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Empirical Assessment  
of Sustainability and Feasibility  
of Government Debt:  
The Philippines Case

Duo Qin, Marie Anne Cagas, Geoffrey Ducanes,  
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## FOREWORD

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## **ABSTRACT**

This paper assesses empirically the sustainability and feasibility of the government debt in the Philippines using the No Ponzi Game criterion. Both historical data and forecasts generated by a quarterly macroeconomic model of the Philippines are used in the assessment. Stochastic simulations are carried out to mimic future uncertainty. The test results show that, up to the end of the present administration in 2010, the Philippine government debt is not sustainable but weakly feasible, that the feasibility is vulnerable to major adverse shocks, and that simple budgetary deficit control policy is inadequate for achieving debt sustainability or strengthening feasibility.

## I. INTRODUCTION

The huge public debt in the Philippines has raised serious and growing concerns about the ability of the Philippine government to manage its debt obligations and the long-run sustainability of government fiscal policy. Several studies done on the Philippines have shown, by detailed analyses of the fiscal position over recent years, how the country's public debt has been fluctuating from sustainable to unsustainable levels (see e.g., Paderanga 1995 and 2001, and Manasan 1997 and 2004).

The present paper extends these studies by subjecting the national government debt position up to 2014 to an array of formal empirical tests based on available theories of long-run sustainability and feasibility of public debt. Two branches of theories are considered. One uses the No Ponzi Game (NPG) condition as the criterion for long-run sustainability within the framework of an infinite-horizon representative agent model (see Chalk and Hemming 2000, and Bergman 2001). The other establishes, within the framework of a stochastic overlapping generations model, the feasibility conditions for Ponzi games in a situation where the government manages its bond portfolio to a lower debt rate than the market rate. (A government is said to be playing a Ponzi game when it just keeps on paying old debt by issuing new ones. However, the government cannot continuously engage in a Ponzi scheme: its debt cannot grow indefinitely.) As both theories are explicitly expressed in terms of future debt and interest rate trends, stochastic forecasts are generated from a quarterly macroeconomic model of the Philippines to extend the testing period to 22 years, i.e., 1993Q1–2014Q4. In addition, several shocks are also introduced during the forecasting period to examine how vulnerable the government debt situation would be in the face of significant adverse risks.

The rest of the paper is structured as follows: Section II briefly describes the fiscal and public debt situation in recent years. Section III outlines the testable theories of public debt sustainability and feasibility. Section IV reports the empirical test results. The last section concludes.

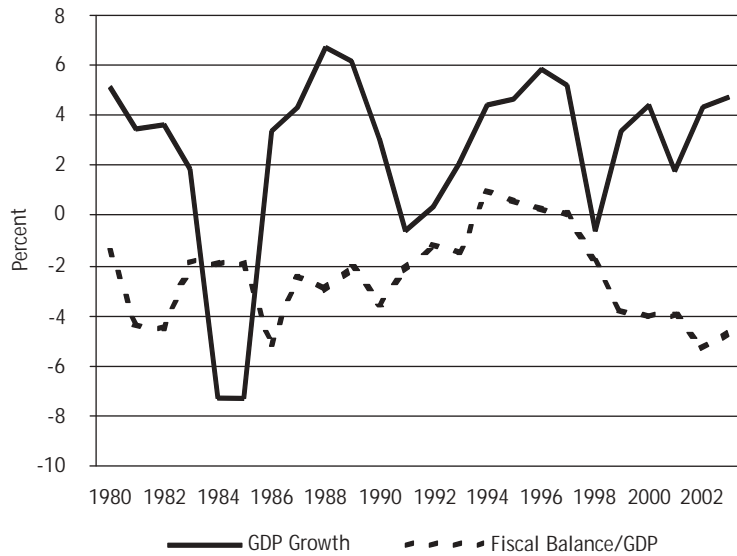
## II. THE FISCAL AND GOVERNMENT DEBT SITUATION IN THE PHILIPPINES

Chronic deficits have marked the Philippine government's fiscal position since the early years of the country's development.<sup>1</sup> There was brief respite in the mid-1990s when the government's fiscal position improved enough to register a surplus of less than 1 percent for the period 1994-1997. The occurrence of the Asian financial crisis, however, pushed the fiscal balance back to the negative plane when it fell to -1.9 percent of gross domestic product (GDP) in 1998, and then plummeted to -5.2 percent in 2002. In 2003, the deficit stood at 4.6 percent of GDP (see Figure 1).

---

<sup>1</sup> In the 1960s, government was in deficit 8 out of the 10 years and fiscal deficit averaged about 1 percent of GDP for the decade. In the 1970s it was in deficit 7 out of the 10 years and the fiscal deficit averaged about one-half of 1 percent of GDP. In the 1980s the government was in deficit all 10 years and fiscal deficit averaged about 2.5 percent of GDP.

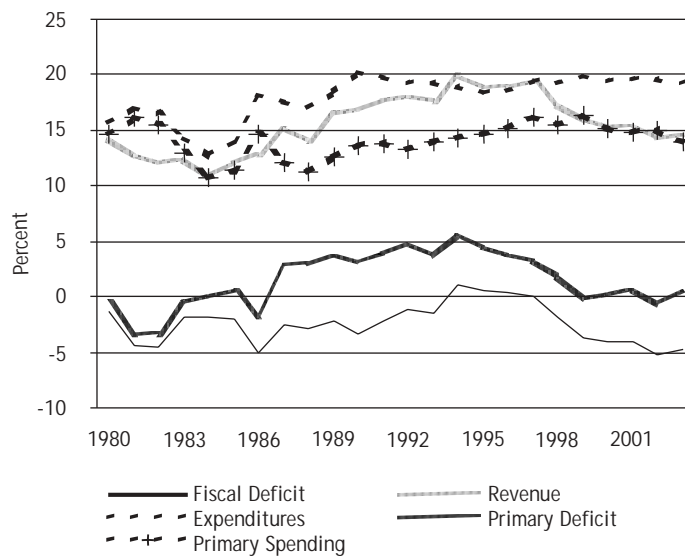
FIGURE 1  
 GROWTH OF GDP AND RATIO OF FISCAL BALANCE TO GDP



Sources: National Statistical Coordination Board; Bureau of Treasury.

The deterioration of the fiscal balance is mostly due to shortfalls in government revenues, especially tax revenues (which accounts for more than 85 percent of the total). The national government's revenue efforts have declined from a peak of 19.9 percent of GDP in 1994 to 14.6 percent of GDP in 2003 (see Figure 2). From its peak of about 17 percent in 1997, the tax effort has slid to 12.5 percent in 2003. Government expenditures, on the other hand, have been fairly stable, averaging about 18 percent of GDP for the period 1980-2003. Its growth has been kept to a minimum and has been on a downward trend since 2000. In particular, primary spending (i.e.,

FIGURE 2  
 FISCAL AGGREGATES

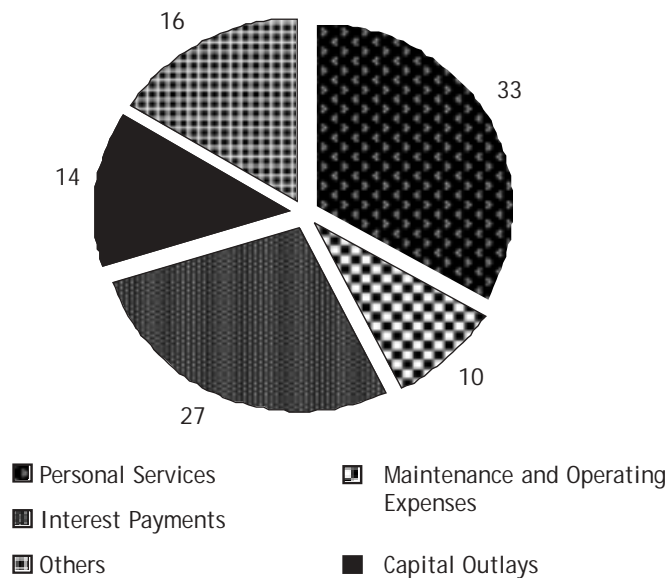


Source: Bureau of Treasury.



national government spending net of interest payments) has been reined in, with its share to GDP falling from 16.3 percent in 1999 to 14.0 percent in 2003. Capital expenditures have been reduced: after reaching its peak of more than a quarter of total expenditures in the early 1980s, it is down to 13.5 percent in 2003.<sup>2</sup> In contrast, the amount spent for servicing of debt escalated. From an average of 4.6 percent in 1975-1979, it went up to about 7 percent in 1980-1983, ballooned to almost 25 percent in 1984-1989, and has averaged more than 24 percent in 2000-2003 (Figure 3).

FIGURE 3  
NATIONAL GOVERNMENT EXPENDITURES, 2003 (PERCENT)

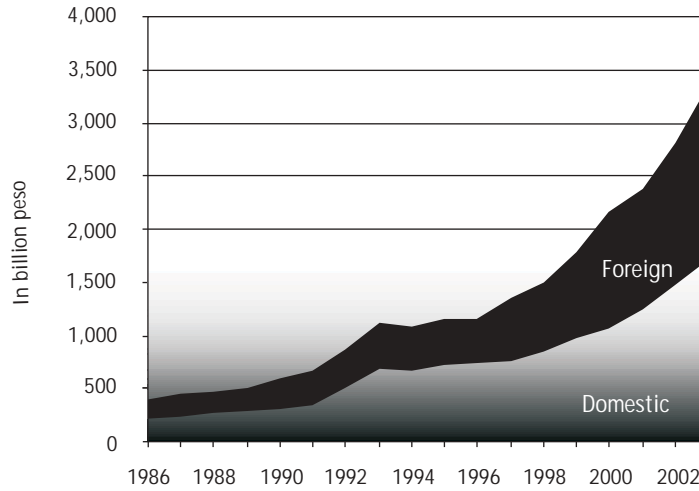


Source: Department of Budget and Management.

A major threat to the national government's fiscal position is the large stock of national government debt and the associated costs of servicing that debt. In the 1970s and 1980s, large debt inflows were used to stimulate the economy and to provide a cushion against external shocks that had often plagued the economy in the early years of its development. Then in the 1990s it also became a means to service the liabilities of ailing government agencies. By this time, domestic resources have become a significant part of Philippine public debt reflecting the government's struggle to service its foreign debt while incurring fiscal deficits (Figure 4). From a peak of PHP95.4 billion in 1994, primary balance (i.e., total revenues less nondebt expenditures) went into deficit in 2002 (PHP24.9 billion) before registering a surplus of PHP26.5 billion in 2003.

<sup>2</sup> Of note is the fact that infrastructure spending of the national government has remained repressed and has not exceeded 2 percent of GDP. Indeed, the brunt of fiscal adjustment has primarily been absorbed by infrastructure and other development spending—expenditures developing countries like the Philippines badly need.

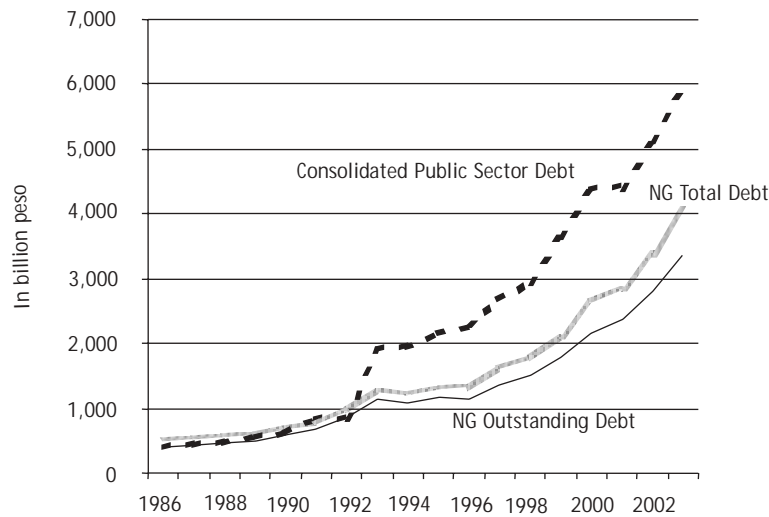
FIGURE 4  
 NATIONAL GOVERNMENT OUTSTANDING DEBT



Source: Bureau of Treasury.

The national government's total outstanding debt stood at PHP3.36 trillion (which is 78 percent of GDP) at the end of 2003. Including contingent liabilities, this would amount to about PHP4.1 trillion (or 94.5 percent of GDP). The consolidated public sector debt is much higher at PHP5.9 trillion—a whopping 137 percent of GDP. All three are on an upward trend (Figure 5).

FIGURE 5  
 CONSOLIDATED PUBLIC SECTOR DEBT AND NATIONAL GOVERNMENT DEBT



Note: NG means national government. Simple regression of the consolidated public debt on the NG outstanding debt using data from 1993 onward shows a relatively constant relationship between the two, with the slope coefficient estimate of 1.7.

Sources: CEIC Data Company Ltd., Bureau of Treasury.

The growth of public debt has been very high, averaging above 15 percent between 1999 and 2003. The national government debt has been growing at a higher rate for the same period, with the increase largely attributed to the continuing national government deficits. However, an equally sizeable amount (about 37 percent) of the increase in debt is due to nonbudgetary items and assumed liabilities of government corporations (see Figure 5), underscoring the continuous practice of condoning inefficiency and irresponsibility of government-owned and controlled corporations (GOCC).

Warnings of the public debt problem have recently been voiced at an increasing volume by economists and institutional investors in the Philippines as well as internationally (e.g., see De Dios et al. 2004). However, most of these are based on case analyses rather than rigorous empirical tests. This paper attempts to fill in this gap.

### III. THEORIES OF GOVERNMENT DEBT SUSTAINABILITY AND FEASIBILITY

The key consideration for any government to resort to debt is the availability and feasibility of debt financing. This consideration underlies the theoretical approach to determine the debt sustainability on the lenders' constraint, which is commonly expressed by the present value constraint (PVC).

Under the highly idealistic assumptions of an economy with one sector, in steady state and on a dynamically efficient growth path, the PVC-based theory of government debt results in the long-run condition of No Ponzi Games. The theory starts from the government debt accounting identity. With respect to the Philippine case, this identity results in:

$$B_{t+1} = q_{t+1}B_t + D_{t+1} + L_{t+1} \quad (1)$$

where  $B_t$  denotes the government debt at time  $t$ ;  $q_t$  the one-period interest rate factor, e.g.,  $q_t = 1 + r_t$ , with  $r_t$  being the equilibrium interest rate with respect to the marginal rate of substitution derived from the optimization of consumers' preference function;  $D_t$  is the primary fiscal deficit, i.e., budget deficit excluding interest payment; and  $L_t$  denotes the off-budget account deficit, due mainly to the contingent liabilities of GOCCs.<sup>3</sup> Forward substitution of (1) yields:

$$B_t = \sum_{j=1}^{\infty} \frac{-(D+L)_{t+j}}{\prod_{i=1}^j q_{t+i}} + \lim_{\tau \rightarrow \infty} \frac{B_{t+\tau}}{\prod_{j=1}^{\tau} q_{t+j}} \quad (2)$$

Since the first term on the right-hand side of (2) is expected to balance out in general, the lenders' constraint results in the NPG condition:

<sup>3</sup> Notice that the term  $L_t$  is absent in the standard debt accounting identity, where only net debt is considered (e.g., see Lebow 2004).

$$\lim_{\tau \rightarrow \infty} \frac{B_{t+\tau}}{\prod_{j=1}^{\tau} q_{t+j}} = 0 \quad (3)$$

The limit in (3) defines the necessary condition for the long-run debt sustainability. It implies that government debt cannot grow faster than the average interest rate in the long run.

A popular alternative is to examine the sustainability condition in terms of the debt-to-income ratio, instead of debt alone, based on the argument that all the budget variables are highly dependent on the macroeconomic situation (see for example Cuddington 1996). Let us define the debt ratio by  $b_t = B_t / Y_t$ ; the primary deficit ratio by  $d_t = D_t / Y_t$ ; and the off-budget account deficit ratio by  $l_t = L_t / Y_t$ , where  $Y_t$  is the aggregate income and often represented by GDP or gross national product (GNP). Equation (2) can be rewritten as:

$$b_t = \sum_{j=1}^{\infty} \left( \prod_{i=1}^j \frac{g_{t+i}}{q_{t+i}} \right) - (d + l)_{t+j} + \lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} b_{t+\tau} \quad (4)$$

where  $g_t$  is the growth factor:  $Y_{t+1} = g_{t+1} Y_t$ . The NPG condition corresponding to (3) becomes:

$$\lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} b_{t+\tau} = 0 \quad (5)$$

Equation (5) highlights the importance of the dynamic efficiency assumption, since it is necessary to have the interest rates larger than the economic growth rates for the nontrivial case of  $b_{t+\tau} \neq 0$  in (5).<sup>4</sup>

Empirical tests of the debt sustainability conditions (3) or (5) entail knowledge of the time-series properties of the variables in these equations, since these conditions require us to infer the asymptotic properties of the limit functions from finite data samples. In particular, it is crucial to know the time-series properties of the debt or debt ratio series, as the interest rate and the economic growth rate are normally expected to be either stationary or nontrended random walk.<sup>5</sup> Following Bergman (2001), we assume that the government debt be generated by a first-order autoregressive, i.e., AR(1), process:<sup>6</sup>

$$\begin{aligned} B_t &= \alpha_0 + \alpha_1 B_{t-1} + \varepsilon_t \\ &= \sum_{k=0}^{t-1} \alpha_0 \alpha_1^k + \alpha_1^t B_0 + \sum_{k=0}^{t-1} \alpha_1^k \varepsilon_{t-k} \end{aligned} \quad (6)$$

<sup>4</sup> The assumption is embodied in the infinite-horizon representative consumer model (Bohn 1995).

<sup>5</sup> A number of empirical tests are built on the time-series relationship between the fiscal deficit and the debt series (Quintos 1995, Bohn 1998). However, this approach is not applicable here since there is an off-budget deficit component in the Philippine government debt.

<sup>6</sup> This is a testable assumption. The results below can be extended to an AR( $n$ ) process when  $n > 1$ .

where  $e_t$  is a zero-mean stationary process. When  $\alpha_1 < 1$ , the NPG condition (3) is satisfied. When the debt series is nonstationary, i.e.,  $\alpha_1 \geq 1$ , the NPG condition (3) can be examined by combining it with (6):

$$\lim_{\tau \rightarrow \infty} \frac{B_{t+\tau}}{\prod_{j=1}^{\tau} q_{t+j}} = \lim_{\tau \rightarrow \infty} \left( \frac{1}{\prod_{j=1}^{\tau} q_{t+j}} \left( \sum_{k=0}^{t+\tau-1} \alpha_0 \alpha_1^k + \alpha_1^{t+\tau} B_0 + \sum_{k=0}^{t+\tau-1} \alpha_1^k \varepsilon_{t+\tau-k} \right) \right) \quad (7)$$

The NPG condition now becomes:

$$\lim_{\tau \rightarrow \infty} \frac{\sum_{k=0}^{\tau} \alpha_0 \alpha_1^k}{\prod_{j=1}^{\tau} q_{t+j}} = 0, \quad \lim_{\tau \rightarrow \infty} \frac{\alpha_1^{\tau}}{\prod_{j=1}^{\tau} q_{t+j}} = 0 \quad (8)$$

Condition (8) requires that the degree of explosiveness in the roots of the debt series be no larger than what the compounding interest rates could dampen out in the long run.

The same approach applies if empirical tests are based on the debt ratio. Starting from an AR(1) process:

$$b_t = \beta_0 + \beta_1 b_{t-1} + v_t \quad (9)$$

where  $v_t$  is a zero-mean stationary process, and combining it with (5):

$$\lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} b_{t+\tau} = \lim_{\tau \rightarrow \infty} \left( \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} \right) \left( \sum_{k=0}^{t+\tau-1} \beta_0 \beta_1^k + \beta_1^{t+\tau} b_0 + \sum_{k=0}^{t+\tau-1} \beta_1^k v_{t+\tau-k} \right), \quad (10)$$

we obtain the following convergence conditions:

$$\lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} \sum_{k=0}^{\tau} \beta_0 \beta_1^k = 0, \quad \lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} \beta_1^{\tau} = 0 \quad (11)$$

It is a widely known fact that government bonds normally enjoy significantly lower interest rates than the market equilibrium rates. Moreover, many governments utilize the bond market to reduce their debt interest payments by issuing bonds of different maturities to roll over government debt (Bohn 1995 and 1998). As a result, the aggregate interest rate of the government bond portfolio is normally lower than the growth rate of the economy, making the simple NPG scheme (5) implausible (Blanchard and Weil 2001). Under this situation, the issue then becomes to what extent the government can violate the present value budget constraint and make it feasible to play debt Ponzi games.

In a recent paper, Barbie et al. (2004) investigate this issue by means of the stochastic overlapping generations model. They establish the necessary and sufficient conditions of the feasibility of government debt Ponzi games under a scenario where the government utilizes rollover bond issuance strategies.<sup>7</sup> Their conditions essentially boil down to the nondivergence of the ratio of the aggregate interest rate of the public bond portfolio to the economic growth rate under all kinds of stochastic shocks:

$$\lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{q^b(z)_{t+j}}{g(z)_{t+j}} < \infty \quad (\text{necessary condition}) \quad (12)$$

$$\sum_{j=1}^{\infty} \left( \prod_{j=1}^{\tau} \frac{q^b(z)_{t+j}}{g(z)_{t+j}} \right)_j \leq \phi < \infty \quad (\text{necessary and sufficient condition}) \quad (13)$$

where  $q^b$  denotes aggregate interest rate factor of the government bond portfolio,  $z$  denotes the state of random shocks, and  $f$  is a finite positive bound representing the credit constraint faced by the government. Conditions (12) and (13) show that government Ponzi games would not be possible unless the government could obtain debt finance at a lower interest rate than the average economic growth rate in the long run. Barbie et al. (2004) refer to the ratio,  $q^b / g$ , as the real interest rate of debt payment, and to  $\phi$  as setting a fixed upper bound for the debt ratio. The latter is not difficult to see if we assume (5) converges to a positive number instead of zero when the interest rate is the lower-than market bond rate, i.e.:

$$\lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{g_{t+j}}{q^b_{t+j}} b_{t+\tau} = \lambda > 0 \quad \Rightarrow \quad \lim_{\tau \rightarrow \infty} b_{t+\tau} = \lambda \lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{q^b_{t+j}}{g_{t+j}}, \quad (14)$$

provided that  $\lim_{\tau \rightarrow \infty} \prod_{j=1}^{\tau} \frac{g_{t+j}}{q^b_{t+j}} \neq 0$ .

#### IV. EMPIRICAL TESTS OF GOVERNMENT DEBT SUSTAINABILITY AND FEASIBILITY

In this section, empirical tests are conducted on the Philippine national government debt. Ideally, the tests should be conducted on the consolidated public debt. But this series is available only at annual frequency. As the consolidated public debt is roughly 1.7 times the national government debt (see the footnote in Figure 5), the conclusions that we draw from the empirical tests on the national government debt should be also applicable to the consolidated public debt.

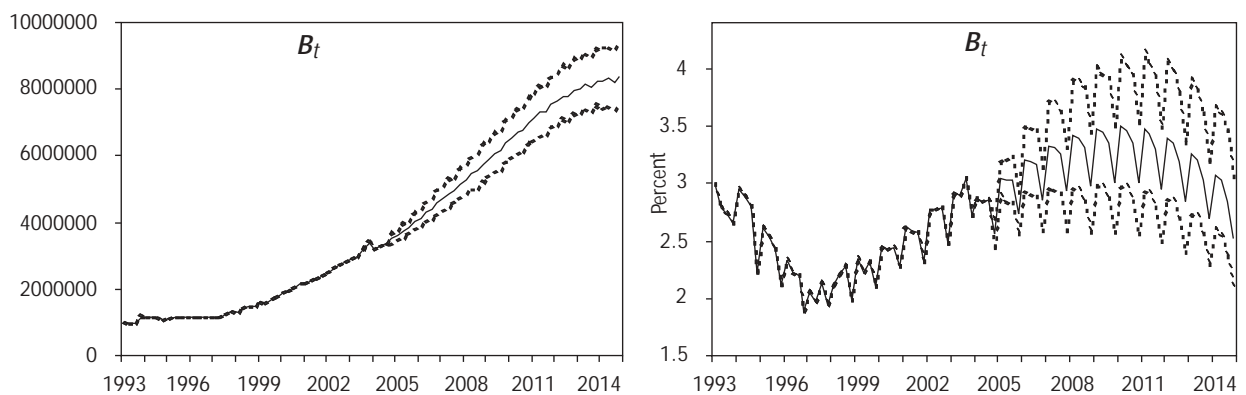
Almost all the empirical tests of government debt sustainability in the literature have been carried out using historical time-series data (Bohn 1998, Chalk and Hemming 2000). However, a major weakness of these tests is that the past results may not be directly projected into the future, where all the PVC theories are really focused on. This can be especially worrisome considering that the dynamics of the government debt tends to be highly susceptible to the macroeconomic environment in a small and open economy like the Philippines.

<sup>7</sup> Notice that the condition for feasibility is weaker than that for sustainability (Barbie et al. 2001).

Here, we conduct the tests using a quarterly time-series sample combining historical data with future data forecasted by a quarterly macroeconomic model of the Philippines built by the Asian Development Bank (we refer to this model as the ADB Philippine model). The model contains over 80 variables and is estimated using the data sample from 1990Q1 to 2004Q2, although some data series are shorter, e.g., the government fiscal account series, including the debt series to be used in our tests, start from 1993Q1 (see Ducanes et al. 2005 for more detailed description of the model). The forecast period is 2004Q3–2014Q4. Forecast values of some exogenous variables are partly based on forecasts from the OECD Economic Outlook and Oxford Economic Forecasting World Model; otherwise, the forecasts of an exogenous variable are extrapolated from its present time path. During the forecast period, a large number of stochastic simulations are computed using the bootstrap method for shock generation.<sup>8</sup> This method enables us to empirically mimic the  $z$  component of equations (12) and (13) in accordance with the random patterns of the ADB Philippine model residuals. Quantiles are calculated from the large set (200 in our experiments) of the simulation results to illustrate the distribution of the stochastic forecasts. In particular, values at 2 and 97 percent quantiles are used as the approximate 95 percent confidence band of the simulation mean values. Below, we refer to the data series of the simulation mean values as the “mean” data series and the other two as the “upper” and “lower” data series, respectively. Figure 6 shows the debt and debt ratio series with these forecasting bands.

Let us first examine the simple time-series properties of the government debt and debt/GDP ratio series respectively. As shown from the unit-root test results in Table 1, both series exhibit strong nonstationary properties, with the debt series showing certain explosive tendency. The test results are also reflected in the ensuing regression analysis. We start by running an AR(4) model for the debt and debt ratio series in order to test the assumption of AR(1) in equations (6) and

**FIGURE 6**  
**DEBT,  $B_t$ , AND DEBT/GDP RATIO,  $B_t$ ; HISTORICAL DATA PLUS FORECASTS BY STOCHASTIC SIMULATIONS**



Note: The solid lines are the mean data series; the dotted lines are the upper and the lower series forming approximately 95% confidence interval.

<sup>8</sup> The method randomly draws shocks from single equation residuals over a specified historical sample period and adds them to each forecast period. For more details, see Pierse (2001).

TABLE 1  
 UNIT ROOT TESTS BY AUGMENTED DICKY-FULLER (ADF) TEST

DEBT SERIES				
AUGMENTED LAGS	ADF-TEST	$\beta$ FOR $Y_{T-1}$	T-VALUE OF LONGEST LAG	SIGNIFICANCE LEVEL OF LONGEST LAG
3	2.03	1.01	-0.52	0.60
2	2.00	1.01	4.49	0.00
1	4.78	1.02	-1.55	0.12
0	4.52	1.01		
DEBT RATIO SERIES				
3	-0.74	0.98	0.91	0.37
2	-0.66	0.99	-1.83	0.07
1	-0.86	0.98	-0.06	0.95
0	-0.88	0.98		

Note: The null hypothesis is  $\beta = 0$ . The critical values of ADF tests are: -2.90 at 5% and -3.51 at 1%. The sample covers 1994Q1 - 2014Q4. Seasonal dummies are added in the debt ratio test, as the series exhibits significant seasonal feature inherent from GDP.

(9). As visible from Table 2, the assumed AR(1) process is accepted for the debt ratio series in both the full-sample and subsample estimations, whereas the debt process is captured by an AR(3) in the full-sample estimation and by an AR(1) only in the subsample estimations. Moreover, the one-lag coefficient estimates for the debt ratio exhibit stronger time invariance than those for the debt series, conforming to what was expected in the previous section.

In view of the regression results, we have conducted the sustainability tests on the debt ratio only. It is discernible from the recursive  $\hat{\beta}_1$  of (9) in Figure 7 that this coefficient drifts below unity in the aftermath of the Asian financial crisis and converges to unity during the forecasting period of the sample, even though the unit value is within the 95 percent band for the entire sample. Considering the finite-sample uncertainty in  $\hat{\beta}_1$ , two versions of condition (11) are tested, one using the full sample estimate  $\hat{\beta}_1$  and the other the recursive  $\hat{\beta}_{1,t+j}$ :

$$\left\{ \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} \hat{\beta}_1^{\tau} \right\}, \left\{ \prod_{j=1}^{\tau} \frac{g_{t+j}}{q_{t+j}} \prod_{j=1}^{\tau} \hat{\beta}_{1,t+j} \right\} \quad (11')$$

The condition relating to the intercept term is disregarded here because its estimates are insignificant, as shown in Table 2.

In the NPG theories, government bonds are assumed to bear the same rate as the equilibrium interest rate. However, this assumption seldom holds in reality. Thus, in order to examine the different effects of interest rates, we consider three rates: market lending rate, 91-day Treasury bill (TB) rate, and government debt portfolio rate derived from the government debt interest payment and the debt series. As seen from Figure 8, the government rates are remarkably lower than the market rate. More interestingly, the derived portfolio rate is far smoother than the TB rate, possibly reflecting government efforts in debt portfolio management to minimize and stabilize the debt cost payment.

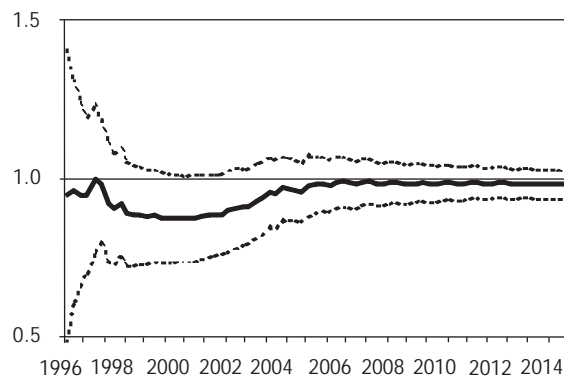


**TABLE 2**  
**AR(4) ESTIMATIONS FOR THE MEAN SERIES OF DEBT AND DEBT RATIO**

COEFFICIENT	LAG 1	LAG 2	LAG 3	LAG 4	INTERCEPT
Full Sample: 1994Q1 to 2014Q4					
Debt	0.9410 (0.1087)*	0.5521 (0.1485)*	-0.5482 (0.1516)*	0.0630 (0.1209)	26180 (13810)
Debt Ratio	0.9950 (0.1102)*	-0.2063 (0.1511)	0.2951 (0.1514)	-0.1004 (0.1102)	0.0474 (0.0632)
Subsample: 1994Q1 to 2009Q4					
Debt	1.0037 (0.1243)*	0.2291 (0.1783)	-0.1526 (0.1807)	-0.0629 (0.1274)	8866 (13270)
Debt Ratio	0.9875 (0.1274)*	-0.0895 (0.1745)	0.1760 (0.1749)	-0.0874 (0.1271)	0.0401 (0.0776)
Historical data: 1994Q1 to 2004Q2					
Debt	0.9432 (0.1544)*	0.0138 (0.2053)	0.0968 (0.2064)	0.0117 (0.1624)	-47302 (25420)
Debt Ratio	1.0462 (0.157)*	-0.0173 (0.225)	0.1146 (0.2272)	-0.1995 (0.1582)	0.1385 (0.1339)

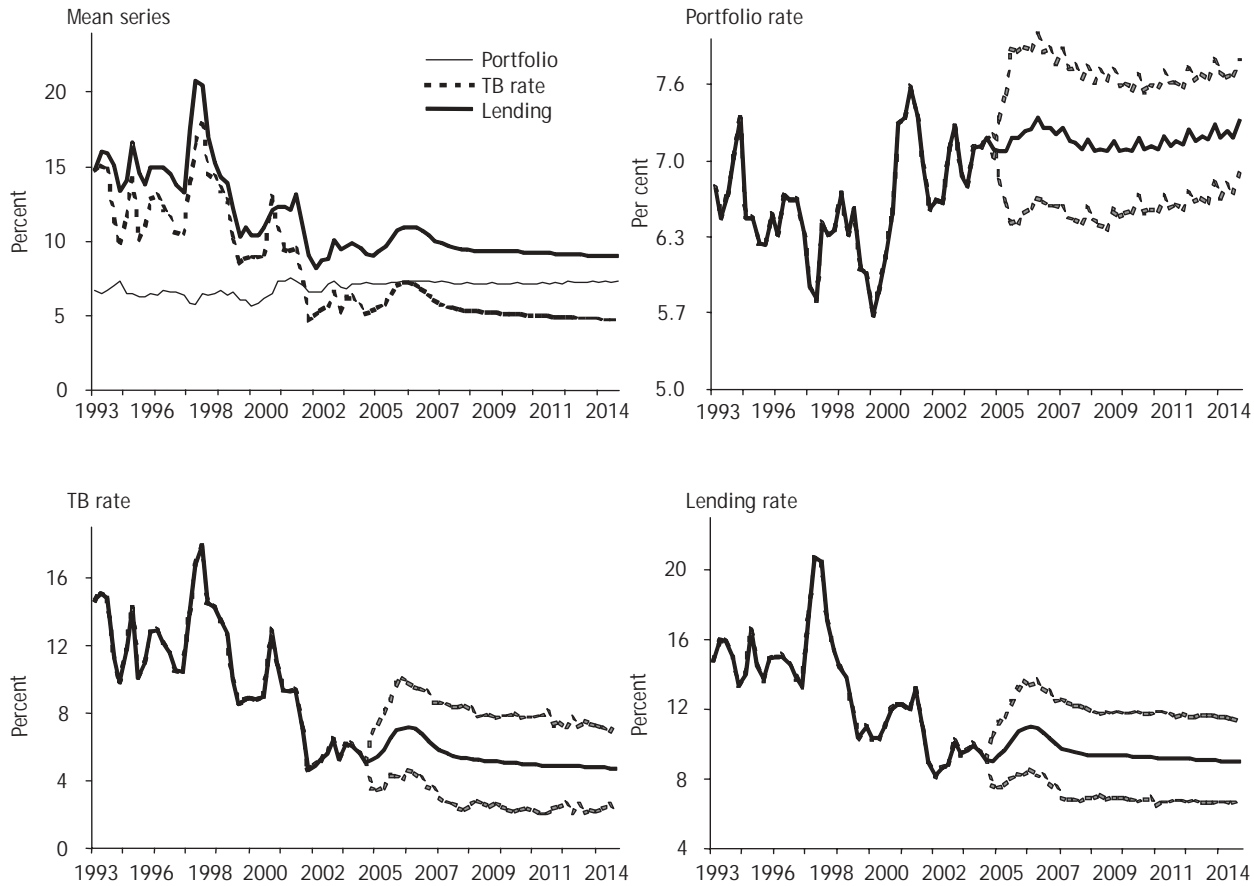
Note: The statistics in parentheses are standard errors. Those marked by \* are significant at 5%. Seasonal dummies are added in the AR(4) model for the debt ratio.

**FIGURE 7**  
**RECURSIVE ESTIMATES OF  $\beta_1$  in Equation (9)**



Note: The dotted lines are 95% confidence intervals.

FIGURE 8  
 INTEREST RATES

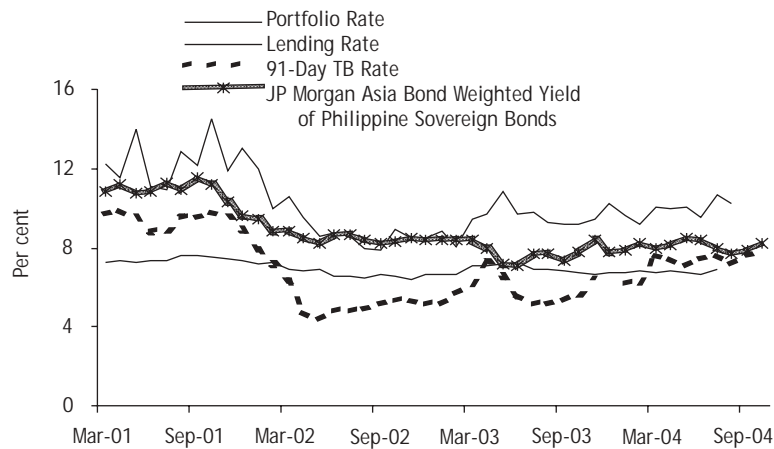


Note: TB rate denotes 91-day Treasury bill rate. The solid lines are the mean data series; the dotted lines are the upper and the lower series forming approximately 95% confidence interval.

To check whether the chosen rates represent adequately the market rates for the government bonds, Figure 9 plots these rates together with the JP Morgan bond yield of the weighted Philippine sovereign bonds for the period of 2000Q1–2004Q2. Discernibly, the 91-day TB rate and the portfolio rate are a bit lower than the JP Morgan bond yield while the lending rate is higher. This suggests that the test results from the three rates should provide us with a fairly good confidence region.

Three pairs of the series in (11') are calculated, each using one of the three interest rates. The results are plotted in Figure 10. Noticeably, the results using the full-sample coefficient estimate show significantly higher values than those using the recursive results. This is due to the fact that  $\hat{\beta}_1$  exceeds its subsample estimates for over one third of the sample period, as shown in Figure 7. However, the full sample  $\hat{\beta}_1$  should be relatively reliable for out-of-sample inference based on the recursive results as it converges to a highly constant value with the sample size. Notice that the lending rate appears to provide the only case where the NPG condition is likely to be satisfied

**FIGURE 9**  
**INTEREST RATES AND YIELD OF GOVERNMENT BONDS**



Note: JP Morgan Asia Bond Weighted Yield of Philippine Sovereign Bonds comes from Datastream.

in the infinite future, as it gradually decreases with time. The series based on the portfolio rate also appears to be converging very slowly and is estimated to be approximately zero around 2020, indicating that a government Ponzi game is present during the current regime.<sup>9</sup>

To directly assess the feasibility of the Ponzi game, we calculate the test series of (12) and (13) using the portfolio rate and the TB rate, respectively, and plot them in Figure 10. The results show that only the necessary condition is satisfied up to 2014, not the sufficient condition. This indicates the feasibility of the debt Ponzi game played by the government to be near the borderline of becoming infeasible for the foreseeable future. Nevertheless, the sufficient condition (13) is likely to hold for the infinite future as both test series under (12) show a downward trend toward zero. Noticeably, the series for the necessary condition using the portfolio rate shows a visibly slower converging speed than that using the TB rate, suggesting that the government bond portfolio faces a tighter credit constraint than short-term bills. This suggests the increasing risk that investors attach to the government bonds of longer terms.

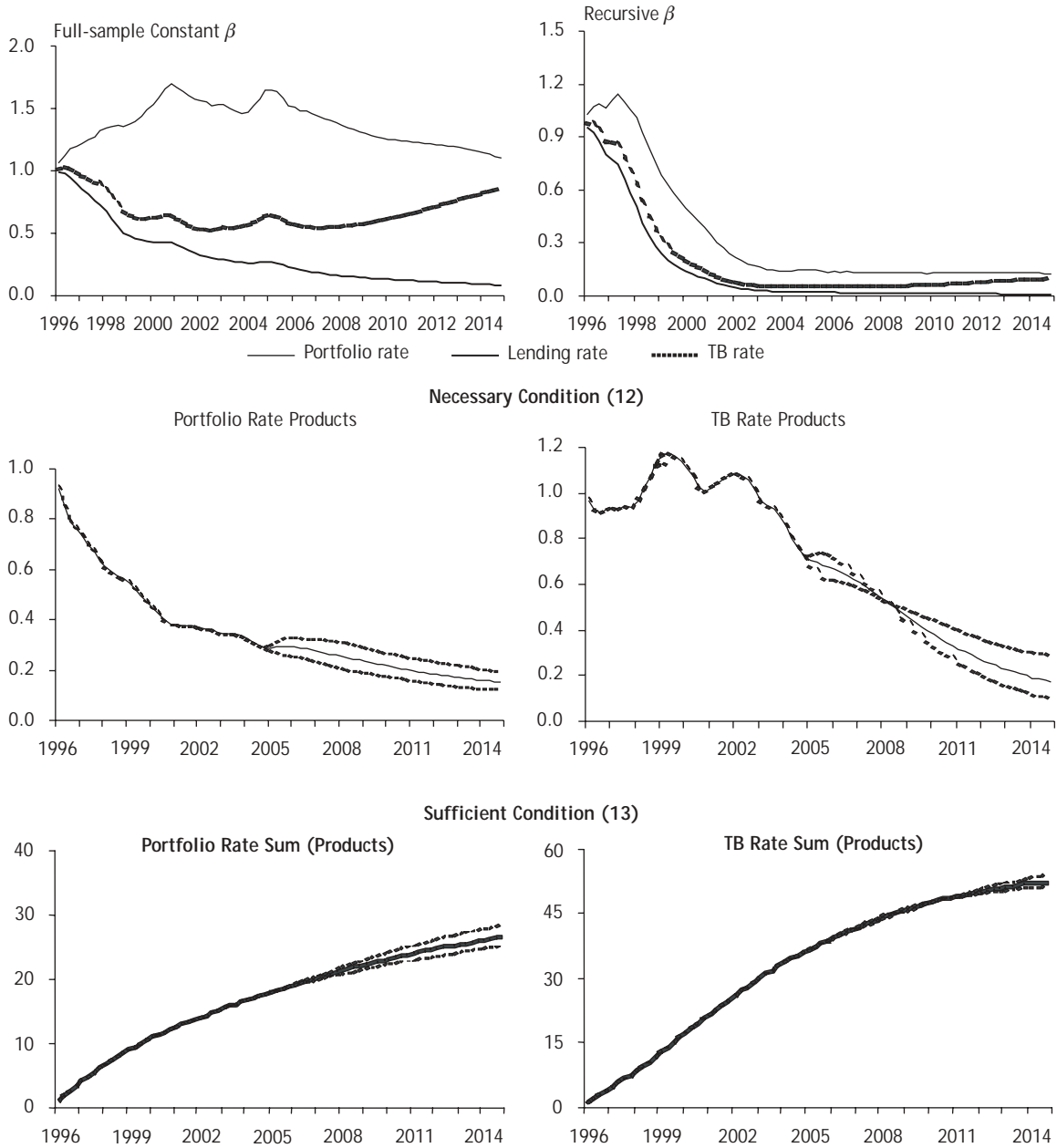
Indeed, practical concerns over the future uncertainty of the debt situation is asymmetric, i.e., investors are far more watchful of those uncertain situations when the sustainability or feasibility of government debt is at risk of being violated than vice versa. The worry is warranted by a number of government debt default crises triggered by adverse shocks in small and open economies with weak governments, such as Argentina and Brazil.<sup>10</sup> Since the feasibility test results in Figure 10 indicate that the present debt situation in the Philippines is about marginally feasible, we run a model simulation to examine how much an adverse shock would worsen the government debt situation. The simulation assumes the adverse shock to be a currency crisis occurring in 2005Q4–2006Q4, with the peso-dollar exchange rate devaluing 40 percent in total (see Figure 11).<sup>11</sup>

<sup>9</sup> The next election year is 2010.

<sup>10</sup> Calvo et al. (2003) demonstrate how a mismatch in the public debt composition led to a crisis in Argentina triggered by its currency devaluation shock; Razin and Sadka (2002) show how the then forthcoming October 2002 election in Brazil, which indicates expected regime change, could trigger a debt crisis even though the debt ratio is relatively low and the fundamentals are sound.

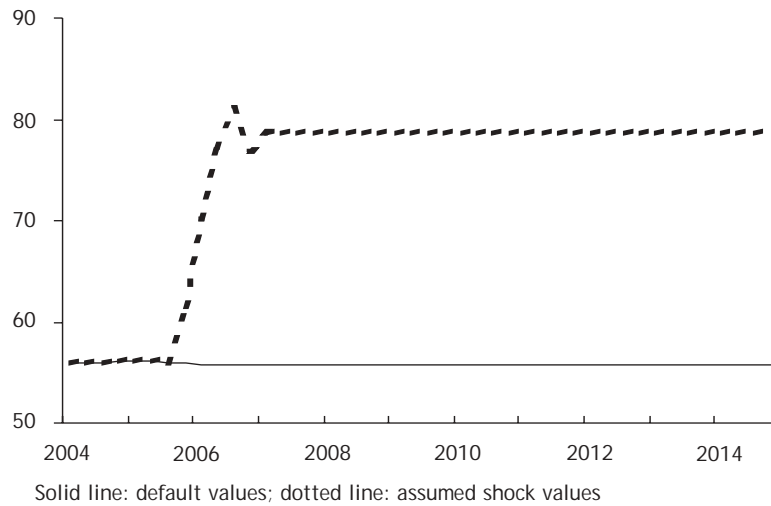
<sup>11</sup> The exchange rate is exogenous in the Philippine model. Since the model also assumes world trade demand as exogenous the simulation does not reflect the possible reactions of this variable to the devaluation shocks.

FIGURE 10  
 TESTS OF (11'), (12) AND (13)



Note: It takes about 6 more years for the portfolio rate series in (11') to converge to zero. The solid curves in (12) and (13) are mean series and the dotted lines are the lower and upper series forming a 95% confidence interval. The portfolio series in (12) would take about 4 more years to converge to zero.

**FIGURE 11**  
**ASSUMED EXCHANGE RATE DEVALUATION (PESO/US\$)**

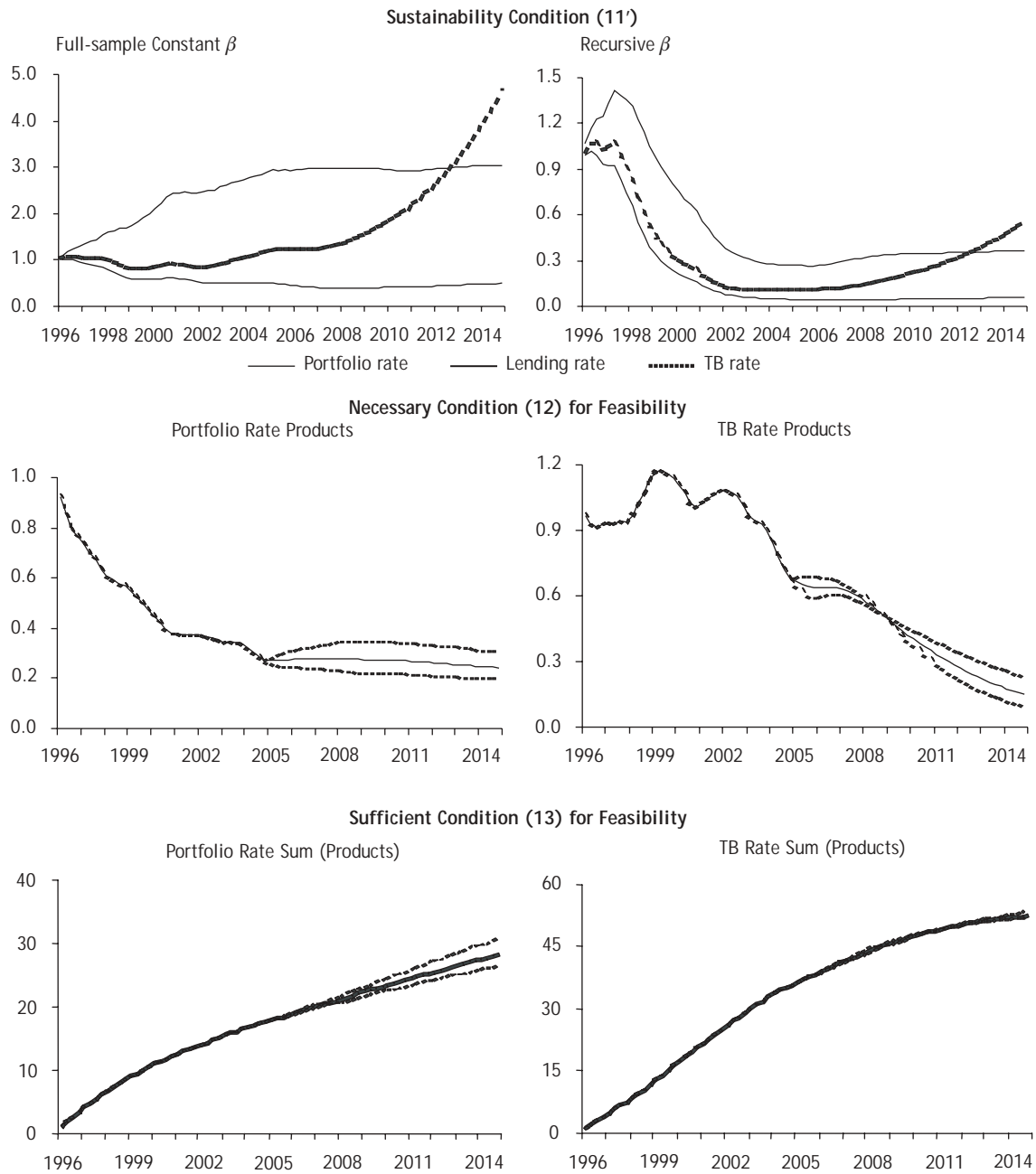


Both the sustainability test (11') and the feasibility tests (12) and (13) are recalculated using the simulation results for the forecasting subsample, see Figure 12. In comparison with Figure 10, the sustainability results (11') are now in a visibly worse state, especially with the disappearance of the downward trend in the series based on the portfolio rate and the lending rate; the test results using the portfolio rate no longer hold for either (11') or (12), illustrating that the currently feasible state of the government debt is indeed fragile and highly susceptible to adverse external shocks.

Given the severity of the government debt situation, we run another simulation to examine whether fiscal policy adjustments would help improve the situation. We set the simulation as achieving zero deficit by 2010, in accordance with the target of the current government. Experimenting with various schemes of curbing fiscal expenditure and raising tax revenue, we find that this target is achievable by having the tax revenue increase by 11 percent per annum<sup>12</sup> together with a capped annual growth at 5 percent of the government expenditure net of interest payment for six years, i.e., 2004Q4-2010Q3. Figure 13 shows the dynamic path of the budget deficit under this simulation as compared with that of the default simulation (the left panel), and the impact of this simulation on GDP growth as well as interest rate (the right panel). Noticeably, the fiscal target leads to prompt deficit deterioration post the target period and a persistent slowdown of the economy during the target period, suggesting that such a severe target is highly likely to incur grave fiscal burden for the next regime while depressing the overall economy during the present regime. This kind of policy consequence is hardly surprising in view of the already undersized public sector in the Philippines, as described in Section II. What is surprising are the simulation test results, which show no chance of achieving the sustainability condition or the feasibility condition within the present regime (see Figure 14), in spite of the heavy policy cost. Our finding reveals the inadequacy of designing fiscal policy around controlling budget deficit alone in order to achieve debt sustainability. Much more comprehensive policies are required.

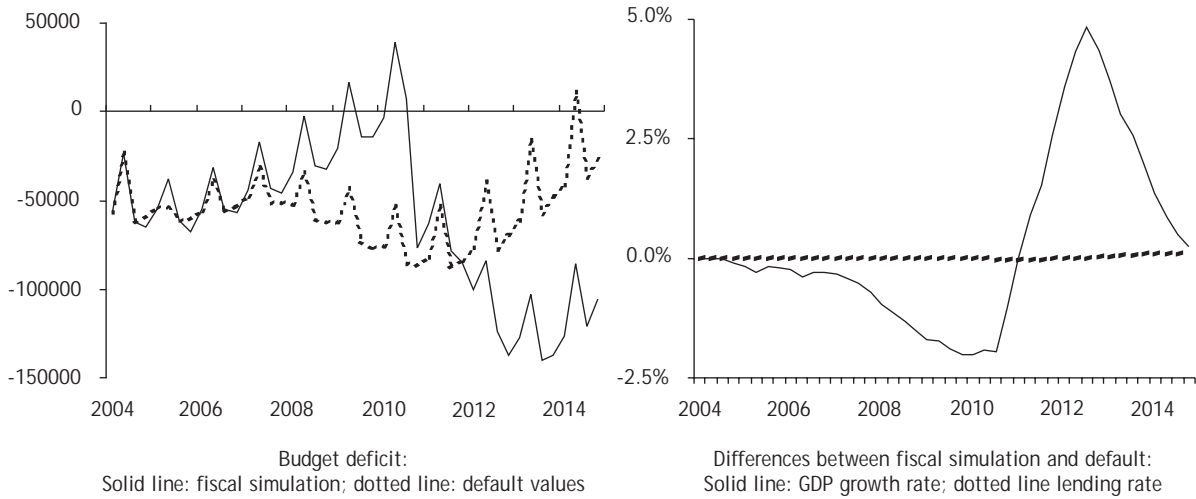
<sup>12</sup> Notice that increase in tax revenue does not necessarily depend on raising tax rates. In the Philippine case, improvement in taxation efficiency and promotion of faster economic growth are the paramount factors.

FIGURE 12  
 TESTS OF (11'), (12) AND (13) UNDER EXCHANGE RATE SHOCK SIMULATION

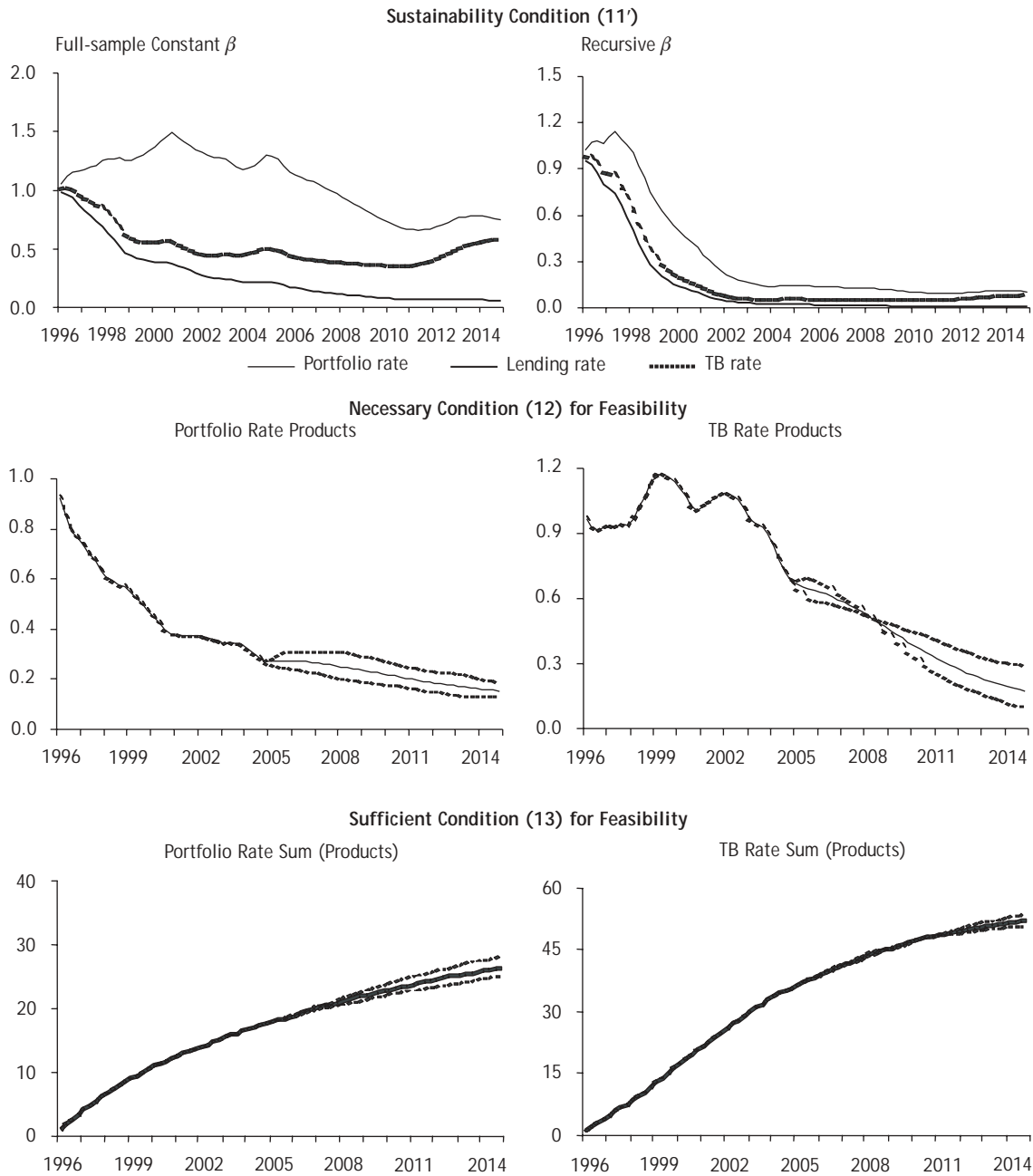


Note: In this simulation, the exchange rate devalues by 11, 14, 10, and 5 percent for the consecutive four quarters starting from 2005Q4; recovers by 5 percent in 2006Q4; drops by 2 percent in 2007Q1; and stays constant afterward. Convergence to zero is unachievable for the portfolio rate series in (11') and (12).

FIGURE 13  
FISCAL SIMULATION IMPACT: BUDGET DEFICIT AND GDP GROWTH



**FIGURE 14**  
**TESTS OF (11'), (12) AND (13) UNDER FISCAL SIMULATION**



Note: In the model simulation, tax revenue is assumed to increase by 11% annually and government noninterest expenditure growth is controlled to not exceed 5% annually during 2005-2010. It takes about 2 more years for the portfolio rate series to converge to zero in (11'). It takes over 5 more years for it to converge to zero in (12).



## V. CONCLUSIONS

This paper assesses empirically the sustainability and feasibility of the government debt situation in the Philippines. The assessment is based on the NPG criterion and mainly carried out on the debt-to-GDP ratio using both its historical data and forecasts generated by a macroeconomic model of the Philippine economy.

Our assessment shows that the government debt situation is not sustainable as far as the present regime is concerned. One key reason for the existing high government debt is the fact that the government still enjoys lower bond rates than the market lending rates. In other words, the Philippine government bonds are still perceived as having relatively low default risk. Our assessment also shows that the Philippine government is playing a weakly feasible debt Ponzi game. The debt strategy satisfies the necessary condition but fails the sufficiency condition for feasibility up to 2014, although it might satisfy both conditions for the infinitely remote future. These results indicate the vulnerability of the debt situation.

The vulnerability is further confirmed by our experiment of a shock simulation using the Philippine model. We find that the government debt no longer satisfies the debt feasibility condition under a hypothetical exchange rate crisis. This result shows that the government is facing a high risk of running into a debt crisis in the event of a major adverse shock to the economy.

Our findings provide strong support to the warnings about the critical government debt situation and highlight the difficulty and the urgency of improving the government's fiscal position in the present Philippine economy. Indeed, our model simulation shows that the simple fiscal policy of medium-term budget deficit control alone is inadequate for reversing the unsustainable debt situation. This underscores the importance of studying the dynamic interaction between proposed corrective policies to control public debt and the underlying macroeconomic variables. Any policy aimed at addressing the debt sustainability problem must take into account not just its effect on debt but also its effect on other economic variables, such as interest rates and the overall economic growth, which are themselves factors that determine debt sustainability. What is highly needed are more comprehensive and well-coordinated policies aimed at promoting sustained economic growth, increasing resilience to exogenous shocks as well as improving debt management.

The results further point at the nonevadable responsibility that public debt creditors and donors should take in helping the heavily debt-burdened country to avoid a debt crisis. In particular, large institutional creditors must review lending policies to ensure that their loans and accompanying provisions are carefully based on the debt sustainability of the country concerned as derived from its macroeconomic framework. If loan provisions are not based on market perceived risk or if debt service can largely be covered by grants, aid, or debt relief, then the government will have little incentive to pursue sound macroeconomic policies and increase its capacity to pay (IMF and IDA 2004).

What would therefore be the optimal policy strategy to attain debt and fiscal sustainability for the current regime? The solution is beyond the scope of the present study, but the results, hopefully, would help policy making move toward the right direction.

## APPENDIX DATA DESCRIPTION AND SOURCES

DATA SERIES	DESCRIPTION	SOURCE <sup>1</sup>
91-day Treasury Bill Rate (%)	Weighted averages per annum	CEIC Data Company Ltd., BSP, ADB Philippine Model
Bond Yield	JP Morgan Asia Bond Weighted Yield of Philippine Sovereign Bonds	Datastream
Capital Outlays	In billion pesos	DBM
Consolidated Public Sector Debt	In million pesos	CEIC Data Company Ltd., BTr
Expenditure	In million pesos	CEIC Data Company Ltd., BTr
Fiscal Deficit	Revenue less expenditure	BTr
Gross Domestic Product	Current price (in million pesos)	CEIC Data Company Ltd., ADB Philippine Model
Interest Payments	Current price (in million pesos)	CEIC Data Company Ltd., BTr, ADB Philippine Model
Lending Rate (%)	Weighted averages per annum. Annual rates are averages of monthly rates. Monthly rates are annual percentage equivalent of all commercial banks' actual monthly interest income on their peso-denominated loans to the total outstanding levels of their peso-denominated loans, bills discounted, mortgage contract receivables and restructured loans.	CEIC Data Company Ltd., BSP, ADB Philippine Model
MOOE	In billion pesos	DBM
National Government Debt	In million pesos	CEIC Data Company Ltd., BTr
National Government Outstanding Debt	Outstanding Domestic Debt + Outstanding Foreign Debt, Current price (in million pesos)	CEIC Data Company Ltd., BTr, ADB Philippine Model
Personal Services	In billion pesos	DBM
Portfolio rate (%)	Interest payments/National government outstanding debt	CEIC Data Company Ltd., BTr, ADB Philippine Model
Primary Deficit	Revenue less primary spending	BTr
Primary Spending	Expenditure less interest payments	BTr
Revenue	In million pesos	CEIC Data Company Ltd., BTr

BTr means Bureau of Treasury.

DBM means Department of Budget and Management.

<sup>1</sup>Actual data are sourced from CEIC Data Company Ltd. and/or official sources. Forecast data are sourced from the ADB Philippine Model.

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