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Deficit Financing Strategy and Fiscal Sustainability in Bangladesh

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Abstract

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Keywords

fiscal sustainability, budget deficit, fiscal regime, fiscal reaction function, Bangladesh

JEL Classification

H63, C51, E62, E69

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Deficit financing strategy and fiscal sustainability in Bangladesh

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Historically, Bangladesh's government conducted a deficit-biased fiscal policy, largely due to robust GDP growth and favourable interest rates, facilitated by the country's access to concessional finance as a low-income country. However, persistent deficit-biased fiscal policy is not sustainable in the long term without fiscal reform as interest rates rise with the rising per capita income and development. Using annual data from 1983 to 2022, with a 2-state regime-switching model this paper finds that the government's fiscal response to rising public debt was stabilising during 1989-1995 and 2002-2014 with 84% probability (sustainable) while the response was insignificant during 1983-1989, 1996-2001, and 2015-2020 with 80% probability (unsustainable). In addition, a time-varying parameter model in a state space framework finds evidence of unsustainable fiscal policies consistent with the regime-switching model. The main reason for fiscal unsustainability appears to be the rising interest rates due to changes in budget financing mixes, higher interest payments, and persistent expansionary fiscal policy without major fiscal reforms. The lack of fiscal policy response to the output gap, indicating an absence of countercyclical measures and no evidence of long-term sustainability, contradicts the government's long-term fiscal objectives.

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1 Introduction

The role of fiscal policy has been recognised in the macroeconomic literature as it stabilises the economy from various macroeconomic shocks by affecting aggregate demand directly and closes the gap between saving and investment. By contrast, monetary policy affects supply and demand through price adjustment. Historically, fiscal policy was key in building physical and social infrastructure in developing countries after World War II. Vito and Howell (1997) found that fiscal policy instruments, such as tax, expenditure, and budget could play a vital role in affecting countries' long-term growth performance by affecting resource allocation, macroeconomic stability, and income distribution. However, the use of fiscal policy raises the question of its sustainability after the debt crisis in Latin American countries in the 1980s.

Despite higher GDP growth, Bangladesh has not been able to mobilise enough domestic resources for sustainable development due to widespread tax evasion and tax avoidance (IMF, 2019). Government revenue was below 8 per cent of GDP until the introduction of the value-added tax law in 1991, which rose to 10 per cent for some years and then dropped to 9 per cent without notable reform (Figure 1). The revenue generation capacity is one of the lowest in the world compared to the revenue-GDP ratio of 27 per cent of GDP in emerging countries and 44 per cent of GDP in industrial countries (Callen et al., 2003). Government expenditure, around 10 per cent of GDP in the early 1980s, also rose to 13 per cent in the late 2020s. Low government revenue along with low public expenditure (partially stems from a lack of capacity to spend allocated resources in the development budget) has helped to maintain fiscal discipline over the years (Hussain and Hossain, 2020).

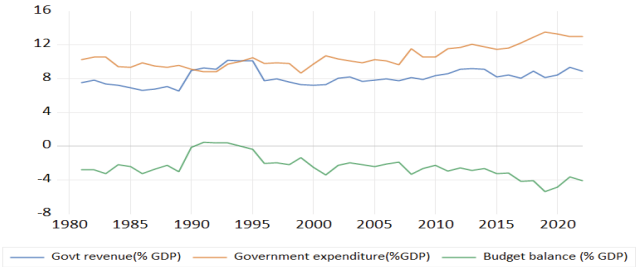


Figure 1 Revenue, Expenditure & Budget Balance
Source: IMF-WEO, Government revenue before 1990 was adjusted with grants.

Persistent budget deficits and slower GDP growth in the 1980s resulted in accumulating public debt, reaching 50.0 per cent of GDP in FY94 from 21.83 per cent of GDP in 1980 (Figure 2). However, the improved fiscal position[2], reduced dependence on foreign aid, and higher GDP growth (Figure 3) resulted in favourable debt dynamics that stabilised the public debt level from 50.0 per cent of GDP in FY94 to 27.7 per cent in FY16. The trend in public debt started to reverse from 2016 onwards with expansionary fiscal policy and the rising trend of effective interest rates (Figure 3).

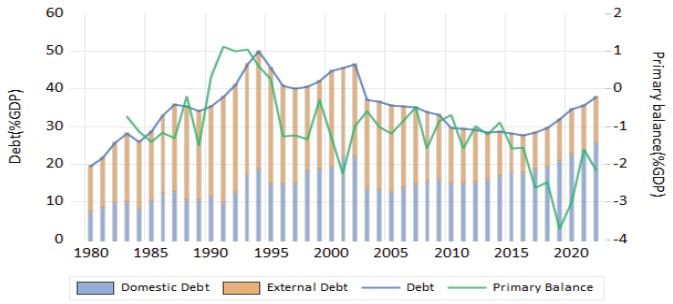


Figure 2 Government Debt and Primary Balance
Source: IMF historical debt database, IMF-WEO and Finance Division, MOF

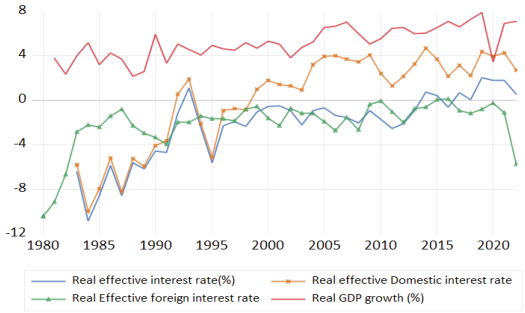


Figure 3 Interest rate and GDP growth (%)
Source: IMF-WEO and Finance Division, MOF

The government's budget financing structure has changed significantly during the sample period. The government budget relied heavily on foreign financing before the 1990s. This reliance began to decline from 1990 onwards, dropped considerably after the mid-1990s, and reached its lowest point in 2011 (Figure 4). Following the fall of the Soviet Union in 1989 and the end of the Cold War, Western countries' motivation to provide concessionary finance to developing countries dropped significantly (Dilruba, 2021). Consequently, the government turned to high-interest rate-bearing national saving certificates (NSCs) to finance its budget deficit without significant reform in the financial market. As a result, the government's domestic interest payments increased significantly. Further, the trend of foreign financing reversed in the 2010s with the major infrastructure projects undertaken by the government, which were financed from large emerging countries, such as China, Russia, and India at a significantly higher interest rate along with shorter

[2] The primary balance was positive from FY90 to FY95. The average primary balance was -1.06 per cent with a maximum of 1.11 per cent of GDP in 1991 and -3.7 per cent of GDP in 2019.

repayment periods (Bhattacharya and Ashraf, 2018). Moreover, Bangladesh's graduation from a low-income country to a lower-middle-income country in 2015 has increased the cost of foreign loans. Consequently, the government's interest payments nearly quadrupled in the 2020s (approx. 2 per cent of GDP) than in the 1980s (0.5 per cent of GDP).

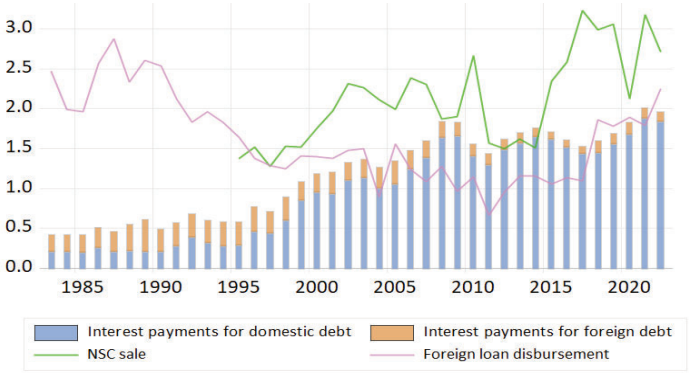


Figure 4 Budget financing & Govt. interest payments (% GDP)

Source: Finance Division, MOF

Since external debt is denominated in foreign currency, the government depends on exports and remittances to repay the foreign loan. However, Bangladesh's export basket is also quite narrow[3] and often encounters competitive pricing from the rest of the world. The unfavourable terms of trade have adverse[4] effects on the foreign exchange reserve. The IMF approved US$ 3.3 billion under the extended credit facility and US$ 1.4 billion under the resilience and sustainability facility in a 42-month program to restore macroeconomic stability, relax financing constraints, and rebuild foreign exchange reserves (IMF, 2023). Despite the IMF's assistance, the country's foreign exchange reserve kept falling with rising import costs since the start of the Russia-Ukraine war and the rise in external loan repayments. The dwindling reserve has limited the central bank's capacity to intervene in the foreign exchange market and consequently, the real exchange rate depreciated 13.76%

[3] Nine Western markets, including the US, UK and Germany, account for two-thirds of the country's apparel exports, which constitute approximately 85% of the total exports.

[4] Foreign exchange reserves fell to 31.20 billion USD at the end of June 2023 from 41.82 billion USD at the end of June 2022.

in 2023 (Figure 5). Since external debt is denominated in foreign currency, the depreciation of the local currency raises the cost of borrowing and increases the external debt stock.

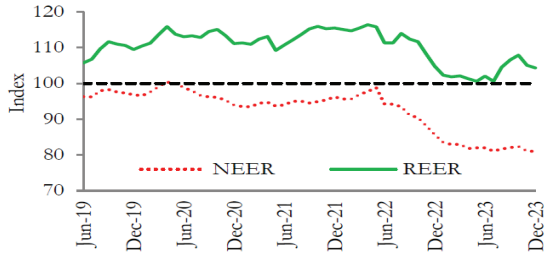


Figure 5 Effective Exchange Rate Indices (Base 2015-16=100)
Source: Bangladesh Bank

In 2020, the government set long-term targets in its 20-year perspective plan, 'Vision 2041': a revenue target of around 24 per cent of GDP, an expenditure target of 29 per cent of GDP, and a debt target of 40 per cent of GDP, maintaining a persistent 5 per cent deficit (GED, 2020). Although Abdullah et al. (2018) suggested a budget deficit threshold of 4.55~5.00 per cent of GDP for Bangladesh, a persistent 5 per cent budget deficit could increase debt levels, especially with rising interest rates and slowing GDP growth. Reinhart et al. (2003) and IMF (2002a) observed that emerging market economies cannot sustain a higher level of debt due to their inherent characteristics, such as volatility, weaker institutions, and poor credit history. The emerging countries that fell into debt crises in the past were generally characterised by low revenue base, lower financial depth, and exchange rate control, from which Bangladesh is no exception. Sovereign debt default episodes in emerging countries show that in 35 per cent of the cases, the default occurred at a debt-GDP ratio below 40 per cent (Callen et al., 2003).

This paper examines the fiscal sustainability of Bangladesh with three different model approaches, the constant parameter model, regime-switching model, and time-varying parameter model using annual data from 1983 to 2022 in the context of its macroeconomic stability and development. The constant parameter model reveals that the government's fiscal response to the rising debt was insignificant during the sample period and fiscal policy did not react to the output gap, indicating it is not countercyclical. Temporary government spending appears to be a determinant of fiscal policy. The regime-switching model finds that fiscal policy did not respond to the rising debt level

during 1983-1988, 1996-2001, and 2015-2000 while the fiscal response was significant during 1989-1995 and 2002-2014. The paper did not find any evidence of long-term sustainability based on the duration of regimes and the strength of the fiscal response, despite it satisfies both non-Ponzi game[5] conditions (also called transversality condition) and debt-stabilising conditions (stationarity of the debt-GDP ratio) on average. The time-varying parameter model finds consistent results with the regime-switching model. The main reasons for fiscal unsustainability appear to be higher interest payments due to interest rate rises on the back of changing budget financing mixes, and persistent expansionary fiscal policy without major fiscal reforms.

This paper contributes to the fiscal policy decision-making process in Bangladesh. First, this paper introduced a model-based regime-switching fiscal rule for Bangladesh to analyse its fiscal sustainability in the context of fiscal policy objectives and macroeconomic developments. This is particularly important given the rising government interest payments due to structural shifts in budget financing from low-cost foreign finance to high-cost domestic finance. Second, the paper provides evidence that the government cannot afford to conduct persistent deficit-biased fiscal policy without improving the tax base for its long-term fiscal sustainability. Third, this paper delves into Bangladesh's fiscal policy-making process and implementation, an area that received relatively less attention in the literature.

The rest of the paper is organised as follows. Section 2 reviews relevant literature on fiscal sustainability, section 3 discusses the analytical framework and data sources, section 4 discusses constant parameter models, section 5 discusses regime-switching parameter models, section 6 discusses time-varying parameter models and section 7 compares results from different models with empirical evidence and section 8 provides conclusions and policy recommendations.

[5] No Ponzi Game (NPG) conditions imply that the government does not service its debt by issuing new debt regularly. Over the long term, the present value of debt must decline towards zero, asymptotically, the debt ratio cannot grow at a rate equal to or higher than the growth-adjusted interest rate.

2 Literature review

Fiscal sustainability depends upon several factors: i) the trajectory of the debt-GDP ratio, ii) whether the debt stabilises at a level consistent with an acceptable rollover risk while preserving growth, iii) the realism of underlying assumptions, and iv) debt composition (IMF, 2011b). The intertemporal budget constraint (IBC) approach assumes a government faces the following budget constraints:

$$D_t = (1+i)D_{t-1} - (T_t - G_t) = (1+i)D_{t-1} - PB_t \qquad (1)$$

where, D_t= Government debt stock at the end of the period t, i = Nominal interest rate, T= Government tax revenue, G = Primary government expenditure (without interest payment)

T-G= PB= Primary balance.

Solving forward equation (1) can be written as

$$D_t = \lim_{j\to\infty}(1+i)^{-j}D_{t+j} + \sum_{j=1}^{\infty}(1+i)^{-j}\left(T_{t+j} - G_{t+j}\right)$$

A government is solvent if the present value of all future primary surplus is enough to cover the outstanding debt, i. e. there is no scope to run a Ponzi Game or roll over debt forever. If the discounted future primary surpluses are not enough to cover the outstanding debt, then the government is overborrowing (Callen et al., 2003). The IBC approach regards fiscal policy as sustainable if the government can service its debt without any major adjustment (sooner or later), which does not necessarily imply that debt has to be non-increasing (Chalk and Hemming, 2000).

As the government's tax base and expenditure grow in a growing economy, it is intuitive to write the budget equation in ratio in debt-GDP form:

$$\frac{D_t}{Y_t} = \frac{(1+i)D_{t-1} - PB_t}{Y_t} = \frac{(1+r)(1+\pi)D_{t-1}}{(1+g)(1+\pi)Y_{t-1}} - \frac{PB_t}{Y_t}$$

$$\Rightarrow \quad d_t = \frac{1+r}{1+g}d_{t-1} - pb_t \qquad (2)$$

where d = debt/GDP, g = real GDP growth rate, r = real interest rate, π = GDP deflator inflation, pb = PB/GDP; Subtracting d_{t-1} from both sides of equation (2) we get,

$$d_t - d_{t-1} = (\frac{1+r}{1+g} - 1)d_{t-1} - pb_t$$

$$\Rightarrow \quad \Delta d_t = (\frac{r-g}{1+g})d_{t-1} - pb_t \qquad (3)$$

Equation (3) indicates that debt will grow at a growth-adjusted interest rate $(\frac{r-g}{1+g})$ if the primary balance is zero. If r < g, debt will fall and can be sustainable even with a negative primary balance. When the debt stabilises (i. e. $d_t = d_{t-1}$, $\Delta d_t = 0$), $pb^* = \frac{r-g}{1+g} d^*$

where pb^* is called debt stabilising primary balance and d^* can be interpreted as a steady state level of debt (Blanchard et al., 1990). If the actual primary balance is less than the debt-stabilising primary balance, the debt-GDP ratio will rise, making this fiscal policy unsustainable.

While this IBC approach is simple and has a straightforward interpretation, it is based on an arbitrary definition of sustainability (i.e. only a stable debt-GDP ratio is required) (Callen et al., 2003). It is unlikely that a country will always maintain a stable debt-GDP ratio because some circumstances may warrant increasing the budget deficit and debt level. Bohn (1995) suggests IBC approach does not adequately deal with the interest rate implications of uncertainty and risk aversion. IBC is difficult to assess in the stochastic environment as average deficits and the realised path of debt can be misleading if interest rates are below the growth rate.

Trehan and Walsh ((1988), (1991)), and Quintos (1995) test if the debt series is difference stationary or if government revenue and spending are cointegrated, rejection of which is interpreted as evidence against sustainability. However, Bohn (1998) shows that unit root tests are inconsistent and misleading as they do not adjust for fluctuations in GDP and government spending. Bohn (2007) also explains that standard unit root and cointegration tests are incapable of rejecting sustainability as IBC proves to be satisfied if either the debt series or the revenue and interest spending series are integrated of an arbitrarily high order. Complementing the theoretical approach of Blanchard et al. (1990) and other complex frameworks, Bohn (1998) proposes a simple model-based sustainability test that demonstrates that a positive response of primary balance to changes in the debt-income ratio is sufficient to guarantee that the debt ratio will revert to some finite steady-state value regardless of interest rates and growth rates (i.e. to satisfy the IBC

condition). Ghosh et al. (2013) viewed this condition as a weak form of sustainability as it ignored the ever-increasing debt-GDP ratio (there may be a limit for positive values of primary surplus at a high level of debt). However, empirical literature has extensively used Bohn's framework to assess fiscal sustainability.

The model-based sustainability test with Bohn (1995) framework does not allow the relationship between primary surplus and debt to be time-varying, which could be the case when the systematic relationship between primary surplus and debt varies across time. Further, the estimation of linear or nonlinear fiscal reaction functions with constant parameters is subject to biases in the presence of structural breaks or regime changes as found by empirical literature, such as Favero and Monacelli (2005), Davig et al. (2006), and Bianchi (2013). They produced evidence suggesting that fiscal rules may be better described by the fiscal regimes (Fiscal policy may stabilise debt in one regime but does not stabilise or even provide negative feedback to the rising debt in another regime). They show that fiscal policy could be locally (periodic) unsustainable with a periodic explosive debt-GDP ratio but could be globally (long) sustainable. Nguyen et al. (2017) also extended the fiscal sustainability analysis by allowing time-varying feedback on the debt-GDP ratio across the sample period with a state space model.

The joint Debt Sustainability Analysis (DSA) by the IMF and the World Bank assessed that Bangladesh's debt remains at low risk of debt distress by forecasting macroeconomic variables and whether the set thresholds are likely to be breached with isolated shocks (IMF, 2023). Using the IMF framework, Islam and Biswas (2005), and Islam (2008) found that Bangladesh's debt is sustainable based on the evolution of the debt dynamic coefficient $(1 + r)/(1 + g)$. Slightly deviating from IMF's judgmental projection Goswami and Hossain (2013) forecasted macroeconomic variables with an ARIMA model and used those forecasted data in the IMF/World Bank DSA framework and found that Bangladesh's debt is sustainable for the period 2013 to 2033. Bhattacharya and Ashraf (2018) simulate public debt and external public debt in the context of recent expensive external financial flows with the debt-stabilizing primary balance approach and the IMF/World Bank DSA framework. They found that public debt is sustainable from FY 2017-26; however, the external debt service to revenue ratio is significantly higher than the IMF

threshold in all projected years (more than one-fourth of government revenue is required to service external debt). Using a similar framework to the World Bank, Hussain and Hossain (2020) found that Bangladesh's debt is sustainable at a constant 31 per cent to GDP with a primary deficit of 1.3 per cent of GDP; however, the fiscal policy is procyclical and state-owned enterprises' debt poses a key fiscal risk.

Gunter and Rahman (2008) reviewed Bangladesh's public debt trend (1993-2006) using SimSIP's debt projection module and found that the public debt is sustainable; however, the country is highly indebted in terms of NPV of debt to government revenue and debt service to government revenue. They observed that Bangladesh did not qualify for heavily indebted poor countries (HIPC) debt relief as the government substituted external debt with domestic debt. Following Blanchard (1990), Begum and Flath (2020) suggested a sustainable tax rate (17-28 per cent of GDP) for Bangladesh to contain the debt-to-GDP ratio at the current level, based on annual data from 2003 to 2017. They predicted an explosion of public debt without increasing the current tax rate. Medina (2018) assesses the impacts of macroeconomic shocks (real GDP growth, real effective exchange rate, and domestic real interest rate) on external public debt-to-GDP ratio in a stochastic framework using annual data from 1996-2012. He finds that Bangladesh's external debt is at low risk, however, the fiscal aggregates are sensitive to commodity price and exchange rate shock and could be affected by contingent liabilities, unfunded pension systems and weak institutional capacity (budget forecasting error, external debt management, and data discrepancies).

Most of the previous studies (Islam and Biswas (2005), Islam (2008), Goswami and Hossain (2013), Bhattacharya and Ashraf (2018), Hussain and Hossain (2020)) used the IMF/World Bank's DSA Framework, which uses a deterministic bound test[6] approach. This framework has been criticized by Celasun et al. (2006) for methodological limitations, such as i) disregard of correlations between shocks as the joint dynamic response of the variables are relevant for debt

[6] It refers to the stress testing used in the DSA template to assess the impact of specific shocks on certain key variables.

dynamics, ii) fiscal policy is assumed not to react to the simulated economic developments, and iii) in an uncertain world, each bound test has a near-zero probability of occurrence, and thus, cannot quantify risks properly. Berg et al. (2014) also criticised the IMF's Debt Sustainability Framework (DSF)'s methodological limitations as i) the core of the DSF is the debt threshold approach, which loses information to a simple alternative ii) the rule used for aggregating information is too conservative (predicting crisis too often), and iii) the rule is inaccurate as a predictor of debt stress. The DSA framework has also been criticised for its optimistic projection of the macroeconomy as a creditor (Goswami and Hossain, 2013, IMF, 2004, Guzman and Heymann, 2015). IMF (2011b) discusses the scope of improvement for IMF's current DSF.

The government's fiscal behaviour can be characterised by the fiscal objectives and constraints that shape the fiscal policy decision-making process. One way is to look at the relationship between primary balance (key operating target) and objectives of fiscal policy[7] (such as stabilisation of output and maintaining debt sustainability) (Callen et al., 2003). Such rules are well established in the monetary policy analysis but are less established for fiscal policy, especially for less developed countries. This paper draws on three model-based sustainability tests- i) a constant parameter model-based fiscal sustainability test with Bohn (1998) framework, ii) a 2-state regime-switching model (sustainable regime with positive feedback to the debt-GDP ratio and unsustainable regime with insignificant or negative response to the debt-GDP ratio) (Aldama and Creel, 2020), and iii) a time-varying parameter model (allows variation of the coefficient of the debt-GDP ratio across the sample period) (Nguyen et al., 2017). The paper provides empirical evidence of the government's fiscal response in the context of fiscal policy objectives and macroeconomic developments.

[7] The objective of fiscal policy in Bangladesh is to ensure macroeconomic stability and foster a high growth. The stabilisation of output and debt sustainability are important indicators for macroeconomic stability and growth.

3 Theoretical framework and data

3.1 Theoretical framework

The fiscal reaction function can be derived from equation (3):

$$pb_t = (\frac{r-g}{1+g})d_{t-1} - \ \Delta d_t$$

$$= \ \beta * d_{t-1} - \ \zeta * Z_t + \ \epsilon_t \qquad (4)$$

where, Z_t are fiscal and macroeconomic variables that contribute to the rising debt (Δd_t), $\epsilon_t \sim i.i.d(0, \sigma_\epsilon^2)$.

When the government's fiscal policy and macroeconomic objectives affect the debt, the relationship between the primary balance (a key operating target) and fiscal policy objectives (such as output stabilisation and debt sustainability) can be modelled through an explicit fiscal reaction function. This captures the systematic fiscal response through primary surplus to current economic conditions (business cycle) and solvency concerns, reflected by the positive impact of the outstanding public debt and other factors that affect the government's fiscal response. The positive relationship between primary balance and debt is sufficient to revert the debt-GDP ratio to a steady state if other determinants of fiscal policy are stationary (Bohn, 1998).

3.2 Data

Annual data from 1983 to 2022 are used for this study on the grounds of availability and consistency with the fiscal institutional process as fiscal policy is declared and executed once a year. Data were primarily collected from the IMF-World Economic Outlook database. Government revenue data that are taken from IMF-WEO were aligned by including grant data from FD-MOF before 1990. Government interest payments before 1990 are taken from the Finance Division (FD)- Ministry of Finance (MOF) and are used to calculate the primary balance. Government debt data before 2002 are taken from the IMF historical debt database and adjusted to IMF-WEO data using the common base year 1995-96. Total government debt data are segregated into external and domestic debt based on the external debt from the External Resources Division (ERD), MOF. Terms of trade data were collected from the IMF-commodity database and

exchange rate data from the Bruegel database. Other data are taken from the Bangladesh Bureau of Statistics (BBS), and Bangladesh Bank (BB). Nominal data are deflated with the GDP deflator at the 2016 constant price. Detailed data descriptions and sources, descriptive statistics, and data properties are shown in Table A1, A2 and Figure A1 respectively.

Temporary government expenditure, $Gtemp_t = (\frac{gexp_t - gexp_t^*}{y_t}) * 100$, where $gexp_t$ is the government's primary expenditure, $gexp_t^*$ is the primary expenditure trend, and the output gap, $Ygap_t = (1 - \frac{y_t}{y_t^*}) * (\frac{gexp_t}{y_t}) * 100$, where y_t is the GDP and y_t^* is the GDP trend. Gtemp and Ygap are calculated according to Barro (1986) and Barro (1979). The output gap is calculated an economic downturn context when actual output falls below its long-term trend. The trend and cyclical component of the output gap, temporary government spending, and terms of trade gap were constructed using the HP filter. Following Ravn and Uhlig (2002) the HP filter parameter is adjusted with the 4th power of the observation frequency ratios to yield an HP parameter value of 6.25 for annual data. To circumvent endpoint biases of the HP filter, the data were projected till 2027 using ARIMA models, filtered data to trend and cyclical components and then dropped the last 5 observations.

Three formal unit root tests (Augmented Dickey-Fuller (ADF), Phillips Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests) are conducted after visual inspection of line graphs and correlogram of all variables. The ADF test with break shows that the primary balance has a unit root with a break in 1989. The PP test also found a unit root in the primary balance while the KPSS test did not find any evidence of unit root. The government debt was found nonstationary with ADF and PP tests, however, the KPSS test did not find any evidence of unit root in the government debt. Details about the unit root tests are shown in Table A3. EViews 13.0 software has been used in data processing and estimating results.

4 Constant parameter fiscal reaction function

4.1 Model specification

Following Bohn (1998) and Callen et al. (2003), the fiscal reaction function includes a range of determinants believed to affect the primary surplus to model the government's fiscal behaviour. The function shows how the government responds (through primary balance) to the output gap, temporary government spending, debt level, and other macroeconomic variables.

The paper estimates the baseline fiscal reaction function in line with equation (4) as follows:

$$pb_t = \alpha + \beta * d_{t-1} + \gamma_1 * Gtemp_t + \gamma_2 * Ygap_t + \theta * \acute{X}_t + e_t \qquad (5)$$

where pb_t denotes primary surplus to GDP ratio at time t, d_{t-1} is one period lag of government debt-GDP ratio, $Gtemp$ is temporary government spending, $Ygap_t$ is the output gap, $X_t$are other economic, policy and institutional variables of interest, such as revenue-GDP ratio as a proxy for the capacity of fiscal institutions, government's interest payments, domestic inflation as the government often resorts to the central bank for budget financing, external loan disbursement as a proxy for financing constraints, trade-weighted real effective exchange rate, terms of trade gap as Bangladesh is a supply chain economy that imports a lot for its garments industries and exports to the rest of the world, and current account balance as the government relies on foreign financing to meet the budget deficit.

The paper focuses on the primary surplus to capture both the automatic and discretionary responses of fiscal policy to the business cycle. A one-period lag of the debt-GDP ratio is used as an internal instrument instead of the contemporaneous debt-GDP ratio to prevent the reverse causality from primary surplus to Debt/GDP. As macroeconomic stability is one of the major objectives of fiscal policy, the output gap has been included in the model although empirical literature finds that fiscal policy is procyclical in developing countries (Ilzetzki and Vegh, 2008, Perotti, 2007). Estimating equation 5 directly would generate problems of endogeneity and autocorrelations as it is highly likely that fiscal policy drivers are not independent across time. This lack of independence may come from political preference, demographics, military expenditure, or any other omitted drivers

of fiscal policy. This persistence would result in a driving process e_t, which is correlated with the right-hand side variables, such as debt and output (Plödt and Reicher, 2015). To address this persistence of the error term, it is assumed that e_t follows an AR (1) process with a persistent coefficient ρ. Therefore, equation (5) has been rewritten as follows:

$$pb_t = \alpha + \beta * d_{t-1} + \gamma_1 * Gtemp_t + \gamma_2 * Ygap_t + \theta * \acute{X}_t + \rho * e_{t-1} + \varepsilon_t \quad (6)$$

As sustainable debt is also an objective of fiscal policy, equation 7 includes an interaction term between the debt level and output gap as a trade-off between stabilising the economy and stabilising debt.

$$pb_t = \alpha + \beta * d_{t-1} + \gamma_1 * Gtemp_t + \gamma_2 * Ygap_t + \gamma_3 * d_{t-1} * Ygap_t + \theta * \acute{X}_t + \rho * e_{t-1} + \varepsilon_t \quad (7)$$

A positive coefficient of β indicates a rise in the debt-GDP ratio prompts the government to increase the primary surplus, which in turn reduces the debt-GDP ratio. γ_1 should be negative as when the government's temporary expenditure rises, the primary surplus falls. γ_2 should be negative as when the output goes below its potential, the primary surplus will go down. The coefficient γ_3 should be positive as the counter-cyclicality of the appropriate fiscal stance decreases at a high level of debt (Fournier and Lieberknecht, 2020).

The government may not always show linear responses to the rising debt, which could be nonlinear given the fiscal constraints encountered by the authority. Therefore, nonlinear fiscal reaction functions are also estimated with the polynomial function of the public debt-GDP ratio.

$$pb_t = \alpha + \beta_1 * d_{t-1} + \beta_2 * d_{t-1}^2 + \gamma_1 * Gtemp_t + \gamma_2 * Ygap_t + \theta * \acute{X}_t + \rho * e_{t-1} + \varepsilon_t \quad (8)$$

Ghosh et al. (2013) find that the primary balance increases with rising debt levels, but the responsiveness eventually weakens and decreases at a high level of debt, which is called fiscal fatigue. To consider this fiscal fatigue, Equation 9 estimates a 'kinked' response of the fiscal policy that considers only when the debt-GDP ratio goes above the sample average.

$$pb_t = \alpha + \beta * d_{t-1} + \beta_2 * max\left(d_{t-1} - \bar{d}, 0\right) + \gamma_1 * Gtemp_t + \gamma_2 * Ygap_t + \theta * \acute{X}_t + \rho * e_{t-1} + \varepsilon_t \quad (9)$$

4.2 Results

Table 1 estimates the constant parameter fiscal reaction functions as discussed in section 4.1. The baseline model has been estimated in line with the fiscal objective of maintaining macroeconomic

stability and fiscal sustainability. The model shows the government's response (through primary surplus) to the rising debt-GDP ratio, temporary government expenditure and output gap. A dummy[8] variable has been used as a sign of structural shift in 1989 as demonstrated by the unit root test, which has been found significant in all models.

Table 1 Determinants of Primary Surplus

Dependant variable	*Primary surplus (% of GDP)*										
Model	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***
Constant	-3.00*	-1.82	-2.82	0.18	-2.77	-2.29	-3.10	-3.45	16.43	-3.02	-2.77
	(1.68)	(1.75)	(1.77)	(5.98)	(1.96)	(1.77)	(1.63)	(2.00)	(9.10)	(1.70)	(1.75)
Lagged debt d_{t-1}	0.05	0.054	0.05	-0.12	0.045	0.06	0.05	0.05	0.04	0.05	0.05
	(.05)	(0.042)	(0.05)	(.30)	(0.057)	(0.04)	(0.04)	(0.05)	(0.04)	(.05)	(.05)
d_{t-1}^2				0.002							
				(.004)							
d_K					0.032						
Max $(0, d_t - \bar{d})$					(0.059)						
Temp Govt Exp. (Gtemp)	-0.70***	-0.73***	-0.68***	-0.74***	-0.72***	-0.74***	-0.76***	-0.73***	-0.72***	-0.71***	-0.64***
	(0.23)	(.23)	(0.26)	(0. 26)	(0.24)	(0.22)	(0.24)	(0.21)	(0.21)	(0.23)	(0.23)
Output gap (Ygap)	0.72	0.18	-3.34	0.50	0.74	0.51	0.39	0.91	1.19	0.73	0.78
	(1.47)	(1.88)	(12.44)	(1.73)	(1.47)	(1.65)	(1.62)	(1.31)	(1.78)	(1.49)	(1.58)
$d_{t-1} * Ygap$			0.13								
			(0.41)								
D_Pb1989	-1.63***	-1.58***	-1.69***	-1.61***	-1.62***	-1.54***	-1.70***	-1.72***	-1.60***	-1.64***	-1.59***
	(0.29)	(0.35)	(0.35)	(0.31)	(0.29)	(0.34)	(0.30)	(0.29)	(0.30)	(0.29)	(0.29)
@trend		-.05*									
		(.02)									
Government Interest Payments (IP)						-0.77					
						(0.56)					
Domestic Inflation (d_inf)							0.05				
							(0.06)				
Foreign loan Disbursement (Fld)								0.36			
								(0.45)			
Real Effective Exchange rate (lz)									-3.93		
									(1.80)		
TOTgap										0.02	
										(0.18)	
Current Account Balance (CAB)											0.08
											(0.08)
DW statistics	1.98	1.92	1.97	1.95	2.00	1.91	1.92	1.89	1.95	1.98	2.0
Adj. R^2	0.71	0.73	0.71	0.71	0.71	0.72	0.71	0.72	0.75	0.71	0.71
Observations	40	40	40	40	40	40	40	40	40	40	40

Figures in parentheses are standard errors. '***' indicates significance level at 1%, '**' indicates significance level at 5%, '*' indicates significance level at 10%. All Models are controlled for first-order serial correlation in the residuals.

[8] A dummy was used for the global financial crisis (GFC), and it was found insignificant. The effect of the GFC was not significant for Bangladesh as the financial sector is not significantly connected to the rest of the world. A separate dummy was used for the slowdown effect of COVID-19, and it was found insignificant although COVID-19 had a significant effect on Bangladesh's economy.

In model 2, a trend component was added but other covariates remain the same. The trend component is significant only at a 10 per cent level and it does not improve the results and is thereby excluded in the subsequent models. Model 3 includes an interaction term between the debt level and the output gap to capture the government's trade-off between stabilising the economy and stabilising the debt level (Fournier and Lieberknecht, 2020). The nonlinearity of the fiscal response has been modelled through models 4-5. Models 6-7 examine the fiscal response by controlling for the government's interest payments and domestic inflation. Model 8 controls foreign loan disbursement, a typical financial constraint encountered by the fiscal authority in developing countries (Baum et al., 2017). Models 9-11 examine the government's fiscal responses by controlling for trade-weighted real effective exchange rates, terms of trade gap and the current account balance respectively.

Model 1 shows that primary surplus does not respond to the debt-GDP ratio and output gap significantly as the t-statistics are low. The insignificant coefficient of the debt-GDP ratio indicates that fiscal policy does not respond to the rising debt level during the sample period. The insignificant coefficient of the output gap indicates that fiscal policy does not function as a counter-cyclical (stabilisation) tool in Bangladesh, which can be explained by the procyclical fiscal policy pursued in developing countries where the fiscal authority increases the public expenditure during the boom and shrink the expenditure during bad time and worsen the situation (Perotti, 2007). Empirical literature, such as Beyer and Milivojevic (2021) and Hussain and Hossain (2020) also find that fiscal policy is procyclical, which amplifies boom and bust cycles in Bangladesh. Callen et al. (2003) observe that emerging countries only with better institutional quality pursue more countercyclical policy (ability to control expenditure and revenue). The model also finds that the primary surplus declines significantly in response to *temporary* government spending. For 1 per cent increase in temporary spending reduces the primary surplus by 0.7 per cent. Temporary government expenditure plays a significant role in fiscal policy, highlighting the inherent constraints faced by the authorities in implementing fiscal policy. The constraints may come from the weak capacity of revenue mobilisation and inefficiency in the budget execution. The government often controls expenditures when government revenue cannot reach the target (Hussain and Hossain, 2020). Further, the disbursement of the foreign loan also plays a role here,

if the disbursement is delayed, then the government often retracts the preplanned expenditure. Therefore, a significant gap often exists between the declared budget and the executed budget (Byron and Mahmud, 2022).

Model 3 includes an interaction term between the debt level and the output gap to capture the government's trade-off between stabilising the economy and stabilising debt although both are individually insignificant. As both the debt coefficient and output gap coefficient are insignificant, the interaction term is also found insignificant. Ideally, the countercyclicality of the appropriate fiscal stance decreases at high debt levels (Fournier and Lieberknecht, 2020).

When the debt-GDP ratio rises, the government might increase its fiscal effort to contain the debt, however, when it rises sharply, the government might show a sign of fatigue by not allocating a higher primary surplus. The nonlinearity of the fiscal response has been modelled through models 4-5. In model 4, the square of the debt-GDP ratio is included in addition to the debt-GDP ratio to see whether fiscal policy shows any nonlinear response to the increased debt-GDP ratio. The coefficient of the square of the debt-GDP ratio is found insignificant. The insignificant coefficient of the square term of the debt/GDP ratio is expected because the coefficient of the single debt-GDP term is also insignificant. It is unrealistic to assume that a government with low institutional capacity would respond to sharply rising debt by raising taxes or reducing government expenditure. Ghosh et al. (2013) find that even advanced economies encounter difficulties in raising taxes or cutting non-interest expenditures at high levels of debt. Model 5 estimates a kinked version of the fiscal reaction function by considering only when the debt-GDP ratio crosses the sample mean. The response is insignificant, which is expected because fiscal policy does not respond to debt at normal times. When the debt level goes beyond the sample average, the fiscal authority might feel a stress situation and is unlikely to respond to the debt level. Callen et al. (2003) find that the response of primary surplus weakens as the debt-GDP ratio rises in emerging countries and the response stops when the debt level exceeds 50 per cent of GDP.

The government's interest payments, which almost quadrupled at the end of 2020s from the 1980s (Figure 4) are controlled in Model 6. The coefficient is found negative but insignificant, indicating that the government's interest payments do not yet significantly impact fiscal policy decisions. During the sample period, Bangladesh benefitted from concessional finance at lower interest rates, resulting in a low effective interest rate. This may explain why the government's interest payments did not significantly impact fiscal policy decisions. The government occasionally resorts to the central bank to finance the budget deficit, which increases the monetary base and money supply and could be a source of inflation that may affect the fiscal balance. Model 7 examines the impact of domestic inflation on the government's fiscal balance. The coefficient is found positive but insignificant, indicating that the government's fiscal policy was not affected by domestic inflation in the sample period. Generally, higher inflation is associated with a larger primary surplus in emerging countries whereas it is negative in industrial countries, reflecting the government's effort to contain inflation (Callen et al., 2003).

The fiscal authority in Bangladesh depends on external financing to meet the budget deficit, especially for infrastructure development. Model 8 examines the financial constraints, such as the disbursement of foreign loans encountered by the fiscal authority. The coefficient is found insignificant. This indicates that external financing constraints do not affect the fiscal balance significantly. The share of foreign financing has been reduced drastically over the years and foreign financing has also become somewhat exogenous to the government as its disbursement is tied to the execution of government projects. Further, the government often makes up external financing with nonbank borrowing, especially through national saving certificates. This could be the reason for the insignificant response of the primary surplus to external finance. Model 9 examines government fiscal response while controlling for the trade-weighted real effective exchange rate. The coefficient of the trade-weighted real effective exchange rate is found insignificant. Due to heavy intervention by the central bank in the foreign exchange market, the exchange rate is controlled. This may explain why the coefficient of the exchange rate is not significant.

Model 10 examines whether the terms of trade influence the fiscal balance as the government earns a significant amount of revenue from import duty[9]. Unfavourable terms of trade reduce exports, which affects import volume and import duty is affected. The coefficient is found insignificant, which indicates that terms of trade do not affect the government's fiscal decisions significantly. In a deficit-biased fiscal policy, the budget deficits are either funded by domestic savings or external financing, therefore, the current account balance could affect the government's fiscal decisions, which is considered in Model 11. The coefficient is found insignificant, which indicates that the current account balance does not affect the fiscal decision of the government. The reason could be that the government takes external financing mainly for project financing not operating expenditure (consumption expenditure).

In all models, temporary government spending significantly affects the fiscal policy decision whereas the output gap and debt/GDP ratio do not affect the fiscal policy decisions. Temporary government spending dictates fiscal policy, indicating ineffective fiscal planning. This is evident from the significant gap between budget targets and budget implementation. The government's budget implementation rate ranges between 80-85 per cent of the declared budget from 2009 onwards (Byron and Mahmud, 2022). This raises the question about the fiscal objectives of the government, particularly its emphasis on macroeconomic stability. Since fiscal policy does not stabilise output, the government tends to spend more when the economy is strong and less when it is weak, which undermines macroeconomic stability. No model shows positive significant feedback on the debt-GDP ratio, which indicates that the government's debt is not sustainable as Bohn (1998) suggests that the fiscal authority must demonstrate a positive response to the increasing debt as a measure of fiscal sustainability.

[9] 12.83 percent of the total revenue came from Import duty in FY23. MOF 2023. Medium Term Macroeconomic Policy Statement 2023-24 to 2025-26. *In:* MACROECONOMIC WING, F. D., MINISTRY OF FINANCE (ed.). Dhaka: Finance Division, Ministry of Finance.

The response of the primary balance to domestic and foreign debt is also analysed separately (Table 2) to assess if the government responds differently to domestic or foreign debt. Model 1 replaces total government debt with domestic debt and foreign debt. Models 2-4 examine the response of primary balance to domestic and foreign debt separately by controlling government revenue, government interest payments and domestic inflation respectively. Models 5-8 examine the response of the primary balance to the rising debt by controlling foreign loan disbursements, trade-weighted real effective exchange rate, terms of trade gap, and current account balance respectively.

Table 2 Fiscal response to domestic debt and foreign debt

Dependant variable	*Primary surplus (% of GDP)*							
Model	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Constant	-2.87	-9.97	-2.18	-3.08	-3.68	22.09	-2.88	-2.60
	(1.99)	(0.92)	(2.01)	(1.91)	(1.89)	(15.40)	(2.00)	(1.98)
Domestic debt d_{t-1}^{d}	0.07	0.002	0.07	0.05	0.03	0.08*	0.07	.06
	(.05)	(0.003)	(.06)	(0.05)	(0.06)	(0.04)	(0.05)	(.06)
Foreign debt (d_{t-1}^{e})	0.03	0.0006	0.05	0.05	0.07	-0.01	0.03	0.03
	(0.08)	(0.002)	(0.06)	(0.08)	(0.06)	(0.09)	(0.09)	(.09)
Temp Govt Exp. (Gtemp)	-0.70***	-1.01**	-0.74***	-0.76***	-0.75***	-0.71***	-0.71***	-0.63***
	(0.22)	(.006)	(0. 22)	(0.24)	(0.23)	(0.18)	(0.22)	(0.22)
Output gap (Ygap)	0.62	-1.06	0.48	0.39	0.99	1.14	0.64	0.68
	(1.51)	(0.025)	(1.65)	(1.62)	(1.31)	(1.67)	(1.52)	(1.71)
D_Pb1989	-1.59***		-1.50***	-1.69***	-1.80***	-1.46***	-1.59***	-1.53***
	(0.33)		(0.36)	(0.36)	(0.32)	(0.36)	(0.35)	(0.35)
Govt revenue (GR_y)		0.99***						
		(.004)						
Government Interest Payments (IP)			-0.86					
			(0.82)					
Domestic Inflation (d_Inf)				0.05				
				(0.06)				
Foreign loan disbursement (Fld)					0.41			
					(0.42)			
Real Effective exchange rate (lz)						-5.03*		
						(2.90)		
TOTgap							0.02	
							(0.18)	
Current Account Balance (CAB)								0.08
								(0.10)
DW statistics	1.93	1.88	1.97	1.92	1.93	1.86	1.94	1.95
Adj. R^2	0.71	0.99	0.71	0.70	0.71	0.76	0.70	0.71
Observations	40	40	40	40	40	40	40	40

Figures in parentheses are standard errors. '***' indicates significance level at 1%, '**' indicates significance level at 5%, '*' indicates significance level at 10%. All Models except model 2 are controlled for first-order serial correlation in the residuals. Model 2 is controlled for 4th-order serial correlation in the residuals.

Model 1 shows that the primary balance does neither respond to the rising domestic debt nor to the rising foreign debt during the sample period as the respective coefficients are insignificant.

Temporary government spending negatively affects the primary surplus while the output gap does not affect it. The model also finds a structural break in the year 1989 significant as the baseline model. The primary balance also remains unresponsive to the domestic and foreign debt while government revenue is controlled (Model 2). The model also shows that increasing government revenue positively affects the primary balance almost one-to-one (a 1 % increase in government revenue causes the primary surplus to increase by 0.99 %). Model 3 shows that the primary surplus does not respond to domestic debt or foreign debt when the government's interest payments are controlled. Model 4 shows that the primary surplus does not respond to domestic debt or foreign debt while domestic inflation is controlled.

Model 5 shows that the primary surplus does not respond to the increasing foreign debt or domestic debt as the respective coefficients are insignificant when foreign loan disbursements are controlled explicitly. The primary surplus weakly responds to the rising domestic debt but does not respond to the rising foreign debt while the trade-weighted real effective exchange rate is controlled (Model 6). The coefficient of the trade-weighted real exchange rate is -5.02 and it is significant at a 10 per cent level. This indicates 1 per cent appreciation of the domestic currency reduces the primary surplus by 5.02 per cent. When the domestic currency appreciates, it negatively impacts exports, causing the government to lose revenue due to the decline in exports. Model 7 shows that the primary balance does not respond to the debt when the terms-of-trade gap is controlled. Model 8 shows that fiscal response remains unresponsive to the growing debt while controlling the current account balance. The analysis based on the segregation of total debt into domestic and foreign shows that the result is consistent with the baseline model as the primary surplus does not respond to either domestic debt or foreign debt in most cases. The primary surplus weakly responds to the domestic debt when the trade-weighted real effective exchange rate is controlled, as the coefficient is significant at only a 10 per cent level.

5 Regime switching fiscal reaction function

5.1 Model specification

Since independence in 1971, various governments adopted different fiscal measures, driven partly by necessity and partly by imprudence or short-sightedness (Dilruba, 2021). Therefore, the relationship

between primary surplus and debt might not be always constant. Empirical data shows that the primary balance shows a positive response to the rising debt in some years, but it does not show the same in other years in Bangladesh (Figure 2). The estimation of nonlinear fiscal reaction functions with constant parameters is subject to biases in the presence of structural breaks or regime changes as found by Favero and Monacelli (2005), Davig et al. (2006), and Bianchi (2013). They produced evidence that fiscal rules may be described better by different fiscal regimes where fiscal policy might not stabilise public debt in one regime, but it might stabilise debt in another regime. They show that fiscal policy could be locally (periodic) unsustainable with a periodic explosive debt-GDP ratio but could be globally (long) sustainable. As fiscal policies were changed across the sample period, a regime-switching model[10], which can agonistically accommodate the hidden structural shifts in the data, was deployed to capture the fiscal behaviour of different regimes.

Following Aldama and Creel (2020), a regime switch fiscal sustainability model is defined for Bangladesh:

$$ps_t = \alpha(z_t) + \beta(z_t) * d_{t-1} + \gamma_g(z_t) * Gtemp_t + \gamma_y(z_t) * Ygap_t + \sigma(z_t)\varepsilon_t^s \qquad (10)$$

$\alpha(z_t)$ is a regime-switching constant, regime-switching parameter $\beta(z_t)$ represents the feedback effect of the initial debt-GDP ratio, d_{t-1} on the primary surplus conditional on two discrete fiscal regimes (z_t) as defined:

$$\beta(z_t) = \begin{cases} \beta_s > 0 & \text{if } z_t = 1\ (Sustainable\ regime) \\ \beta_{ns} \leq 0 & \text{if } z_t = 0\ (Unsustainable\ regime) \end{cases}$$

$\gamma_g(z_t)$ and $\gamma_y(z_t)$ are regime-switching parameters for temporary government spending and output gap and $\sigma(z_t)$ is the regime-switching standard error associated with an i.i.d distributed shock $\varepsilon_t^s \sim N(0,1)$. Long-run estimates of the parameters are estimated from the regime switch parameter estimates and their respective ergodic (long-run) probabilities as follows: $\beta = \pi_s * \beta_s + \pi_{ns} * \beta_{ns}$

[10] A Markov switching model represents an agnostic way of modelling regime changes in fiscal policy without any critical assumption about the drivers of regime shifts.

, where $\pi_s(\pi_{ns})$ is the ergodic probability of a sustainable (unsustainable) regime and $\beta_s(\beta_{ns})$ is the parameter associated with a sustainable (unsustainable) regime. The ergodic probabilities are defined as follows: $\pi_i = \frac{1-P_{jj}}{(1-P_{jj})+(1-P_{ii})}$ for all (i, j) ∈ (0, 1) and P_{ij} is the transition probability from state i to state j. The standard deviation of the long-run estimated coefficient is computed as follows: $\sigma_\beta = \sqrt{(\pi_s * \sigma_{\beta s})^2 + (\pi_{ns} * \sigma_{\beta ns})^2 + 2Cov(\beta_s, \beta_{ns})}$, where covariance between the two regimes, $Cov(\beta_s, \beta_{ns})$ is assumed zero, as they are mutually exclusive, i.e. cannot occur at the same time.

Aldama and Creel (2020) proposed and tested analogous conditions on a regime-switching fiscal rule such that NPG and debt-stabilising conditions hold in the long run. They derived a sufficient condition for a regime-switching fiscal policy that satisfies the NPG condition. The condition is the coefficient of the debt-GDP ratio, $\beta > 0$, which is an unconditional expectation of β given by $\pi_s * \beta_s + \pi_{ns} * \beta_{ns}$. This condition is equivalent to: $\beta_s > |\beta_{ns}| \frac{d_{ns}}{d_s}$, where $d_i = \frac{1}{1-P_{ii}}$ is the expected duration of regime i. This suggests that a regime-switching fiscal policy must satisfy the NPG conditions on average. The longer the unsustainable regime is, the larger the primary surplus required to stabilise the debt. This implies that fiscal policy can be periodically unsustainable if it satisfies present-value budget conditions.

As the NPG conditions do not impose any stationary restrictions on the debt-GDP ratio, if the debt-GDP ratio is ever increasing, a stronger constraint on fiscal policy is required to stabilise the debt. Aldama and Creel (2020) proposed a sufficient (stricter) condition for the debt-GDP ratio in such cases: $\beta\pi > \frac{r-g}{1+g}$, which can be expressed in terms of the expected durations of the regime as follows: $\beta_s > |\beta_{ns}| \frac{d_{ns}}{d_s} + \frac{r-g}{1+g} * \frac{d_{ns}+d_s}{d_s}$, where r and g are long-run averages of real interest rate and real GDP growth. This states that if the growth-adjusted real interest rate ($\frac{r-g}{1+g}$) is positive, a debt stabilising condition is stricter than the NPG condition.

5.2 Results

Table 3 estimates the 2-state regime-switching fiscal reaction function with the sample from 1983 to 2022. In regime 1, the primary surplus positively responds to the debt/GDP (significant at 10 per cent). For a one per cent rise in the debt, the primary surplus increases by 0.04 per cent. The positive fiscal response of the primary surplus to the increasing debt-GDP ratio demonstrates the government's intention to bring back the debt level to a lower level by running a primary surplus. Therefore, the fiscal policy is sustainable in Regime 1. While Regime 2 estimates a positive response of primary surplus to the debt-GDP ratio, the coefficient is insignificant, indicating that fiscal policy does not respond to the increasing debt-GDP in Regime 2. Therefore, regime 2 is called an unsustainable regime. The sustainable regime is more persistent than the unsustainable regime as the duration of the sustainable regime is approximately 6.21 years while the unsustainable regime is 4.98 years on average. Temporary government spending negatively affects the fiscal policy in both regimes.

Table 3 Estimated Markov-Switching Fiscal Rule for Bangladesh (1983-2022)

Dependant variable	*Primary surplus (% of GDP)*		
Regime-switching parameters	Regime 1	Regime 2	Long run estimate
c	-3.97	*-3.83*	*-3.91*
	(5.82)	*(0.88)*	*(4.11)*
d_{t-1}	0.04*	*0.01*	*0.03*
	(0.02)	*(0.03)*	*(0.02)*
Temporary govt. spending (Gtemp)	-0.69***	*-0.84****	*-0.76****
	(0.13)	*(0.09)*	*(0.08)*
Regime-invariant parameter			
Dummy for the year 1989, D_PB1989		*-2.03****	
		(0.34)	
Persistence, ρ (coeff. of *AR (1))*		*0.97****	
		(0.08)	
Standard error (σ)		*0.30****	
		(1.22)	
Regime Properties	*Regime Probabilities*	*Ergodic Probabilities*	*Expected Duration*
i=1	*0.84*	*0.55*	*6.21*
i=2	*0.80*	*0.44*	*4.98*
Durbin-Watson statistic	*1.97*	*Observations*	*40*

The Regime switching model has been estimated without an output gap (Ygap) as it is found insignificant. Huber-White robust standard errors are in parentheses. '***' indicates significance level at 1%, '**' indicates significance level at 5%, '*' indicates significance level at 10%. Regime invariant first-order serial correlation is controlled in the residual.

The model finds three episodes (1983-1988, 1996-2001 and 2015-2020) of fiscal unsustainability with an 80 per cent probability when the government's fiscal response to the increasing debt-GDP

is insignificant (Figure 6). The findings of the regime-switching model have been analysed within the context of Bangladesh's evolving macroeconomic environment.

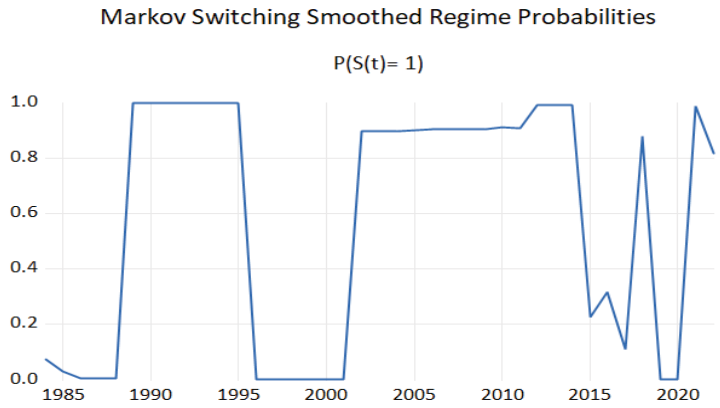


Figure 6 Estimated sustainable fiscal regimes, Bangladesh (1983-2022)

The first unsustainable regime (1983-1988) was marked by military regimes with unstable political systems characterised by political protests (Rahman, 1990). During the 1980s, the government shifted from a state-controlled economy to a market-oriented economy with reforms for private sector development (Hassan and Salim, 2011). However, due to political uncertainty, the country experienced weaker GDP growth, averaging 3.70 per cent. During this period, the government depended on foreign loans for budget financing (Dilruba, 2021). Weaker GDP growth accompanied by weaker fiscal capacity resulted in weak revenue collection (government revenue grew at 2.84 per cent, figure 7). However, the government's interest payments grew sharply, averaging 9.92 per cent as the government was mostly dependent on foreign financing to cover the budget deficit. Higher interest payments and lower GDP growth accompanied by expansionary fiscal policy contributed to accumulating the debt level during the period.

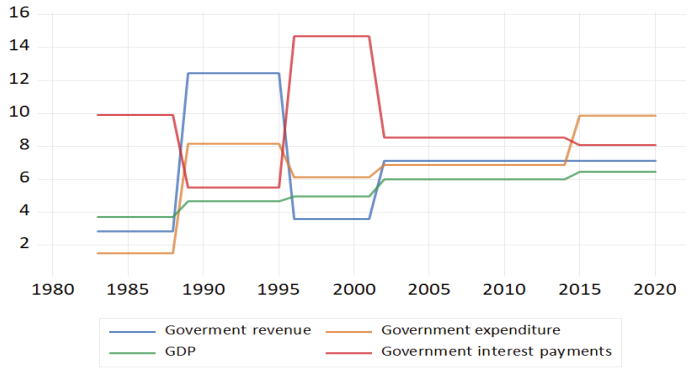


Figure 7 Average growth (%) in GDP, government's revenue, expenditure, and interest payments

The second unsustainable regime (1996-2001). The multifibre agreement in the Uruguay round of GATT ended the protection of textile industries in high-income countries, paving the way for the Bangladesh garment industry to compete in the world market (IMF, 1996, Dilruba, 2021). The country experienced a steady GDP growth, averaging 4.94 per cent during the period, although GDP growth fell significantly as a massive flood struck in July-September 1998. The government conducted an emergency flood-related assistance program that raised the government expenditure while government revenue fell due to the flood shock and subsequently raised the budget deficit (IMF, 2000). Although the government handled the economic policy deftly during the 1998 floods, monetary and fiscal policies remained expansionary and structural reform stagnated after the mid-1990s (IMF, 2002b, IMF, 1998). The lack of major economic reforms inhibited the economy from attaining its growth potential. The share of government subsidies and current transfers rose significantly as losses of nonfinancial state-owned enterprises rose sharply. With the decline of concessional foreign financing, the government relied on domestic sources, especially NSCs, which offer high interest rates, to cover the budget deficit (IMF, 1998). Consequently, the government's interest payments grew 14.67 per cent on average and nearly doubled (1.18 per cent of GDP in 2001 from 0.63 per cent of GDP in 1995) in five years. Massive interest payments accompanied by moderate GDP growth and expansionary fiscal policy resulted in the rapid accumulation of public debt.

The third unsustainable regime is from the year 2015 to 2020. This period is marked by robust GDP growth (GDP grew at an average rate of 6.46 per cent) and expansionary fiscal policy. Despite the strong GDP growth, the tax base has not expanded accordingly (the government's

Revenue GDP ratio marginally increased to 8.47 per cent in 2020 from 8.21 per cent in 2015). The Value Added Tax (VAT) and Supplementary Duty (SD) Act, 2012, which was enacted under the IMF Extended Credit Facility (ECF) arrangement, and implemented on 1 July 2020 onwards has not been successful in enhancing domestic revenue with lower preferential VAT rates applied to many items (IMF, 2020b). Despite a low tax base, the government pursued an expansionary fiscal policy (the average revenue growth was 7.11 per cent while the average primary expenditure growth was 9.87 per cent) and government investment rose significantly with major investment in mega infrastructure projects including the Padma Bridge and Rooppur Nuclear power plant. The major infrastructure projects were financed from emerging market economies (China, Russia, India) at significantly higher interest rates than the traditional concessional loan (Bhattacharya and Ashraf, 2018). The cost of external financing also rose following Bangladesh's graduation to a lower-middle country in 2015. During the period, domestic financing was mostly sourced from the sales of NSCs, which offered significantly higher interest rates than the market rate (IMF, 2018a). Consequently, the government's interest payments increased significantly, averaging 9.87 per cent during this time. This period also includes the COVID-19 economic shock when the GDP growth plummeted to 3.45 per cent. The government implemented a stimulus package worth 3.6 per cent of GDP to stimulate the economy during the shock period. Most of the packages were composed of bank loans with support from Bangladesh Bank's refinancing schemes, which also increased the government's budget deficit and contributed to the accumulation of the debt stock (IMF, 2020b).

The regime-switching model finds the period 1989-1995 as sustainable the coefficient of debt-GDP coefficient is positive with 84 per cent probability. The period (1989-1995) is marked by the end of the military regime and transition to the democratic regime. Prudent macroeconomic policies and a strong drive for structural reforms (in financial, fiscal and external sectors) in the context of successive IMF Structural Adjustment Facility (SAF) and Enhanced Structural Adjustment Facility (ESAF) arrangements resulted in robust output and export growth before the mid-1990s (IMF, 2002b, IMF, 1998). The introduction of Value Added Tax (VAT) law in 1991 significantly improved the government's tax base (the tax-GDP ratio rose to 10.09 per cent of GDP

in 1995 from 5.29 in 1989). During the period, financing the overall budget deficit was mostly met from foreign grants (mainly food and commodity aid) and foreign borrowing, which was highly concessional, in the form of project aid. Foreign financing accounted for more than 80 per cent of the total financing in the early 1990s (IMF, 1998). The government's fiscal position improved during this period, contributing to a decline in the debt level from 1994 onwards.

The regime-switching model also finds the period 2002-2014 as sustainable since the debt-GDP coefficient is significant and positive with 84 per cent probability. Despite global uncertainties[11], the country experienced robust GDP growth, averaging 5.99 per cent over this period. This was bolstered by the easing of infrastructural bottlenecks, particularly in power generation, and aided by accommodative policies (IMF, 2011a). The rapid expansion of the Ready-Made Garment (RMG) industry and strong domestic demand backed by the inflow of foreign remittance contributed to the robust growth (Bangladesh's export share in the world market doubled between 1995 and 2012) (World_Bank, 2015, IMF, 2019). Prudent Macroeconomic Policies and Structural Reforms under the IMF Extended Credit Facility (ECF) also helped to steer the economy through domestic and global challenges except for revenue performance (IMF, 2015). While the fiscal stance was broadly prudent, the pace of structural fiscal reform was not as expected (IMF, 2005). Due to a lack of major reforms, the tax base has not expanded in proportion to GDP growth. The revenue-GDP ratio increased from 8.02 per cent in 2002 to 9.13 per cent of GDP in 2014. Foreign financing decreased considerably during the period, leading the government to rely on domestic finance, particularly through NSCs, to cover the budget deficit. As a result, government interest payments grew steadily, averaging 8.53 per cent during the period. However, consistent GDP growth of nearly 6 per cent over 11 years helped reduce the debt stock during this period.

[11] Bangladesh's economy was not significantly affected by the global financial crisis due to its limited financial integration with the rest of the world.

The ergodic (long-run) probabilities are calculated from the estimated short-run probabilities of the two regimes. The long-run estimate of the debt coefficient and its standard deviation are calculated according to Aldama and Creel (2020) as described in section 5.1. The estimate of the long-run coefficient has been found insignificant (Table 3), which indicates that the null hypothesis of fiscal unsustainability in the long run cannot be rejected. The coefficient of long-run estimates depends on the duration of the respective regimes (sustainable and unsustainable) and the extent of the fiscal response. It may not be realistic for the government to always maintain stable debt by running a primary surplus to the increasing debt. However, the longer the duration of the unsustainable regime is, the larger primary surplus is required to stabilise the debt. Since the persistence of an unsustainable regime is 5 years long, a stronger fiscal response is required to make the debt sustainable in the long run.

The insignificance of the debt coefficient, in the long run, can also be explained by the extent of fiscal reform measures undertaken during the sample period while the government persistently ran expansionary fiscal policy. Out of 5 periods, only in 1989-1995, the country experienced significant fiscal reform by introducing the VAT law that expanded the tax base. Continuing fiscal reforms were essential to expanding the tax base of a growing economy. However, the government continued expansionary fiscal policy while the structural reform agenda stagnated after the mid-1990s (IMF, 2002b, IMF, 1998). Like other emerging economies, Bangladesh experienced robust economic growth during the 2000s, riding on its RMG industry and remittances (World_Bank, 2015). Higher GDP growth allowed the government to run an expansionary fiscal policy without pursuing major fiscal reforms. The attempted fiscal reform measures by implementing the VAT and SD Act 2012 from FY 2020 onwards could not expand the tax base due to lower preferential VAT rates applied to many items (IMF, 2020a). Therefore, Bangladesh's tax-GDP ratio remained one of the lowest in the world despite significant progress and economic development over the years. The fiscal space generated by higher GDP growth has been constrained by inadequate tax revenue. These findings align with Begum and Flath (2020), who suggest that a sustainable tax rate for Bangladesh should range from 17 to 28 per cent of GDP, nearly double the current tax base. The findings also align with Hussain and Hossain (2020), who found that Bangladesh can

achieve fiscal sustainability with a constant 31 per cent debt-GDP ratio with 1.3 per cent of GDP as a primary deficit. Their findings also indicate the country's low debt-carrying capacity. However, the government debt was 37.86 per cent of GDP and the primary deficit was 2.16 per cent of GDP in FY 2022. Bhattacharya and Ashraf (2018) found that Bangladesh's debt is sustainable until FY 2026, however, they found that the external debt service to revenue ratio is significantly higher than the IMF's threshold. Although the IMF-World Bank debt sustainability analysis finds that Bangladesh's debt is sustainable, they identified several weaknesses in domestic revenue mobilisation, such as irrational tax concessions and tax avoidance (IMF, 2019).

Table 4 Long run NPG conditions and Debt stabilising conditions with Regime Switching model

Coeff (Sus regime) (β_s)	*NPG conditions* $(\lvert\beta_{ns}\rvert \frac{d_{ns}}{d_s})$	*Debt stabilising conditions.* $(\lvert\beta_{ns}\rvert \frac{d_{ns}}{d_s} + \frac{r-g}{1+g} * \frac{d_{ns}+d_s}{d_s})$
0.04088	0.00661	-0.1216

The long-run NPG conditions and debt stabilising conditions are calculated according to the formula in the first row.

Table 4 shows that the coefficient of the sustainable regime is greater than the coefficient when the NPG condition and debt stabilising condition are satisfied in the long run. This implies that the fiscal policy satisfies both NPG conditions and debt-stabilising conditions in the long run in a regime-switching setting. Generally, the debt stabilising conditions are stricter than the NPG condition when the interest rate exceeds the growth rate. However, debt stabilising conditions for Bangladesh were lower than the NPG condition due to the negative interest rate-growth differential over the sample period. The negative interest-growth differential has generated enough fiscal space to conduct persistent expansionary policy without raising debt. However, persistent expansionary fiscal policy is not sustainable with rising interest payments without expanding the tax base.

6 Time-varying parameter (TVP) model with Kalman Filter

6.1 Model Specification

As the 2-state regime switching model identifies episodes of both debt sustainability, characterised by positive feedback to the debt-GDP ratio, and unsustainability, where the response to the debt-GDP ratio is insignificant, a time-varying parameter model has been employed to examine how the coefficient of the debt-GDP ratio varies over the sample period. The model shows how the

government's fiscal response (β) to the debt-GDP ratio varies across the sample period following Nguyen et al. (2017).

In a state space framework, the Kalman filter[12] has been used to estimate the signal (observation) equation (11) and two state (transition) equations (12 & 13). The signal equation (11) estimates the response of the primary balance to the debt level and allows the coefficient of the debt-GDP ratio to be varied across the sample period. The coefficient of debt-GDP ratio has been estimated from the state equation (12) with a random walk model. The persistence of fiscal policy has been estimated with the state equation (13).

$$ps_t = \alpha + \beta_{t-1} * d_{t-1} + \gamma_1 * Gtemp_t + \gamma_2 * Ygap_t + e_t \quad (11)$$

$$\beta_{t-1} = \beta_{t-2} + \vartheta_{t-1}, \vartheta_{t-1} \sim N(0, \sigma^2) \quad (12)$$

$$e_t = \rho * e_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim N(0, \sigma^2) \quad (13)$$

The residual terms ε_t and ϑ_t are assumed to be serially independent with contemporaneous variance structure: $\Omega_t = var[\, \varepsilon_t \, \vartheta_t]' = \begin{bmatrix} H_t & G_t \\ G_t' & Q_t \end{bmatrix}$ where H_t is an $m \times m$ symmetric variance matrix, Q_t is an $n \times n$ symmetric variance matrix, and G_t is an $m \times n$ matrix of covariances. Details about the Kalman filter in estimating the time-varying fiscal reaction function have been discussed by Nguyen et al. (2017).

6.2 Results

The results of the time-varying parameter model are summarised in Table 5. The coefficient of temporary government expenditure is -0.77, which is significant at a 5 per cent level. This indicates that for a 1 per cent increase in the government's temporary spending, the primary balance falls by 0.77 per cent.

[12] Kalman filter is a recursive algorithm for sequentially updating the one-step-ahead estimate of the state mean and variance given new information.

Table 5 Parameter estimates of the Time-varying parameter model

	Estimate	*Standard Error*	*t-Statistics*	*Probability*
Constant	*-6.19*	*15.59*	*-0.39*	*0.69*
Gtemp	*-0.77*	*0.15*	*-5.18*	*0.00*
log (σ_ε^2)	*-8.01*	*0.42*	*-18.95*	*0.00*
log (σ_ϑ^2)	*-23.15*	*26.08*	*-0.89*	*0.37*
Persistence, ρ	*0.98*	*0.05*	*18.27*	*0.00*

The output gap (Ygap) has been removed from the estimation as it is found insignificant. To ensure that the variance of ε (σ_ε^2) and variance of ϑ (σ_ϑ^2) are positive, they are defined as $\sigma_\varepsilon^2 = \exp(estimated\ coeff)$ = exp (-8.01) = 0.0769 and $\sigma_\vartheta^2 =$ exp $(estimated\ coeff)$= exp (-23.15)=0.0002.

Figure 8 plots the time-varying coefficient of β_{t-1}, with the dashed lines signifying the 95% confidence interval. The figure shows a significant variation of the debt-GDP coefficient across the sample period. The point estimates show that the coefficient is 0.05 (on average) with a maximum of 0.08 and a minimum of 0.02 over the sample period. The model estimates that the debt-GDP coefficient was significantly positive during 1990-1995 and 2006-2014, meaning that fiscal policy responded to the rising debt during this time. The debt-GDP coefficient was insignificant during 1983-1989, 1996-2002, and 2015-2021, meaning that fiscal policy did not respond to the rising debt. If the government does not respond to the increasing debt persistently, the debt level is bound to rise and can become unsustainable.

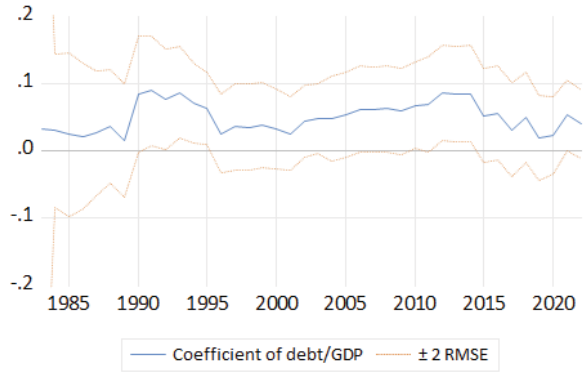


Figure 8 Time-varying parameter estimates of $\widehat{\beta}_{t-1}$

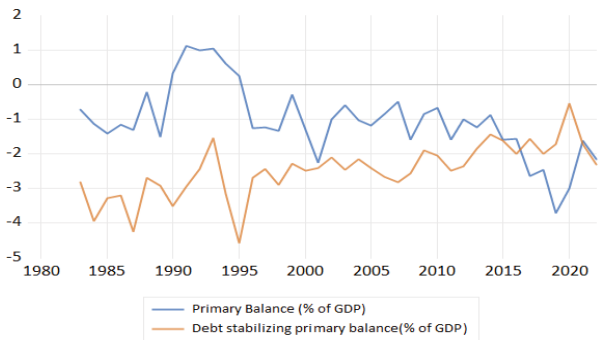


Figure 9 Primary balance versus debt stabilising primary balance

Figure 9 shows the debt-stabilising primary balance (DSPB), which was calculated from equation 3 (the government intertemporal budget constraint), and the actual primary balance. If the actual primary balance is lower than the DSPB, government debt will increase and if it is higher than DSPB, the debt level will decrease. The TVP model estimates a positive coefficient of debt-GDP when the actual primary balance is significantly higher than the DSPB except in 1983-1989, when the country experienced lower growth and the fiscal structure was weak, characterised by high and uneven tariffs, various excises taxes and narrow corporate and personal income taxes (IMF, 1998).

7 Comparison of results with different models

The constant parameter model indicates that fiscal policy does not respond to the rising debt (Table 1). If the government does not respond to the rising debt, the debt could increase persistently as Bohn (1998) emphasises that the government should run a primary surplus in response to the rising debt for fiscal sustainability. When total government debt is divided into domestic debt and foreign debt, fiscal policy remains unresponsive to the rising debt according to the constant parameter model (Table 2). The government's fiscal behaviour may not be accurately captured due to frequent changes in Bangladesh's economic and political landscape during the sample period. The regime-switching model which accommodates structural shifts in data, found that fiscal policy responds to the rising debt in some regimes (1989-1995, 2002-2014) but remains unresponsive in other regimes (1983-1988, 1996-2001, 2015-2020). On the other hand, the TVP model found that fiscal policy responded positively to the rising debt-GDP during 1990-1995 and 2003-2014 and did not respond significantly during 1983-1989, 1996-2003, and 2015-2021.

The TVP model found that fiscal policy was not sustainable during 1983-1989 like the regime-switching model, which found that fiscal policy was not sustainable during 1983-1888. The result Empirical evidence suggests that the macroeconomic conditions were weak due to political instability during that period (Rahman, 1990). The country experienced the lowest GDP growth during the period and the tax base was quite low although the country enjoyed concessional financing as a low-income country (Dilruba, 2021). The revenue structure was weak, characterised by high and uneven tariffs, various excise taxes, and narrow corporate and personal income taxes

(IMF, 1998). The government debt level rose sharply from 28.16 per cent of GDP in 1983 to 35.27 per cent in 1988, indicating that fiscal policy was sustainable at that period.

While the regime-switching that fiscal policies were sustainable during 1989-1995, the TVP model found a sustainable regime during 1990-1995. After political instability in the 1980s, this period was relatively calm and the government implemented structural reforms with the IMF SAF and ESAF programme During this period, the fiscal position was managed prudently and major tax reforms were implemented as the government introduced VAT law in 1991, which were initially applied to manufacturing and import stages, and then expanded through the removal of exemptions (IMF, 1998). Expansion of the tax base contributed to stabilising the government debt.

The regime-switching model found an unsustainable fiscal regime for 1996-2001 and the TVP model found an unsustainable fiscal period for 1996-2002. Both models found that fiscal policy was unsustainable 1996-2001. Empirical evidence suggests that the macroeconomic conditions became fragile after the mid-1990s as no major reform efforts were made after the mid-1990s, which inhibited the economy from attaining its full potential (IMF, 2002b, IMF, 1998). However, the government continued to pursue expansionary fiscal policy with rising government subsidies and current transfers due to losses in SOE. The domestic imbalance in the economy created pressures in the foreign exchange market and foreign exchange reserves declined. The government relied on high interest-bearing nonbank saving certificates in the absence of foreign financing, which raised the government interest payments. During this period, the debt stock rose from 40.78 per cent in 1996 to 45.42 per cent in 2001, suggesting that fiscal policy did not respond to the rising debt as found by the regime-switching model.

The regime-switching model found sustainable fiscal policies during 2002-2014, supported by the TVP model, which found sustainable fiscal policies during 2003-2014. Despite the global headwind, the country experienced robust GDP growth with the rapid expansion of the RMG industry and strong domestic demand backed by a higher inflow of remittances from foreign countries (IMF, 2019). Prudent macroeconomic policies and structural reforms under the IMF's

ECF program also helped to steer the economy except for revenue performance (IMF, 2015). However, higher GDP growth created fiscal space for the government to stabilise the debt stock.

Both the regime-switching and the TVP model find that fiscal policy was unsustainable from 2015 onwards, which also includes the period of the COVID-19 shock. The government conducted an expansionary fiscal policy without significant structural reform during the period. The implementation of the modified version of the VAT & SD Act 2012 did not enhance the tax base (IMF, 2020b). The higher budget deficit was mostly covered by NSCs borrowing with the shrunken flow of concessional financing following Bangladesh's graduation to a lower middle-income country in 2015 (IMF, 2018a). The government also implemented a large stimulus package to tackle the COVID-19 shock. Expansionary fiscal policy without improving the tax base, higher interest payments, and government expenditure related to the COVID-19 shock contributed to higher budget deficits and debt stock.

Overall, the result of the TVP model is consistent with the result of the regime-switching model. Both models found 2 episodes of fiscal sustainability when the government stabilises the debt level and 3 episodes of fiscal unsustainability when the government debt increased significantly.

8 Conclusion and Policy Implications

This research has examined the fiscal sustainability of Bangladesh with three different models- the constant parameter model, the regime-switching model and the time-varying parameter model using annual data from 1983 to 2022. The fiscal reaction function estimated with a constant parameter model finds that fiscal policy was not sustainable in the sample period as it did not respond to the rising debt. The government's fiscal response was also examined separately for domestic and foreign debt. Fiscal policy also remained unresponsive to both domestic and foreign debt. The fiscal policy did not respond to the output gap, indicating that it is not countercyclical but could be procyclical as in many other developing countries (Perotti, 2007). However, temporary government spending negatively affects fiscal policy.

As Bangladesh's economy experienced several structural changes during the sample period, this paper used a regime-switching model to capture the hidden structural shifts in the fiscal behaviour of the government. The regime-switching model finds that the government conducted sustainable fiscal policy during 1989-1995 and 2002-2014 with 84 per cent probability, and unsustainable fiscal policy during 1983-1988, 1996-2001, and 2015-2020 with 80 per cent probability. Empirical evidence suggests that political instability, weaker GDP growth, and a smaller tax base are reasons for unsustainable fiscal policy in 1983-1988 (Dilruba, 2021). Expansionary fiscal policy without structural reform, combined with higher interest payments from high-cost domestic borrowing through non-bank NSCs in the absence of foreign financing, has increased the government's liabilities and raised the debt stock, seems to be the reason for unsustainable fiscal policy during 1996-2001(IMF, 2002b, IMF, 1998). The third episode of unsustainability (2015-2020) is linked to the absence of major structural reforms despite the country experiencing robust GDP growth. The expansionary fiscal policy, without an expanded tax base, reduced the government's fiscal space to accommodate COVID-19-related expenditures, consequently, increasing the budget deficit and government debt (IMF, 2019, IMF, 2020b). The long-run coefficient of the debt-GDP ratio was also found insignificant, indicating that the government debt is not sustainable in the long run despite the model satisfying both the NPG condition and the debt stabilising condition on average during the sample period. The time-varying parameter model in a state space framework also finds that the government's fiscal response varies across the sample period, and fiscal policy was sustainable from 1983 to 2015 but unsustainable from FY 2016 onwards. Thus, all models indicate that fiscal policy has been unsustainable from 2016 onwards.

The main reason for fiscal unsustainability appears to be the structural shift in fiscal policy, such as a rise in interest rates due to changes in budget financing mixes, higher interest payments, and persistent expansionary fiscal policy without major reforms in tax policy. Higher government interest payments erode the fiscal space generated by higher GDP growth without major structural reforms in the revenue sector. The government might conduct unsustainable fiscal policies for some time due to necessity; however, the longer an unsustainable fiscal policy is conducted, the stronger fiscal surplus is required to stabilise the debt (Aldama and Creel, 2020). These findings

are in line with Begum and Flath (2020), Hussain and Hossain (2020), and Bhattacharya and Ashraf (2018), who either find the current fiscal policy unsustainable with a low tax base or find a lower threshold debt level than the current debt level for sustainability or express concern about debt rolling over risks.

An unsustainable fiscal policy is detrimental to the long-term growth and development of the country because of its possible unfavourable effects on the stock of productive capital (Masson, 1985). It also increases government borrowing costs and raises the budget deficit, leading to a spiral effect on the debt level. Easterly and Schmidt-Hebbel (1993) observed that a higher debt servicing cost is usually met through more borrowing that accelerates the debt stock with a deficit-biased fiscal policy. As Bangladesh already graduated to a lower middle-income country in 2015, concessional finance is no longer an option to cover the budget deficit. The interest rate at which a country borrows largely depends on its institutions and its history of economic management. Weak fiscal structures and a weak financial system are symptoms of debt-intolerant countries, for whom access to capital markets can be problematic unless debt ratios are brought down to a safer level (Reinhart et al., 2003). The history of default indicates that countries that fell into a debt trap fell into it recurrently. Given Bangladesh's relatively short economic history and access to concessional low-cost interest rates, the country has managed its fiscal debt without significantly expanding its tax base. However, with rising interest rates, delaying fiscal reforms is no longer an option.

The high GDP growth in the last decade that stabilises the government debt was mostly driven by government-led investment in physical infrastructure, which did not stimulate private investment[13] due to the lack of reforms necessary to improve the business environment. Khan and Reinhart (1990) found that private investment has a greater direct impact on economic growth than public investment in a sample of twenty-four developing countries. Therefore, it is unlikely that the

[13] The private investment stands at 23.64% of GDP against the target of 25.32% of GDP at the end of FY 23. The government's eight five-year plan set the private investment target of 27.35 % of GDP to achieve 8.51 % of GDP growth by FY2025.

economy will sustain higher GDP growth in the upcoming years. Sinha (2017) suggests that Bangladesh should focus on reforms to raise total factor productivity to achieve sustainable long-term growth. Even if a high GDP growth generates a negative interest rate growth differential (IRGD), it is not sufficient to contain debt in the presence of persistent expansionary fiscal policy, as IRGD rises with rising debt, per capita income, and reforms in the financial sector (Escolano et al., 2017). Therefore, the government must run a primary surplus at some point in time for its long-term sustainability of the debt (Blanchard et al., 1990, Masson, 1985).

As the current fiscal policy is not countercyclical, it cannot stabilise the economy; rather it would amplify the boom-and-bust cycle if it is pro-cyclical. Temporary government spending affects fiscal policy significantly, implying that the government's fiscal planning is not effective. If the government's revenue falls, the government cuts the capital expenditure to adjust the revenue loss, which creates inefficiency in investment spending (IMF, 2019). The current tax policy is used to support or protect specific industries and activities in an ad-hoc manner, which is inefficient. Such fiscal policy does not support the government's medium-term macroeconomic framework (MTMF), which aims to support higher investment, long-term growth, and macroeconomic stability.

The paper contributes to Bangladesh's fiscal policy decision-making process by highlighting the government's incapacity to respond to the rising debt in the long run. The government may conduct unsustainable fiscal policies for some time; however, a strong fiscal response is required after those unsustainable periods to stabilise the debt. Improving the tax base would enable the government to spend more in productive sectors, such as health and education, which are essential for long-term growth. Deficit-biased fiscal policy contributed to the country's development in the past as the country enjoyed concessional finance from the rest of the world. However, this trend cannot continue with rising interest rates and low revenue capacity. Maintaining the current fiscal policy will increase the budget deficit and government debt. The government should create enough fiscal space by expanding its tax base through structural reforms in the tax policy and administration to absorb major macroeconomic shocks, such as COVID-19. The fiscal authority should address

rising debt levels by running a primary surplus frequently or reducing the primary deficit. This is essential to maintain debt sustainability and macroeconomic stability.

This study is an empirical investigation based on a relatively short data set. While a longer data series could enhance the reliability of the results, the findings remain valid as they are robust across various model specifications. Overall, the study effectively demonstrates how the government should respond to the rising debt levels by running a primary surplus frequently or minimising the deficit to ensure fiscal sustainability.

Appendix A

Table A1. Data description and sources

Variable	Code	Description	Source
Government revenue	GR_Y	IMF data do not include grants in government revenue before 1990, revenue data were aligned by including grants from the Finance Division, Ministry of Finance (FD-MOF) before 1990 (% of GDP)	IMF-WEO, FD-MOF
Government expenditure	Gexp	Government's primary expenditure at 2016 price (Government's total expenditure-Interest payments), converted in logarithm.	IMF-WEO, FD-MOF
Temporary government expenditure	Gtemp	$Gtemp_t$ =($\frac{gexp_t - gexp_t^*}{y_t}$) *100; Expenditure trend ($gexp_t^*$) is calculated with the HP filter. The end sample bias of the HP filter was removed by forecasting government expenditure for an additional 5 years, which was later deleted after using the filter.	IMF-WEO, FD-MOF
Government interest payments	IP	IMF provides data from 1990 onwards, data from 1983-1989 collected from FD, % of GDP	IMF-WEO, FD-MOF
Primary surplus	Pb	Government revenue- Government primary expenditure (% of GDP)	IMF-WEO, FD-MOF
General govt debt	dgr	IMF-WEO provides data from 2003 onwards, data before 2002 are calibrated from the IMF historical public database using the base year 1995/96, % of GDP. Total debts are segregated into domestic and external debt based on ERD data	IMF-WEO, IMF historical public database, ERD
GDP growth rate	g	@ FY2016's constant price	IMF-IFS, BBS
Output gap	Ygap	$Ygap_t$= $(1 - \frac{y_t}{y_t^*})$ *($\frac{gexp_t}{y_t}$)*100, Output trend (y_t^*) is calculated with the HP filter.	IMF-WEO, FD-MOF
Domestic inflation	d_inf	d_inf= ($\frac{GDP\_def_t}{GDP\_def_{t-1}} - 1$)*100	BBS
Terms of Trade gap	TOTgap	TOTgap= $(1 - \frac{tot)}{tot^*})$*100, terms of trade trend (tot^*) has been calculated with HP filter.	IMF-commodity database
Real effective interest rate	r	Interest payments (current year) are divided by the average domestic debt (current and the previous year) and then deflated by GDP deflator inflation.	FD-MOF, IMF-WEO
Foreign loan disbursement	Fld	% of GDP	ERD-MOF
Real effective exchange rate	lz	Calculated from an average of monthly data (trade weight 120 countries) from 1993 onwards, data before 1993 were converted to a fiscal year from annual calendar year data (trade weight 65 countries) and then converted to log form. An increase means appreciation.	Bruegel
Current account balance	CAB	% of GDP	IMF-WEO

Table A2. Descriptive Statistics

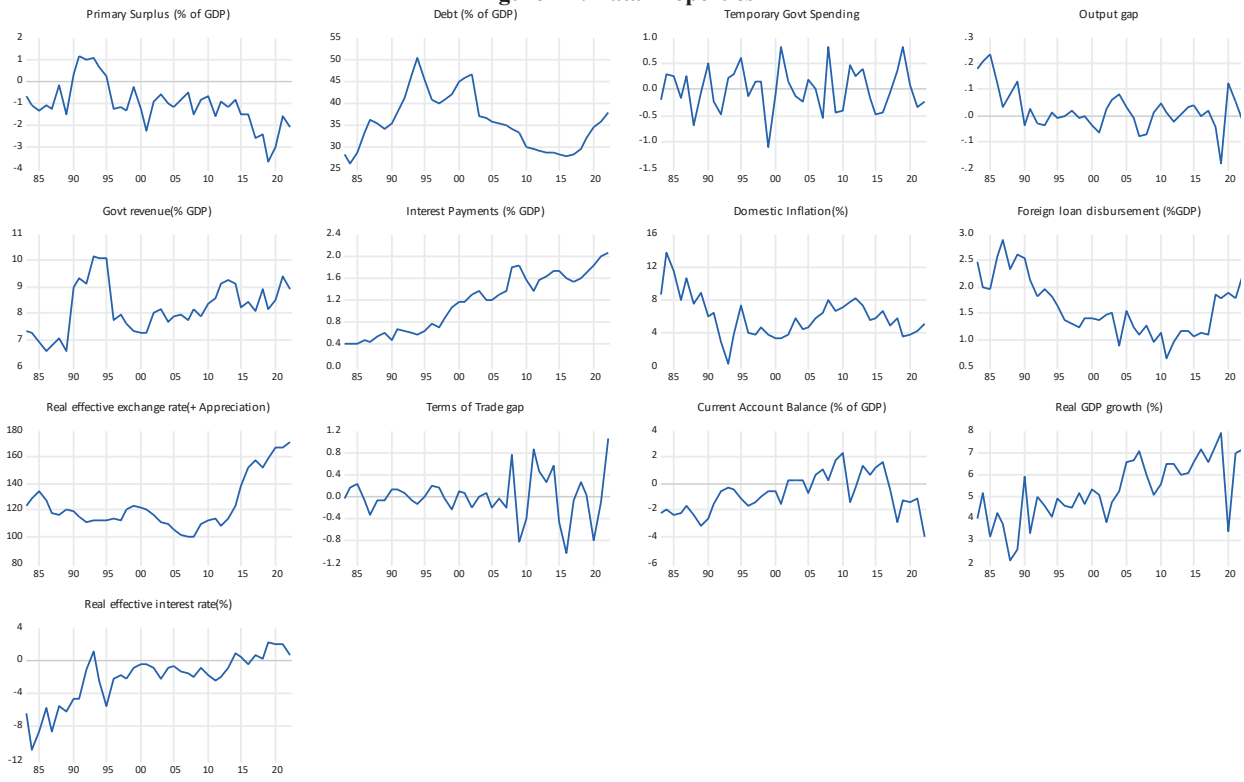
	PB	dgr	Gtemp	Ygap	GR_Y	IP	D_INF	Fld	lz	TOTgap	CAB	g	r
Mean	-1.06	35.55	0.01	0.02	8.20	1.15	6.03	1.62	4.81	0.01	-0.79	5.28	-2.20
Median	-1.18	35.28	-0.02	0.01	8.11	1.20	5.81	1.49	4.76	-0.01	-0.81	5.18	-1.46
Maximum	1.11	50.07	0.82	0.23	10.17	2.04	13.77	2.88	5.14	1.04	2.35	7.88	2.07
Minimum	-3.71	25.88	-1.10	-0.18	6.55	0.40	0.35	0.67	4.60	-1.03	-4.05	2.16	-10.86
Std. Dev.	1.04	6.27	0.42	0.08	0.95	0.52	2.53	0.55	0.15	0.40	1.46	1.39	3.02
Skewness	0.07	0.47	-0.12	0.54	0.28	-0.02	0.73	0.52	0.96	0.03	0.09	-0.21	-1.01
Kurtosis	3.47	2.34	2.92	4.19	2.44	1.59	4.16	2.39	2.99	4.24	2.55	2.33	3.53
Jarque-Bera	0.39	2.24	0.11	4.29	1.05	3.32	5.81	2.40	6.15	2.55	0.39	1.05	7.30
Probability	0.82	0.33	0.95	0.12	0.59	0.19	0.05	0.30	0.05	0.28	0.82	0.59	0.03
Sum	-42.51	1,422.06	0.47	0.91	327.95	45.89	241.39	64.83	192.26	0.21	-31.68	211.09	-88.17
Sum Sq. Dev.	41.94	1,531.36	7.00	0.24	34.93	10.65	249.78	11.60	0.83	6.35	82.82	74.82	356.86
Observations	40	40	40	40	40	40	40	40	40	40	40	40	40

Table A3. Unit root test

Variables	ADF (test statistics)		Phillips-Perron (test statistics)		KPSS (test statistics)		Integrated Order	Structural Break (ADF)
	Level	1st Diff	Level	1st Diff	Level	1st Diff		
Pb(C,T)	-3.21*		-3.16		0.09		I (0)	1989
dgr (C)	-2.26		-2.18		0.17		I (0)	2002
IP(C,T)	-3.59**	-4.67***	-2.62	-8.40***	0.10	0.34	I (0)	-
z(C,T)	-0.94	-4.39***	-0.21	-4.19***	0.18**	0.09	I (1)	2013
Fld(C)	-1.89	-8.24***	-1.73	-8.29***	0.48**	0.32	I (1)	1990
CAB(C)	-2.46	-6.78***	-2.46	-7.07***	0.40*	0.23	I (1)	1990

C- Constant, T- Trend, *- significant at 10%, **-significant at 5%, ***-significant at 1%

Figure A1. Data Properties



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