# The New Fiscal Framework of the Brazilian Economy: Theory, Model, and Empirical Evidence of an (Un)sustainable Fiscal Regim

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**El nuevo marco fiscal de la economía brasileña: Teoría, modelo y evidencias empíricas de un régimen fiscal (in)sostenible**

*Resumen*. Este trabajo tiene como objetivo desarrollar un modelo matemático capaz de representar el nuevo marco fiscal de la economía brasileña para simular sus efectos en diferentes escenarios. Con base en el modelo desarrollado y las condiciones iniciales presentadas por el gobierno, se puede afirmar que esta regla fiscal no es sostenible. En el mejor de los escenarios, el índice de endeudamiento alcanzaría el 84,01% en 2026, muy por encima de las metas establecidas. Evidentemente, los resultados son sensibles a las hipótesis y parámetros definidos originalmente por el nuevo marco, los cuales deben ser reconsiderados y recalibrados mediante procedimientos que exploren soluciones viables hasta encontrar la óptima. Por último, la economía brasileña está atrapada en una trampa, ya que el éxito del nuevo marco depende de la aceleración del crecimiento a largo plazo. Sin embargo, los recursos para su viabilidad son insuficientes y, para colmo, están siendo restringidos por la propia regla fiscal.

*Palabras clave*: Nuevo marco fiscal; Sostenibilidad de la deuda pública; Programa de aceleración del Crecimiento; Brasil.
*Clasificación JEL*: H60; O11; O40

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*Abstract.* This paper aims to develop a mathematical model capable of representing the new fiscal framework of the Brazilian economy become possible to simulate its effects in different scenarios. Considering the model developed and the initial conditions presented by the government, it can be said that this fiscal rule is not sustainable, given that in the best scenario the debt ratio should reach the level of 84.01% in 2026, well above the established goals. Evidently, the results were sensitive to assumptions and parameters originally defined by the new framework, which must be rethought and recalibrated through procedures that scan the viable solutions until the one considered optimal to be found. Finally, the Brazilian economy is caught in a trap, since the success of the new framework depends on the growth acceleration of long-term, whose resources for its viability are insufficient for its realization and, to make matters worse, are being restricted by the fiscal rule itself.

*Keywords*: New Fiscal Framework; Public Debt Sustainability; Growth Acceleration Program; Brazil.
*JEL codes*: H60; O11; O40

## 1. Introduction

The debate surrounding the dynamics of debt has always held a prominent place among economists, and it is no different in the current context of the Brazilian economy. Since the implementation of the "Public Spending Ceiling" Constitutional Amendment No. 95 in 2016, various criticisms have arisen regarding its effectiveness.

Considering this, in 2023, the federal government proposed a structural modification to the country's fiscal rule with the New Fiscal Framework (NAF), outlined in draft legislation 93/2023. The central objective of the proposal is to restore fiscal stability and macroeconomic credibility to the Brazilian economy, essential factors for stimulating private investments and promoting long run sustainable growth. This new fiscal regime reconfigures the rules for control- ling public accounts, allowing for real adjustments in public spending and investments under certain conditions.

Initially, the federal government's plan was to achieve a zero fiscal deficit in 2024, followed by primary surpluses in 2025 and 2026. The underlying strategy of the new fiscal framework aimed to stabilize the Debt-to-GDP Ratio (General Government Gross Debt / Gross Domestic Product) through the fulfillment of predefined fiscal targets, with margins of 0.25%, conditioned on revenue expansion, which is closely tied to economic growth.

This paper aims to develop a mathematical model capable of representing the proposed new fiscal framework by the government, allowing simulations in different scenarios of inflation rates, interest rates, growth, and fiscal targets to understand their effects on the debt ratio. This theoretical model seeks to formalize the assumptions of the fiscal rule, as well as explain the origin and definition of the parameters used. The simulations conducted allow for the analysis of the viability of the proposed targets and the expected results.

To achieve the objective, the paper is organized into six sections, in addition to this introduction. The second section provides a brief literature review. The following section focuses on recent fiscal efforts in the Brazilian economy. In the fourth section, the theory and assumptions of the model are explained. Next, the mathematical model of the new fiscal framework developed is presented. In the sixth section, the results of the simulations are presented and discussed in detail. Finally, there are the concluding remarks.

## 2. Literature Review

The concept of fiscal sustainability has introduced into the analysis the perspective on the expected behavior of the public deficit, combined with an attempt to maintain the Debt/GDP ratio stable. Fiscal policy, as a macroeconomic instrument, should avoid intertemporal inconsistency problems and gain credibility, by building an institutional framework committed to the use of fiscal rules, in order to sustain its anchor role in the system and ensure the stability of macroeconomic variables.

This theoretical construction outlined the first generation of fiscal rules and supported the use of this instrument in an increasing number of countries. According to (Kopits & Symansky, 1998), the rationality behind the adoption of fiscal rules reflected a context of fiscal deterioration and the practical failure of discretionary policies, combined with the observed gains from the new institutional framework that emerged with the implementation of strict fiscal control.

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The concept of fiscal rules became sufficiently generic and open to a wide range of possibilities to encompass different instruments. Among the main ones, according to (Fund 2018), we can list:

- Expense or public spending rules, which aim to establish a maximum limit for the growth of government spending over time, in order to prevent it from behaving pro-cyclically and growing beyond what would be sustainable; [4]
- Revenue or taxation rules, which establish maximum limits on the tax burden; [5]
- Budget outcome rules, which define criteria for metrics that consider both government expenditures and revenues together;[6] and
- Public debt rules, which aim to prevent the accumulated debt volume over time from exceeding a certain level considered manageable.[7]

The global crisis of 2008 made it evident that fiscal rules could not deal with that exceptional economic moment, as maintaining the current norm would require a strong fiscal tightening in the future to compensate for the debt growth, with negative impacts on the fragile economic situation of the countries. Thus, there was a need to review the model based on strict fiscal control, giving way to second-generation fiscal rules, with fiscal targets, more flexible to meet the demands imposed by the economic conjuncture.

Therefore, the literature has drawn attention, since the subprime crisis, to the operational aspects in the implementation of fiscal rules that are not exclusively associated with the concept of fiscal sustainability (Schick, 2010; Dabán, 2011; Schaechter, Kinda, Budina, & Weber, 2012).

The second-generation fiscal rules, in general, involve arguments in an attempt to make the implementation of such instruments viable. Some of the main issues include:

- Effectiveness of Fiscal Rules on Debt-to-GDP Ratio, that is, the effectiveness of fiscal rules in achieving their objectives. The literature argues that rules are necessary to discipline government behavior and prevent unsustainable deficits. However, several authors disagree with this view, arguing that rules can be circumvented or ignored by governments and that their effectiveness is limited in economic crisis situations;[8]
- Flexibility versus Rigidity of Fiscal Rules, as very rigid rules can hinder governments' ability to respond to economic shocks and implement countercyclical policies, while very flexible rules can allow the accumulation of unsustainable debt. Finding the right balance is a complex challenge;[9] and
- Effective Fiscal Rules on Economic Growth, as effective fiscal rules can promote growth by ensuring macroeconomic stability and reducing fiscal uncertainty. On the other hand, overly restrictive fiscal rules can stifle growth by limiting public investments and governments' ability to implement countercyclical policies.[10]

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[4] (Lerner, 1959; Hoel, 1984)

[5] (Musgrave, 1959)

[6] (Buiter, 1990)

[7] (Samuelson, 1995; Musgrave, 1969)

[8] (Wyplosz, 2012; Alesina, 2000)

[9] (Barro & Gordon, 1983; Kopits, 2001)

[10] (Hemming, Kell, & Mahfouz, 2000)

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In summary, the current debate seeks to find the right balance between fiscal discipline, political flexibility, and stimulus to economic growth. Thus, it is essential to develop effective and sustainable fiscal rules that promote long run stability and economic welfare.

## 3. From Fiscal Responsibility to the Public Spending Ceiling in the Brazilian Economy

The debate around fiscal rules is old, driven by the constant need to structure and actively manage public expenses to meet the demands of society. These guidelines are essential to regulate and shape the allocation of resources in line with the nation's objectives, which depend on various factors, including social, political, and long run strategic factors.

The literature argues that fiscal rules are fundamental in resolving the problem of dynamic inconsistency and tend to generate better macroeconomic results when compared to the alternative. In this perspective, the use of rules for the current economic policy would be the best solution to make it intertemporally consistent (Kydland & Prescott, 1977). The rules would act as macroeconomic anchors, guiding private sector decisions and ensuring better coordination of economic policies (Sargent & Wallace, 1984). Thus, these rules have two functions: i) to ensure fiscal solvency (sustainability of public debt) in a context of uncertainty; and ii) to address the aforementioned problem of temporal inconsistency.

In Brazil, an important milestone that represented a "turning point" was the Fiscal Responsibility Law - FRL (da República, 2000), whose objective was to establish some rules or norms aimed at fiscal responsibility in the management of public finances. In particular, the law sought to limit personnel expenses, increase transparency in the allocation of resources, and control the indebtedness of federal entities. The structural changes promoted by the FRL gained notoriety and quickly gained public recognition, from opinion polls to official documents from international organizations (Afonso, 2016).

However, the existence of the FRL did not prevent the fiscal crisis that plagued the Brazilian economy between 2014 and 2016. According to (Gobetti & Orair, 2017), this new context, characterized by slowdown growth, reduced tax revenues, and compulsory expansion of public spending, put the solvency of the State at stake and led fiscal policy to face difficulties, aggravated by accounting maneuvers (creative accounting and fiscal pedals) to ensure compliance with the primary target without restricting expenses.

According to (Salomão, 2023), the crisis in the Brazilian economy in the mid-2010s presented policymakers with a complex dilemma: restrict or expand economic activity? Some advocated an expansion of public spending to boost the economy and, consequently, increase tax revenue, aiming for ex post budget balance. On the other hand, there were those who believed in *a priori* budget balance, concerned about the effects that macroeconomic instability could have on the fiscal situation, as it would impact inflation rates, interest rates, and growth rates, consequently, affecting public indebtedness.

Proposals for fiscal adjustment dominated the Brazilian economic debate in recent years and gained new momentum with the approval and implementation of the "Public Spending Ceiling" draft legislation (Constitutional Amendment 95/2016), which provided for the containment of expenditure growth (Volpe et al., 2023). The diagnosis of the proposing economic team of this regime was that there was a structural problem in public spending, mainly due to mandatory expenses defined in the 1988 Federal Constitution. Accordingly, the

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government considered it necessary to definitively contain the disorderly growth of primary expenses.

The (Dieese, 2016) believed that the ceiling on expenses could, as indeed happened, further stifle the state's capacity to make public investments, considered central to improving the competitiveness and growth rate of the Brazilian economy. In fact, (Da Silva & Salomão, 2021) demonstrated that in a context of involuntary growth of mandatory expenses, discretionary expenses (investments) would be the adjustment variable.

In summary, the exhaustion of the expenditure ceiling was notorious and evidenced in the limitation of resources for application in priority areas. This problem occurred due to the significant increase in mandatory expenses, which began to consume most of the available resources, while discretionary expenses, which include investments, not only stagnated but also experienced a significant decline over time (dos Deputados, 2023). Indeed, according to (Mariano, 2019), the rule exacerbated problems during the economic recession of the past decade, being too rigid, and deepened social and regional inequality in the country.

## 4. Theory and Assumptions of the New Fiscal Framework

In this context, the federal government presented the "New Fiscal Framework (NAF)" to replace the "Ceiling on Expenses." The proposal makes the regime more flexible by combining targets for the growth of primary expenses with targets for the primary result of the general government to stabilize gross debt at 77.34% of GDP by 2026.

The proposal is simple and based on the assumption that the real growth of primary expenses cannot exceed revenue growth, with lower and upper limits defined at 0.6% and 2.5%, respectively.

**Figure 1. Growth of Gross Domestic Product and Real Growth of Expenses**
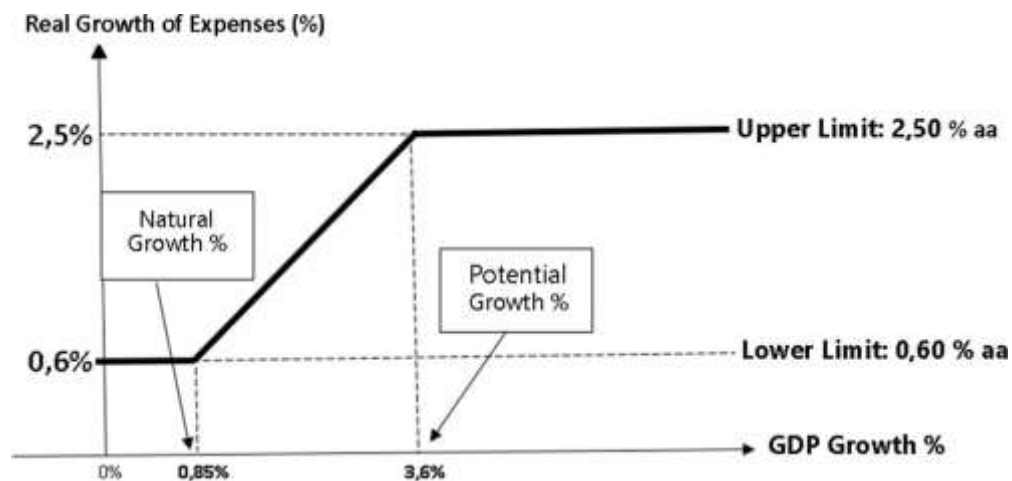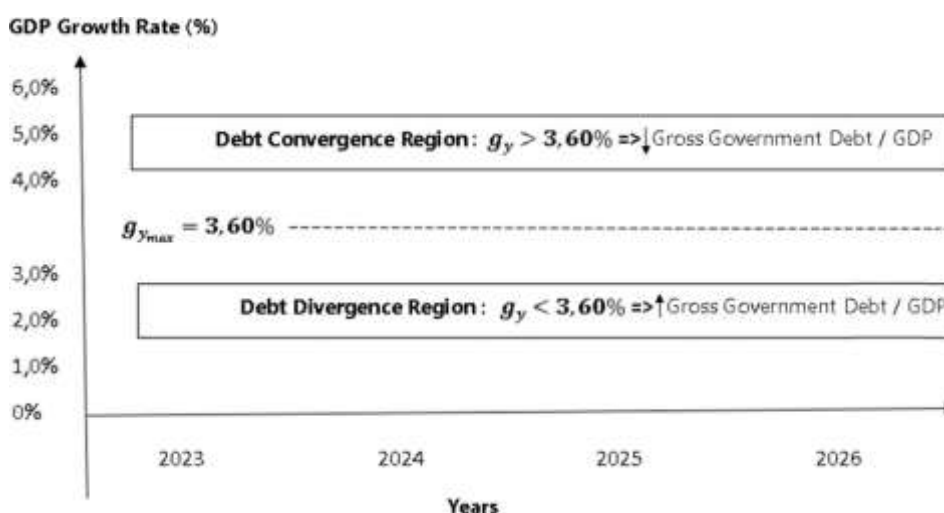


**Sourc**e: Own elaboration.

These limits were set to trigger the countercyclical mechanism of economic policy. The lower limit refers to the real growth of expenses considering the Brazilian economy's natural growth rate, while the upper limit refers to expense growth when the country is growing at the potential growth rate, determined by the sum of productivity growth plus population

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growth. Thus, Figure 1 defines the growth rates of the lower and upper limits as 0.85% and 3.6%, respectively.

Suppose that the revenue growth rate closely follows the product growth rate. Considering real growth in primary spending equal to 2.5%, we have a potential growth rate of 3.6%.

Theoretically, this would be one of the growth rates that would stabilize the debt ratio, ceteris paribus, in one of the possible scenarios. If the economy's product growth rate is higher than this value, there will be a reduction in the debt ratio and convergence towards the "Debt-to-GDP Target" defined by the new framework. If the product growth rate is less than 3.6%, there will be an increase in the debt ratio and, consequently, a deviation from the government's defined target. Figure 2 shows the regions where there would be convergence (or not) of the GGD/GDP Ratio (General Government Gross Debt-to-GDP Ratio) to the target.

**Figure 2. Economic Growth that Stabilizes the Debt-to-GDP Ratio**



Source: Own elaboration.

In the proposal presented by the New Fiscal Framework, investments have a floor, which is annually adjusted for inflation. Moreover, there is a provision for expanding investment when product growth exceeds 3.6%, which is the potential growth level of the Brazilian economy ($g_{ymax}$). Therefore, growth rate above potential, to avoid inflationary pressure, must be accompanied by an expansion of public investments, which drive private investments. Thus, the proposal provides that if economic growth and revenues are above the upper bound, a portion of the surplus ($\alpha_i$) should be used for public investments and expanding the country's productive capacity (Figure 3). Formally:

If $g_y \leq g_{ymax}$, there is a rule that defines the correction of public investment:

$$I_t = I_{\{t-1\}} \tag{1}$$

$$I_{\{t+1\}} = \left(1 + \pi_{\{t\}}\right)I_t \tag{2}$$

$$I_{\{t+2\}} = \left(1 + \pi_{\{t+1\}}\right)I_{\{t+1\}} \tag{3}$$

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With $\alpha_i = 0$

If $g_y > g_{ymax}$, the real growth of primary spending will be limited by the ceiling of 2.5%. Therefore, the surplus of economic growth revenues ($g_{yt} = g_\tau$) can be used to expand public investment:
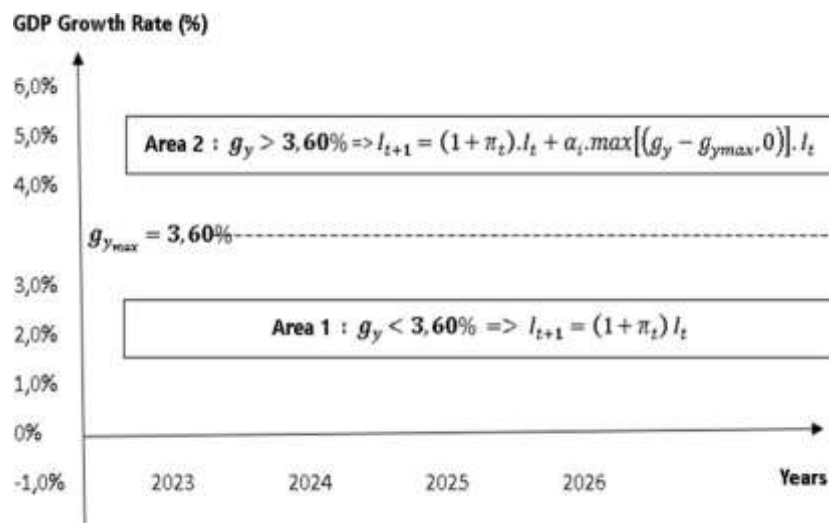
$$I_t = I_{t-1} \tag{4}$$

$$I_{t+1} = (1 + \pi_t)I_t + \alpha_i max[(g_{yt} - g_{ymax}), 0)] \tag{5}$$

$$I_{t+2} = (1 + \pi t + 1)It + 1 + \alpha i\, max\,[(g_{yt} - g_{ymax}), 0)]I_{t+1} \tag{6}$$
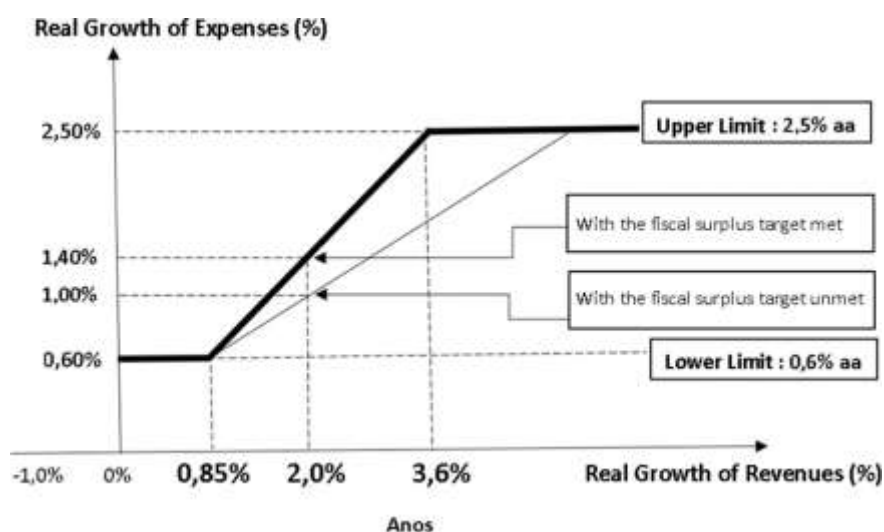
*With $\alpha_i = 0.7$*

**Figure 3. Rules for Expanding Investments**



**Source:** Own elaboration.

Finally, the proposal establishes three sectors of spending growth, as represented in Figure 4. The first sector is when economic growth is less than 0.85%, with expense growth equal to the minimum floor of 0.6%. The intermediate sector occurs when economic growth is between 0.85% and 3.6%. In this case, expense growth will be limited to 50% to 70% of the revenue growth rate. Lastly, if economic growth is above 3.6%, the real growth of primary spending will be 2.5%.

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**Figure 4. Rule for Real Growth of Expenses**

From the above, the proposal presented by the government is interesting, mainly because it is more flexible and puts economic growth as a central variable in the model since it determines the growth of tax revenues over time. Consequently, appropriate economic policies can ensure the sustainability of the debt ratio. Moreover, it is envisaged that a portion of the surplus from tax revenue growth will be directed towards recovering the budget allocated to public investment, which will induce greater private investment and expansion of the productive capacity of the Brazilian economy.

## 5. The Mathematical Model of the New Fiscal Framework of the Brazilian Economy

To understand the dynamics of debt, we start from the fundamental equation showing its main components: interest rate, growth rate, and primary result. Based on this equation, it becomes possible to actively manage the debt to achieve fiscal stability and a country's credibility since an adequate balance between debt issuance and repayment capacity is essential to avoid an economic crisis.

From the above, the debt dynamics behave as follows:

$$B_t = B_{t-1} + rB_{t-1} - (T_t - G_t) \qquad (7)$$

Dividing equation (7) by $Y_t$ (Gross Domestic Product, GDP) and performing the necessary algebra, we arrive at:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = r \cdot \frac{B_{t-1}}{Y_{t-1}} - g_y \cdot \frac{B_{t-1}}{Y_{t-1}} \frac{(T_t - G_t)}{Y_t} \qquad (8)$$

Equation (8) shows how this debt ratio evolves over time.

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It is noted that the main determinants of the variation in Debt-to-GDP Ratio (General Government Gross Debt / Gross Domestic Product) are:

- Interest rate, which positively affects;
- Product growth, which negatively affects; and
- The primary result, if positive, has a negative impact on the debt ratio; otherwise, it positively affects this ratio.

Aware of this, the New Framework establishes a moving target for the primary result, with variation bands. The primary result target for 2023 is -0.5% of GDP, increasing by 0.5% of GDP each year until reaching 1.0% of GDP in 2026. To avoid contingencies due to unforeseen fluctuations in government revenues and expenses, a variation band of 0.25% of GDP is defined. The spending ceiling is maintained, but its growth rule is modified. Note that, instead of zero real expense growth, expenses can now grow in real terms within a range from 0.6% to 2.5% per year. In this range, expenses can grow up to $\alpha_g = 0.7\%$ of the tax revenue growth rate. If the primary result falls below the minimum band limit, then in the next fiscal year, primary expenses can grow at most at a rate equal to 50% of revenue growth. Finally, the proposal also establishes a floor for public investment, which would be R$ 71 billion for the year 2023, annually adjusted for inflation, at least.

To make a detailed assessment of the proposal, a mathematical model is developed based on the assumptions of the new framework. Initially, it is assumed that:

$$g_g \leq \alpha_g g \tag{9}$$

In this case, $g_g$ is the real growth rate of primary expenses, and $g_t$ is the growth rate of tax revenue.

For simplicity and methodological convenience, it is assumed that primary expenses always grow at the maximum allowed rate. Therefore, it is assumed:

$$g_g = \alpha_g g_t \tag{10}$$

The primary result $S_p$ is given by:

$$S_p = T - G \tag{11}$$

where T is tax revenues and G is government spending.

Thus, the growth rate of the primary result ($g_{sp_t}$) will be:

$$g_{sp_t} = \frac{\dot{S}_p}{S_p} = g_\tau \frac{T_t}{S_p} - g_g \frac{G_t}{S_p} \tag{12}$$

Substituting equation (10) into (12), we get:

$$g_{sp_t} = g_\tau \frac{T_t}{S_p} - \alpha_g g_\tau \frac{G_t}{S_p} \tag{13}$$

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Dividing equation (11) by $S_p$ and isolating $\frac{G_t}{S_p}$:

$$\frac{G_t}{S_p} = \frac{T_t}{S_p} - 1 \qquad (14)$$

Then, substituting (14) into (13) and simplifying the terms, we have:

$$g_{sp_t} = \alpha_g g_\tau + \alpha_{sp} g_\tau \frac{T_t}{S_p} \qquad (15)$$

Isolating the primary result in (15), we arrive at the following equation:

$$\left[\frac{T_t - G_t}{Y_t}\right] = \left[\frac{\alpha_{sp} g_\tau}{(g_{sp_t} - \alpha_g g_\tau)}\right] \qquad (16)$$

Thus, the target result depends on the tax revenue growth rate, the primary result growth rate, and the increase in the tax burden as a percentage of gross domestic product (Y). Finally, note that the rule for real expense growth (Eq. 9) has important implications for the final result of the New Fiscal Framework.

Substituting (16) into (8), we obtain the final equation:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r - g_y)\left(\frac{B_{t-1}}{Y_{t-1}}\right) - \left[\frac{\alpha_{sp} g_\tau}{(g_{sp_t} - \alpha_g g_\tau)}\right]\left(\frac{T_t}{Y_t}\right) \qquad (17)$$

Considering $\alpha_g = 0.7$, meaning that expenses can grow at a rate equal to 70% of the tax revenue growth rate for the 12 months preceding the budget preparation, we have $\alpha_{sp} = 0.3$. Thus, we arrive at the equation of the New Fiscal Framework:

$$\boldsymbol{\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r - g_y)\left(\frac{B_{t-1}}{Y_{t-1}}\right) - \left[\frac{0.3 g_\tau}{(g_{sp_t} - 0.7 g_\tau)}\right]\left(\frac{T_t}{Y_t}\right)} \qquad (18)$$

The debt dynamics are defined by equation (18). In the first part, it is shown that its stabilization will depend on the difference between the real interest rate and the product growth rate. Obviously, if the real interest rate is higher than the product growth rate, there will be an increase in the debt ratio; otherwise, there will be a decrease. The second part of the equation shows the importance of revenue growth, primary result growth, and the participation of taxation in the economy's product (T/Y) for debt stabilization.

Thus, it can be stated that this is a debt ratio stabilization model driven by economic growth. In this sense, the New Fiscal Framework is pioneering and innovative, besides making the Growth Acceleration Program (PAC III) strategic for the sustainability of the Brazilian economy's public debt in the coming years.

## 6. Simulations and Evidence Based on the New Fiscal Frame - work of Government Lula III

To develop a more consistent analysis of the government's new fiscal rule, we must first observe the behavior of public debt in recent years. Note that the Debt-to-GDP Ratio (General Government Gross Debt / Gross Domestic Product) remained virtually stable, and the Brazilian economy showed some fiscal stability until 2014. However, in the mid-2010s,

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there is a change in the trend of the time series with the deepening of the economic recession, the fall in the primary surplus, and the increase in interest payments on public debt.

Debt interest payments peaked in 2016. This period was marked by a challenging economic environment, with high costs of financing public debt due to high interest rates. In the following years, with the spending ceiling rule and structural policies, the fiscal situation improved somewhat, with the amount allocated to debt payment also decreasing. This decline may have been influenced by monetary policy strategies aimed at stimulating the economy, with gradual reductions in the benchmark interest rate. The gradual decrease in interest rates contributed to reducing debt service costs. This decrease continues until the end of 2021, when there is a new change in economic policy to contain inflationary pressures.

Figure 5 shows the primary result of the central government. Note that the behavior of this variable changed from 2014 until mid-2022, as the country began to experience persistent primary deficits. This change can be attributed to a number of factors, but mainly to the drop in revenue after the 2014-2016 economic crisis and the increase in emergency spending to deal with an unprecedented pandemic.

**Figure 5. Revenues and Primary Expenses of the General Government (in Billions of Reais)**
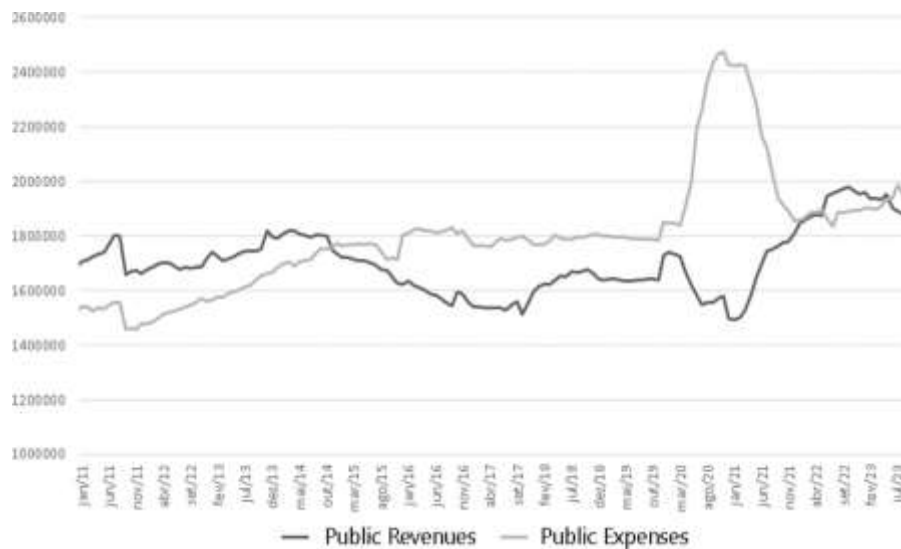

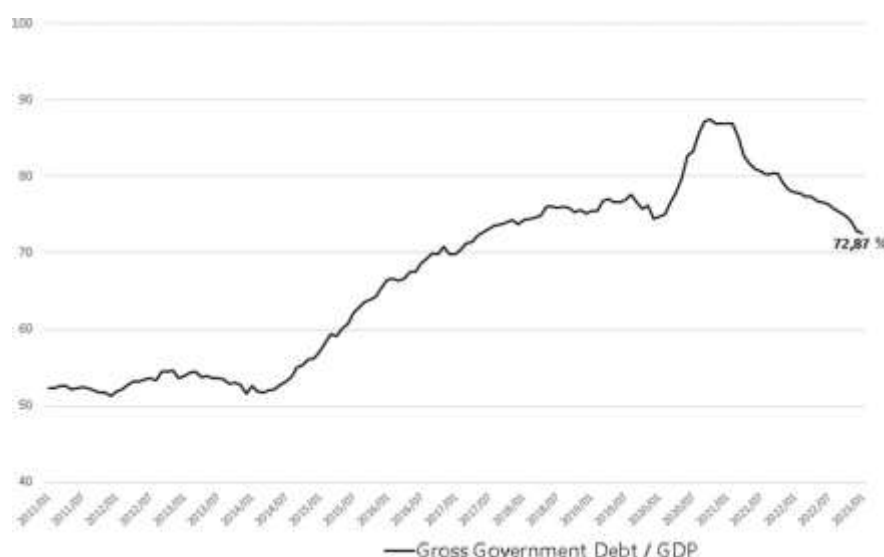
**Source:** Own elaboration.

In fact, even before the pandemic, Brazil was already facing several economic challenges. However, with the reduction in government revenues due to the semi-stagnation of the Brazil- ian economy after 2014, this situation worsened due to the urgent need to expand spending through assistance and compensatory policies during the coronavirus crisis (investments in health, emergency aid, and support to affected companies).

With the emergence of vaccines, the Brazilian economy began a phase of economic recovery, increased revenue, and reduction of pandemic-related expenses, so that the fiscal situation returned to normality, and the country was able to observe a primary surplus in 2022. However, the challenge of overcoming semi-stagnation persists.

Thus, these factors were decisive for the trajectory of increasing the growth of the Brazilian economy's debt ratio, which went from 51.8% to 69.9% and currently it's at 72.87%

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of GDP. Figure 6 shows the evolution of the Debt-to-GDP Ratio (General Government Gross Debt / Gross Domestic Product).

**Figure 6. Evolution of Gross Debt of the General Government (% of GDP)**



**Source:** Own elaboration.

### 6.1. Parameters and Initial Conditions of the Simulations

In this paper, a mathematical model for simulation capable of reproducing the New Fiscal Framework was developed, through which it becomes possible to simulate the effects of primary results on the GGD/GDP ratio, taking as initial parameters (real data and official estimates). The data used for the model simulations were extracted from the FOCUS Bulletin of December 2023. The simulation method brings advantages, such as allowing the realization of projections considering different scenarios.

The main indicator of a country's debt level, which is the GGD/GDP ratio, has as determining factors, in addition to the government's fiscal result, the real GDP growth and the implicit interest rate of the debt. In this sense, the initial challenge of the new framework is to work towards minimal coordination between fiscal and monetary policies, in a context of an Independent Central Bank, due to the direct and indirect effects of these policies on debt.

According to the Focus Bulletin, the real interest rate and the product growth, in 2023, should end at 7.20% and 2.89% per year. The parameters used to simulate the three scenarios were those proposed by the New Fiscal Framework.

**Table 1. Market Expectations**

| Year | Interest | Growth | Inflation |
|------|----------|--------|-----------|
| 2023 | 7.2% | 2.9% | 4.6% |
| 2024 | 5.3% | 1.5% | 3.9% |
| 2025 | 5.3% | 1.9% | 3.5% |
| 2026 | 5.0% | 2.0% | 3.5% |

**Source:** Central Bank

**Table 2. Targets of the New Fiscal Framework**

| Year | Scenario 1 Target | Scenario 2 Target |
|------|-------------------|-------------------|
| 2023 | 75.1% | 75.1% |
| 2024 | 76.2% | 76.4% |
| 2025 | 76.4% | 77.0% |
| 2026 | 76.5% | 77.3% |

**Source:** NAF, Ministry of Finance

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**Table 3. Calibration of the New Fiscal Framework**

| Parameter | Value |
|-----------|-------|
| $a_g$ | 0.7 |
| $a_{sp}$ | 0.3 |
| $a_i$ | 0.7 |

**Source:** NAF, Ministry of Finance. Own elaboration.

### 6.2. Debt Projection Considering the New Fiscal Framework

In this section, we intend to present simulations of the impacts on the indebtedness of the Brazilian economy in three possible scenarios: GGD/GDP of the Base Scenario (NAF Target), which is that presented by the government; Market GGD/GDP, which considers Market Expectations; and the Pessimistic Scenario GGD/GDP, in which simulations consider a primary result 1% below the lower limit proposed by the new framework.

Considering the parameters presented by the New Fiscal Framework, compliance with the originally established primary deficit target, as well as the current and expected real interest rates and growth rates for the coming years, the simulated scenarios demonstrate that the debt ratio should reach at least 84.01% in 2026. Projections considering market expectations show that GGD/GDP should reach 84.40%, while in the pessimistic scenario, this debt ratio should reach the level of 84.36%, a slightly lower value than the market projections.
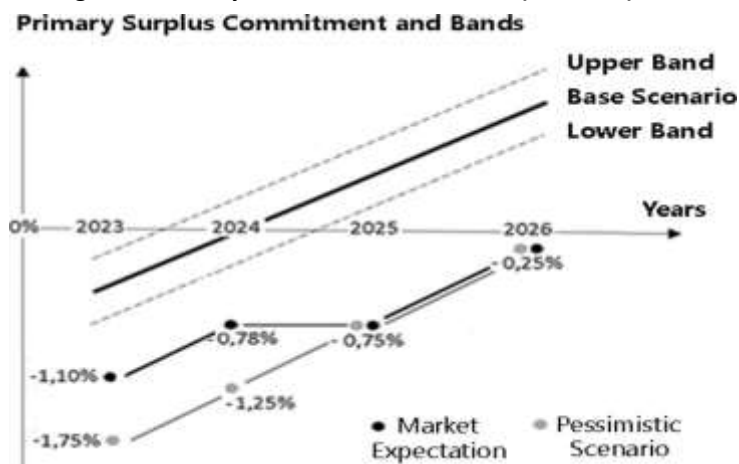
Finally, in an alternative base scenario of a zero deficit in 2025 and a primary surplus of 0.25% in 2026, *ceteris paribus*, the Debt-to-GDP ratio increases by 0.6%, from 84.14% to 84.74%, around R$ 65.4 billion.

**Table 4. Gross Government Debt Projections (% of GDP)**

| Year | GGD Upper Limit (NAF) | GGD Base Scenario (NAF) | GGD Lower Limit (NAF) | GGD Market Expectation | GGD Pessimistic Scenario |
|------|------|------|------|------|------|
| 2022 | 72.87% | 72.87% | 72.87% | 72.87% | 72.87% |
| 2023 | 76.23% | 76.18% | 76.15% | 76.13% | 76.10% |
| 2024 | 79.45% | 79.26% | 79.18% | 79.11% | 79.07% |
| 2025 | 81.69% | 81.89% | 82.19% | 81.82% | 81.77% |
| 2026 | 84.01% | 84.14% | 84.24% | 84.40% | 84.36% |

**Source:** Own elaboration.

**Figure 7. Primary Commitment and Bands (% of GDP)**



**Source:** Own elaboration.

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The model simulations demonstrated that, in the short run, larger deficits result in a slightly lower debt ratio, as it is a post-stabilization model of public debt, therefore driven by the economic growth. However, considering only the final results, working at the upper limit of the primary result band proved to be the best alternative in terms of debt ratio.

**Table 5. Primary Result in Different Scenarios (in Billion Reais)**

| Year | Lower Limit (NAF) | Base Scenario (NAF) | Upper Limit (NAF) | Market Expectation | Pessimistic Scenario |
|------|-------------------|---------------------|-------------------|--------------------|--------------------|
| 2022 | 43,481 | 43,481 | 43,481 | 43,481 | 43,481 |
| 2023 | - 67,081 | - 44,720 | - 22,360 | - 98,386 | - 156,523 |
| 2024 | - 22,695 | 0.00 | 22,695 | - 70,811 | - 113,479 |
| 2025 | 23,133 | 46,267 | 69,401 | - 69,401 | - 69,401 |
| 2026 | 70,789 | 94,386 | 117,983 | - 23,596 | - 23,596 |

**Source:** Own elaboration.

## 6.3. Investment Projections Considering the New Fiscal Framework and the Growth Acceleration Program (PAC III)

In 2023, the New Growth Acceleration Program (PAC III) was launched as a coordinated investment program by the federal government to accelerate economic growth with social inclusion, job creation, and income expansion to reduce social and regional inequalities. As demonstrated earlier, this program can play a central role in the success of the economic growth strategy and debt stabilization in the coming years.

Accelerating economic growth has been a recurring topic on countries' agendas, and discovering its determinants has become crucial for policymaking. Hausmann, Pritchett, and Rodrik (2005) define long run growth acceleration as a sustained change in economic growth over eight years, but establish a filter to identify and distinguish these moments when countries experience growth acceleration. According to the authors, to classify the period of growth acceleration, the following conditions must be met:

- $\Delta g_{t,t+n} > 3.5\%$ per year;

  The estimated growth rate of the country's GDP per capita must be greater than or equal to 3.5% per year;

- $\Delta g_{t,n} > 2.0\%$ per year;

  GDP per capita growth must still be 2.0% higher than the previous eight years; and

- $y_{t+n} > max(y_i), t > i$.

  The authors, in order to exclude episodes of economic recovery, define that the level of GDP in the current period must be greater than or equal to the previous period's maximum peak of per capita GDP.

The idea is that growth acceleration can only be considered sustainable if it respects the three aforementioned conditions.

Silva and Hermida (2018) developed an original mathematical model of growth accelera- tion, endogenizing income elasticities of demand for exports and imports, based on the seminal articles by Thirlwall (1979) and Fargerberg (1988). The authors demonstrated that long run growth acceleration depends on several factors:

1. Investments in R&D to reduce the country's distance from the technological frontier;
2. Technological innovation and consequently, reduction of the country's technological gap;

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3. Growth of physical and human capital;
4. Expansion of investments in infrastructure;
5. Reduction of unit production costs to improve competitiveness and domestic product prices; and
6. Acceleration of global growth.

The challenge of Brazil's economic growth acceleration program is enormous, and to advance in this investment agenda, it becomes necessary to overcome several bottlenecks. PAC IIIis foreseeing public investments totaling R$ 370.2 billion from the General Budget of the Union in the coming years (2023-2026) for efficient and sustainable transportation, water infrastructure, digital connectivity, health, education, science, and technology.

For instance, R$ 220 billion is earmarked for investments in efficient and sustainable transportation (airports, railways, waterways, ports, and roads) in the next four years, just R$ 5 billion more than the average of the last twenty years. To make matters worse, simulations conducted show that the new fiscal regime may further limit the investment strategy of PAC III.

Projections show a discrepancy between the values announced by PAC III and the limits imposed by the investment rule of the New Fiscal Framework. This discrepancy ranges from R$ 60 to 70 billion, depending on economic growth. The incompatibility should be pointed out as a problem so that there is more adequate coordination of federal government programs.

**Table 6. Total Investment Projection and Average Investment by GDP Growth Rate (2023-2026) in Billions of Reais**

| Economic Growth | Investment of the NAF in 2023 | Investment of the NAF in 2024 | Investment of the NAF in 2025 | Investment of the NAF in 2026 | Investment Average Annual of the NAF (2023-2026) |
|---|---|---|---|---|---|
| 1.0% | 71.00 | 74.29 | 77.73 | 81.33 | 76.09 |
| 2.0% | 71.00 | 74.29 | 77.73 | 81.33 | 76.09 |
| 3.0% | 71.00 | 74.29 | 77.73 | 81.33 | 76.09 |
| 3.5% | 71.00 | 74.29 | 77.73 | 81.33 | 76.09 |
| **3.6%** | **71.00** | **74.31** | **77.77** | **81.39** | **76.12** |
| 3.7% | 71.00 | 74.38 | 77.92 | 81.63 | 76.23 |
| 3.8% | 71.00 | 74.45 | 78.07 | 81.86 | 76.35 |
| 3.9% | 71.00 | 74.52 | 78.22 | 82.09 | 76.46 |
| 4.0% | 71.00 | 74.59 | 78.36 | 82.33 | 76.57 |
| 5.0% | 71.00 | 75.30 | 79.86 | 84.70 | 77.72 |

**Source:** Own elaboration.

**Table 7. Projection of Total and Average Investment by GDP Growth Rate in Billion Reais**

| Economic Growth | Total Investment of the NAF (2023-2026) | Total Investment of the PAC III (2023-2026) | Average Annual Investment of the PAC III (Pós 2026) |
|---|---|---|---|
| 1.0% | 304.34 | 371.00 | 75.00 |
| 2.0% | 304.34 | 371.00 | 75.00 |
| 3.0% | 304.34 | 371.00 | 75.00 |
| 3.5% | 304.34 | 371.00 | 75.00 |

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| **3.6%** | **304.47** | **371.00** | **75.00** |
|---|---|---|---|
| 3.7% | 304.92 | 371.00 | 75.00 |
| 3.8% | 305.38 | 371.00 | 75.00 |
| 3.9% | 305.83 | 371.00 | 75.00 |
| 4.0% | 306.29 | 371.00 | 75.00 |
| 5.0% | 310.87 | 371.00 | 75.00 |

**Source:** Own elaboration.

Therefore, the Brazilian economy is caught in a trap, since the success of the new framework depends on the long-term acceleration of growth, whose resources for its viability are insufficient for its realization and, to make matters worse, are being restricted by the fiscal rule itself.

Given the context of resource scarcity, it is suggested that the federal government address this inconsistency in public resources so that the Brazilian economy can break free from the trap of the new fiscal framework[11]. If the government excludes the resources from the PAC from the limits imposed by the NAF, it is recommended that it define a growth acceleration strategy to improve the pace of growth of the Brazilian economy, crucial to maintaining the debt-to-GDP ratio at sustainable levels.

In summary, the new fiscal framework is a debt stabilization strategy driven by growth, making it essential to expand and unlock resources from the growth acceleration program. In this sense, public investments, combined with good governance of industrial policy, may be capable of restoring the prominence of strategic sectors of the economy, as defined by Hausmann and Hidalgo (2009), which are those capable of boosting growth, as they have a positive multiplier effect (downstream and upstream) on employment and the output of the Brazilian economy. With economic growth, tax revenues improve, and the real interest rate converges to the natural rate, reducing the Debt/GDP ratio, country risk, and debt interest payments, improving the fiscal side of the country.

## 7. Final Remarks

The objective of this paper was to pioneeringly develop a mathematical model capable of representing the new fiscal framework presented by the Lula government in 2023. The developed model managed to formalize the assumptions and parameters used by the proponents of the new fiscal rule. The simulations conducted allowed analyzing the feasibility of the proposed targets and the expected results. In this sense, it can be affirmed that it is an unsustainable regime, considering that it would not be capable of stabilizing the debt at the established target; on the contrary, the debt-to-GDP ratio is expected to reach the level of 84.01% in 2026.

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[11] The Decree No. 11,855, of December 26, 2023, which deals with commitment terms regarding the mandatory transfers of resources from the Union for the execution of actions of the New Growth Acceleration Program (New PAC or PAC III) - states in its Art. 6º VII § 3º that "the transfers referred to in the caput are conditioned on the budgetary and financial availability of the transferring entity." In the Art. 3º § 2º of PLP N.93/2023 (Complementary Law No. 200, of August 30, 2023), the "New PAC" is not explicitly excluded, however the expenses of universities and scientific, technological, and innovation institutions; primary expenses authorized in the Annual Budget Law (LOA) and their respective supplementary credits; etc., were excluded from the calculation basis and limits established in this article.

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The mathematical model demonstrated that the results are sensitive to the annual expenditure growth rule, limited to 70% of the variation in primary revenue over the last 12 months, and to the minimum and maximum growth of primary expenses allowed by the New Fiscal Framework. These assumptions have important implications for the final result, and the defined parameters need to be rethought and recalibrated for the objectives to be optimized in terms of primary results, public investment, economic growth, and debt stabilization. This calibration can be performed through procedures that identify all possibilities until the one considered optimal is found.

The mathematical model and the simulations conducted show that this is a very interesting debt stabilization fiscal rule, as it is a proposal driven by growth, which ensures that the government has the conditions to achieve its objectives through appropriate economic policies. In this sense, PAC III becomes strategic for the success of the Brazilian economy in the coming years.

However, there is an incompatibility between the investments allowed by the New Fiscal Framework and those planned by the Growth Acceleration Program (PAC III), which can be resolved through tax reform and better coordination of federal government programs. In summary, the Brazilian economy is trapped in a dilemma, considering that the success of the new framework depends on long run growth acceleration, the resources for which are being restricted by the fiscal rule itself. Thus, it is suggested that the government show how it will resolve this inconsistency, as well as define the long run growth acceleration strategy.

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