



THE NATIONAL
RESEARCH INSTITUTE
PAPUA NEW GUINEA

DISCUSSION PAPER

FISCAL POLICY FOR SUSTAINABLE
DEBT IN PAPUA NEW GUINEA

Satish Chand
Osborne Sanida

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- (b) The undertaking of research into social, political and economic problems of Papua New Guinea in order to enable practical solutions to such problems to be formulated.

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Table of Contents

List of Charts, Figures and Tables	ii
Acknowledgements	iii
Abbreviations and Acronyms	iv
Abstract	v
Introduction	1
Context	3
Trend of fiscal variables and public debt, 2006 to 2020	5
Analytical framework and methods	9
Parameterisation of the model and simulation results	11
Conclusions and policy implications	14
References	15
Appendix: Selected economic and financial data for Papua New Guinea, 2016-2025	17

List of Charts, Figures and Tables

List of Figures

Figure 1: Government revenue, expenditure and fiscal balance, 2006-2020	5
Figure 2: Total public debt and its components, 2006-2020	6
Figure 3: Debt to GDP ratio for PNG, 2006-2020	7
Figure 4: Conventional fiscal balance and primary balance, 2006-2020	8

List of Tables

Table 1: Parameter values used in the analysis of debt sustainability	11
Table 2: Sustainable evolution of primary balance for PNG – Scenario I	12
Table 3: Sustainable evolution of primary balance for PNG – Scenario II	12

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Authors' contributions

The authors jointly conceptualised the project. Professor Chand, lead author, performed the inferential statistical analysis of the data and wrote the first draft and finalised the draft. Dr Sanida did descriptive analysis of the trends for the variables (2006-2020). Both authors contributed to revising the earlier versions of the paper.

Abbreviations and Acronyms

ACT	Australian Capital Territory
ADFA	Australian Defence Force Academy
DC	External Debt
DD	Domestic Debt
DFAT	Department of Foreign Affairs and Trade (Australia)
FBO	Final Budget Outcome
FRA	Fiscal Responsibility Act
GDP	Gross Domestic Product
IDA	International Development Association
IMF	International Monetary Fund
NRI	National Research Institute
PNG	Papua New Guinea
PVC	Present Value Constraint
UNSW	University of New South Wales
US	United States

Abstract

Fiscal policy in the form of government expenditure and taxation has a direct bearing on budget outcomes that, in turn, affects the level of government debt. Public debt is considered sustainable when the government is able to meet all of the payment obligations without recourse to exceptional financial assistance or face the prospects of default. Papua New Guinea (PNG) has legislation in the form of the Fiscal Responsibility Act (FRA) that places a ceiling on debt so as to avert the risks of debt-distress. Here we present data on debt and deficits since 2006, calculate the fiscal path to debt sustainability, and identify risks of distress using numerical simulations. Our analysis shows that the level of public debt in 2021 at 42 percent of Gross Domestic Product (GDP) is sustainable at the prevailing interest rates, and anticipated rates of growth of GDP and inflation. The risk of distress, amounting to the need to run smaller primary deficits to that of the past at the expense of public expenditure, rise with an increase in interest rates and a fall in the rate of growth of GDP. Specifically, a rise in interest rates on debt of 100 basis points with GDP growing at 2 percent will require a balanced primary budget for fiscal sustainability – an outcome that may not be politically palatable in such a climate.

Introduction

Fiscal policy has been expansionary in 2020 and 2021 across the world to contain the contractionary effects of the COVID-19 pandemic. Public expenditures rose suddenly and sharply as the demands for hospitalisation and vaccinations increased at the peak of the pandemic. Lockdowns put in place to contain the spread of the virus led to falls in employment, losses of income for businesses and individuals, and contraction in revenues for the government. Increased public expenditure in the face of falling receipts of revenues culminated into large budget deficits for many governments. The deficits, in turn, have lifted public debt to new highs. The onset of the Omicron variant of the COVID-19 virus as of December 2021 may yet lead to new expenditures and further losses to revenues, pushing public debt even higher in 2022.

The value of gross debt is equal to the total stock of outstanding government liabilities (Chalk & Hemming, 2000). These liabilities are made up of a combination of (longer-term) bonds and (shorter-duration) bills issued by the Treasury, draw-downs of deposits from the Central Bank, and loans from the private sector at home and from abroad including those from international financial agencies. The debt instruments in the form of bonds, bills, and loans place a legal obligation on the debtor to pay interest of specified amounts to the creditor at specific intervals, and the principal at a future date.

The rapid increase in public debt over the past two years has raised questions on the capacity of the debtors to meet their obligations. Fiscal policy is considered sustainable only if the “government is able to meet all of its current and future payment obligations without resorting to exceptional financial assistance or going into default” (Hakura, 2021. p.60). Sustainability, in other words, requires that the debt taken by the government today is at least matched by the present value of primary surpluses over the future. This in turn depends on the discount rate used and the size of primary surpluses: the former is reflected in the interest rate while the latter equals government revenues net of expenditure and interest payments on past debt. In other words, the current value of debt is sustainable if it is at most equal to the discounted sum of expected future surpluses (Cuddington, 1997).

The risk of debt distress within low-income countries is high. The International Monetary Fund (IMF) has warned that: “As public debt rises to record levels, countries need to calibrate fiscal policies to their own unique circumstances” (Gasper et al., 2021). Kristalina Georgieva, the Managing Director of the Fund and Celya Pazarbasioglu observed in December 2021 that: “Despite significant relief measures brought on by the COVID-19 crisis, about 60 percent of low-income countries are at high risk or already in debt distress”, cautioning that “with the debt service suspension initiative expiring [at the end of 2021] and interest rates poised to rise, low-income countries will find it increasingly difficult to service their debts” (Georgieva and Pazarbasioglu, 2021). Such difficulties are expected to emerge in 2022, requiring immediate calibration of fiscal policies including assessment of the sustainability of debt for vulnerable nations. But the capacity to carry debt differs across debtors, meaning that assessment of debt sustainability is context specific.

Establishing the sustainability of public debt is challenging however. While the conceptual framework used for the assessment is simple, the data required to make the assessment demanding. Two separate approaches have been used to assess fiscal sustainability; namely, the Present Value Constraint (PVC or the ‘no Ponzi game’ condition) and the accounting approach. In the case of the PVC, historical data on government revenues and expenditure is used in simple time series models to test if the levels of primary surpluses and debt could continue indefinitely without resistance from the lenders. Specifically, the debt is deemed sustainable if its level is stationary. That said, establishing stationarity requires data over a long period of time (e.g., 50 years) and this information has to come from periods without regime shifts: conditions that are rarely met in practice, and definitely not for most developing countries. The accounting approach is simpler in contrast as it assumes that sustainable debt has a debt-to-GDP ratio that in steady state is constant (Cuddington, 1997; Edwards, 2003). For all practical

purposes, public debt is considered sustainable if its ratio to income is bounded; that is, it does not grow without limit (Chalk & Hemming, 2000). Policymakers regularly test debt sustainability through use of real-time data on the rate of growth of GDP, movements in the exchange rate, and the rates of interest at home and abroad. The exchange rate and foreign interest rates are particularly important when debt is secured on commercial terms from overseas.

Governments have been able to accumulate debt quickly over the past decade. This has been helped by the ultra-low interest rates on public debt, which at least, partly is explained by the abundance of credit, leading to an impression that governments can borrow without limit. This is not only misleading but potentially dangerous. The experience of the debt crisis of the 1980s and the growth collapses that followed as a direct consequence (see Das, Papaioannou, & Trebesch, 2012; Kaminsky & Pereira, 1996), have many lessons for the present. Some nations put in laws to limit borrowing by their governments. Papua New Guinea (PNG) is a case in point where ceilings on public debt were enacted to prevent politicians from indulging in excessive borrowings. The efficacy of these laws remains to be assessed.

PNG has experienced a jump in public debt since 2011. Debt levels were already rising in the lead-up to the pandemic in 2020, but the arrival of COVID-19 hastened this rise. Containing public debt within sustainable limits has been a longstanding problem in PNG. The Fiscal Responsibility Act (FRA) was passed by the National Parliament in 2006. The FRA placed a ceiling of 30 percent of GDP on the level of public debt at any point in time. But this ceiling has been lifted on each of the three occasions when it has been hit: to 35 percent in 2017, 40 percent in 2019, and 45 to 60 percent in 2020 (IMF, 2020; p. 95), with the possibility of more to come. Is this suggestive of ballooning and thus unsustainable debt?

Policymakers in PNG have been watchful of the rising levels of debt. Efforts were being made in 2020 for fiscal consolidation. Such consolidation was to be achieved through reductions in expenditure – largely through reductions in the wage bill of public servants and renewed effort at increasing government revenues – through broadening of the tax base. The advent of the COVID-19 pandemic has stalled these initiatives, meaning that debt has continued on its upwards trajectory.

PNG, however, is far from being a heavily indebted nation. Public debt is projected to reach 52 percent of GDP in 2021 (Ling-Stuckey, 2021). Of the projected total debt (of K46.5 billion), roughly one half is domestic and the remaining debt owed to foreigners largely on concessional terms. While public debt has increased substantially over the past decade, the sustainability of this debt rests on the future path of interest rates, the rate of growth of GDP, and the return generated by public investments funded with borrowing. Continued low rates of interest with an uptick in the rate of growth of GDP while budgets are kept balanced will reduce the ratio of debt to GDP.

This paper answers the specific question on the size of the primary fiscal balance¹ that is necessary to contain debt within the ceiling legislated under the FRA. A related question that is addressed is the levels of fiscal deficits that will keep public sector debt sustainable. Specifically, we estimate the levels of primary balances that are required to contain debt within the legislated limits in light of possible changes to interest rates and growth of GDP. This is done using numerical simulations of the path of primary balance for given rates of growth of the economy and the prevailing interest rates. We find that a lift in interest rates and/or fall in growth rates of GDP are the main risks to debt breaching the legislated ceilings.

The rest of the paper is structured as follows: Section 2 provides the contextual information on PNG; Section 3 presents the trends in budget deficits, primary balances, and public debt from 2006 to 2020; Section 4 provides the analytical framework that is used for simulations later; Section 5 presents and discusses the results; and the final section (Section 6) draws the conclusions and implications for policymaking from the results.

¹ Primary balance is the difference between Government's revenue (what it is earning) and its expenditure (excluding debt repayment), that is, its non-interest expenditure. In other words, it is the nominal budget balance minus interest payments.

Context

Papua New Guinea (PNG) is a developing country of roughly 9 million people located within the South Pacific. The World Bank places PNG as a Lower-Middle-Income country with an estimated per capita income at current prices in 2020 of PGK8,948 (World Bank, 2021a). Nominal GDP increased from K25.5 billion in 2006 to K82 billion in 2020 (Department of Treasury, 2007-2020), an increase of 221.6 percent. According to the World Bank (2021b), the life expectancy at birth for PNG improved from 38 years in 1960 to 63 years in 2019. The literacy rate was 57.3 percent in 2000, increasing to 61.6 percent in 2010 and 63.4 percent in 2015 (Devette-Chee, 2021). Despite the increase, the literacy rate is considered to be low when compared to other countries in the Asia-Pacific Region (Devette-Chee, 2021). Consequently, the demand for basic services such as basic education and primary healthcare is likely to continue for the foreseeable future.

The government has taken an active role in the economy. Public expenditure has historically been targeted at providing basic services. The National Government over the past decade, however, has expanded on its priorities to stimulate the economy, largely through use of deficit financing. This has occurred via increases in both recurrent expenditure and development or capital expenditure. The recurrent expenditure increased by 238 percent from K3.7 billion in 2006 (Department of Treasury, 2007) to K12.5 billion in 2020 (Department of Treasury, 2021). The increase in recurrent expenditure has been undertaken with a view to stimulating aggregate demand, which in turn is expected to lift business growth.

Capital investment expenditure, which leads to promoting employment creation and economic growth (through boosting the factors of production), has increased substantially between 2006 and 2020. That is, capital investment spending increased from K1.6 billion in 2006 (Department of Treasury, 2007) to K6.9 billion in 2020 (Department of Treasury, 2021), a growth of 331 percent. Examples of capital investments include spending on road infrastructure development and maintenance; airport rehabilitations; etc.

As a consequence, the national budget switched from having a surplus of K430 million in 2006 to a deficit of K7.3 billion by 2020, an increase of 1,598 percent (Department of Treasury, 2020). Meanwhile, public debt increased from K6.7 billion (equal to 26% of GDP) in 2006 to K40.2 billion (49% of GDP) (Department of Treasury, 2020). The persistent use of deficits to stimulate the economy leading to rising levels of public debt has raised questions on the sustainability of this policy.

Public debt was rising before the pandemic. The IMF (2020) Report following staff consultation for 2019 recorded a sharp rise in public debt that then led to a request from the PNG Government for a staff monitored program. Debt as a proportion of GDP had risen from 32 percent in 2017 to 37 percent by 2018, having breached the FRA ceiling of 30 percent. The IMF advised that: “A sustained program of fiscal consolidation is needed to put the deficit on a downward path and reduce the public debt ratio, while protecting social spending and much needed public investment” (IMF, 2020; para. 13). The risk of debt distress, the Fund noted, had risen from several quarters including a shift towards external borrowing, a rise in debt service costs as a share of revenues, the expansion of unfunded liabilities, and the use of government guarantees for debt taken on by State-Owned- Enterprises (IMF, 2020; para. 18).

The arrival of COVID-19 in 2020 delayed fiscal consolidation, raising the risks of debt distress. The Fund noted that:

“Papua New Guinea (PNG) entered the crisis with an already fragile macroeconomy and limited policy space to react. Growth in the resource sector has been challenged by weak commodity prices, while the non-resource sector remains hobbled by a lack of foreign exchange and an overvalued exchange rate. The authorities’ program of fiscal consolidation stalled in 2019 and the recognition of contingent liabilities increased the public debt ratio well above what had been previously projected” (page 4).

Prime Minister, James Marape had written a letter to the Managing Director of the IMF in February 2020 that was co-signed by Treasurer, Ian Ling-Stuckey and Central Bank Governor, Loi Bakani informing her that:

“Papua New Guinea is facing several economic crises. There is a budget crisis as years of economic mismanagement have left the new government with the largest deficit in PNG’s history, a declining revenue base, declining levels of delivery of basic health and education services and significant government arrears to our businesses” (IMF, 2020; page 32-34).

A subsequent letter from the Government requested financial support from the IMF to address the budgetary and external financing gaps which the authors claimed were being exacerbated by the COVID-19 pandemic².

The government by then had also approached multilateral and bilateral donors for additional financial assistance, and set in train the process of suspension of debt service under the G-20 COVID-19 Debt Service Initiative (IMF, 2021, para. 8). The IMF had conducted a debt sustainability analysis for PNG in 2019, noting then that the ‘overall risk of debt distress was moderate’ (IMF, 2020). This assessment was revised a year later in which the IMF noted that PNG was “at high risk of debt distress, with no access to external market finance”, but then went on to reassure the authorities that “public debt is still assessed to be sustainable, conditional on the implementation of prudent fiscal policies” (IMF, 2021; para. 16).

While the IMF has stated that prevailing levels of debt are sustainable, questions remain as to how vulnerable PNG is to distress should the local economy remain subdued and/or interest rates rise. We address this question after discussing the trend of key fiscal variables for 2006 to 2020.

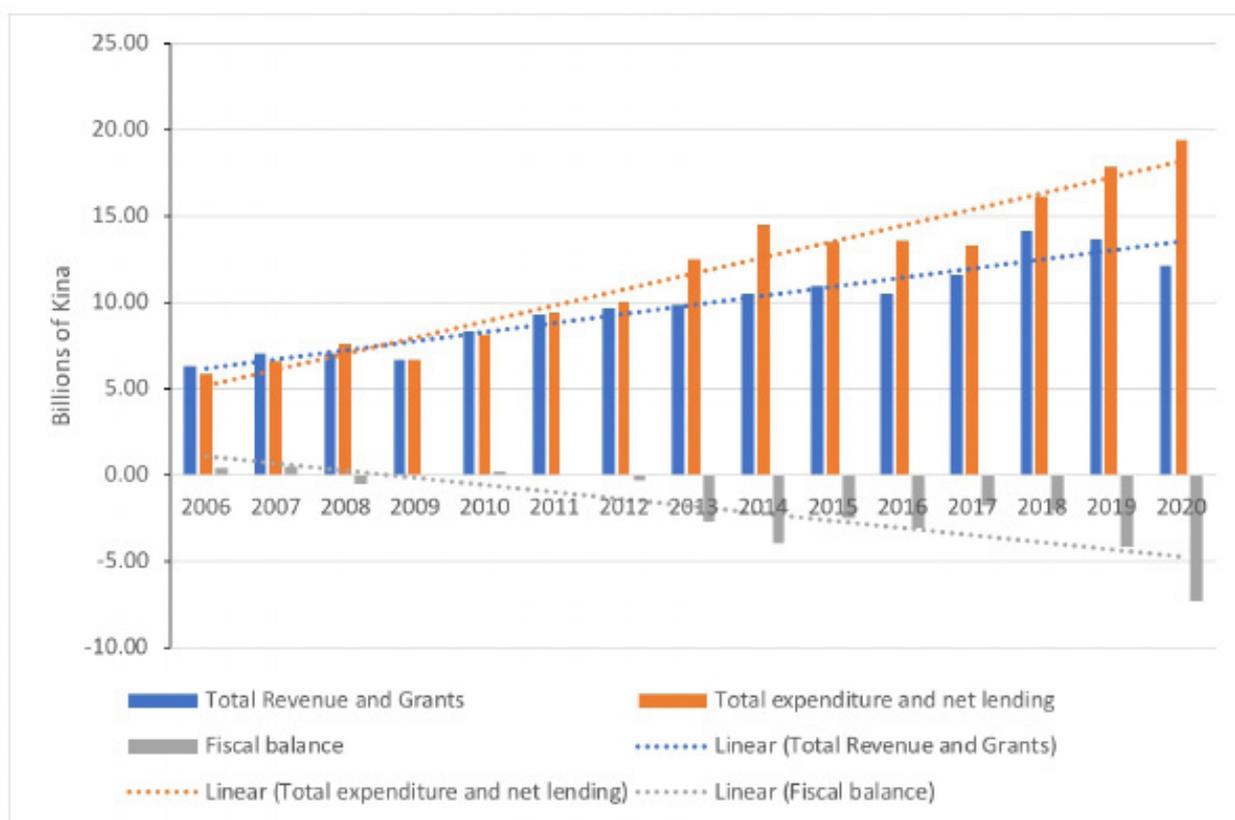
²This letter dated 20 May 2020 was written jointly by the Treasurer and Governor of the Central Bank requesting support under the IMF’s Rapid Credit Facility (IMF, 2021, pp. 23-26).

Trend of fiscal variables and public debt, 2006 to 2020

We discuss the trend of the key fiscal variables and public debt for 2006 to 2020 using data from the Final Budget Outcome (FBO) documents for a 15-year period from 2006 to 2020 published by the PNG Department of Treasury.

Figure 1 presents the trend of three fiscal variables: Government total revenue, total expenditure, and fiscal balance for 2006 to 2020. Both total revenue and total expenditure have an increasing trend as shown by the trend lines. However, the growth of expenditure is much faster than the growth of revenue. Revenue grew at an annual average rate of 5 percent while total expenditure grew at a much higher rate of 9 percent. When expenditure is growing at a higher rate than the revenue, this results in an increasing level of deficits from year to year. This is reflected in the trend line for the fiscal balance (surplus/deficit), which is falling downwards from left to right.

Figure 1: Government revenue, expenditure and fiscal balance, 2006-2020



Source: Authors' compilation based on Final Budget Outcome documents by Department of Treasury, 2006-2020

Looking at the specific performance of the three variables, the following can be seen. For revenues, for 10 of the years, there was an increase (2007, 2008, 2010-2015, 2017 and 2018) and a decline for four of the years (2009, 2016, 2019 and 2020). The highest annual revenue was K14.09 billion in 2018 and the lowest was K6.31 billion for 2006, a range of K7.78 billion.

For total expenditure, there was an increase for 11 of the years (2007, 2008, 2010-2014, 2016, and 2018-2020) and falls for three of the years (2009, 2015 and 2017). The highest expenditure was in 2020 (K19.4 billion) and the lowest was in 2006 (K5.88 billion), a range of K13.52 billion.

The main drivers for increases in expenditure for the given years were increases in personnel emoluments budgets, interest rate payments, and supplementary budgets to account for additional expenditures, which were mainly recurrent in nature. The lower expenditure in 2009 (K6.7 billion) was due to 2008 expenditure

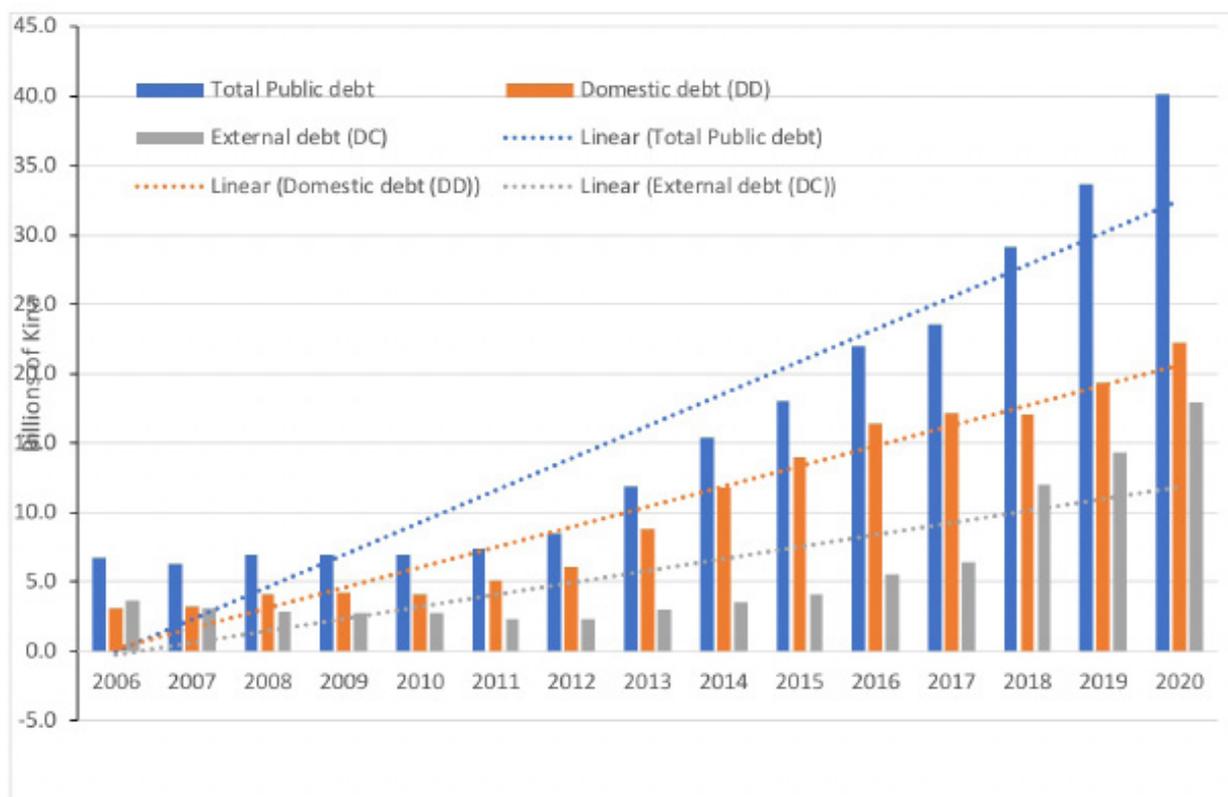
(K7.6 billion) incorporating additional priority expenditure and supplementary budget amounting to about K2.2 billion. The fall in 2015 reflected reductions in appropriations for lower priority projects and savings in recurrent expenditure under the 2015 Supplementary Budget. The 2017 expenditure of K13.3 billion was less than the 2016 expenditure of K13.5 billion. This reduction generally reflected “stricter warrant releases and more stringent prioritisation across Goods and Services and net acquisition of non-financial assets” (Department of Treasury, 2018, p.6).

In terms of the fiscal balance, out of the 15 years under investigation, there was a surplus for only three of the years, 2006 (K430 million), 2007 (K455 million) and 2010 (K186 million), with the remaining years recording deficits. The highest deficit was K7.3 billion in 2020 while the lowest was in 2009 of K400 million, a range of K7.26 billion.

The fiscal balance affects the level of total public debt or the national debt, which is simply the net accumulation of the national government's annual budget deficits inclusive of interest payments on past debt. A deficit will increase the public debt while a surplus will reduce the public debt, if the surplus is used to repay the debt.³ Figure 2 presents the trend of the total debt with its two parts, external debt and domestic debt, for the 15-year period under investigation (2006-2020).

As shown by the trend lines, all three variables (total debt and its two components) have an increasing trend for the period. The total debt was K6.7 billion in 2006 and increased by 497 percent to K40.2 billion in 2020. The average annual rate of growth of total debt was 14 percent. For the period under investigation, total debt fell only for two years: 2007 (by 6.2% to K6.3 billion) and 2010 (by 1.2% to K6.9 billion). For the rest of the years, total debt increased with 2013 recording the highest growth of 40 percent.

Figure 2: Total public debt and its components, 2006-2020



Source: Authors' compilation based on Final Budget Outcome documents by Department of Treasury, 2006-2020

³ As part of government expenditure, there is an item on interest payment. In PNG's case, this item constitutes about 7 percent of total expenditure, with the absolute amount increasing in each year, generally.

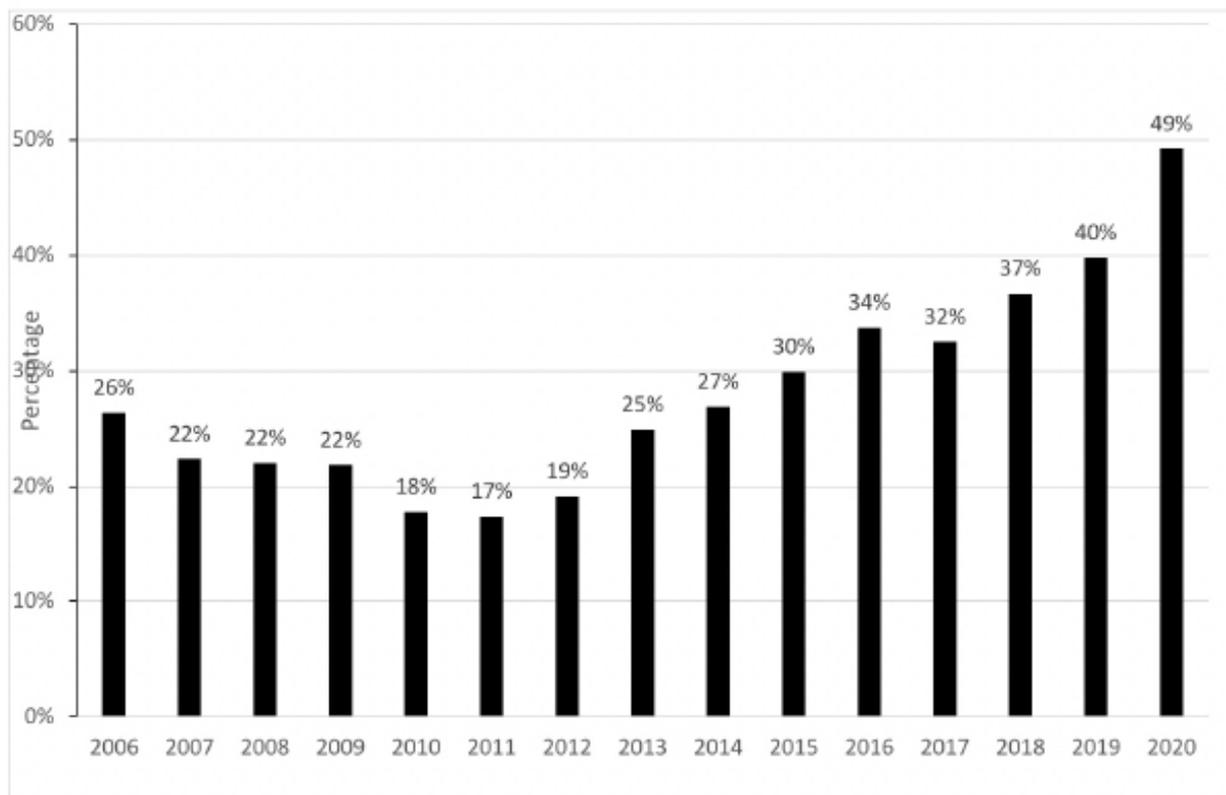
Domestic debt constituted about 66 percent of total debt and it grew at about 16 percent per annum. There were slight declines in two of the years: 2010 (by 0.3% to K4.1 billion) and 2018 (by 0.4% to K17.1 billion). For the rest of the years, domestic debt increased with the biggest increase in 2013 of 45 percent.

External debt makes the up the remaining part of total debt (about 34% of the total). External debt grew on average by 15 percent per annum. However, for the period 2007 to 2011, there were declines. The value of external debt nearly doubled in 2018 relative to the figure in 2017; that is, from K6.4 billion in 2017 to K12 billion by 2018.

An important factor when analysing debt sustainability is the debt-to-GDP ratio or how much is total debt as a percentage of total GDP. Figure 3 shows the trend of the debt to GDP ratio for PNG from 2006 to 2020.

The debt-to-GDP ratio was 26 percent in 2006 and fell to 17 percent by 2011. This was attributable to smaller deficits during this period and also the three surplus budgets: in 2006, 2007 and 2010 (Figure 1). Since 2011, the ratio has increased, except for one decline in 2017 (from 34% to 32%). The ratio increased by 32 percentage points from 17 percent in 2006 to 49 percent in 2020. As stated earlier in the paper, the legislated limit for the debt-to-GDP ratio under the FRA was lifted from 30 percent (original limit) to 35 percent in 2017, to 40 percent in 2019, and once again to 45-60 percent in 2020.

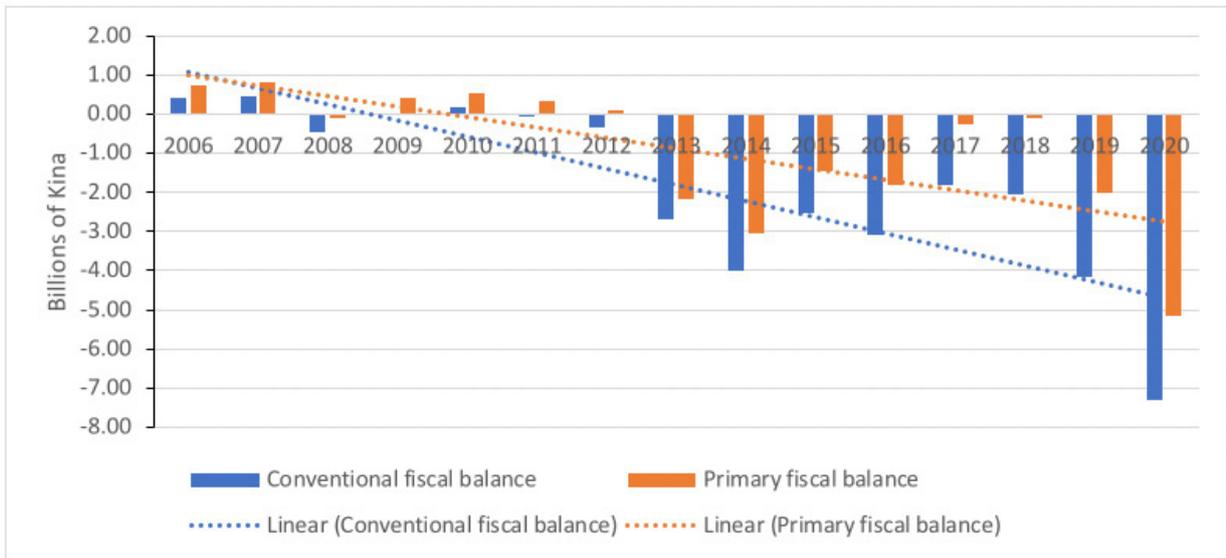
Figure 3: Debt to GDP ratio for PNG, 2006-2020



Source: Authors' compilation based on Final Budget Outcome documents by Department of Treasury, 2006-2020

Of direct relevance to the objective of this paper, we present next a comparison of the conventional fiscal balance with the primary fiscal balance (Figure 4).

Figure 4: Conventional fiscal balance and primary balance, 2006-2020



Source: Authors' compilation based on Final Budget Outcome documents by Department of Treasury, 2006-2020

When interest payments are removed from the expenditure, the residue is the primary fiscal balance which had surpluses for six of the 15 years (2006, 2007 and 2009-2012), compared to only three years for the conventional fiscal balance. The number of deficit years for the primary balance, thus, reduces to nine years from the 12 years recorded for the conventional fiscal balance.

The difference between the conventional fiscal balance and the primary fiscal balance has implications on public debt as well as spending for goods and services. First is that the surpluses under the primary fiscal balance are higher than those under conventional fiscal balance. This means that if there was no interest payment, more funds would have been available to spend on public goods and services or capital investment. In other words, the interest payment has reduced the surplus. However, on a positive note, the same interest payment is contributing to servicing past public debt that may have been used to fund ongoing access to services such as major roads. The second observation is that the deficits under the primary balance are lower than under the conventional fiscal balance. This implies that interest payments have contributed to the increases in the conventional deficits, particularly since 2014.

We discuss next the analytical framework and methods.

Analytical framework and methods

We follow closely the framework in Edwards (2003) that captured the main features of fiscal policy in emerging markets to assess debt sustainability in PNG. Such assessment allows us to calculate the primary balance that is consistent with the debt ceiling set under the FRA. Similar analysis has been used by the IMF and the World Bank to calculate the level of debt forgiveness that is necessary to enable highly-indebted nations to attain a net present value of debt that is at most equal to the net present value of future revenues (International Development Association and International Monetary Fund, 2001).

Public debt (denoted D) is made up of concessional and commercial debt; henceforth denoted as DC and DD (i.e. Bonds), respectively. While DD may be denominated in domestic currency, the effects of the exchange rate is ignored by converting all debt to US dollars. Consequently, an increase in total debt is given by the accounting identity:

$$\Delta D_t = \Delta DC_t + \Delta DD_t = r_t^C DC_{t-1} + r_t^D DD_{t-1} + pb_{t-1} - \Delta B_{t-1} \quad (1),$$

where Δ denotes change, t subscripts for time, r is the nominal interest rate, superscripts C and D on r denote concessional and commercial nominal interest rates, pb is the primary deficit (as a positive number), and ΔB is the change in the monetary base.

We use the accounting approach to assess debt sustainability, and the implied primary balance that is necessary for the level of debt to remain within the legislated ceiling. Recall from above that public debt is considered sustainable under the accounting approach if the primary deficit generates a constant debt-to-GDP ratio for given rate of growth of GDP and interest rates. The primary balance reflects prevailing fiscal effort since interest payments are predetermined by the level of debt in the previous period. The evolution of public debt as shown in equation (1) rests on the prevailing interest rates on concessional and domestic debt, the size of primary deficit, and the value of seigniorage.

The aim of this analysis is to calculate the level of the primary deficit as a share of GDP (i.e. pb/Y) that is consistent with a level of public debt that is sustainable; that is, it satisfies the ‘No Ponzi game’ condition. Following Edwards (2003), we assume that donors are willing to accumulate public debt at a rate θ while those at home at the rate β .

Constraining debt to GDP to be bounded implies that:

$$\theta \leq g + \pi^* \text{ and } \beta \leq g + \pi^* \quad (2),$$

that is, foreign and domestic debt grow at rates less than the rate of growth of nominal GDP; noting that GDP is measured in foreign currency (i.e. US dollars). That is, growth in nominal GDP in US\$ is equal to the sum of the real rate of growth of GDP (g) and US inflation (π^*).

Equations (1) and (2) collectively imply the following time path of public debt:

$$\frac{pb}{Y_t} \leq \frac{1}{1+g+\pi^*} \left[[\theta - r_t^C] \frac{DC_0}{Y_0} e^{(\theta-g-\pi^*)(t-1)} + [\beta - r_t^D] \frac{DD_0}{Y_0} e^{(\beta-g-\pi^*)(t-1)} \right] + (g+\pi) \frac{B_0}{Y_0} \quad (3),$$

where DC_0 , DD_0 , B_0 , and Y_0 denote the initial values of concessional debt, commercial debt, broad money (B), and GDP (Y).

Equation (3) shows that the evolution of the primary deficit as a ratio of GDP depends on the past levels of concessional and domestic debt, the applicable interest rates, the rate of growth of GDP, the levels of foreign and domestic inflation, and the willingness of foreign and domestic creditors to acquire public debt. It also shows that the primary balance, net of the value of seigniorage, is bound from above by a weighted sum of the concessional and domestic debt, with weights reflecting the creditors appetite to lend at the applicable interest rates.

This is shown as equation (3a) below.

$$(1+g+\pi^*) \left[\frac{pb_t}{Y_t} - (g+\pi) \frac{B_0}{Y_0} \right] \leq [\theta - r_t^C] \frac{DC}{Y_0} e^{(\theta-g-\pi^*)(t-1)} + [\beta - r_t^D] \frac{DD}{Y_0} e^{(\beta-g-\pi^*)(t-1)} \quad (3a).$$

We next use equation (3) to work out the minimal necessary fiscal effort to maintain debt sustainability; that is, the level of primary deficit at the ceiling for sustainability. A word of caution is in order here: interest rates are endogenous to the level of debt in a general equilibrium analysis. However, the subsequent analysis is not undertaken in a general equilibrium framework but simply conditional on given interest rates and target domestic inflation.

Two separate scenarios are considered next: one conservative and the other optimistic. In the first scenario, we assume that concessional debt is rolled over time without any new debt being taken. In this case, the nominal value of concessional debt is fixed, meaning that $\theta = 0$ in equation (3). In the second scenario, the real value of concessional debt as a share of GDP is held at the baseline, meaning that in this case $\theta = g + \pi^*$ in equation (3). Domestic debt in both scenarios is held at the baseline, meaning that $\beta = g + \pi^*$.

Equations representing the dynamic path of the primary balance, and the steady state value of concessional and domestic debt are given for each of the above-mentioned scenarios next.

Scenario I: $\theta = 0$ and $\beta = g + \pi^*$

The time path of the sustainable primary balance is given as:

$$\frac{pb_t}{Y_t} \leq \frac{1}{1+g+\pi^*} \left[[-r_t^C] \frac{DC}{Y_0} e^{-(g+\pi^*)(t-1)} + (g+\pi^*-r_t^D) \frac{DD}{Y_0} \right] + (g+\pi) \frac{B_0}{Y_0} \quad (4);$$

the steady state value for the primary balance (i.e. when $t \rightarrow \infty$) is

$$\frac{pb}{Y} \leq \frac{(g+\pi^*-r_t^D)}{1+g+\pi^*} \left[\frac{DD}{Y_0} \right] + (g+\pi) \frac{B_0}{Y_0} \quad (4a);$$

and that for concessional debt of zero (i.e. $DC/Y = 0$) while that for domestic debt at the baseline (i.e. $DD/Y = DD_0/Y_0$).

Scenario II: $\theta = \beta = g + \pi^*$

$$\frac{pb_t}{Y_t} \leq \frac{1}{1+g+\pi^*} \left[[g+\pi^*-r_t^C] \frac{DC}{Y_0} + [g+\pi^*-r_t^D] \frac{DD}{Y_0} \right] + (g+\pi) \frac{B_0}{Y_0} \quad (5);$$

the corresponding steady state value for the primary balance (i.e. when $t \rightarrow \infty$) is as noted in (5), for concessional debt at baseline (i.e. DC_0/Y_0), and that for domestic debt at the baseline (i.e. DD_0/Y_0).

Note that the sustainable primary balance is larger (i.e., a larger primary deficit) in Scenario II compared to that in Scenario I; this being the case given that the country has access to concessional debt at the rate $(g + \pi^*)$. Also note that in the first scenario, the sustainable primary balance net of the gains from seigniorage is negative (i.e. a primary budget surplus) when the rate of growth of GDP (in current dollars) is less than the interest rate paid on domestic debt. This is less so in Scenario II where the weighted average of concessional and domestic debt is taken with the weights being equal to the difference in the rate of growth of nominal GDP to the respective interest rate. We use equations (4) and (5) to calculate the size of primary balance for debt sustainability under the two scenarios next.

Parameterisation of the model and simulation results

We parameterise equation (3) for PNG to estimate fiscal effort that is necessary to keep debt levels within the ceilings set under the FRA. To do so, we replace the inequality in (3) with an equality meaning that the resulting primary balances reflect the minimum fiscal effort for sustainability of public debt.

The parameter values used are shown in Table 1.

Table 1: Parameter values used in the analysis of debt sustainability

Parameter	Symbol	Assumed Value	Source
Initial Concessional Debt to GDP ratio	DC_0/Y_0	22.2 percent	IMF (2020); figure for 2021
Initial Domestic Debt to GDP ratio	DD_0/Y_0	20.2 percent	IMF (2020); figure for 2021
Rate of growth of Concessional Debt (DC)	θ	Scenario I: 0 Scenario II: $(g+\pi^*)$	
Rate of growth of Domestic Debt (DD)	β	Scenario I: $(g+\pi^*)$ Scenario II: $(g+\pi^*)$	Set baseline value of 22.2 percent being maintained.
Rate of growth of real GDP	g	$g = 2, 3, 4, 5, 6, 7$ percent/annum	Range of values chosen.
Nominal interest rate on DC	r^C	1.9 percent + π^*	IMF (2020; p.13)
Nominal interest rate on DD	r^D	5.7 percent + π	IMF (2020; p.13)
Monetary base	B_0/Y_0	26.4 percent	IMF (2020; pp 22, 26).
Domestic inflation	π	3 percent	IMF (2020; page 15).
Foreign inflation	π^*	2.5 percent	Assumed

Notes: The parameters reflect published values as of 2021; interest rate on concessional debt used in the Debt Sustainability Analysis by the IMF is 1.9 percent while that charged on debt from Paris Club is 2.5 percent (IMF, 2020).

Simulation results

The parameter values reported in Table 1 are used to generate the primary balance required for each year over the next decade to place public debt on a trajectory to its stable steady-state value. The real interest rate assumed on concessional debt is 1.9 percent while that on domestic debt of 5.7 percent, thus nominal rates r^C and r^D include the relevant rates of inflation.

Table 2 reports results for Scenario I: this being the conservative scenario where concessional debt in steady state is equal to zero while that for domestic debt of 20.2 percent of GDP – a figure well within the limits set under the FRA. Under this scenario, the primary balance is roughly 1 percent of GDP when GDP grows an annual rate of 2 percent while the corresponding figure under the assumption of an annual growth rate of GDP of 7 percent is a primary balance of roughly 3 percent. In the case of the former (i.e., GDP growing at 2 percent annually), small surpluses are necessary in the first decade. Such an outcome will be a significant departure from the practices of the past.

Table 2: Sustainable evolution of primary balance for PNG – Scenario I

Year	Assumed rate of growth of real GDP (g)					
	0.02	0.03	0.04	0.05	0.06	0.07
1	-0.00427	0.000454	0.005135	0.009779	0.014385	0.018955
2	-0.00385	0.00095	0.005713	0.010435	0.015118	0.019764
3	-0.00346	0.001419	0.006253	0.011044	0.015792	0.020499
4	-0.00309	0.001863	0.00676	0.011609	0.016411	0.021167
5	-0.00273	0.002283	0.007235	0.012134	0.01698	0.021775
6	-0.00238	0.00268	0.00768	0.01262	0.017502	0.022328
7	-0.00205	0.003057	0.008097	0.013071	0.017982	0.022831
8	-0.00174	0.003413	0.008488	0.01349	0.018422	0.023288
9	-0.00144	0.00375	0.008854	0.013878	0.018827	0.023704
10	-0.00115	0.004069	0.009198	0.014239	0.019198	0.024082
Steady State pb	0.005081	0.009713	0.014307	0.018865	0.023388	0.027876
Steady State DC	0	0	0	0	0	0
Steady State DD	0.202	0.202	0.202	0.202	0.202	0.202

Source: Authors' simulations using equations 4 and 4a.

Table 3 presents the results for the scenario where steady state values of public debt is set at the baseline; in this case, a total of 42.2 percent of GDP that sits within the newly legislated ceiling under the FRA. In this case, the primary deficit in steady state for debt sustainability under the assumption that GDP grows at an annual rate of 2 percent is a maximum of 1.3 percent of GDP, and the corresponding figure is 4.6 percent when GDP grows at an annual rate of 7 percent.

Table 3: Sustainable evolution of primary balance for PNG – Scenario II

Year	Assumed rate of growth of real GDP (g)					
	0.02	0.03	0.04	0.05	0.06	0.07
1	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
2	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
3	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
4	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
5	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
6	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
7	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
8	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
9	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
10	0.005294	0.009923	0.014516	0.019072	0.023592	0.028079
Steady State pb	0.012976	0.019637	0.026223	0.032735	0.039176	0.045547
Steady State DC	0.222	0.222	0.222	0.222	0.222	0.222
Steady state DD	0.202	0.202	0.202	0.202	0.202	0.202

Source: Authors' simulations using Equation 5. Note that the time is absent from Equation 5, thus the values for the primary balance are the same across time.

In summary, the primary balance (recall that the levels of the deficit are expressed as positive numbers) is well short of what has been realised over the past decade. Under the conservative scenario (i.e., Scenario I), a primary deficit of no more than 2.8 percent is consistent with debt sustainability when real GDP is growing at 7 percent annually while a balanced budget is required when GDP growth is 2 percent per annum. The corresponding figure under the optimistic scenario is 1.3 percent primary deficit for GDP growth of 2 percent and 4.6 percent for GDP growing of 7 percent per annum. The performance in terms of the size of the primary balances over the past decade suggests that neither of these scenarios are likely without substantial tightening of fiscal policy over the future to keep debt within the FRA ceiling. Fiscal policy will have to be tightened even more if public debt is to be wound back to 35 percent of GDP as envisaged under the last revision to the FRA. These results point to the risk of debt distress with the continuation of deficit financing, and particularly so should interest rates rise and/or GDP contract.

Conclusions and policy implications

The sustainability of public debt, and the stance of fiscal policy for the above, is back on the radar of policymakers in light of sharp and sustained increases in deficits within emerging market economies over the past decade. This trend has been exacerbated by the advent of the COVID-19 pandemic that necessitated large fiscal stimuli to arrest sharp falls in GDP across the world. The pandemic also led to increased expenditure on healthcare and welfare support as demand for hospitalisation and vaccination increased. In the meantime, revenues for state coffers have fallen with the contraction in economic activity brought about by the pandemic. The resulting deficit on the budget has been funded with borrowings that in turn has raised the levels of public debt. The cost of servicing public debt has been low due to record low interest rates both at home and abroad. The record low interest rates may not last while the need for additional public borrowings could increase as new variants of the COVID virus arrive. The IMF, amongst others, have consequently raised questions about the sustainability of public debt.

Public debt is considered sustainable so long as the debtor is able to meet their payment obligations without resorting to emergency assistance or having to default. Such an eventuality has not arisen recently, but warnings are being sounded of the risk of debt distress. For PNG in particular, a debt sustainability analysis undertaken by the IMF in the leadup to the pandemic had concluded that the “risk of external public debt distress remains moderate and the risk of distress in the overall public debt is also moderate”, but then went on to caution that the space to absorb shocks were limited (IMF, 2020; pp. 81-2).

The level of public debt in PNG was rising in the lead-up to the COVID-19 pandemic, with policymakers readying themselves for fiscal consolidation in 2020. The pandemic not only delayed the planned fiscal tightening but increased both the levels of budget deficits and public debt. This has raised concerns regarding the risk of debt distress in future. Here, we present data on the trajectory of budget deficits, primary balances, and the level of debt in PNG from 2006 and 2020. We use this information to argue that fiscal policy has been used to support growth, and this, in turn, has led to an upward trajectory in both deficits and debt. This leads us to ask if the recent rise in debt is sustainable, particularly within the context of the revised debt ceiling of 45 to 60 percent of GDP with a long-term vision of returning this to 35 percent of GDP as envisioned under the FRA.

Our simulations show that the PNG government can abide by the revised FRA ceiling if: (i) interest rates remain low; (ii) GDP growth is high; and, (iii) future deficits are contained. None of these results are surprising; but what is new are estimates of the wiggle room with respect to each of the above parameters. In the case of the first, a one-hundred basis points rise in interest rates could require the government to run balanced primary budgets; on the second, primary deficits must remain below 5 percent of GDP even under the optimistic scenario of GDP growing at an annual rate of 7 percent if debt is to be prevented from spiralling upwards; and, primary deficits can be no higher than 2 percent at the projected medium to long-term GDP-growth forecast of 3 percent (growth projections from IMF, 2020; p.78). These findings provide caution to policymakers in terms of the limited fiscal room remaining to run deficits at historical levels, and the need to lift the rate of growth of GDP.

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Appendix

Table A 1: Selected economic and financial data for Papua New Guinea, 2016-2025

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Nominal GDP (2016): US\$21.1 billion 1/										
Population (2016): 7.9 million										
GDP per capita (2016): US\$2,568										
Quota: SDR 263.2 million										
Real sector										
Real GDP growth	4.1	3.5	-0.8	5	-1.7	0.3	1.4	3.7	3.8	3.4
Resource 2/	9.8	7.9	-9.3	9.7	-3	0.8	1.8	1.7	1.5	1.2
Non-resource	1.5	1.5	3.4	2.9	-1	0	1.2	4.7	4.8	4.4
Mining and quarrying (share)	9	10.2	10.6	10.3	11.8	11.9	12.3	11.9	11.5	11.2
Oil and gas extraction (share)	14.8	16.5	16.8	17.7	12.8	14.5	14.7	14.4	14	13.7
CPI (annual average)]	6.7	5.4	4.7	3.6	3.7	3.6	4.9	4.1	3	2.9
CPI (end-period)	6.6	4.7	4.8	2.9	3.3	4.2	5	3.4	2.9	2.9
Central government operations										
Revenue and grants	16.1	15.9	17.8	15.4	14.1	15.6	16	16.2	16.5	16.8
Of which : Resource revenue	0.6	0.9	1.7	1.5	0.2	0.8	0.7	0.7	0.6	0.6
Expenditure and net lending	20.9	18.4	20.4	19.5	20.4	20.5	20.1	19.8	19.7	19.8
Net lending(+)/borrowing(-)	-4.7	-2.5	-2.6	-4.1	-6.4	-5	-4.1	-3.7	-3.2	-3.1
Non-resource net lending(+)/	-5.4	-3.4	-4.3	-5.7	-6.6	-5.7	-4.8	-4.4	-3.9	-3.7
Money and credit										
Domestic credit	24.6	-0.1	-7.9	12.7	6.3	6.2	6.9	6.9	5.9	7.8
Credit to the private sector	7.2	-3.8	7.4	10.5	2.9	3.2	6	8.4	7.4	7.7
Broad money	10.9	-0.9	-3.8	9.6	0.6	8	9.2	9.2	4.7	6.7
Interest rate (182-day T-bills;	7.4	7.1	7	6.5	4.8	4.5	5.7	6.1	5.2	5
Government debt										
Government gross debt	33.7	32.5	36.8	39	43.5	45.6	46.9	45.6	44.2	42.6
External debt-to-GDP ratio (in	8.5	8.8	15.2	16.5	21.4	24.3	26.1	26.6	27	27.1
External debt-service ratio (pe	2.1	2.1	2.1	3.5	7.1	4	2.6	3.3	3.4	3.3

Source: IMF (2020)



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