficit is thus given by

$$\tilde{d}_t \equiv \tilde{g}_t - \tilde{z}_t = -0.015 - 0.03\sin(t). \tag{20}$$

Since in this example $\theta = 0$, I_t^* is now given by

$$I_t^* \equiv r\tilde{b}_{t-1} + \tilde{d}_t^*. \tag{21}$$

Figure 1, Panel B illustrates I_t^* and its two components: the permanent primary deficit ($\tilde{d}_t^*$) and debt service ($r\tilde{b}_{t-1}$). By construction, $I_t^* = 0$ for all t indicating that fiscal policy is always sustainable. Notice, however, that its components are not constant over time. During periods of high (low) revenues, debt service falls (increases) reflecting the fact that debt is being retired (issued). Since I_t^* is always zero, this implies that the permanent primary deficit moves in opposite direction to the debt service, increasing in periods of high revenues and viceversa. The intuition is simply that retiring debt and increasing the permanent primary deficit are two alternative uses of resources (in a present discounted value sense). Hence, they must move in opposite directions if the solvency constraint is to be satisfied at all points in time.

Consider now a commonly-used indicator of sustainability (the operational deficit, as defined in (5)), which we will refer to as the standard sustainability indicator and denote by I_t. It is calculated as (recall that, in this example, $\theta = 0$)

$$I_t \equiv r\tilde{b}_{t-1} + \tilde{d}_t. \tag{22}$$

Notice that, in contrast to I_t^*, I_t is computed with the actual, rather than the permanent, primary deficit.

Figure 1, Panel C plots the paths of I_t^* and I_t. While I_t^* is always zero, I_t fluctuates between positive and negative values, reflecting the cyclical variations in both fiscal revenues and government debt. The standard sustainability indicator, I_t, would thus (wrongly) suggest that fiscal policy switches back and forth from unsustainable to sustainable, when in fact it is always sustainable. The misleading picture that follows from using the actual, rather

[7] Naturally, these are discrete approximations to the "true" peak and trough, which occur at $t = 1.57$ and $t = 4.71$, respectively.

than the permanent, primary deficit in computing I_t illustrates the importance of constructing a better proxy for the permanent deficit. This will be the subject of Section 5.

Example 2 We will now illustrate a situation in which fiscal policy is unsustainable as of period 0 onwards, which will require a fiscal adjustment at some point in the future. The only change with respect to the previous example is that the path of $\tilde{g}_t$ is now given by[8]

$$\tilde{g}_t = \begin{cases} 0.32, & 0 \leq t < 13, \\ 0.282, & t \geq 13. \end{cases} \tag{23}$$

For $\tilde{g}_t = 0.32$, fiscal policy is unsustainable as of period 0 onwards. The fiscal unsustainability will be corrected at $t = 13$, when government spending is reduced to 0.282. This level ensures that, from $t = 13$ onwards, fiscal policy is sustainable.

Figure 1, Panel D plots the paths of I_t^* and I_t. Notice that I_t^* at $t = 0$ is 2 percent of GDP, indicating that current fiscal policies are unsustainable. Interestingly, the value of I_t^* has a straightforward and useful interpretation: it measures the fiscal adjustment that would be required to make fiscal policy sustainable at time t. For instance, the fact that $I_0^* = 0.02$ signals that a fiscal adjustment of 2 percent of GDP would be needed at $t = 0$ to make fiscal policy sustainable. Moreover, I_t^* increases over time, indicating that the fiscal adjustment that would be needed to revert to a sustainable path is larger the longer the necessary adjustment is delayed. Intuitively, the longer government expenditures remain above the level that can be financed with planned fiscal revenues, the more drastic the adjustment needed to bring government spending in line with planned revenues. For instance, at $t = 12$, the required reduction in government spending is 3.6 percent of GDP, which is almost twice as much as the adjustment that would have been required at $t = 0$. The example assumes that the adjustment is effected at $t = 13$, when the required adjustment is 3.8 of GDP($= 0.32 - 0.282$). Figure 1, Panel D shows how at that point I_t^* falls to zero, indicating that fiscal policy is sustainable henceforth.

As in the previous example, I_t fluctuates around I_t^*, but now exhibits the same upward trend as I_t^*. Once again, relying on I_t to assess either the sustainability of fiscal policy or the magnitude of the adjustment needed to

[8] Formally, the example assumes that the change in $\tilde{g}_t$ at $t = 13$ is unanticipated.

revert to a sustainable path would convey a rather misleading picture. For example, as far out as $t = 8$ — when I_t^* has been flashing a red light for quite some time — the standard sustainability indicator, I_t, would suggest that the fiscal situation is under control and no adjustment is necessary. At the other extreme, at its peak at $t = 11$, I_t would indicate that the necessary adjustment is 6.3 percent of GDP when, in reality, the required adjustment is only 3.4 percent of GDP (i.e., $I_{11}^* = 0.034$). After the adjustment, I_t continues to fluctuate around I_t^* (which is now zero), as in Example 1. This example thus reinforces the need to construct a more accurate proxy for I_t^*.

5 Alternative sustainability indicators

From a practical point of view, it would be simply not feasible to construct I_t^*, since one would need literally all the future path of government spending and revenues to compute the permanent primary deficit, $\tilde{d}_t^*$.[9] To obtain an accurate reading of the fiscal situation, however, there seems to be little choice but to come up with a proxy for I_t^* which is not too demanding in terms of data. This section will discuss two such indicators. We first review an indicator suggested by Blanchard (1990) and then propose an alternative one.

5.1 The Blanchard sustainability indicator

In order to get around the data requirements, Blanchard (1990) essentially suggests proxying the permanent primary deficit, given by (15), with an approximation (to be denoted by $\tilde{d}_t^B$) based on a finite number of periods. Formally, let $\tilde{d}_t^B$ satisfy

$$\sum_{s=0}^{n} \left(\frac{1+\theta}{1+r}\right)^s \tilde{d}_t^B = \sum_{s=0}^{n} \left(\frac{1+\theta}{1+r}\right)^s \tilde{d}_{t+s}. \tag{24}$$

Solving for $\tilde{d}_t^B$:

$$\tilde{d}_t^B = \left(\frac{r-\theta}{1+\theta}\right)\left[1-\left(\frac{1+\theta}{1+r}\right)^{n+1}\right]^{-1} \sum_{s=0}^{n} \left(\frac{1+\theta}{1+r}\right)^{s+1} \tilde{d}_{t+s}. \tag{25}$$

[9] It is worth noting that there has been some econometric work aimed at testing directly the government's intertemporal constraint; see, for example, Corsetti and Roubini (1991).

As suggested by Blanchard (1990), if $r-\theta$ and n are not too large, the right-hand side of the last equation may be approximated by the simple average over the relevant period. Hence,

$$\tilde{d}_t^B \approx \frac{\sum_{s=0}^{n} \tilde{d}_{t+s}}{n+1}. \tag{26}$$

Blanchard's (1990) indicator of fiscal sustainability it thus defined as [10]

$$I_t^B \equiv \left(\frac{r-\theta}{1+\theta}\right)\tilde{b}_{t-1} + \tilde{d}_t^B. \tag{27}$$

As to the value of n to be used in practice, Blanchard (1990) suggests that it should be that time horizon for which projections are available (typically 3 years for OECD countries).

To illustrate the behavior of Blanchard's indicator, we return to example 1 of the previous section. We take $n = 2$ (which implies that we take an average over three periods) and, for consistency, assume that policymakers know the actual values of the primary deficit over this horizon. Figure 2, Panel A plots Blanchard's indicator, I_t^B, alongside the true indicator, I_t^*, and the standard indicator, I_t. While I_t^B fluctuates around the true indicator, its fluctuations are smaller than those of I_t. This suggests that I_t^B is a better indicator than the standard one. Indeed, for this example, the mean squared error for I_t^B is smaller than that for I_t.[11]

5.2 The macro-adjusted deficit

As discussed above, Blanchard's indicator reduces informational requirements by using projections over a short-term horizon. We now proceed to construct an alternative indicator of fiscal sustainability, which reduces informational requirements by putting some conceptual structure into the current framework, which up to now has consisted only of simple intertemporal fiscal accounting. For this purpose, we first introduce the concept of the macro-adjusted primary deficit ($\tilde{d}_t^M$). The macro-adjusted deficit is defined as the level of the primary deficit that would prevail under "normal" macroeconomic conditions.

[10] Blanchard (1990) actually defines the sustainability indicator in terms of tax revenues, rather than deficits. Naturally, the two formulations are identical.

[11] Of course, in practice there will be projection errors in computing Blanchard's indicator, which are assumed away in this example.

This definition is purposely not specific as to what exactly we mean by "normal" macroeconomic conditions. The reason is that "normal" macroeconomic conditions are likely to differ from country to country depending on the macroeconomic variables which affect fiscal revenues and expenditures. For example, for many years, industrial countries have been computing the cyclically-adjusted (or full employment) budget deficit, loosely defined as the deficit which would prevail if the unemployment rate was at its "natural" level. Implicit in this calculation is the assumption that "normal" times should be defined by the natural rate of unemployment. Under this definition of "normal" times, the macro-adjusted deficit would coincide with the cyclically-adjusted or full-employment budget deficit.

In contrast, consider a country — like Argentina or Uruguay — where the main source of revenues are consumption taxes. In this case, shocks to consumption (as a result, for example, of a temporary fall in world interest rates) will have a large impact on fiscal revenues, while possibly leaving largely unaffected the unemployment rate. In this case, it would make little sense, for fiscal purposes, to define "normal times" in terms of the unemployment rate. Rather, it would seem natural to define "normal" macroeconomic conditions in terms of the consumption cycle.

Alternatively, consider a country like Venezuela whose main source of fiscal revenue is oil. Fluctuations in oil prices are therefore the main disturbance to fiscal revenues. Suppose further that future oil prices are largely unpredictable in the sense that the best predictor of future oil prices is the current price. Hence, "normal" macroeconomic conditions — as reflected by the price of oil — will not differ from current macroeconomic conditions, nor will the $\tilde{d}_t^M$ differ from the current primary deficit.

These considerations thus make clear that the need to accommodate different fiscal realities calls for a country-specific notion of "normal" macroeconomic conditions. Furthermore, it is precisely the fact that the practitioner is forced to define "normal" conditions which reduces considerably the data requirements. Notice that while computing the permanent primary deficit, $\tilde{d}_t^*$, would require knowing the whole path of all macroeconomic variables that affect fiscal revenues and expenditures, computing $\tilde{d}_t^M$ only requires knowledge of the "normal" value of the relevant macroeconomic variables. Of course, this informational advantage comes at a cost as the practitioner must take a stand with respect to (i) the underlying behavior of the relevant macroeconomic variables in order to determine their "normal" values, and (ii) how these variables affect fiscal aggregates.

To illustrate the behavior of an indicator of fiscal sustainability based on $\tilde{d}_t^M$, we will proceed to revisit the two examples examined in the previous section under the assumption that policymakers know the value of the relevant macroeconomic variables during "normal" times.

Example 1 revisited Consider the same scenario as in example 1 above. As indicated by equation (19), revenues fluctuate around 31.5 percent of GDP. It seems natural to define "normal" times in this example as given by that level of revenues that would prevail in the absence of cyclical variations (i.e., when $\sin(t) = 0$). Hence,

$$\tilde{d}_t^M = \tilde{g}_t - 0.315. \tag{28}$$

We proceed to define a $\tilde{d}^M$-based indicator of fiscal sustainability (I^M) given by

$$I_t^M = r\tilde{b}_{t-1} + \tilde{d}_t^M. \tag{29}$$

Notice that we now have four indicators of fiscal sustainability: (i) I_t^*, computed using the permanent primary deficit; (ii) I_t^B, computed using Blanchard's approximation of the permanent primary deficit; (iii) I_t^M, computed using the macro-adjusted primary deficit, and (iv) I_t, computed using the actual primary deficit,

Figure 2, Panel B illustrates the behavior of the first three of these fiscal indicators. As before, the true indicator, I_t^*, is always zero, indicating that fiscal policy is always sustainable, while the indicator based on the macro-adjusted primary deficit, I_t^M, fluctuates around I_t^*. The reason is that, by construction, I_t^M relies on $\tilde{d}_t^M$ — which is constant over time — while debt service varies over time. Compared to Blanchard's indicator (I_t^B), I_t^M exhibits smaller variations around I_t^*. This is because I_t^M only reflects fluctuations in the stock of debt since fiscal revenues remain constant at their "normal" level. Hence, under our assumptions, I_t^M is a better proxy of fiscal sustainability than I_t^B, which in turn has already been shown to be better than I_t.[12]

The discrepancy between I_t^M and I_t^* will be affected by the characteristics of the cyclical variations in tax revenues (i.e., the amplitude and duration

[12]Of course, a critical assumption is that the practicioner has perfect knowledge of "normal" times.

of the cycles depicted in Figure1, Panel A). To illustrate this, we vary the amplitude and duration of the cycles captured in equation (19). As shown in Figure 2, Panel C, the discrepancy between I_t^M and I_t^* at any given point in time will be larger the larger the amplitude of tax revenues cycles. Similarly, for cycles of the same amplitude but longer duration, it can be shown that the mean squared error of I_t^M as a proxy for I_t^* will be larger the longer the duration of the business cycle.

Example 2 revisited Consider again example 2 examined above in which fiscal policy was initially unsustainable. Figure 2, Panel D plots the same three indicators of fiscal sustainability for this case. The notable aspect is that I_t^M tracks quite well the magnitude of the fiscal adjustment needed to restore sustainability. In contrast, depending on the state of the business cycle, I_t^B may deliver a rather misleading picture of the required adjustment.

6 Imperfect access to credit markets

When sovereign governments face credit constraints in international markets (i.e., the stock of net debt cannot surpass a given level), then I_t^* will not be sufficient to evaluate fiscal policy sustainability and further information will be needed. The reason is that, in the absence of credit constraints, any debt path that satisfies $I_t^* = 0$ is a feasible path. Under credit constraints, however, all debt paths that do not satisfy the credit constraint will not be feasible.

To illustrate this point, let us introduce a debt ceiling in example 1 above. Specifically, it is assumed that international credit markets will not be willing to keep lending to the government beyond a certain debt threshold (32 percent of GDP in our example). Given this debt ceiling, Figure 3 indicates that, although $I_t^* = 0$, planned fiscal policies are not sustainable because they would imply that at a certain point in time the government would need to borrow beyond the debt ceiling. Hence, $I_t^* = 0$ is a necessary but not a sufficient condition for fiscal policy to be sustainable. In this case, it would also be necessary to compute the path of actual deficits to evaluate whether the debt ceiling will be hit at some point in time. In practice, if credit constraints are believed to be binding, then computations of I_t^* (or whatever proxy is used) will need to be supplemented by a medium-term forecast (say, 3 to 5 years) of the actual fiscal deficits.

7 Fiscal policy sustainability in practice

Up to now, the discussion on fiscal sustainability has been carried out at a conceptual level. The simplicity of the analytical framework has enabled us to focus on the essential concepts without having to be distracted by the complexities of the real world. However, the case studies that constitute the core of this project could not afford this luxury. The authors had to roll up their sleeves, dirty their hands, and face the much more difficult task of actually implementing some of these concepts. The result is an interesting collection of country studies which, in spite of all the practical hurdles, yields many important insights and issues. We now highlight some of the more interesting ones in light of the basic framework developed in the previous sections.

The first case study on Uruguay, by Borchardt, Rial, and Sarmiento, illustrates two important issues. The first issue is that the macro-adjusted fiscal deficit ($\tilde{d}^M$) yields a substantially different reading of the fiscal situation when cyclical factors are the dominant force in the economy. In the case of Uruguay, cyclical variations in the economy during the period under study (1974-1996) were mainly induced by periodic exchange rate-based stabilization attempts. The consumption boom-recession cycles associated with such stabilizations resulted in corresponding cycles in tax revenues — since the tax structure is mainly based on consumption taxes.[13] As a result of these consumption cycles, the actual deficit delivers at times a rather misleading picture of the underlying fiscal situation. The second issue is the application of intertemporal fiscal accounting in its purest form to the finances of the Uruguayan social security system. The authors project the whole path of social security revenues, expenditures, and deficits before and after the 1995 reform for a period of 50 years. The present discounted value computations deliver stunning results: social security reform in Uruguay has reduced the system's implicit debt by 60 percent of GDP, compared to an explicit net public debt of only 20 percent of GDP.

In the Peruvian case study, Arias, Cuba, and Salazar provide a very clean example of the difference between ex-ante and ex-post sustainability. The path of fiscal deficits in Peru between 1970 and 1991 displays a remarkably regular cycle with peaks in 1977, 1983, and 1988 exceeding 10 percent

[13] For a theoretical and empirical examination of the boom-recession cycle in consumption associated with exchange rate-based stabilizations, see Calvo and Végh (1997). The fiscal consequences of this cycle have been addressed by Talvi (1997).

of GDP. While this could be construed as an ex-ante sustainable policy in which the deficit is endogenously responding to the ups and downs of the business cycle, the authors argue for an alternative interpretation. They see these deficit cycles as the result of unsustainable fiscal policies which eventually forced policymakers to default — either de facto through large discrete devaluations which reduce the real value of existing nominal obligations or outright default. It is precisely through defaults — whether implicit or explicit — that the fiscal situation becomes sustainable *ex-post*. In contrast, ex-ante sustainability is likely to manifest itself in changes in policies (i.e., changes in tax rates, reduction in public sector real wages) which do not involve defaults.

This crucial distinction between ex-ante and ex-post sustainability resurfaces in the case of Venezuela. In the corresponding country study, Garcia Osio *et al* offer a textbook example of an economy in which shocks to revenues are predominantly exogenous, largely unpredictable, and highly variable as result of Venezuela's heavy dependence on oil revenues. Oil revenues in Venezuela constitute two thirds of total revenues and their variability is more than twice that of non-oil revenues. Under these circumstances, it should perhaps come as no surprise that the time path of government expenditures has essentially mimicked — with some lags — the behavior of world oil prices. Furthermore, the variability of government expenditures is essentially the same as that of oil revenues. While this pattern of government expenditures could be interpreted as an optimal ex-ante response to largely unpredictable fluctuations in oil revenues, the traumatic adjustments — mainly through large and costly devaluations — documented by Osio *et al* seem to point out to inefficient ex-post adjustments to otherwise unsustainable paths.

In the case study on Argentina, Cetrangolo, Damill, Frenkel, and Jimenez document how the fiscal consolidation in Argentina in the aftermath of the Convertibility plan was achieved through a succession of fiscal reforms, which left behind decades of fiscal profligacy. In fact, the authors show that, with the fiscal structure prevailing at the beginning of the Convertibility plan, the fiscal deficit would have reached around 2.6 percent of (trend) GDP by 1994 as opposed to a near balanced budget achieved in 1994. This suggests that the dramatic improvement in the fiscal accounts in Argentina was not only due to the post-stabilization boom of the early 1990s but was also the result of an unrelenting effort on the part of the authorities to consolidate the fiscal situation.

In contrast to Argentina, in the study on Brazil, Bevilaqua and Werneck present a fascinating case of fiscal unsustainability in the aftermath of a successful inflation stabilization program — the Real plan implemented in July 1994. Based on simulations, they argue that, under reasonable assumptions, a sharp increase in public debt is all but inevitable unless there is a change in current fiscal policies. The possibility of future fiscal adjustments is constrained by the presence of severe rigidities stemming from the 1988 constitutional reform, including revenues lost to state and local governments, the granting of lifetime tenure to public employees, and the expansion of social insurance benefits. Given these rigidities, the authors conclude that it is unlikely that the required spending cuts will be forthcoming without a major fiscal reform. Brazil's case thus provides a vivid example of the issues that surface when fiscal sustainability is at stake and of the potential costs of delaying the necessary fiscal adjustment.

While the survival of Brazil's Real plan hinges on a quick resolution of the underlying fiscal unsustainability, Colombia's fiscal problems are related to medium-term trends. In the study on Colombia, Alonso, Olivera, and Fainboim illustrate how increases in discretionary public spending may propel a sustainable fiscal situation onto an unsustainable path. The authors identify the early 1980s and the early 1990s as the two turning points in Colombia's recent fiscal history. While in the former case, higher spending took the form of lax wage and investment policies, in the latter case it can be traced back to fiscal decentralization and social security outlays. Based on econometric analysis and medium to long-term fiscal projections, the authors conclude that the fiscal situation is unsustainable mainly due to a disequilibrium in the social security finances, which calls for additional reforms of Colombia's social security system.

8 Concluding remarks

Latin American countries operate in a highly volatile macroeconomic environment. Under these circumstances, fiscal indicators based on current figures are likely to provide a misleading picture of fiscal policy sustainability. This paper has argued in favor of constructing alternative fiscal sustainability indicators anchored in the principles of intertemporal fiscal accounting and presented a basic framework to guide the construction of these indicators. Since the "true" indicator of sustainability would require unreasonable

amounts of information, alternative indicators must be used. This paper has proposed the use of a sustainability indicator based on a "macro-adjusted deficit", defined as the primary deficit that would prevail under "normal" macroeconomic conditions. The additional structure needed to define "normal" times reduces substantially the informational requirements.

Needless to say, translating this paper's conceptual framework into a set of indicators which are easy to compute and useful for policy decision-making is a formidable challenge. This challenge is taken up by the case studies that form the core of this project on Argentina, Brazil, Colombia, Peru, Uruguay, and Venezuela. At the same time, these case studies offer a fascinating account of the recent fiscal history of the countries under study and put into perspective the interaction between fiscal policy, on the one hand, and monetary policy, external shocks, and structural reforms on the other.

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Table 1. Macroeconomic environment and fiscal aggregates
Volatility indicators

	Latin America	OECD
Macroeconomic environment (1970-1992)		
GDP	4.7	2.2
Private consumption	5.6	2.1
Domestic investment	16.1	8.3
Real exchange rate	13.4	4.8
Inflation (in % per year)	463.5	3.9
Terms of trade	15.1	8.9
Capital flows (% of GDP)	2.8	1.7
Fiscal aggregates (1970-1994)		
Revenues	15.2	5.2
Expenditures	15.7	3.9
Change in primary surplus (% of GDP)	3.6	1.4

Note: Unless otherwise indicated, all variables are expressed as growth rates.
Volatility is measured by the standard deviation.
Source: IDB (1995) and Gavin *et al* (1996).