

査読論文

Sustainability Analysis of Bangladesh Government Debt: Are Bangladesh Taxes High Enough?

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Abstract

This paper investigates the sustainability of Bangladesh public debt by calculating the sustainable tax-rate trajectory and comparing it with the current tax rate. Here, the ‘sustainable tax-rate trajectory’ is one that, if adopted immediately and maintained, would eventually result in the same government debt-to-GDP ratio in 2100 as exists currently. It’s a trajectory and not a single tax rate because any reasonable lower bound on the government-debt-to-GDP ratio places an upper bound on the tax rate. The tax rate is lower in years when the bound is a binding constraint than in years in which it is not. To calculate the sustainable tax-rate trajectory for Bangladesh, we consider three cases. *Case 1*: Government expenditures per person rise until 2050 at an annual rate that is one percent greater than the growth rate of GDP, and after 2050 grow at the same rate as GDP. *Case 2*: Government expenditures per person are always proportional to GDP. *Case 3*: Government expenditures per person are always proportional to GDP per worker. We calculate the sustainable tax-rate trajectory for each of the three cases, conditional on the interest rate and assuming that the Bangladesh population will grow as forecast by UN experts and that its per-capita real GDP will rise at 2 percent per year until the end of this century. The sustainable tax rates under these various scenarios generally range from 17 percent of GDP to 28 percent. The current Bangladesh tax rate is around 10 percent of GDP. The main conclusion is that to maintain the sustainability of its debt, the Bangladesh government must increase its revenue substantially. It is likely to do so for two reasons.

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First, an explosion of public debt looms on the horizon if it does not. Second, government revenue relative to GDP in Bangladesh is among the lowest in the world, even lower than in most other developing countries. In the Wikipedia page titled ‘List of countries by tax revenue to GDP ratio,’ of the 178 countries listed, Bangladesh is in 161st place.

Key words

Sustainable tax rate, Expenditure Forecasting, Public Debt

JEL Classification Code

H63, J11

1. Introduction

We analyze the sustainability of Bangladesh public debt according to Blanchard’s debt-sustainability criterion (Blanchard, 1990), which deduces from the government’s inter-temporal budget constraint the required overall tax rate needed to eventually stabilize the debt-to-GDP ratio at its current level. This is the same criterion used by Broda and Weinstein (2005) in their analysis of sustainability of Japanese government debt. We apply the Blanchard and Broda & Weinstein method to the analysis of Bangladesh.

From the time of its independence in 1971, Bangladesh has been a persistent recipient of foreign aid, much of it in the form of concessionary loans. As such, the country’s own sovereign debt capacity has been frequently monitored and assessed by the IMF and by scholars. Bangladesh has persistently surpassed the IMF thresholds for debt sustainability. Yet its tax revenue as a percent of GDP remains among the lowest in the world, even among developing countries, and it has repeatedly exhibited primary fiscal deficits. This prompts us to ask, are Bangladesh taxes high enough? The Blanchard and Broda & Weinstein sustainable tax rate approach is the correct way of answering this question. And the answer is unambiguous. Bangladesh taxes are too low and are likely to be going up soon. The sustainable tax rate approach gets at something the IMF thresholds are missing—public debt sustainability over a long horizon requires a steady and adequate flow of tax revenue. Because of its low taxes, Bangladesh is a prime example for demonstrating this point.

We adapt the Broda and Weinstein (2005) method of forecasting Japanese government

expenditures to our analysis of Bangladesh. But there are important differences between Japan and Bangladesh that inform and motivate our analysis. Japan is a high-income country on or near its equilibrium growth path. Bangladesh is a developing country converging on its long-term equilibrium growth path but still far below it. In their analysis of Japan, Broda and Weinstein (2005) assumed that its real GDP would continue to grow at a constant rate of 2 percent per year, which enabled them to couch their analysis as conditional on the interest rate gap—the difference between the interest rate and the GDP growth rate. The recent growth rate of real GDP of Bangladesh is over 7 percent per year, which is a welcome sign that the country is indeed converging on its long-term equilibrium growth path but is too high of a growth rate to imagine continuing until the end of this century. In our analysis of Bangladesh, we presume that its per-capita real GDP will grow at 2 percent per year, which will mean a slowing of the growth rate of real GDP itself as the population peaks and then declines later in this century as predicted by the United Nations Population Division. We therefore diverge from Broda and Weinstein in not couching our estimates as conditional on an unchanging interest rate gap. The calculations become a bit more tedious under our framework, but this is unavoidable. Our assumptions predict Bangladesh real GDP growth averaged over the remainder of the century of about 3 percent per year.

No forecast of future government spending can be perfectly accurate, so in our calculations of forecasting government's expenditure and the sustainable tax-rate trajectory for Bangladesh we consider three cases. *Case 1*: Government expenditures per person rise until 2050 at an annual rate that is one percent greater than the growth rate of GDP, and after 2050 grow at the same rate as GDP. *Case 2*: Government expenditures per person are always proportional to GDP. *Case 3*: Government expenditures per person are always proportional to GDP per worker. These three cases are similar though not identical to the Broda and Weinstein (2005) analysis, but are expansive enough to encompass the situation of a developing country such as Bangladesh as well as Japan¹. They reflect a wide range of possible future trajectories of government spending, from rapid growth in government spending per person (Case 1) to moderate growth in government spending per person (Case 2) to slow but persistent growth in government spending (Case 3). All are plausible both for Japan and for Bangladesh but for different reasons. For example, for Japan, rapid growth in government spending (Case 1) is plausible because of the rapid aging of the population. For Bangladesh, rapid growth in government spending is plausible because as income per person rises with development, the population

may well demand greater provision of government services.

We calculate the sustainable tax-rate trajectory for each of the three cases, conditional on the interest rate. It turns out the interest rate has little effect on our calculation. This is because a higher interest rate not only increases the burden of servicing government debt that taxes would avoid but also reduces the present value of the future government spending that taxes are needed to fund.

Our calculation is of the sustainable tax-rate trajectory rather than a single sustainable tax rate because we presume that the government-debt-to-GDP ratio has a lower bound. The government of a developing country is unlikely to ever become only a lender and not a borrower. A lower bound on government-debt-to-GDP—in our case set at 0.10—implies an upper bound on the tax rate, and in our calculations the sustainable tax-rate trajectory of Bangladesh is constrained by that upper bound. When the bound is reached and the constraint is binding the sustainable tax rate is lower than it otherwise would be, implying that it must be higher than otherwise in years when the constraint is not binding. This is a nuance that seems to have eluded previous scholars of debt sustainability. In that sense it is an original contribution of the present study. The ‘sustainable trajectory’ is one in which the tax rate when not at its upper bound is at the lowest level consistent with funding the existing debt and projected government spending through the given planning horizon (in our case, through 2100). If the tax rate is unconstrained then the sustainable trajectory is a single constant tax rate—the ‘sustainable tax rate’ as defined by Blanchard (1990) and embraced by Broda and Weinstein (2005) and others.

In this paper, a sustainable tax-rate trajectory, if adopted immediately and maintained, would result in the same government debt-to-GDP ratio in 2100 as exists currently. The Bangladesh sustainable tax rates under the various scenarios we consider generally range between 17 and 28 percent of GDP. The current Bangladesh tax rate is around 10 percent of GDP. The inescapable conclusion is that to maintain the sustainability of its debt, the Bangladesh government must increase its revenue substantially. It is likely to do so for two reasons. First, an explosion of public debt looms on the horizon if it does not. Second, government revenue relative to GDP in Bangladesh is among the lowest in the world, even lower than in most other developing countries. In the Wikipedia page titled ‘List of countries by tax revenue to GDP ratio,’ of the 178 countries listed, Bangladesh is in 161st place.

This paper contributes to recent literature on debt sustainability in developing

countries, and Bangladesh in particular. Analyses of debt sustainability are assessments of the adequacy of a nation's fiscal resources to meet its sovereign debt obligations without its government having to resort to extraordinary measures. As a practical matter, the World Bank and the IMF have adopted threshold limits for government debt in relation to GDP and other similar statistics. The IMF 'template' for debt sustainability analysis is to ascertain from forecasts of macroeconomic variables whether the thresholds they have set are likely to be breached. For example, the most recent IMF debt sustainability analysis of Bangladesh (International Monetary Fund, 2018) finds that "Over the medium term, debt ratios are projected to remain on a sustainable path..." in other words, below the threshold level for debt-to-GDP which is 55% for low-income countries with 'medium' debt-carrying capacity. Islam and Biswas (2005) and Islam (2008) follow a similar method to that of the IMF, with forecasts of the Bangladesh debt-to-GDP ratio based on simple extrapolation of its recent trajectory and find that the forecast lies below the IMF threshold. Goswami and Hossain (2013) forecast macroeconomic variables for Bangladesh including debt-to-GDP, using an ARIMA specification. They use the model to predict whether the IMF threshold would be breached based on these forecasts and find that it would not be. Bhattacharya and Ashraf (2018) also adopt the IMF template approach and, based on extrapolations of recent growth rates in real GDP and real rates of interest on Bangladesh public debt, find little likelihood that the IMF threshold in debt-to-GDP ratio will be breached in the near future. Medina (2018) estimates a VAR model with recent macroeconomic time-series for Bangladesh and uses the model to simulate the effects on the debt-to-GDP ratio of stochastic shocks to real GDP growth, prices, exchange rates, and interest rates. He concludes that the Bangladesh debt-to-GDP is likely to remain within the IMF threshold.

Studies of debt sustainability that are outside the IMF template—that is, not focused on whether an arbitrary threshold set by the IMF is likely to be breached—follow one of two approaches. The first is analysis of the cointegration relation between government revenue and expenditures as pioneered by Bohn (1998) with US time-series data. The idea is that if revenue and expenditures are cointegrated, then their long-term tendency to move together would mean that a debt spiral is unlikely. To our knowledge, this type of analysis has not been applied to the Bangladesh case, perhaps for lack of enough years of observation without structural breaks. Bohn used two hundred years of data for his analysis of the US.

The other approach to debt sustainability is the one we adopt, comparison of the actual overall tax rate with the tax rate that would stabilize the debt-to-GDP ratio at its

current level as first proposed by Blanchard (1990)²—what he referred to as the “sustainable tax rate” (p. 14). To calculate the sustainable tax rate (or sustainable tax-rate trajectory) over a horizon longer than just a few years requires long-range forecasts of demographic and macroeconomic variables. These long-range forecasts pose obvious challenges. Broda and Weinstein (2005) meet these challenges head on for Japan. Others have adopted their general method of calculating a sustainable tax rate for Japan, including Doi et al. (2011). Here we adapt it to the case of a developing country—Bangladesh. We hope that our example will prompt other analysts and developing country financial bureaucrats to forsake the IMF template and adopt the Blanchard and Broda & Weinstein sustainable tax-rate approach when evaluating the soundness of developing country fiscal management.

2. Methods

In this section, we discuss the method of calculating the sustainable tax rate, that is, the tax rate that if adopted immediately and maintained, after a set number of years, n , would return the debt-to-GDP ratio to its initial level. And here let us begin with the simple and standard assumption that the tax rate is unbounded. In our numerical computations we go on to drop this assumption and impose a lower bound on government debt which, when binding, implies an upper bound on the tax rate.

If after n years, the debt-to-GDP of Bangladesh returns to its current level, then we can consider that debt level as sustainable. By knowing the sustainable tax rate, we can understand the current increase in tax revenue that is needed if future crises are to be averted. Broda and Weinstein (2005) and Doi et al. (2011) use this method for the case of Japan. We adapt it for Bangladesh. In this approach, we use an inter-temporal budget constraint for the government, proposed by Blanchard (1990), to derive a macro model of debt sustainability.

The proposed government budget constraint is given below:

$$G_t - T_t + iB_{t-1} = B_t - B_{t-1}, \dots \dots \dots [1]$$

where G_t stands for government expenditure excluding interest payments, T_t is revenue, B_t and B_{t-1} are government debt at time t and $t - 1$, and i is the interest rate which is assumed to be unchanging. Government expenditures and tax revenue are all expressed either in real (inflation-adjusted) values and the interest rate is the real interest rate, or

all expressed in nominal currency units and the interest rate is the money rate of interest. When this interest rate is multiplied by the debt outstanding at time $t - 1$, then we get the current interest payment due at time t . So $G_t + iB_{t-1}$ represents government total expenditure, from which subtracting the tax revenue will give the government deficit. This deficit can be paid by issuing new debt which will be equal to the difference between debt at times t and $t - 1$. In Equation [1] we do not consider seigniorage. This is a conservative assumption, because ignoring seigniorage revenue leads to a higher value for the sustainable tax rate.

Dividing both sides of Equation [1] by $GDP \equiv Y_t$, and rearranging, we get

$$\frac{B_t}{Y_t} = \frac{G_t - T_t}{Y_t} + \frac{(1+i)B_{t-1}}{(1+\eta)Y_{t-1}} \dots\dots\dots [2]$$

$$b_t = g_t - \tau_t + \frac{1+i}{1+\eta} b_{t-1} \dots\dots\dots [3]$$

In equation [3], $b_t = \frac{B_t}{Y_t}$, $g_t = \frac{G_t}{Y_t}$, and $\tau_t = \frac{T_t}{Y_t}$ denote government debt, government expenditures, and tax revenues, each divided by GDP, and $\eta = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$ is the growth rate of GDP, which for the moment let's assume to be constant.

Repeated substitution into Equation [3] of the previous year's debt-to-GDP ratio, beginning with $t = 1$, results in an expression for the debt-to-GDP ratio in future year, $t = n$, implied by the given future trajectory of primary deficits, $g_t - \tau_t$, for $t = 1, \dots, n$ (see Broda and Weinstein, 2005).

$$b_n = \left(\frac{1+i}{1+\eta}\right)^n b_0 + \sum_{t=1}^n \left(\frac{1+i}{1+\eta}\right)^{n-t} (g_t - \tau_t) \dots\dots\dots [4]$$

By rearranging Equation [4], we can write the debt-to-GDP ratio at time $t = 0$ as a function of the debt-to-GDP ratio at time $t = n$, which is given below.

$$\left(\frac{1+\eta}{1+i}\right)^n b_n + \sum_{t=1}^n \left(\frac{1+\eta}{1+i}\right)^t (\tau_t - g_t) = b_0 \dots\dots\dots [4']$$

Sustainability of government debt is defined by Blanchard (1990) as the condition in which the debt-to-GDP ratio at some future time, $t = n$, is no greater than its initial value,

that is, $b_n \leq b_0$. From Equation [4] the sustainability criterion is the following.

$$\left(\frac{1+i}{1+\eta}\right)^n b_0 + \sum_{t=1}^n \left(\frac{1+i}{1+\eta}\right)^{n-t} (g_t - \tau_t) \leq b_0. \dots\dots\dots [5]$$

As noted by Broda and Weinstein (2005), Equation [5] is algebraically equivalent to the following, which is another way of representing the Blanchard sustainability criterion.

$$\left(\frac{1+\eta}{1+i}\right)^n b_0 + \sum_{t=1}^n \left(\frac{1+\eta}{1+i}\right)^t (\tau_t - g_t) \geq b_0. \dots\dots\dots [5']$$

The sustainable tax rate, τ^* , is the lowest positive tax rate that would fulfill equation [5] if maintained over the period, $t = 1, \dots, n$. The sustainable tax rate—deduced by Broda and Weinstein from Equation [5']—is the following³.

$$\tau^* = \begin{cases} \frac{i-\eta}{1+\eta} \left[b_0 + \left\{ 1 - \left(\frac{1+\eta}{1+i}\right)^n \right\}^{-1} \sum_{t=1}^n \left(\frac{1+\eta}{1+i}\right)^t g_t \right], & \text{if } i > \eta \\ \frac{1}{n} \sum_{t=1}^n g_t, & \text{if } i = \eta \dots\dots\dots [6] \\ \frac{\eta-i}{1+i} \left[-b_0 + \left\{ 1 - \left(\frac{1+i}{1+\eta}\right)^n \right\}^{-1} \sum_{t=1}^n \left(\frac{1+i}{1+\eta}\right)^{n-t} g_t \right], & \text{if } i < \eta. \end{cases}$$

Equation [6] demonstrates that, if the interest rate is higher than the growth rate, the current debt relative to GDP and current government expenditure relative to GDP each has a positive effect on the sustainable tax rate. But if the interest-growth rate difference is zero, the sustainable tax rate equals the average government expenditure relative to GDP—it is the tax rate consistent with a zero primary fiscal balance. And if the interest-growth rate difference is negative, then the sustainable tax rate is consonant with a persistent primary fiscal deficit⁴.

Broda and Weinstein (2005) based their computation of sustainable tax rate for Japan on the first row in Equation [6]. They assumed a continuing steady growth of Japanese real GDP equal to 2 percent per year and conditioned their estimates of the sustainable tax rate on different possible interest rates. They argued that the sustainable tax rate is more sensitive to the interest rate gap—the interest rate minus the GDP growth rate—than it is to the level either of the interest rate or growth rate. In this way, they artfully showed by their computations that the sustainable tax rate as defined by Equation [6]

varies over a narrow range for Japan even as its future interest rates and GDP growth rates vary widely. These strengths of the Blanchard approach apply to the developing countries too. But we do want to consider the now-rapid growth of a country like Bangladesh that is converging toward a long-run equilibrium growth path but still far below it. Recent growth in Bangladesh real GDP has been above 7 percent per year. That is unlikely to continue for decades.

We will assume in our analysis that the Bangladesh **per-capita real GDP** will grow at 2 percent per year, from 2020 until the end of this century, but that the population of Bangladesh will follow the trajectory predicted by the United Nations Population Division, rising steadily until mid-century, and afterward turning downward as is now happening in Japan. These assumptions mean that the growth rate of **real GDP** will be higher in the decades until mid-century than in the decades afterward. In our calculation of sustainable tax rate, we do not assume a constant real GDP growth rate as Broda and Weinstein did, and do not straightforwardly adopt Equation [6] as our computational algorithm. Instead, we base our estimate of sustainable tax rate on a variant of Equation [5'] in which terms such as $(1+\eta)^t$ are replaced by $\prod_{k=1}^t (1+\eta_k)$. The equation is the following.

$$\frac{\prod_{t=1}^n (1+\eta_t)^t}{(1+i)^n} b_0 + \sum_{t=1}^n \frac{\prod_{k=1}^t (1+\eta_k)^k}{(1+i)^t} (\tau_t - g_t) \geq b_0 \dots\dots\dots [7]$$

We solve for the ‘sustainable tax rate,’ $\tau^* = \tau_t \forall t$, defined as the lowest tax rate that would fulfill Equation [7] if maintained over the period, $t = 1, \dots, n$. It is the constant tax rate that solves Equation [7] with equality. We compute this tax rate using brute-force numerical methods⁵. In short, we adopt the Broda and Weinstein approach but unlike them allow the GDP growth rate to vary from year to year. We assume a constant interest rate over the planning horizon but make separate computations assuming different interest rates. It turns out that if the interest rate is constant, it matters little for the sustainable tax rate whether the interest rate is higher or lower.

The tax rate τ^* that solves Equation [7] with equality can result in debt-to-GDP ratios less than zero in some years. This means that the government is lending rather than borrowing in those years. That matches the experience of no developing country of which we are aware. This prompts us to impose a lower bound on the debt-to-GDP ratio. In our computations we set this lower bound at $\bar{b} = 0.10$.

$$b_t \leq \bar{b} \quad \forall t \dots\dots\dots [8]$$

Because the tax rate in each year affects the subsequent year's debt-to-GDP ratio, this lower bound on the debt-to-GDP ratio amounts to an upper bound on the tax rate in each year. These upper bounds on tax rates τ_t , $t = 1, \dots, n$, are implicit in the following way of expressing the lower bound on the debt ratio, which is based on Equation [4].

$$b_t = \frac{(1+i)^t}{\prod_{j=1}^t (1+\eta_j)^j} b_0 + \sum_{j=1}^t \frac{(1+i)^{t-j}}{\prod_{k=1}^j (1+\eta_k)^{t-k}} (g_j - \tau_j) \leq \bar{b} \quad \forall t \dots\dots\dots [9]$$

The 'sustainable tax-rate trajectory' is the series, τ_t^* , $t = 1, \dots, n$, for which τ_j solves Equation [9] with equality in any year for which $b_t = \bar{b}$, and in other years is the common tax rate that, together with the tax rates for the years in which the debt ratio is at the lower bound, solves Equation [7] with equality.

Implicit in these characterizations of sustainable tax rates is the idea that leveling of tax rates over time is desirable. A sustainable tax-rate trajectory is just sufficient to fund projected government spending and service the initial debt but is also as level as possible. That is, along with Blanchard, we define the sustainable tax-rate trajectory as one in which the tax rate in each year, unless constrained by the lower bound on the debt ratio, is unchanging over time. The advantage of an unchanging tax rate—tax smoothing—lies in minimizing the excess burden of taxes needed to fund the given stream of government spending and service the initial debt. As shown by Barro (1979), this tax-smoothing logic can be based on a presumption that excess burden varies with the square of the tax rate. We will not explore these issues further in this paper but note the close association between tax smoothing and the concept of sustainable tax rate.

In all our computations we presume that from 2020 to 2100, the interest rate will be generally greater than the growth rate of GDP. This is a conservative assumption in the sense that we err on the side of finding that taxes are too low. We leave to another occasion a detailed exploration of scenarios with interest rate less than the growth rate, which is the subject of the recent AEA presidential address of Oliver Blanchard (Blanchard, 2019), applied to the US.

3. Forecasts of Bangladesh real GDP, government spending, and interest rates

To compute sustainable tax rates for Bangladesh we require trajectories over our forecast horizon, 2020 to 2100, for real GDP and for government spending other than for debt servicing. We also require the initial level of government debt, and some assumption about the future interest rate on Bangladesh government debt. Here we discuss the data and assumptions for constructing these needed parameters.

3.1. Real GDP

We base our forecast of the growth trajectory of real GDP from 2020 until 2100 on a United Nations Population Division forecast of Bangladesh population growth. We assume growth in per-capita real GDP of 2 percent per year. In other words, our projected forecast of real GDP growth in each year is 2 percent greater than that year's projected growth in population.

For this analysis, we use historical and future population, both total population and working-age (15–64) population. The historical population is taken from the World Bank (World Development Indicators), and future population projections (of medium variant scenario) are from the United Nations Population Division. The United Nations Population Division uses historical data for population projection. These data are constructed from population censuses, from fertility statistics based on counts of live births by age groups of mothers, and from mortality statistics based on numbers of deaths by age and sex 12 months prior to census survey. The UN Population Division uses the cohort-component method for population projection.

The UN population projection indicates that the Bangladesh population will increase up to 2050, reflecting 'population momentum,' the persistence of an abundance of women in the population who are of reproductive age, for some years after declines in fertility and mortality. After 2050, the Bangladesh population will steadily decline until the end of the 2100 century. Figure 1 depicts the Bangladesh population projections for broad age groups for 1950 to 2100 (Source: UN Population Division). From the figure, we can see that currently, among the 170 million Bangladesh population, 115 million are of working age (age 15 to 64), 45 million are of young age (age 0 to 15) and the remaining 10 million are older (age 65 or more). Currently in Bangladesh the fertility rate is 2.1, under-5 mortality is around 25 per 1,000 live births, and life expectancy is 70 for males and 75 for females (UN Population Division). The projected steady rise in the Bangladesh working population

up to 2040 depicted in Figure 1 is a manifestation of population momentum. The projected steady increase in older population up to the end of the century will complete the demographic transition.

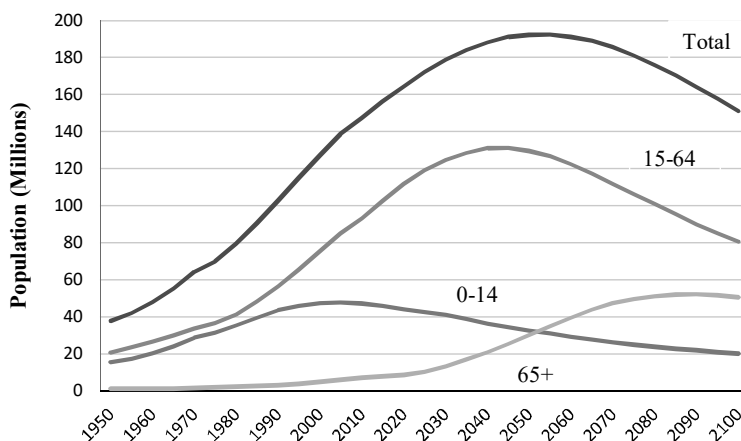


Figure 1. Bangladesh Population, both Historical and Projected, by Broad Age Groups, 1950 to 2100

Source: UN Population Division. <https://population.un.org/wpp/>

Our assumption of 2 percent per year growth in per-capita real GDP is an educated guess but one we can defend. Bangladesh GDP is below its long-term equilibrium growth path but seems to be converging. This process can take decades. For example, the per-capita real GDP growth of Japan from 1885 until 1985 averaged around 3 percent per year, effectively increasing real GDP per person sixteen-fold. Our assumed 2 percent per year per-capita growth rate for Bangladesh therefore lies within a reasonable range, one for which there is historical precedent. It means an increase in Bangladesh per-capita real GDP of 3,800 USD (purchasing power parity) in 2020, to around 40,000 USD in 2100.

The 2 percent per year per-capita growth combined with the UN population projection implies growth in real GDP averaged over the forecast interval, 2020 to 2100, of about 3 percent per year. As a practical matter, the sustainable tax-rate trajectory itself is little affected by variation in the real GDP growth rate, so long as the interest rate gap (real interest rate minus real GDP growth rate) is positive. For us, that means real interest rates of 3 percent or higher. Blanchard (1990) suggested that sustainable tax rate computations might be based on an interest rate gap of 2 percent, which for us would mean a real interest rate of 5 percent. This is our preferred specification.

3.2. Government spending

To calculate a sustainable tax rate requires an assumed future trajectory of government expenditures other than for servicing the government debt. That is, government expenditures here include both final purchases and transfers but exclude interest payments. Government spending is of course difficult to forecast over a long horizon and so we will base our sustainable tax rates on three different government spending forecasts. The sustainability calculation is made for each of three different cases. The three cases are as follows.

- **Case 1:** Government expenditures *per person* rise until 2050 at an annual rate that is one percent greater than the growth rate of GDP, and after 2050 grow at the same rate as GDP.
- **Case 2:** Government expenditures *per person* are always proportional to *GDP*.
- **Case 3:** Government expenditures *per person* are always proportional to *GDP per worker*.

The initial value of government spending relative to GDP for all cases is the same and is based on recent projections, $\frac{G_t}{Y_t} = 0.171$. The Figure 2 shows the trajectory of real GDP from 2020 to 2100 under our assumptions, and also shows the trajectories of real government spending for each of the three cases. The differences in government spending among the three cases are more evident in the Figure 3 that shows the trajectory of government spending as a fraction of GDP for each of them.

The three cases correspond to the three cases posited by Broda and Weinstein (2005)

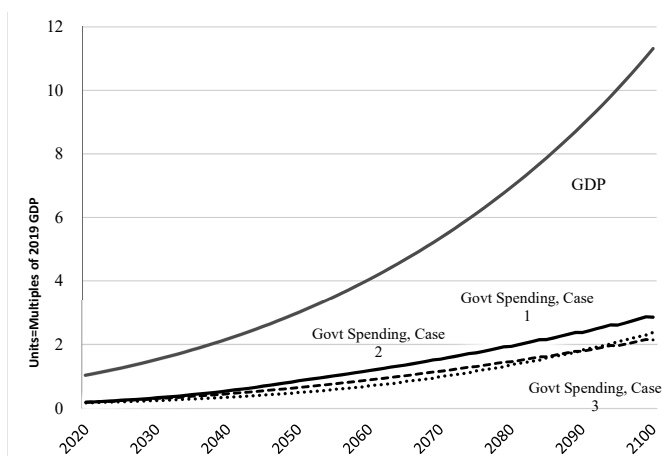


Figure 2. Projected real GDP and government spending, 2020 to 2100

Source: Authors' own calculation

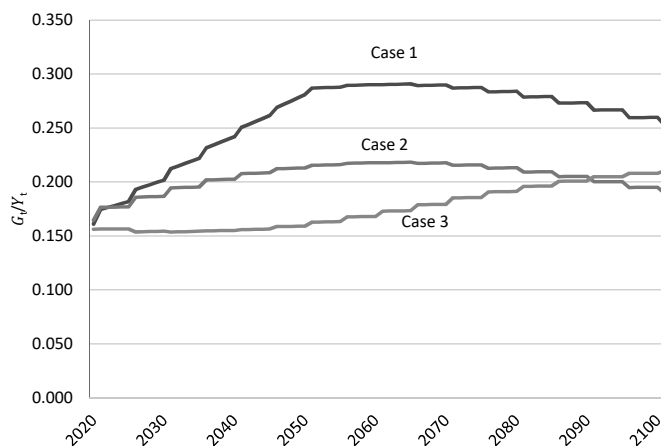


Figure 3. Bangladesh government expenditure as a fraction of GDP, for the three different cases, 2020–2100

Source: Authors' own calculation

in considering future government spending of Japan. (The correspondence is not exact. Their Case 1 is based on projected shares of the elderly in the Japanese population while ours is based on an assumed deepening of Bangladesh public spending after 2050 not necessarily related to pending demographic change).

Our three cases span the wide range of plausible outcomes. Our Case 1 predicts that as the Bangladesh economy develops, government expenditures per person as a share of GDP will grow. Here it is useful to recognize that government expenditures include both final purchases—a component of GDP—and transfers (other than interest payments). Japan and other high-income countries have enacted generous government pension systems and government provided health services for all citizens. Much of the Japanese government transfers associated with these programs flow to the elderly. As the elderly have become a larger fraction of the total population of Japan, government transfers have risen and so government spending per person as a share of GDP has also risen. Once the elderly fraction of the population reaches a maximum, government spending per person as a share of GDP would stabilize and perhaps even begin to decline. Bangladesh has not yet established a system of generous government pensions and government provided health spending. But as its economy develops and converges on its high-income equilibrium growth path, it can be expected to do so. The expansion of government transfer payments this will entail must mean an increase in government spending per person as a share of GDP. Once convergence is achieved, and social welfare programs are fully operative—say around 2050—government spending per person as a share of GDP would become stable.

The Broda and Weinstein ‘Case 1’ for Japan allows for expansion of government spending as a share of GDP as the fraction of the population who are elderly grows, and its stabilization once the elderly fraction of the population reaches a maximum. Our analogous Case 1 for Bangladesh allows for expansion of government spending as a share of GDP as the nation develops and broadens its government transfer payments, and its stabilization once the government welfare system reaches maturity. In our projection for Case 1, total government expenditures as a share of GDP peak in 2064 at a level of 29 percent of GDP.

Our Case 2 is more conservative than Case 1 in its prediction about evolving government transfers in Bangladesh. Case 2 presumes that through the end of this century government spending per person will rise along with GDP but no more than this. There is no great deepening of social government spending as the economy develops. This scenario predicts that Bangladesh government total expenditure will rise over the next 40 years and reach 22 percent of GDP. Total expenses will then gradually fall to 19 percent of GDP by the end of the twenty-first century.

Under both Case 1 and Case 2, the decline in Bangladesh population after 2050 predicted by the UN would exert a downward force on government spending as a share of GDP in the last half of the current century. This is especially evident for Case 1, because Case 1 allows for a sharper increase in government spending as a share of GDP before this downward force of declining population exerts itself. The Case 2 forecast of government spending as a share of GDP also turns downward with the decline in population. But the Case 3 forecast of government spending as a share of GDP does not turn downward in the last half of this century. That is because Case 3 presumes that government spending per person is proportionate to GDP per worker. Our forecasts presume that per-capita GDP will grow at a constant rate. That means that the projected downturn in population in the last half of this century would be met with an increase in productivity—GDP per worker will continue to grow, and in fact grow even faster in the last half of the century than in the first. Case 3 presumes that as GDP per worker increases and the income per person of the country grows, Bangladesh citizens will insist upon and will receive a commensurate expansion of government transfers and government provided services. Case 3 predicts a steady but moderate rise in government spending as a share of GDP through the end of this century, ultimately reaching 21 percent of GDP in 2100.

All three cases for predicting Bangladesh government spending are plausible. They each rest on sensible premises about public choice in a developing economy. We cannot say with any confidence whether government spending as a share of GDP will balloon rapidly

and then contract as in Case 1 and Case 2, or increase slowly but steadily as in Case 3. That is why we compute sustainable tax rate trajectories for all three.

3.3. Initial debt level and assumptions about interest rates

A further component of the sustainability calculation concerns the Bangladesh government's debt position. Annual data on Bangladesh gross debt—that is government debt owed both to foreigners and domestic entities—for 2003–2017 come from the IMF-WEO online databases. Figure 4 shows the movement in Bangladesh government gross debt as a percentage of GDP, 2003–2017. Gross debt decreases from 44.3 percent of GDP in 2003 to 33.7 percent of GDP in 2017. In our computations we have set the initial (2017) debt level at 33.7 percent of GDP. The initial debt level has only a small effect on the sustainable tax-rate trajectory.

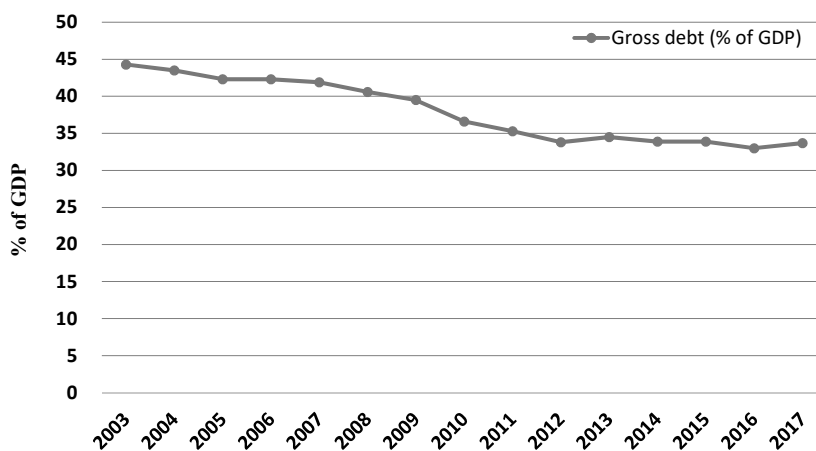


Figure 4. Bangladesh government debt-to-GDP ratio, 2003–2017

Source: IMF-WEO, https://www.imf.org/external/datamapper/GGXWDG_NGDP@WEO/OEMDC/ADVEC/WEOORLD/BGD

We will have more to say about the composition and details of currently outstanding Bangladesh government debt when discussing the policy implications of our analysis. There we will also discuss some details of the interest rates attached to the debt. In our computations, rather than assert and defend a particular interest rate projected into the future we compute sustainable tax-rate trajectories for alternative assumed real interest rates—3, 4, 5, 6, and 7 percent—which encompass the likely actual range Bangladesh will experience in our judgment. And as it turns out, the sustainable tax-rate trajectory is little

affected by the interest rate.

4. Sustainable tax rate calculation for Bangladesh

Here we calculate sustainable tax-rate trajectories under the assumptions detailed in the previous section. First, we follow the Blanchard and Broda-Weinstein approach of calculating a single constant tax rate that if implemented immediately and maintained until 2100 would result in the same debt-to-GDP ratio observed initially. Then we go on to consider sustainable tax rate trajectories with lower bounds on debt-to-GDP ratio equal to 0.10 which imply upper bounds on tax rates, bounds which are binding in some years in our computations.

4.1. Single sustainable tax rate for each of the three cases.

We begin by adopting the Blanchard approach of determining a single sustainable tax rate conditional on parameters. The formula for constructing the tax rates is Equation [7]. These sustainable tax rates for each of the three cases regarding government spending, and for interest rates of 3, 4, 5, 6, and 7 percent are shown in Table 1. Just to recap, the sustainable tax rates shown in the table are constructed for the 80-year time span, $t_1 = 2020$ to $t_n = 2100$. The initial debt-to-GDP ratio is $b_0 = 0.337$. These calculations are based on projected real GDP rising so that per-capita GDP grows 2 percent per year, given the UN population forecast. Under this condition, real GDP rises approximately 3 percent per year, averaged over the forecast interval. For this reason, the alternative interest rates correspond to approximate interest rate gaps—differences between interest rate and GDP

Table 1. Sustainable Tax Rate for Bangladesh, 2020 to 2100

		Sustainable Tax Rate		
Assumed real interest rate	Approximate interest rate gap (interest rate – GDP growth rate)	Case 1	Case 2	Case3
3	0	0.262	0.206	0.175
4	1	0.259	0.208	0.174
5*	2*	0.256	0.209	0.174
6	3	0.253	0.210	0.174
7	4	0.250	0.211	0.174

*Preferred specification.

Source: Authors' own calculation

growth rate—which is worth noting because the interest rate gap has a much greater effect on the sustainable tax rate than does the level of interest rate and growth rate.

Notice that the level of the interest rate (or approximate interest rate gap) has little effect on the implied sustainable tax rate. Interest rate gaps ranging from 0 to 4 percent only affect the second decimal point of the sustainable tax rate. On the other hand, assumptions about projected government spending do seem to matter substantially. This is confirmation for Bangladesh of the main point argued by Broda and Weinstein (2005) for Japan—projected government spending is the major determinate of the sustainable tax rate; meaning that interest rates, growth rates and initial debt matter very little.⁶

We will discuss our calculations in order from the one calling for the greatest tax increase (Case 3) to the one calling for the lowest (Case 1). In thinking about these sustainable tax rates, keep in mind that the current tax rate of Bangladesh is a little less than ten percent of GDP, to be precise, $\tau_0 = 0.0983$.

Case 3 assumes that all public expenditures as a share of GDP will rise proportionally with GDP-per-worker. In that case, Bangladesh will become a more generous welfare state. The scenario implies that Bangladesh must raise its taxes substantially, i.e. approximately 7 percentage points of GDP. And that is the lowest needed tax increase based on any of the three cases.

Case 2 assumes that per-capita expenditures as a share of GDP will always be proportional to GDP. As was true for Case 3, the interest rate has little effect on the sustainable tax rate for Case 2. The sustainable tax rate is higher than for Case 3. For Case 2, government expenditures as a share of GDP follow the forecasted rise and then fall in population and remain above the predicted government spending for Case 3. That is why the sustainable tax rate is higher for Case 2 than for Case 3. It calls for a tax raise of about 10 percent of GDP, an effective doubling of taxes.

Case 1 assumes that, until the year 2050, per-capita expenditures as a share of GDP will rise one percent per year, and after 2050 will remain constant. Of the three cases, Case 1 predicts the greatest future increase in government spending as a share of GDP. As with Case 2, government spending in Case 1 follows the forecast of population, rising even more sharply than for Case 2 as population grows, and then falling as population declines in the last half of the century. As with the other cases, so it is with Case 1—the interest rate has little effect on the sustainable tax rate.

One thing to note here is that, for Case 2, the sustainable tax rate is slightly higher if the interest rate is higher, which is the opposite of the other two cases. The reason is that

for Case 2, the effect on accumulation of government debt of a higher interest rate holding economic growth constant is greater than its effect on the present value of the predicted stream of government spending. A higher interest rate means that government debt accumulates more rapidly which tends to increase the sustainable tax rate. But at the same time, a higher interest rate, holding economic growth constant, lowers the present value of the predicted stream of government spending, which tends to decrease the sustainable tax rate. For a flatter future trajectory of government spending as in Case 2, the effect of a higher interest rate on the accumulation of debt is the dominant effect on the sustainable tax rate. For a future trajectory of government spending more skewed toward the future as in Cases 1 and 3, the effect of a higher interest rate on the present value of government spending is the dominant effect on sustainable tax rate.

Bringing together all the results, we can see that the sustainable tax rate is little affected by the assumed interest rate gap but is greatly affected by the assumed future trajectory of government spending. The sustainable tax rate is between 17 percent of GDP and 26 percent of GDP, compared to the current tax rate of around 10 percent of GDP. Whether the sustainable tax rate is closer to 17 percent of GDP or 26 percent of GDP depends upon whether Bangladesh government spending as a share of GDP will rise to match levels characteristic of high-income countries, levels commensurate with a welfare state.

4.2. Sustainable tax-rate trajectories with lower bound on the debt-to-GDP ratio.

If our aim had been nothing more than to replicate the Broda-Weinstein analysis of Japan, only applied to Bangladesh, we could have stopped at the end of the previous section. But our aim is beyond that to introduce an innovation to the method of analyzing fiscal sustainability. Our innovation is to consider the implications of a lower bound on the debt-to-GDP ratio. To see why this is necessary, turn attention to Figure 5 that shows the trajectory of the debt-to-GDP ratio for each case, if the interest rate is 5 percent and the sustainable tax rates shown in Table 1 are adopted. For each of them, the debt-to-GDP returns to the same level in 2100 as its initial 2019 level, indicating the constant tax rates do fulfill the criterion of sustainability. However, for Cases 1 and 3 the debt-to-GDP ratio becomes very low, and indeed becomes quite negative. This means that the government is no longer borrowing but is instead lending—a lot. This is implausible. It matches the actual history of no developing country of which we are aware. Our tax sustainability computations require adjustment.

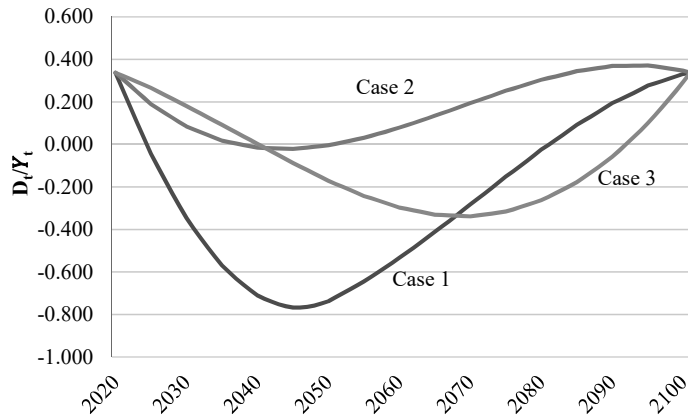


Figure 5. Debt-to-GDP ratio with immediate adoption of sustainable tax rate, under each of the three cases

Source: Authors' own calculation

In our amended computations we have set a lower bound on the debt-to-GDP ratio equal to 0.10 which seems reasonable to us. Under this assumption we recalculated sustainable tax-rate trajectories for each of the three cases, for interest rate equal to 5 percent. Our method of calculation is as described in section 3. The sustainable tax-rate trajectories are shown in Figure 6b, which is below Figure 6a showing the implied debt-to-GDP ratios given these tax-rate trajectories.

As can be seen in the Figures 6a and 6b, when the debt-to-GDP ratio is at its lower bound of 10 percent, the corresponding sustainable tax rate is at an upper bound and lies below the level it attains when the debt-to-GDP lower bound is not binding. To return the

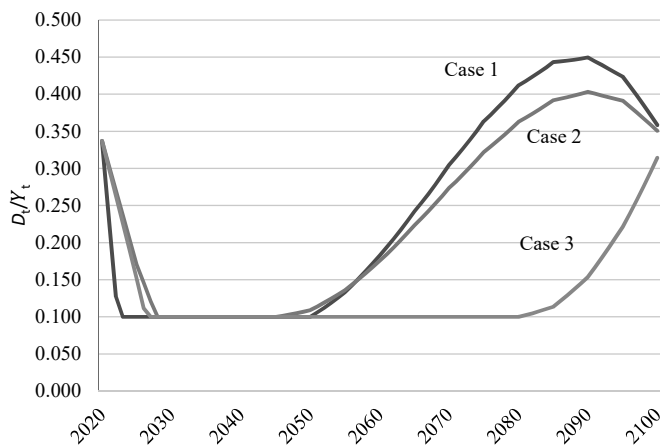


Figure 6a. Debt-to-GDP for each of the three cases, with sustainable tax rate constrained by lower bound of debt-to-GDP ≥ 0.10

Source: Authors' own calculation

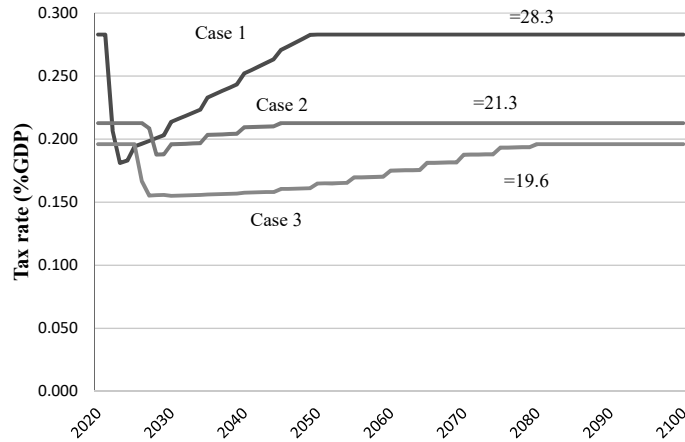


Figure 6b. Sustainable tax rate trajectories for each of the three cases, constrained by lower bound of debt-to-GDP ≥ 0.10

Source: Authors' own calculation

debt-to-GDP ratio in 2100 to its initial 2019 level requires that to compensate for the years in which the tax rate was lower because of the binding constraint on the debt-to-GDP ratio, the tax rate must be set higher in the other years when the constraint is not binding. The tax rates for years when the constraint is not binding are labeled in Figure 6b, and also shown in Table 2 with comparisons to the sustainable tax rates ignoring the constraint on the debt-to-GDP.

Table 2. Sustainable tax rates with and without lower bound on debt-to-GDP ratio

Assumed real interest rate	Approximate interest rate gap (interest rate – GDP growth rate)	Sustainable Tax Rate		
		Case 1	Case 2	Case 3
<i>Highest tax rates along sustainable tax-rate trajectories with lower bound on debt-to-GDP ratio equal to 0.10:</i>				
5*	2*	0.283	0.213	0.196
<i>For comparison (from Table 1): Sustainable tax rates if no constraint on debt-to-GDP ratio:</i>				
5*	2*	0.256	0.209	0.174

Source: Authors' own calculation

The constraint has a significant effect on the height of the sustainable tax-rate trajectories, though a smaller effect than we might have supposed. The constraint does induce decades-long periods in which the tax rates along these sustainable trajectories are

quite a bit below their highest levels.

5. Policy implications for Bangladesh

5.1. Tax revenue and government spending

Our computations have shown that the Bangladesh current tax rate—around 10 percent of GDP—is too low to sustain the debt-to-GDP ratio. This result should astonish no one, for government spending other than for debt servicing has been hovering around 15 percent of GDP. The recent trajectories of government expenditures and revenues as percent of GDP are shown in Figure 7. In the figure, ‘government revenue’ includes not only taxes but also fees, tolls, and profits of government enterprises equaling around 1 percent of GDP. The shortfall between government expenditures and government revenue have precipitated persistent budget deficits. In the figure, the ‘primary deficit’ excludes interest payments, which have been around 1 percent of GDP.

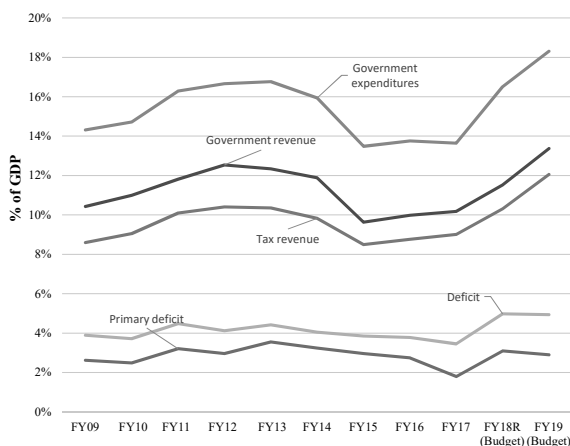


Figure 7. Bangladesh government revenue and expenditure, percent GDP, FY2009-FY2019

Sources: Bangladesh Bank, Annual Report, Appendix Table (“Trends of Major Macroeconomic Indicators”), various years. Items: ‘Expenditures,’ ‘Revenue,’ ‘Tax revenue’ and ‘Overall deficit (excluding grants)’. https://www.bb.org.bd/pub/publicn.php?cat_id=0&pub_id=2

Primary deficit constructed by subtracting interest as percent of GDP from ‘Deficit.’ Interest as percent of GDP imputed from IMF (Total debt service (% of GNI) [DT.TDS.DECT.GN.ZS]) and GNI/GDP from World Bank WDI.

Under all three of our alternative cases pertinent to the evolution of government spending, the Bangladesh debt-to-GDP ratio will rise quite dramatically in the coming decades. As shown in Figure 8, depending on the case, by 2050, 2060 or 2070 the debt-to-

GDP ratio will surpass 500 percent which is far greater than ever observed by any country. Something will change before this situation comes about. The only question is what will change and when.

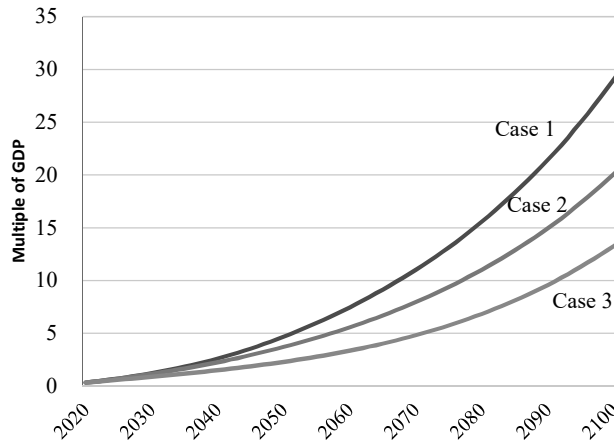


Figure 8. Debt-to-GDP ratio for each of the three cases under the current tax regime

Source: Authors' own calculation

We might first turn attention to government spending in Bangladesh. It is hard to see great opportunity for pruning government spending in Bangladesh. As is true of many developing countries, government spending relative to GDP is low compared to the high-income countries. And, as detailed in Table 3, the objects of spending are mostly standard and familiar items—education, health, agriculture, power, transport, public administration, and social welfare. Khanam and Khanam (2017) describe the evolution of Bangladesh central government spending, 1974 to 2014. In the central government budget, expenditures are separated into current expenditures and capital expenditures (in Bangladesh these are called ‘revenue expenditures’ and ‘development expenditures’). The current expenditures—salaries of government employees, procurement spending and transfers including subsidies and interest payments—are mostly dedicated to police, jails and the judiciary, defense, education, and health. As Khanam and Khanam show, the biggest variation in current expenditures over the years is in interest payments, the other components rising along with GDP. The capital expenditures—spending on public investment projects—are mostly for infrastructure such as roads, bridges, electricity grids telecommunication, and government buildings including schools and hospitals. Capital expenditures have risen along with GDP and over the years tilted more toward health and

education and less for defense. The Table 3 shows the composition of current expenditures ('non-development' expenditures) and capital expenditures ('development expenditures') for the most recent fiscal year ending in June 2019. The pattern is unremarkable.

Table 3. Break-down of Bangladesh Public Expenditure, 2018–2019

	BDT in Crore	%	% of GDP
Total Expenditure	442,541	100.0	18.3
Non-Development Expenditure	266,926	60.3	11.0
Non-Development Revenue Expenditure	247,945	56.0	10.3
<i>Domestic Interest</i>	45,278	10.2	1.9
<i>Foreign Interest</i>	3,467	4.3	0.1
Non-Development Capital Expenditure	18,981	4.3	0.8
Food Account Operation	282	0.1	0.0
Loans and Advances (Net)	1,884	0.4	0.1
Development Expenditure	173,449	39.2	7.2
Development Programs financed from Non-Development Budget	299	0.1	0.0
Non-ADP Projects	4,143	0.9	0.2
Non-ADP FFW and Transfer	2,008	0.5	0.1
Annual Development Program (ADP)	167,000	37.7	6.9
<i>Agriculture</i>	6,918	1.6	0.3
<i>RD and RI</i>	15,154	3.4	0.6
<i>SICT</i>	13,354	3.0	0.6
<i>Education and Religion</i>	15,469	3.5	0.6
<i>Physical Planning and Housing</i>	20,372	4.6	0.8
<i>Power</i>	23,225	5.2	1.0
<i>Transport</i>	38,100	8.6	1.6
<i>Public Administration</i>	4,964	1.1	0.2
<i>Health and Population</i>	10,902	2.5	0.5
<i>Social Wel- fare, Women Affairs and Youth Dev.</i>	650	0.1	0.0
<i>Others</i>	17,892	4.0	0.7

Source: Bangladesh Economic Review 2019, Chapter 04

<https://mof.gov.bd/site/page/44e399b3-d378-41aa-86ff-8c4277eb0990/BangladeshEconomicReview>

That brings us to taxes. There is ample space to increase taxes in Bangladesh. Indeed, Bangladesh tax revenue as a percent of GDP is among the lowest in the entire world. The Bangladesh system of taxation resembles that of other developing countries. It relies much on import tariffs, inflation, government monopolies, and other such distorting taxes because it is constrained in the ability to enforce and collect less-distorting taxes (VAT, personal income tax and so on). As argued by Gordon and Li (2009), the constraint arises

because of the difficulty of monitoring and taxing economic activity when much of the population does not have bank accounts that the government can scrutinize. When economic activity occurs in the informal sector—the shadow economy—it is difficult to tax. All developing countries face this dilemma, not only Bangladesh. Additionally, the government can increase tax revenue substantially by inventing new working areas to involve a large number of the unemployed working-age population. But tax revenue relative to GDP in Bangladesh is low even when compared to other developing countries in Asia and elsewhere. As shown in Figure 9, the structure of taxes in Bangladesh is about the same as the average for low-income and middle-income countries, but total revenue as a percent of GDP is remarkably lower.

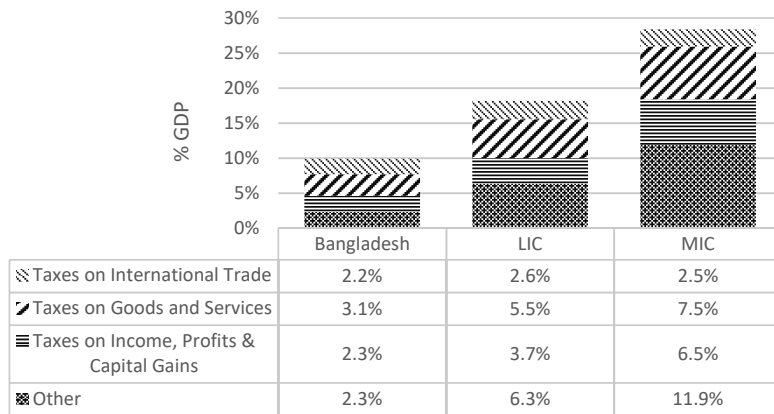


Figure 9. Government revenue by type, percent of GDP, annual average 2008–2017, Bangladesh, Low-Income Countries and Middle-Income Countries

Source: Constructed from ICTD / UNU-WIDER Government Revenue Dataset 2019

The Heritage Foundation collects data on the tax revenue of each country as a percentage of GDP, from the individual country pages, under the “Fiscal Freedom” section, to use in constructing its ‘Index of Economic Freedom.’ The Wikipedia page titled ‘List of countries by tax revenue to GDP ratio,’ lists these data for 2015. Listed in order from the most tax revenue as a percentage of GDP to the least, Bangladesh ranks 161st out of the 178 countries.

The low taxes of Bangladesh are a political choice. To understand the basis for that choice it is instructive to explore some details of the Bangladesh public debt. Much of it is in the form of external loans from the World Bank and ADB and from the governments of Japan and China, all of which are at below-market interest rates. Most of these loans are

sufficiently concessionary to meet the OECD definition of ‘overseas development assistance,’—foreign aid. Because of the low interest rates, the Bangladesh government debt-to-GDP fell from 2000 to 2015, even as its primary deficits persistently reached 3 percent of GDP. As shown in Figure 10, external debt and gross debt (=external debt plus domestic debt) has been trending downward as a percentage of GDP in Bangladesh. The upward spiral in the government debt-to-GDP ratio that we confidently predict will occur in the absence of a tax increase will only materialize when the foreign aid is exhausted. Bangladesh has already attained the World Bank classification of ‘low-middle income’ country and seems headed toward ‘middle income,’ after which foreign aid will surely end. When it does, the debt-to-GDP ratio will soar and political pressure to raise taxes will soon follow. To document some of these claims more fully we next briefly describe the structure of public debt in Bangladesh.

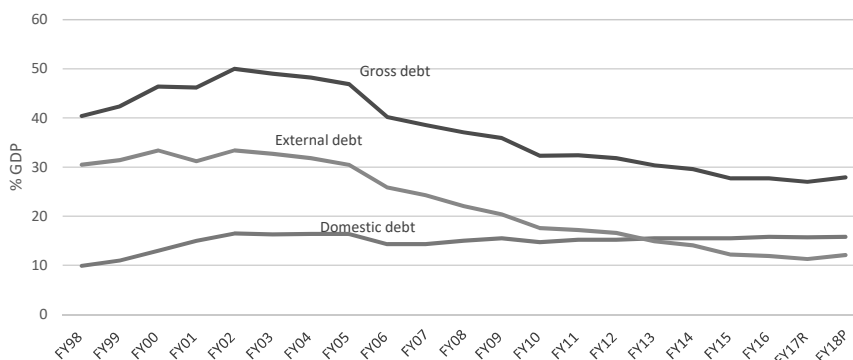


Figure 10. Bangladesh gross debt, external debt, and domestic debt, percent GDP, FY1998- FY2018

Sources: Bangladesh Bank annual report, various years. Same tables as Figure 7. Items: ‘Government debt outstanding,’ ‘Domestic debt,’ and ‘External debt (Excluding IMF loan).’

5.2. Composition of public debt

The Table 4 lists the main types of Bangladesh government debt and their amounts outstanding at the end of the 2018 fiscal year (June 2018). Let us briefly describe each type of debt and its approximate associated interest rate.

5.2.1. Domestic Debt

As shown in Table 4, at the end of the 2018 fiscal year (June 30, 2018), domestic debt was 55.6 percent of all government debt outstanding. The domestic debt is mostly composed of ‘Treasury Bills’ and ‘Treasury Bonds’—short-term and long-term tradeable

securities denominated in the local currency—and ‘National Saving Certificates’—non-tradeable saving certificates offered to individuals at above-market interest rates through post offices and government banks and denominated in the local currency.

The interest rates of Treasury Bills and Treasury Bonds are market-determined at auction and vary according to maturity. The T-bills are short-term with maturities of three months, six months and one year, and recent (FY2016-FY2018) coupon rates (annual interest rates) between 4 percent and 5 percent (Guarantco, 2019, Figure 15, p. 29). The T-bonds are long-term with maturities of two years, five years, 10 years, 15 years and 20 years, and recent annual interest rates from 5 percent to 9 percent (Guarantco, 2019, Figure 16, p. 29). The interest rates are higher for T-bonds of longer maturity, indicative of their greater risk.

National Savings Certificates comprise more than half of the Bangladesh domestic debt and nearly one-third of all public debt. These were first issued in 1944 by the Ministry of Finance of India, have survived partition and Bangladesh independence from Pakistan, and continue to the present day under the auspices of the National Saving Bureau of the central bank of Bangladesh, the Bangladesh Bank. The National Saving Certificates are non-tradeable. The maturities are typically three years or five years with penalties for early withdrawal. Eligibility to purchase varies according to the specific certificate—women older than 18 years, retired government employees, citizens older than 18 years, and so on—as does the maximum annual amount that an eligible individual may purchase. The interest rates for such certificates are recently in the range of 11.0% to 11.7% and are deliberately set above the market interest rates of other financial assets. For instance, the Bangladesh private bank prime lending rate is recently around 9.5 percent. The National Saving Certificates are a government pension scheme in nascent form which is likely to evolve and expand in the future as Bangladesh develops and enacts social welfare programs like those that the high-income countries such as Japan already have.

The Bangladesh inflation rate (2019 rate of change in GDP deflator) is 4.5 percent per year, having steadily fallen from its 2016 peak of 6.7 percent per year over the last three years. Putting all of this together, it seems that the current nominal rate of interest on domestic debt is around 9 percent ($= \frac{1}{2}$ times NSC rate of 11 percent + $\frac{1}{2}$ times T-bond rate of 7 percent). This corresponds to a real rate of interest of about 5 percent (assuming an expected rate of inflation of 4 percent). Recall that 5 percent real rate of interest was a basis for our computations of sustainable tax rate. But the domestic debt is only about half of the outstanding debt. We also need to examine external debt.

Table 4. Composition of Bangladesh Government Debt, End Fiscal Year 2018 (July 2017 to June 2018)

Domestic Debt by category	Percent of All Debt	Percent of Domestic Debt	US \$ billion
Treasury Bills	3.3	6	\$3.04
Treasury Bonds	17.2	31	\$15.69
Specialized Bonds	1.1	2	\$1.01
National Savings Certificates	30.0	54	\$27.34
Other (Government Pension Funds etc)	3.9	7	\$3.54
Total Domestic Debt	55.6	100	\$50.63
Outstanding External (public and publicly guaranteed) debt by creditor	Percent of All Debt	Percent of External PPG debt	US \$ billion
Multilateral	28	62.5	\$25.21
<i>of which</i>			
World Bank (IDA*)	15.6	35.2	\$14.20
Asian Development Bank	9.7	21.9	\$8.85
Bilateral	10.1	22.7	\$9.18
<i>of which</i>			
Japan	5.2	11.7	\$4.71
China	2.2	4.9	\$2.00
Short Term Debt	2.1	4.8	\$1.95
Guarantees (state-owned enterprise debts)	4.4	10.0	\$4.03
Total External Debt	44.4	100.0	\$40.37
Total All Debt	100.0		\$91.00

Source: Compiled from: IMF, Staff Report for the 2019 Article IV Consultation—Debt Sustainability Analysis, August 5, 2019, pp. 2–3.

*IDA=World Bank Group's International Development Association

5.2.2. External debt

The government of Bangladesh has been privileged to borrow from the World Bank and Asian Development Bank and from the governments of Japan, China, and other countries, on concessionary terms—below-market interest rates. These external loans are denominated in foreign currency units (USD), are typically long-term loans of 15 to 30 years, and are mostly earmarked for public investment in infrastructure. The earmarking is achieved by tying the loans to disbursements for specific investment projects and sometimes even to specific construction contractors from the lender countries. Such constraints on how a loan can be used reduce the economic value of the loan to the recipient country, making it difficult to ascertain its true interest rate⁷. Nevertheless, we shall note some details of these multilateral and bilateral foreign loans. The sources of all

these details are (Guarantco, 2019, pp. 14–22).

The World Bank (International Development Association) currently outstanding loans to Bangladesh are at a stated 1.5% interest rate. The ADB loans to Bangladesh are at fixed rates of 2.6% to 2.9% or variable rates equal to the 6-month London Interbank Offered Rate (LIBOR) which is recently around 2.7%. Japanese government long-term (15–20 years) loans since FY 2013 have been at a fixed rate of 1.5% or variable rate of LIBOR + 0.4% to 1.1%. The government of China is providing long-term loans to Bangladesh at a fixed interest rate of 2%. From these very rough observations, it seems the external loans to Bangladesh are at USD nominal interest rates mostly from 2% to 3% (bdnews24, 18 January, 2019). In recent years the US inflation rate has risen to around 2% per year, the announced policy target of the US Federal Reserve Bank. An expected US inflation rate of 2% implies a real rate of interest on Bangladesh foreign debt of about 1%—substantially lower than the real rate of interest on the domestic debt (which we judged to be about 5%).

As shown in Table 4, roughly half of the government debt of Bangladesh is domestic and the other half is external. We infer that the real rate of interest on the Bangladesh public debt is about 3%, which is the average of that on domestic debt (5%) and external debt (1%). The growth rate of Bangladesh real GDP lately has been as high as 6 percent per year—which means a negative interest rate gap of 3 percent, which is about the same percent of GDP as the recent primary government surpluses. This is why the debt-to-GDP ratio has declined in recent years. Recent trajectories of real GDP growth and inflation are shown in Figure 11.

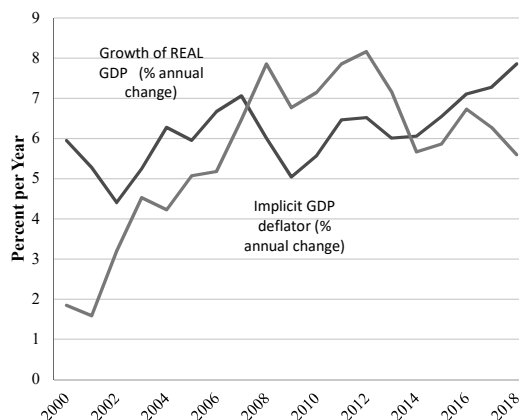


Figure 11. Bangladesh real GDP growth rate and inflation rate, 2000–2018

Source: Asian Development Bank (ADB), Key Indicators for Asia and the Pacific 2019. www.adb.org/statistics

5.2.3. *Does the composition of public debt matter?*

Sovereign debt denominated in foreign currency is at greater risk of default than if denominated in domestic currency, and at lower risk of monetization. To monetize sovereign debt denominated in a foreign currency is not impossible but would require a deliberate and unanticipated real appreciation of the home currency. To monetize sovereign debt denominated in the local currency would only require an unexpected inflation of the currency, a much easier thing to accomplish. Sovereign debt in local currency has generally been rated as safer than the sovereign debt of the same country denominated in foreign currency, but the gap has become less in the last 20 years (Amstad et al, 2020). To put it another way, based on bond ratings, the greater default risk of the foreign currency debt tends to outweigh the greater monetization risk of the local currency debt, but not by that much, particularly recently. Amstad et al (2020) analyze the determinates of the risk gap between local currency and foreign currency sovereign debt of countries with emerging economies (including Bangladesh) and find that declining inflation rates and reduced exchange rate volatility are the main reasons the gap has narrowed over their period of observation (1995 to 2015).

The IMF template places much emphasis on the risk of default on the external debt. This is of course a matter of great importance to international lenders to developing country governments, and the IMF is an agent of these lenders and indeed also a vehicle for them. But it would be myopic to ignore local currency debt in assessing the likelihood of entering a debt spiral that invites a fiscal crisis that could lead to monetization if not default. The question we are asking—and that Blanchard and Broda & Weinstein are asking—is whether taxes are high enough permanently to stave off a pending fiscal crisis. Our answer is taxes in Bangladesh are not yet high enough. Under the current tax structure, tax revenue is quite lower than government spending. When economic growth slows and the interest rates charged by foreign lenders to the Bangladesh government are no longer concessionary and rise to the market level, the Bangladesh government debt-to-GDP will rise and keep rising. The composition of public debt—domestic versus external—does not affect this analysis.

6. Conclusion

This study analyzed the government debt sustainability of Bangladesh, using a similar approach to the one Broda and Weinstein (2005) applied to the Japanese case. The novelty

of this paper is that we apply this method of analysis to a developing country—Bangladesh. A further novelty is that we consider the implication of a lower bound on the debt-to-GDP ratio. This should probably be a feature of this kind of analysis even when applied to a high-income country like Japan.

From 2000 to 2018 the Bangladesh GDP growth rate was higher than the interest rate on its sovereign debt. For this reason, the Bangladesh government debt-to-GDP ratio steadily decreased, even though the country persistently displayed a primary fiscal deficit. This situation is unlikely to continue. The interest rates on Bangladesh public debt are as low as they are because most of the external public debt—about half of the sovereign debt—is concessionary, at below-market interest rates, a form of foreign aid. Bangladesh is developing. In a few more years it is likely to have become a middle-income country based on the World Bank classification. The foreign aid will end, and Bangladesh will have to stand on its own, borrowing at the market rate of interest. Economic growth may continue but not at the unsustainably high annual rates recently observed such as 7 percent or 8 percent per year. Our analysis anticipates the end of the negative interest rate gap and predicts a persistent rise in the debt-to-GDP ratio. Then taxes will have to go up if fiscal crisis is to be averted. We are confident that Bangladesh taxes will go up.

As the Bangladesh economy develops, its growth rate will slow, and its persistent primary deficits will precipitate a rising government debt-to-GDP ratio. This is not sustainable. How high must Bangladesh taxes be raised to stabilize its debt-to-GDP ratio at its current level? That is the question we have attempted to answer here. Our finding is that the sustainable tax rate of Bangladesh is well above the current tax level which is near 10 percent of GDP. A clearly sustainable tax rate for Bangladesh is between 17 percent of GDP and 28 percent of GDP.

We have made forecasts of government spending as a share of GDP for three different cases. *Case 1*: Government expenditures per person rise until 2050 at an annual rate that is one percent greater than the growth rate of GDP, and after 2050 grow at the same rate as GDP. *Case 2*: Government expenditures per person are always proportional to GDP. *Case 3*: Government expenditures per person are always proportional to GDP per worker.

For *case 1* and *case 2*, government expenditure as a share of GDP increases, reaches a peak around 2065 and then starts to decline. For *case 3*, government expenditure as a share of GDP shows a continuous increasing trend. In none of the cases does expenditure ever rise above 30 percent of GDP. But to keep the debt situation sustainable, the Bangladesh government needs to increase its tax revenue. If the tax rate can be increased

early, and maintained, it will obviate any need to raise the tax rate to still higher levels later.

In this study, the proposed sustainable tax rate for Bangladesh from 2022 to the rest of the century is 17 to 28 percent of GDP (its current level is 9.83 percent of GDP). In the future, the labor force will shrink and the population will age. Health costs for the population will rise (Streatfield and Karar, 2008, p.265) even as the old-age dependency ratio increases which might cause an unsustainable fiscal situation for Bangladesh like that currently facing Japan. Thailand and Korea also face pressure to meet the rising demand for pensions and long-term health care expenditure. To face this situation, the government needs to increase tax revenue.

A latent idea behind the concept of a sustainable tax rate is the tax-smoothing logic elucidated by Barro (1979, 1995). That is, under certain conditions—that the marginal tax rate is proportionate to the average tax rate and all taxes are fully shifted onto labor, et cetera—minimizing the burden of taxes needed to fund a projected future stream of government expenditures entails the setting of an overall tax rate that is stable through time. A single sustainable tax rate to be established and maintained into the future could be understood as fulfilling the conditions consonant with minimizing the tax burden. In other words, the sustainable tax rate is the tax-smoothing tax rate. This suggests a way of evaluating the welfare costs of deviation from the sustainable tax rate or delay in implementing it: Calculate the excess burden of taxes in all years under each scenario and compare each with the optimal case. We explore these ideas further in a companion paper to this one (Begum and Flath, forthcoming).

Notes

- 1 The Broda and Weinstein Case 1 assumes that government spending per person will rise in proportion to the share of the elderly in the Japanese population and so level off when that share reaches a maximum. Our Case 1 assumes that government spending per person will rise until 2050 and then level off but not necessarily tracking the share of the elderly in the Bangladesh population.
- 2 This much-cited paper—indeed classic paper—by Blanchard was apparently never published in a refereed journal. It appeared as an OECD economics department working paper.
- 3 These are limiting cases, which are close approximations for large n . The expression for $i > \eta$ is derived from Equation [5] invoking the following.

$$\lim_{n \rightarrow \infty} \sum_{t=1}^n \left(\frac{1+\eta}{1+i} \right)^t = \frac{1+\eta}{i-\eta}, \text{ if } i > \eta, \text{ and } \lim_{n \rightarrow \infty} \left(\frac{1+\eta}{1+i} \right)^n = 0, \text{ if } i > \eta.$$

The expression for $i < \eta$ (which is not in Broda and Weinstein, 2005), is derived from Equation [5] and invoking the following.

$$\lim_{n \rightarrow \infty} \sum_{t=1}^n \left(\frac{1+i}{1+\eta} \right)^{n-t} = \frac{1+i}{\eta-i}, \text{ if } i < \eta, \text{ and } \lim_{n \rightarrow \infty} \left(\frac{1+i}{1+\eta} \right)^n = 0, \text{ if } i < \eta.$$

- 4 For unchanging government spending relative to GDP, $g_t = g, \forall t$, invoking the assumptions detailed in the previous footnote we have the following.

$$\tau^* = \left(\frac{i-\eta}{1+\eta} \right) b_0 + g > g, \text{ if } i > \eta$$

$$\tau^* = - \left(\frac{\eta-i}{1+i} \right) b_0 + g < g, \text{ if } i < \eta.$$

- 5 Based on Equation [2], we construct in an Excel spreadsheet the time series from 2020 to 2100 of government debt-to-GDP ratios contingent on an assumed constant tax rate and given our assumed trajectories of real GDP and government spending and assumed initial public debt-to-GDP ratio. We then manually iterate on the tax rate until hitting on the tax rate such that the debt-to-GDP ratio in 2100 matches the initial debt-to = GDP ratio of 2020. This is our ‘brute force’ method.
- 6 In their words: “[t]he main contribution of this chapter is to argue that the current debt and deficit levels in Japan have almost no impact on long-run sustainability calculations and that the “right” long-run tax level simply depends on the forecast of the “right” long-run expenditure level.” Broda and Weinstein (2005, p. 5)
- 7 Suppose that I ‘loan’ you \$100 at a zero interest rate (meaning you will repay me \$100 one

year from today) on the condition that you use the loan proceeds to buy apples from me (I will hold the \$100 in escrow until receiving your purchase orders). If the price of my apples is set by me above the market price of apples, is this really a zero-interest-rate loan? No, it is not. Interest payments are implicit in the inflated prices of the apples. Cell phone subscriptions are sold in Japan under this kind of scheme on what is purported to be zero-interest-rate credit. Purported ‘zero-interest-rate’ mortgages are marketed in Japan under the same sort of ruse.

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