

Stress Testing Ghana's Debt Sustainability Analysis 2010-2021

By Anthony Q. Q. Aboagye*

Ghana exited her 16th IMF Debt Bailout Programme in April 2019. Unfortunately, in May 2023, she signed on to her 17th IMF Debt Bailout Programme because the country's debt had once again become unsustainable. The question posed in this paper is, leading to 2021, did the authorities in Ghana undertake a thorough debt sustainability analysis? This study used the IMF-World Bank Debt Sustainability Framework for Low-Income Countries to analyse the dynamics of Ghana's debt over 2010-2021. Using averages of key variables over 2000-2009, the baseline scenario revealed that, had these averages prevailed, Ghana's debt ratio would have risen from 35% in 2009 to only 43% in 2021, a far cry from the actual 80.1% that drove her economy into a tailspin in 2022. The baseline scenario was stress tested assuming worsening scenarios of historical values of key variables. The results indicated that looking forward from 2009, moderate stress (worsening of the values of key variables by two standard errors) would be enough to make the year-on-year evolution of the debt ratio unsustainable. The cause of the ballooning debt ratio was traced to a primary balance that remained lower than its debt stabilizing value and Ghana having to borrow regularly to service previous debt.

Keywords: *debt sustainability analysis, stress test, Ghana, IMF, primary balance*

Introduction

In March 2021, Ghana borrowed USD 3 billion in the Eurobond market. At the same time, she announced plans to borrow another USD 1 billion in the last quarter of that year. However, this second issue did not materialize because by the third quarter of that year, it had become clear that the Eurobond market had become jittery about Ghana in respect of the quantum of Ghana's outstanding debt stock. In fact, the country's debt had been judged by the market to be unsustainable. This inability to borrow in the international capital market set off a chain of events that included the approach to the International Monetary Fund (IMF) for a three-year assistance programme midway through 2022. In December 2022, just before defaulting on her domestic and foreign debt servicing obligations, Ghana signed an IMF Staff Level Agreement. Under the agreement, she was to renegotiate new terms for the debts on which she had defaulted to render her debt sustainable. The restructuring of the debt has been referred to by the Ghanaian authorities as debt exchange – exchanging old debt for new debt under revised terms. By the end of February 2023, much of her domestic debt had been exchanged. On May 17, 2023, the IMF Management and

*Professor, University of Ghana Business School, Ghana.

Executive Board accepted Ghana's request to lend the country SDR 2.242 billion (USD 3 billion) over three years under strict conditions.

The crux of the matter here is that it had become the case that since Ghana returned to the international capital market in 2007 to borrow, the country would regularly borrow to payoff maturing debt plus to fund her budget deficits. Thus, Ghana had remained in perpetual debt. Not only that, the ratio of her debt stock to gross domestic product had been rising year-after-year. In 2014, Ghana was classified "moderate risk of debt distress". But by 2017 her situation had so deteriorated that she was reclassified "high risk of debt distress" and remained there in 2018. Since the second half of 2021, she's been in "debt distress" state.

Did Ghana not see her debt becoming unsustainable so soon after exiting her 16th IMF programme on April 2, 2019? Indeed, on April 3, 2019, having just exited her 16th IMF Programme the previous day, the country's President declared,

What I am saying to Ghanaians, to all of us, is that, in the 62 years of our independence, this was the 16th IMF bailout programme that the nation had gone into. Let it be the last time that we would resort to an IMF programme.¹

Because debt unsustainability had become common place among middle and low-income countries for some time, the IMF and World Bank had developed and revised a framework that establishes the debt and debt service thresholds that will apply when assessing the extent of risk of debt distress that these countries face (IMF 2005, 2012, 2013). The IMF and World Bank regularly conduct joint debt sustainability analysis (DSA) of countries and discuss results with country authorities. Without a doubt, Ghana was conscious of the need to undertake her own DSA. That, the Ghanaian authorities realise the importance of Ghana's debt to be sustainable is evident in statements made in every annual national budget statement delivered by the Minister of Finance on behalf of the president of the country from (2018 through 2021). Please see Appendix A for details.

There is ample evidence that the World Bank and the IMF have been undertaking individual and joint sustainability analysis of Ghana's debt. Their December 2019 joint analysis (IMF 2019) concluded that Ghana's risk of external debt distress was high. So was Ghana's overall risk of debt distress. Their April 2020 joint analysis (IMF 2020) reached the same conclusions. In fact, another joint analysis, dated September 2021 (IMF 2021), just before Ghana reversed her original decision to return to the international capital market in the last quarter of 2021 for yet another loan, reached exactly the same conclusion – high risk of external debt distress and high overall risk of debt distress. The results of these analyses are publicly available.

The DSA covered public and publicly guaranteed debt (financial sector clean-up costs and energy sector contingent liabilities). The DSA results were particularly sensitive to shocks affecting GDP growth, the primary balance, exports, foreign direct investment and exchange rate. The April 2020 DSA concluded that four out of five external debt indicators had breached thresholds of baseline scenario. And that breaches of acceptable bounds were identified in respect of i) the present value

¹President speaking to the nation on April 3, 2019.

of external debt to GDP, ii) debt service to exports, iii) debt service to revenues and iv) total public debt to GDP ratio.

Much earlier, the June 2008 external DSA indicated that Ghana's external debt dynamics was subject to moderate risk of debt distress. However, when external and domestic debt were taken together, the overall assessment was that "Ghana's debt distress has increased compared to the 2007" due to "recent rapid accumulation of external and domestic public debt contracted on commercial terms, and high current account and fiscal deficits that expose the country to structural vulnerabilities in the event of a reversal of favorable terms of trade."

With such overwhelming evidence that the authorities were aware that there was the need for Ghana's debt to be sustainable, and also aware of the IMF-World Bank framework for assessing sustainability of sovereign debt, how come her debt became unsustainable so soon after exiting the 16th IMF Programme? How was Ghana's own DSA conducted? Surely, the Ghanaian approach to DSA analysis could not have deviated much from the IMF-World Bank framework. Did they not stress test their base analysis? If they did, what did their worsening scenarios reveal?

Following this introduction, is a brief review of the schools of thought on the effects of public borrowing and some African empirical evidence. Then, government budget constraints and borrowing are discussed. After this, the IMF-World Bank framework for assessing debt carrying capacity and sustainability is discussed. Baseline and stress tests results of an application of the IMF-World Bank framework for Ghana's DSA over the period 2010 to 2021 are reported and discussed in the context of Tax revenues, non-tax expenditures, interest payments, the real rate of interest, the real rate of growth of the economy and the primary balance. Finally, concluding statements are made.

Literature Review

Is Debt Beneficial?

Theoretical and empirical studies of the effect of sovereign debt on the dynamics of economic growth date back to the middle of the 20th century. The literature on the subject has coalesced to a number of schools of thought.

One is the *Neoclassical school*, which takes the position that increasing public debt has a negative effect on economic growth. Another is the *Keynesians school*. Keynesians argue that the effect of government debt is positive during economic recession. Then, there is the *Monetarist school*, which argues that the supply of money in an economy is the primary driver of economic growth. For, as the availability of money in the economy increases, aggregate demand for goods and services increases too. Finally, there is the *Ricardian school*. Their position is that the effect of debt on economic growth is neutral.

Kedir et al. (2023), using data on 48 African countries, 1991-2018, show that the link between country debt and growth of economy varies from country to country. They estimated country-specific response of growth to debt accumulation and concluded that debt can enhance growth or be detrimental to growth depending

on the quality of institutions. They advise researchers against overgeneralizations, based on average results. However, another study of the effect of sovereign debt on the economic performance of 41 African countries over 2002 to 2020 concluded that under no circumstance is debt beneficial. Authors (Kinyondo et al. 2021) admonished African countries to reduce their debts.

For many African countries, even when steps have been taken to reduce debt (e.g., Highly Indebted Poor Country Initiative), debt has built up again quickly. This is one reason why many development economists consider public debt a developmental challenge in Africa. UNICEF (2021) notes that, in Africa and other developing countries, debt servicing was exceeding expenditures on health, education, and social protection combined. On its part, the United Nations Economic Commission for Africa (2019) posits that in more recent times, debt servicing by African countries has been made more difficult by slow economic growth, deteriorating terms of trade, loose fiscal policies and tighter monetary policy by foreign central banks.

Budget Constraint

Typically, public debt servicing capacity is analysed by focusing on the primary balance, which is the difference between total government revenues less government's non-interest expenses. Thus, the primary balance indicates a government's debt servicing capacity. If the primary balance is not enough to service previously contracted debt, the government may borrow to pay interest on previous debt. Naturally, this increases the stock of public debt. Typically, to improve the primary balance, a government may try to increase tax revenues or reduce her non-interest expenses.

The budget constraint facing governments in any year requires that interest and non-interest expenses equal the sum of government revenues, additional borrowing and the amount of new money issued (domestic currency). If the government borrows from domestic and external sources, external borrowings may be analysed in the context of balance of payments. A macroeconomic accounting identity says that, when a country's spending exceeds her domestic output, domestic real investment will exceed domestic savings. The excess investment comes from foreign investors in the form of capital inflows to the country in question.

Another macroeconomic accounting identity says that, if a country's national spending exceeds her national income, then her imports must exceed her exports by the same amount. In a freely floating exchange rate system, the deficit must be paid for by external borrowing. Foreigners from whom the deficit country is borrowing are investing in the deficit country. It must be emphasized that these foreign investments must be paid back with interest.

Debt Sustainability

The literature has generally established that countries with good policies, good assets, strong institutions and positive macroeconomic prospects can sustain higher levels of external debt than others. A country's public debt, including publicly guaranteed debt, is considered sustainable if she is able to meet all her current and

future payment obligations without exceptional financial assistance or going into default.

In the literature, two main approaches to debt sustainability analysis are discussed. One is the debt-stabilizing primary balance approach. This approach focuses on the primary balance that would lead to achieving a pre-determined debt path, given assumptions about the real interest rate and growth rate of the economy. See for example, Ncube and Brixiová (2014) and Izák (2009). The other approach is debt path projections and how these relate to debt sustainability thresholds. This approach is more commonly used by the International Monetary Fund (IMF) and the World Bank. See for example, IMF (2005, 2012, 2013).

Debt-stabilizing Primary Balance Approach

This approach proceeds on the grounds that the cost of public debt servicing depends on the variables that determine the debt dynamics, namely, primary balance, outstanding debt stock, inflation rate and growth rate of the economy. Izak (2009) shows that the nominal amount of debt service is influenced by the primary balance, the real growth rate of the economy, the inflation rate and the change in debt stock. And that, debt service to GDP ratio increases with both the primary deficit (negative of primary balance) to GDP ratio and debt service to GDP ratio but decreases with GDP growth rate. To stabilize the debt-GDP ratio, the primary balance and the growth rate of the economy times the debt-GDP ratio must be able to finance the debt service.

From this perspective, the primary balance is important for fiscal sustainability. The primary surplus (positive primary balance) required for stabilization of the debt-GDP ratio is given by the differential between the real cost of debt and GDP growth rate multiplied by the Debt/GDP ratio. Ncube and Brixiová (2014) showed that public debt-to-GDP ratio may be reduced by accelerating growth, improving primary balances, and reducing the real interest (by raising inflation), and/or defaulting on their debt.²

Analysing the differential between the real interest rate and growth rate of 29 African economies, Ncube and Brixiová (2014) showed that high growth and negative real interests contributed to decline in debt burden in Africa from 2008 to 2012. However, for economies that borrowed on market terms, whether domestic (e.g., Kenya) or international (e.g., Ghana) the impact of real interest rates in lowering the debt burden was low. They also concluded that in more than half of the countries, the primary balance was above what was required to keep the debt-to-GDP ratio at its 2007 level. The insight is that the fiscal position of majority of the African countries was sustainable between 2008 and 2012.

Debt Path and Debt Sustainability Threshold Approach

For low (and middle) income countries with access to international capital markets, the IMF and the World Bank have developed a framework to help them analyse the likely evolution of their debt stock going forward, given certain conditions (IMF 2005, 2012, 2013).

²Inflation impacts the debt-GDP ratio through lowering the real interest rate.

Called the debt sustainability framework (DSF), it requires regular debt sustainability analysis of a country's projected debt burden over the next 10 years considering the country's vulnerability to economic and policy shocks. The framework uses a composite indicator that considers a country's historical performance, outlook for real growth, remittance inflows, international reserves, and other factors. Because countries vary in their ability to settle their debts, especially foreign debt, the DSF classifies countries' debt-carrying capacity into three categories – *strong*, *medium*, and *weak* with associated maximum thresholds. In determining debt-carrying capacity, at least three criteria are considered: the present value of external debt to gross domestic product (GDP), or to exports; present value of external debt servicing to countries exports ratio or to countries revenues; and present value of total public debt to country GDP. A country that is experiencing difficulties in servicing its debt, (in arrears, ongoing or impending debt restructuring) is said to be in *debt distress*. It is noted that debt sustainability also depends on the global environment through demand for exports, and for developing countries, remittance inflows.

IMF (2005, 2012, 2013) show that for a small open developing economy, like Ghana, the framework considers the country's public debt to GDP ratio (composite domestic and foreign), d_t , to evolve according to the equation:

$$d_t = \theta_t^* d_{t-1} - (pb_t + \mu_t) \quad (1)$$

where,

$$\theta_t^* \equiv \frac{1+i_t^*}{(1+g_t)(1+\pi_t^*)} \quad (2)$$

$$i_t^* = \left((1 - \alpha) i_t^h + \alpha i_t^f \right) + \alpha \varepsilon_t (1 + i_t^f) \quad (3)$$

i_t^* , is the effective nominal interest rate which is a weighted average of the domestic interest rate, i_t^h , foreign interest rate, i_t^f ,

α is foreign debt to GDP ratio, and

ε_t is the depreciation/appreciation rate of the domestic currency.

g_t , is the real rate of growth of the GDP.

π_t^* is the GDP deflator which depends on the domestic inflation π_t^h , foreign inflation π_t^f , and exchange rate movements. It is given by,

$$\pi_t^* = \left((1 - \beta) \pi_t^h + \beta \pi_t^f \right) + \beta \varepsilon_t (1 + \pi_t^f) \quad (4)$$

where, β is the output share of tradables in total GDP.

pb_t in equation (1) is the primary balance to GDP ratio, while μ_t is the change in money supply as a ratio of GDP, (seiniorage). The primary balance is defined as government revenue less government's non-interest expenses. That is, interest on debt is paid out of primary balance.

Debt is explosive if $\theta_t^* > 1$. That is, if the real rate at which interest is paid on the public debt, given by $r_t^* \equiv \frac{1+i_t^*}{(1+\pi_t^*)} - 1$, exceeds the real rate of growth of the economy, g_t . (That is, the path taken by the evolution of debt is looked upon as unsustainable if pb_t and μ_t are not unrealistically high). On the contrary, if $\theta_t^* < 1$,

then each subsequent year's debt falls below the preceding year's. And the burden of debt servicing reduces over time.

However, if $r_t^* > g_t$, it may be possible to contain debt if the primary balance is positive and large enough (holding seigniorage constant). Thus, pb_t is a good indicator of government's efforts to contain debt (referred to as fiscal adjustment).

Croce and Ramon (2003) argue that were the economy in steady state, $r^* < g^*$ would lead to a situation whereby government can issue debt and roll it over forever. This would be a Ponzi scheme that results in inefficient capital accumulation.

The framework in equation (1) enhances comparison of situations across countries and is also used by the Bretton Woods institutions for their own analyses and serves as a basis for policy advice. DSAs are central to accessing IMF financing and programmes.

Stress Tests

Evolution of debt according to equation (1) may be investigated for a country's vulnerability to economic and policy shocks. Starting from a base year's debt ratio, d_0 , historical averages of i_t^* , π_t^* , g_t , pb_t and μ_t are used to investigate how the debt ratio may evolve over the next 10 years or so. To be truly useful and forward looking, the variables driving the evolution of debt (base case) must be subject to stress tests since nobody knows what future will unfold. Note that calculation of i_t^* involve i_t^h and i_t^f so it is these two that are stressed. Also, calculation of π_t^* and involves π_t^h and π_t^f , and it is these that are stressed.

Given that Ghana must have been conducting analyses of how her debt could possibly evolve and still be sustainable, such analyses should have been done under several scenarios of policy variables, macroeconomic variables and debt servicing costs. For example, historical averages of the variables for the years 2000 through 2009 could have been taken as the base case and the possible dynamics (evolution) of debt under several scenarios of effective GDP deflators, effective interest rates, rate of growth of the economy and other variables investigated for about 10 years. This should be repeated regularly, at least yearly. Typically, interest centres on exceptional but plausible negative scenarios of evolution of key variables. Up to three standard deviations of historical values of important variables are used. This is the subject matter of this study.

Ghana on Debt Restructuring Path

On December 4, 2022, the Ghana government announced a Debt Exchange Programme for holders of domestic bonds issued by the Government of Ghana and two special purpose vehicles set up by the state (ESLA Plc and Daakye Trust Plc). The total value of domestic debt outstanding at the time was USD 13.7 billion (GHS 137.3 billion). The debt exchange agreement was concluded in February 2023. The new terms were that bonds that would have matured in 2023 will be exchanged for a staggered series of payments (combination of interest and principal) running from 2027 through 2033 both dates inclusive. Debts that would have matured after 2023

will be exchanged for a series of payment running from 2027 through 2038, both dates inclusive.

On December 19, 2022, the Ghana government announced that the sovereign had suspended payments on most of her external debt. As such, she will not service payments due on her Eurobonds, commercial loans and most bilateral loans until a new arrangement was put in place to exchange the old foreign debt for new foreign debt. She emphasized that this was an interim measure and that she was ready to “engage in discussions with all of its external creditors to make Ghana’s debt sustainable”.

Methodology

While Ghana government speaks freely of DSA, they do not provide the model that they use for their analysis. For this exercise, we use the *IMF-World Bank Debt Sustainability Framework For Low-Income Countries* discussed earlier.

As discussed, the evolution of debt in this framework is given by equation (1). The variables needed involve foreign nominal interest rate and inflation rate. This study uses US data for foreign country variables because more than 80% of Ghana’s international trade is denominated in USD. The variables required for operationalizing the model are sourced as follows:

The study proceeds by first documenting Ghana’s actual year-on-year values of d_t . Then, actual values of i_t^* , π_t^* , r_t^* , g_t , and θ_t^* are calculated for each year from 2010 through 2021. Please see Table 1 for the definition and sources of variables. Next, the means of annual values i^* , π^* , r^* , g^* , and θ^* for the period 2000 through 2009 were calculated together with their standard errors. Following this, the path that Ghana’s debt would have evolved between 2010 and 2021 had the dynamics followed the means of the values just calculated was estimated. Finally, these baseline estimates were stress tested assuming worsening of the variables by one, two and three standard errors. That is, under mild, moderate and extreme but plausible shocks respectively.

Table 1. Definition and Sources of Variables Used in DSA. t is Year

Variable	Definition	Source
d_t	Debt stock as a proportion of GDP in year t	World Bank https://data.worldbank.org/country/GH
θ_t^*	See equation (2)	Calculated according to equation (2)
g_t	Real rate of growth of GDP, constant 2015 prices	World Bank https://data.worldbank.org/country/GH
α	Foreign debt to GDP ratio	Republic of Ghana (2021). Annual Public Debt Report for 2021
i_t^*	Effective nominal interest rate	Calculated according to equation (3)
π_t^*	Effective GDP deflator	Calculated according to equation (4)
i_t^h	Domestic inflation rate	World Bank https://data.worldbank.org/country/GH
i_t^f	US inflation rate	World Bank https://data.worldbank.org/country/GH

ε_t	depreciation/appreciation rate of the domestic currency	World Bank https://data.worldbank.org/country/GH
β	is the output share of tradables in total GDP	World Bank https://data.worldbank.org/country/GH
GDP_t	Gross Domestic Product	Ghana Statistical Service Bulletin, various years
pb_t	primary balance to GDP ratio	World Bank https://data.worldbank.org/country/GH
μ_t	change in money supply as a ratio of GDP	Set equal to zero

Source: Author's compilation.

Results and Discussion

Column (2) of Table 2 presents Ghana's actual end of year public debt to GDP ratio from 2009 through 2021. This ratio increased steadily from 35% to 80.1% over the period. By the end of 2021, Ghana had become debt distressed and could not borrow from the international capital markets anymore. This set in motion the chain of activities that are the subject matter of this paper and which are still unfolding.

Also, indicated in Table 2 are calculated annual values of i_t^* , π_t^* , r_t^* , g_t , θ_t^* and pb_t . It is noted that, for the period in question, other than 2010, 2011 and 2021, the effective real rate at which Ghana paid interest on her debt, r_t^* , exceeded the real rate at which her economy grew, g_t . In such a situation, the debt ratio would grow unless moderated by the primary balance. Unfortunately, Ghana's primary balance ratio was negative in seven out of the 12 years. Even when the primary balances were positive, they were small, resulting in a negative 12-year average. The results are what we see in column (2) of Table 2, rising debt ratio year-after-year. Thus, pb_t was no help in lowering the path of Ghana's debt.

μ_t has been set equal to zero, mainly because information on seigniorage is not readily available. However, we take consolation in the fact that Arisen and Veiga (2005) have noted that countries that develop their institutions to be conducive to greater economic freedom show lower reliance on seigniorage financing of public deficits. Ghana has whole heartedly adopted the principle of economic freedom.

Table 2. Empirical Evolution of Ghana's Debt to GDP Ratio, and Key Variables of her Debt Dynamics. Column (9) is Baseline Estimates of the Evolution Using Historical Averages

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year	dt	\bar{i}_t^*	π_t^*	r_t^*	g_t	θ_t^*	pb_t	a_t^*
2009	35.0%							35.0%
2010	37.5%	14.5%	11.7%	2.5%	7.9%	0.950	0.10%	35.6%
2011	42.6%	11.0%	8.0%	2.8%	14.0%	0.902	2.00%	36.2%
2012	47.8%	16.4%	5.3%	10.5%	9.3%	1.011	-1.60%	36.8%
2013	42.9%	20.4%	10.1%	9.4%	7.3%	1.019	-0.20%	37.4%
2014	51.2%	19.3%	13.1%	5.4%	2.9%	1.025	-2.90%	38.1%
2015	55.6%	20.1%	6.5%	12.8%	2.1%	1.104	-0.30%	38.8%
2016	56.9%	22.7%	10.7%	10.8%	3.4%	1.072	-1.10%	39.4%
2017	55.6%	16.0%	6.8%	8.7%	8.1%	1.005	0.50%	40.1%
2018	57.6%	16.6%	7.4%	8.6%	6.2%	1.022	1.40%	40.8%
2019	62.4%	15.9%	5.0%	10.4%	6.5%	1.037	0.80%	41.6%
2020	76.1%	16.7%	7.4%	8.6%	0.5%	1.081	-8.00%	42.3%
2021	80.1%	13.9%	9.0%	4.5%	5.4%	0.992	-4.10%	43.1%
Average		17.0%	8.4%	7.9%	6.1%	1.018	-1.12%	

Source: \bar{i}_t^* , π_t^* , r_t^* , and θ_t^* calculated from equations (1), (2), (3) and (4) by author.

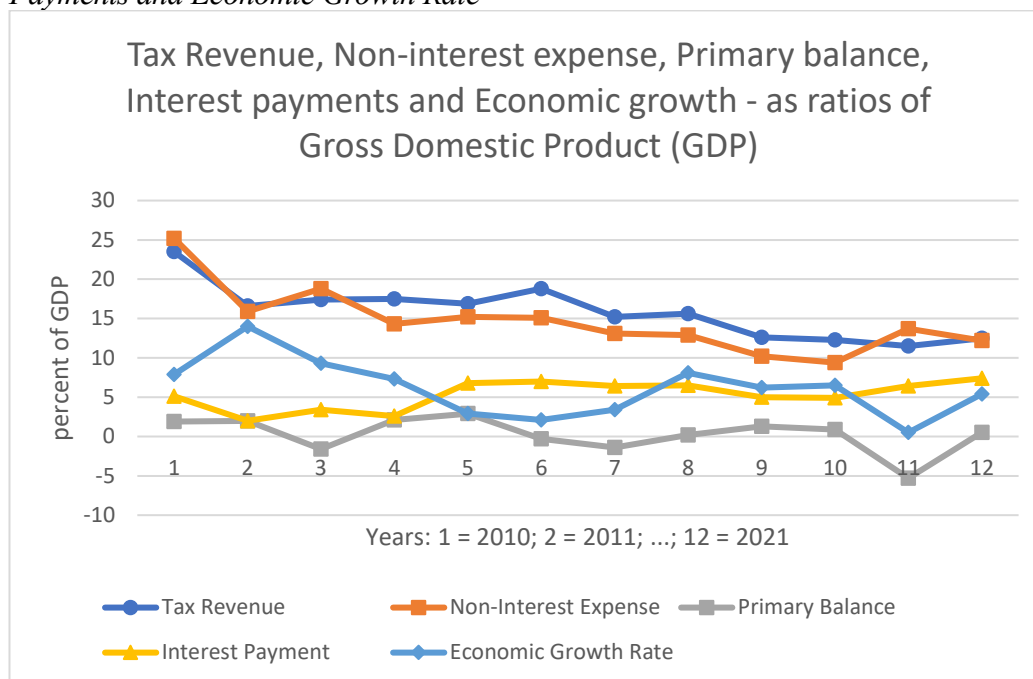
Column (9) of Table 2 presents the baseline scenario of the evolution of Ghana's debt using 2000 to 2009 averages of $\bar{i}^* = 19.10\%$; $\pi^* = 10.45\%$; $r^* = 7.83\%$; $g = 5.36\%$; $\theta^* = 1.023$; and $pb = +0.23\%$.

Had the averages of the variables for 2000 to 2009 prevailed during 2009 to 2021, the debt ratio would have risen from 35% in 2009 to only 43% at the end of 2021. A rather beautiful picture. Once again, μ_t has been set equal to zero. This is repeated for all stress testing scenarios.

History indeed counts for something. The 2000 to 2009 period included three years during which Ghana was under the *Highly Indebted Poor Country Initiative* (2002-2004). Under this initiative, Ghana received comprehensive debt reduction with net present value USD 2.186 billion, 56% of Ghana's total debt outstanding.³ Obviously, this influenced Ghana's historical actual \bar{i}^* ; π^* ; r^* ; g ; θ^* ; and pb . Thus, consistent with theory, staying with historical actuals only would not be good enough.

³<http://www.imf.org/external/np/hipc/index.asp>

Figure 1. Trends in Tax Revenue, Non-interest Expense, Primary Balance, Interest Payments and Economic Growth Rate



Source: Drawn from data compiled from Ghana's annual *Budget Statements*.

Figure 1 is a pictorial presentation of fluctuations in key ratios. It shows that tax revenue and non-interest expense generally trended downwards between 2010 and 2021. While Non-oil expenses were below tax revenues much of the time, they exceeded tax revenues in 2010, 2012 and 2020. The primary balance hovered around zero. It was positive in five years and negative the other seven years. Interest expenses were positive all through and were generally rising. The interest expense graph was higher than the primary balance graph all through. Thus, Ghana ran an overall deficit all through the period. The real growth rate of GDP was positive (almost zero in 2020) all through but fluctuated from year-to-year.

Primary Balance

Interest in the primary balance led this author to compare the mean primary balances for the 2000-2009 period and 2010-2021 period. The mean for 2000-2009 was 0.23% of GDP and -1.12% for the 2010-2021 period. A statistical test of differences in the two means says -1.12% is statistically smaller than 0.23% at the 95% confidence interval. Here then is what is driving post 2009 debt dynamics - the average primary balance ratio for the 2010 to 2021 period is statistically smaller than the average of the earlier period. That is, public expenditure ratios were relatively higher during the 2010-2021 period than during the 2000-2009 period.

However, another test revealed no statistical difference between the mean real borrowing rate of 7.9% and the mean real growth rate of GDP of 6.1%, both for the 2010-2021 period. With r^* not statistically different from g^* , the path followed by Ghana's debt over the 2010-2021 period depended critically on pb , which was near zero and negative on average.

Debt stabilizing primary balance

For debt-stabilizing **pb** analysis, we turn to a statement in Ghana's 2019 budget statement. In there one reads

Paragraph 346:

*Mr. Speaker, one of the main goals of the [16th] IMF Extended Credit Facility (ECF) was to implement fiscal consolidation to restore debt sustainability and macroeconomic stability. This goal has been achieved with great success. To ensure **irreversibility** [emphasis added], government is committed to maintain debt sustainability to achieve the "Ghana Beyond Aid Agenda". In 2019, strategies including capping non-concessional borrowing at US\$750.00 million will be enforced to achieve a **nominal debt to GDP ratio of not more than 60 percent** [emphasis added].*

So, the question now is, what primary balance would have ensured that Ghana's debt ratio was stabilized at the intended 60%? The 2019 budget was read in November 2018 to be effective January 1, 2019. In 2018, r^* was 8.6%, g^* was 6.2% and $d_{t-1} = 57.6\%$. Based on equation (1), and assuming a preferred stable debt ratio of 60% implied in the 2019 Budget Statement, the debt stabilizing primary balance works out to 1.4%.

This was the **pb** for 2018. Of course, Ghana's debt did not stabilize, but exploded. In 2019, the **pb** was 0.8% and the debt ratio moved up to 62.4%. In 2020, **pb** was -8% and the debt ratio exploded to 76.1%.

For the period 2008-2012, Ncube and Brixiova (2014) observed that high growth rate of economies and negative real interest rates contributed to decline in debt burden among 29 African countries. In this study, the actual primary balance is less than debt stabilizing primary balance (Table 2) that was responsible for the rising debt ratio. UNECA (2019) has argued that given that most African governments' revenues (Ghana inclusive) are in the range of 12% - 20% of GDP, these countries must increase revenues through tax reforms, non-tax revenue, enhanced tax administration, reduced tax evasion and reduced tax avoidance especially in the natural resources sector. In fact, they added that raising government revenues to 20% will lift 16 African countries out of the debt trap.

Stress Tests

In 2010 for example, managers of the Ghanaian economy would have been happy with the debt path revealed by the base scenario, (last column of Table 2). In fact, a scenario that shows these very gentle increases in the debt ratio may have translated to some implied incentive to borrow more. What about stressed scenarios?

Theory says that in conducting stress tests, many scenarios should be considered including extreme but plausible cases. Up to three standard errors off the mean baseline values are typically used. Here we present scenarios of mild, moderate and extreme but plausible scenarios, respectively, one, two and three standard errors or worsening base values of i^* , π^* , r^* , g , θ^* and **pb**.

The variables driving i^* , are i_{us} , i_{gh} , α and ϵ . Please refer to equation (3). The variables driving π^* , are π_{us} , π_{gh} , β and ϵ . Please refer to equation (4). r^* is

calculated from i^* , and π^* ; and θ^* is calculated from r^* and g . Thus, we proceed with scenarios in which i_{us} , i_{gh} , π_{us} , π_{gh} , and β deteriorate by one, two and three standard errors of their 2000 to 2009 means.

Table 4 presents the results. Column (3) headed “1 SE worse”, means key variables are one standard error worse than the 2000 to 2009 average. That is, $r^*=8.75\%$; $g = 4.86\%$; $\theta^* = 1.037$; $pb = -0.83\%$; $\beta = 45.94\%$. Table 4 says, if all key variables deteriorate by one standard error, the debt ratio shoots up from the baseline projection of 43% in 2021 to 67% that year. The reason is that θ^* would have increased from 1.023 to 1.037 and pb deteriorated from 0.23% to -0.83%. Note that, 67% debt ratio is higher than the 55% threshold recommended by IMF Guidelines for economies judged to have *medium* debt carrying capacity.

Table 4. Debt to GDP Dynamics under Worsening of Key Variables

Year	Base Case	1 SE worse	2 SE worse	3 SE worse
2009	35.0%	35.0%	35.0%	35.0%
2010	35.6%	37.1%	38.6%	41.8%
2011	36.2%	39.3%	42.0%	49.3%
2012	36.8%	41.6%	45.7%	57.7%
2013	37.4%	44.0%	49.4%	66.9%
2014	38.1%	46.5%	53.4%	77.2%
2015	38.7%	49.0%	57.4%	88.6%
2016	39.4%	51.7%	61.7%	101.3%
2017	40.1%	54.4%	66.1%	115.3%
2018	40.8%	57.3%	70.7%	130.9%
2019	41.5%	60.2%	75.5%	148.1%
2020	42.3%	63.3%	80.5%	167.3%
2021	43.0%	66.5%	85.7%	188.5%

Legend: “1 SE worse” is one standard error worse; “2 SE worse” is two standard errors; and “3 SE worse” is three standard errors.

Source: Author’s calculations.

Column (4) of Table 4, headed 2 SE worse, means key variables are two standard errors worse than the 2000 to 2010 average. That is, $r^* = 9.34\%$; $g = 4.37\%$; $\theta^* = 1.047$; $pb = -1.90\%$; $\beta = 43.07\%$. Table 4 says, if all key variables deteriorate by two standard errors, the debt ratio shoots up from the baseline figure of 43% in 2021 to 85.7%. The reason is that θ^* has increased from 1.023 to 1.047 and pb has deteriorated from 0.23% to -1.90%. The projected debt ratios under this scenario are higher than the actuals in Table 2 and would have caused Ghana more headaches than she is now suffering. Stress results of this scenario should have made the economic managers scratch their heads. They should then have developed contingency plans. It would appear they did not.

Column (5) of Table 4, headed 3 SE worse, means key variables are three standard errors worse than the 2000 to 2009 average. That is, $r^* = 15.219\%$; $g = 3.87\%$; $\theta^* = 1.109$; $pb = -2.96\%$; $\beta = 40.21\%$. Unfolding of this scenario would have been disastrous for a lower middle-income country like Ghana. In fact, long before reaching a debt to GDP ratio of 188% projected in Table 4 for 2021, no external

economic agent would have been willing to lend to Ghana. The domestic currency would have collapsed to the point where, on purchasing power parity basis, Ghana would have lost her lower middle-income status and returned to being a low-income country. In fact, Table 4 says the 2021 debt ratio at which the wheels fell off Ghana's economy at 80% of GDP was reached soon after 2014, seven years earlier under this scenario.

Conclusion and Recommendations

The obvious matter here is that Ghana should have undertaken stress tests of the base scenario of the path of her debt stock for up to 10 years. Mild, moderate, extreme but plausible scenarios should have been considered. Results of these tests should have informed drawing up of credible contingency plans in the face of unfolding events/variables. A developing economy must undertake stress tests of plans she formulates.

Clearly, fiscal adjustments (improving primary balance) and undertaking investments that enhance economic growth above the effective real rate at which she pays interest on debt contracted would have helped. Unfortunately, the fruits of growth-enhancing investments take time to become evident, but they are necessary.

Fiscal adjustments involve reduction in government expenditure, increasing government revenues or both. The former is not politically palatable. The latter involves hard work. Interestingly, contained in Ghana's 17th Programme with the IMF (2023) is a condition that Ghana must increase her primary balance to +1.5% of GDP from 2025 through 2028.

Equation (1) recognises the role of monetary policy. This has been downplayed here because of lack of objective data and its potential to be inflationary, as Adenutsi (2008) cautioned the Ghanaian authorities.

Acknowledgments

The author is grateful to the University of Ghana Business School for partially funding this research.

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Appendix A

Indication that Ghana Has Been Aware of the Need for her Debt to be Sustainable

2018 Budget Statement

Paragraph 204:

Mr. Speaker, attaining debt sustainability is one of the key objectives of Ghana's debt management policy. The latest DSA reveals a declining public debt to GDP trajectory based on the positive developments in the primary balance.

Paragraph 346:

In 2018, the Ministry will continue to carry out its mandate of managing public debt to achieve sustainability and ensure that government funding requirement is raised at least cost at a prudent level of risk. In addition, it will conduct and publish a revised Debt Sustainability Analysis (DSA) and Medium-Term Debt Strategy (MTDS) to guide borrowing.⁴

2019 Budget Statement, Paragraph 346:

Mr. Speaker, one of the main goals of the [16th] IMF Extended Credit Facility (ECF) was to implement fiscal consolidation to restore debt sustainability and macroeconomic stability. This goal has been achieved with great success. To ensure irreversibility, government is committed to maintain debt sustainability to achieve the Ghana Beyond Aid agenda. In 2019, strategies including capping non-concessional borrowing at US\$750.00 million will be enforced to achieve a nominal debt to GDP ratio of not more than 60 percent.⁵

2020 Budget Statement, Paragraph 160:

Government is committed to maintaining the public debt at sustainable levels below the established threshold of 65 percent of GDP in line with Ghana's ranking as a moderate performer under the new Debt Sustainability Framework.

2021 Budget Statement

Paragraph 171:

COVID-19 aggravated the situation in 2020 and, together with the Financial Sector Bailout and the Energy Sector IPP payments, resulted in the debt-to-GDP ratio exceeding the ECOWAS threshold of 70 percent at the end of the year.

Paragraph 239:

The medium-term fiscal framework will be anchored on debt sustainability given the exigencies of the time, the elevated debt levels, as well as the limited fiscal space and budget rigidities.

⁴Note that, when the 2018 Budget Statement was being read in November 2017, Ghana was firmly into her 16th Program with the IMF.

⁵In spite of promised limit of US\$ 750 million of non-concessional loans in 2019, in March 2019, Ghana issued three loans to raise a total of US\$ 3 billion! One wonders what happened! It is noted that in March 2019, Ghana was on the verge of exiting her 16th tutelage

Paragraph 242:

Our resolve to ensure debt sustainability in the medium-term will support a medium-term fiscal path that will ensure a return to the Fiscal Responsibility ACT threshold of a deficit of 5 percent of GDP and a positive primary balance by 2024.

