



Assessing the sustainability of fiscal policy in Morocco: Insights into economic stability

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Abstract

This study explores the sustainability of fiscal policy in Morocco, a country with limited natural resources, by examining the factors that contribute to its long-term effectiveness. To assess fiscal policy sustainability, we used a quantitative approach, drawing on historical data and relevant macroeconomic indicators. Our analysis focused on the relationship between fiscal policy and economic growth, which is a crucial factor affecting public finance sustainability, among other key macroeconomic indicators. We utilized a combination of two models, cointegration strategy and Bohn's adapted specification method, to investigate the long-run properties of the intertemporal budget constraint. Our findings suggest that fiscal policy in Morocco may not be sustainable and effective in the long-term, indicating potential risks and threats to the country's economic stability. Unsustainable fiscal policies can lead to a lack of confidence in public finance, currency depreciation, and inflationary pressures. Therefore, it is essential to take action to address the sustainability of Morocco's fiscal policy to counteract potential crisis shocks on the economy. The research suggests policymakers the need to implement effective fiscal policy that can address the challenges facing Morocco's economy. The fiscal rules will confronting the economic structural problems; however, it will promoting fiscal transparency and long-term economic growth.

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1. Introduction

The sustainability of fiscal policy over the long term was given a central role in economic analysis, with a focus on short-term concerns regarding fluctuations in the business cycle and the cyclicity of fiscal policy. The sustainability of fiscal policy has the potential to impact economic performance in various ways. When fiscal policy is perceived as sustainable, the government will have a lower risk of facing limitations on borrowing. This will also reduce the possibility of a higher risk premium being added to the borrowing costs faced by the government and the private sector. Sustainable fiscal sustainability allows the government to borrow in response to temporary shocks to its budget, without having to cut spending programs or raise tax rates. However, there are significant challenges in managing fiscal policy during the economic cycle. This is due to political pressures to increase discretionary spending when the government experiences large surpluses (especially when debt targets have already been achieved) and technical difficulties in determining whether budget surpluses are structural or cyclical. Delays in the design and implementation of discretionary fiscal policy can make fiscal stimulus (such as increased spending or lower taxes) ineffective at the appropriate time. Additionally, for developing economies, the impact of discretionary fiscal policy on overall demand is moderate due to leakage from imports (Brook, 2013; Parkyn & Vehbi, 2014).

More recently, the importance of sustainable public finances has received growing attention following the 2008-2009 financial crisis, in this current context where the global economy is facing the effects of the global crisis. The interest in maintaining a sustainable and viable fiscal position in order to ensure macroeconomic and financial stability is currently a key policy question both in advanced economies and developing economies. Policies, including monetary policy and exchange rate policy, can no longer control other economic policy instruments, especially in small open economies, as the global economy becomes increasingly integrated and liberalized (Carmignani, 2010). However, this discretionary fiscal policy is inevitably accompanied by the deterioration of fiscal viability (Escario, Gadea, & Sabate, 2012; Kumhof, Freedman, Laxton, & Lee, 2009; Padoan, 2009). The sustainability of fiscal policy has been extensively explored by the existing literature, which mainly focuses on its measurement, but according to Menguy (2008) little is known about the determinants of public finance sustainability, these determinants could provide political implications for the government to maintain their public finances more sustainable. In the current context, the rise in inflation and high interest rates in 2022 have had a direct impact on the sustainability of Morocco's fiscal policy. The price increases have led to an increase in government spending, which has reduced the available budget margin for public spending and investments. Furthermore, high interest rates have increased borrowing costs for the government, reducing its ability to invest in development projects and meet the needs of the population.

The sustainability of the budget policy is crucial for ensuring long-term economic stability and sustainable development in Morocco. Thus, political decision makers must ensure the adoption of sustainable budget policies that can manage current economic challenges while preparing for the future. This may include measures such as reducing unnecessary spending, increasing revenue, diversifying the economy, and promoting sustainable investments. Finally, the establishment of fair taxation and the optimization of public spending can also contribute to a sustainable budget policy and long-term economic stability in Morocco. The results of this research can be useful for setting up sustainable budget policies. The analysis can also contribute to a broader understanding of budget policy sustainability in developing countries and ensure long-term economic stability and sustainable development.

In light of the current economic challenges, the sustainability of fiscal policy has been a subject of significant concern. In the context of recent events, such as increasing inflation and interest rates, this is especially pertinent. The effect of fiscal policy on long-term economic growth is critical because unsustainable fiscal policies can increase the public debt and reduce the economy's capacity for long-term growth. In this context, the case of Morocco provides a potential opportunity to study the sustainability of fiscal policy in the Middle East and North Africa (MENA) region. In the MENA region, Morocco is one of the few countries with a structured framework of fiscal policy, making it an excellent case study for the sustainability of fiscal policy. In addition to addressing the concern of growing public debt, Morocco has been establishing fiscal policies aimed at stimulating economic growth and reducing poverty.

The country has been implementing fiscal reforms aimed at improving the sustainability of its public finances, including measures to increase revenue and control spending. In recent years, Morocco has faced a number of challenges, including higher inflation, interest rates and COVID crisis effects. The country has responded to these challenges by implementing a tight monetary policy and reducing public spending. Despite these efforts, the sustainability of fiscal policy remains a concern, as the government continues to face pressure from rising public debt and a large fiscal deficit.

The structure of the article will focus on the issue of budget policy sustainability in Morocco. It will include a literature review, a description of the methodology, an analysis of the results, and a discussion on the implications for future budget policies. Macroeconomic indicators and statistical techniques will be used to evaluate the impacts of budget policy on economic growth.

2. Related Literature Review

There is a general consensus on the definition of fiscal sustainability in the literature, although there are some controversies (Harck, 2000; Pasinandti, 2000)¹. Fiscal sustainability refers to the future implications of current budget policies, in other words, the question of whether the government can maintain its current budget policies in the future without endangering its solvency (Croce & Juan-Ramon, 2003). This policy could either be a policy in which the debt rate does not increase (Tanner & Samake, 2008) or a policy in which the debt ratio increases as long as the debt dynamics are under control (Afonso & Rault, 2010; Blanchard, 1990; Bohn, 1998; Buiter, 1985; Jondeau, 1992; Pasinandti, 2000)².

Beyond the concept, it is generally acknowledged that it is difficult to measure the level of sustainability. The literature distinguishes two approaches that are generally based on projections of the deficit and public debt. One approach involves conducting intertemporal budget constraint sustainability tests, and the other approach focuses on a set of sustainability indicators. Studies using the first approach are divided into three groups: studies using the stationarity of the debt process, studies using the cointegration relationship between budget variables, and studies using the reaction function between the budget deficit and public debt. The problem of budget sustainability could be interpreted as an analysis of the trend of debt relative to GDP

¹ e.g., Pasinandti (2000) and Harck (2000) discuss the concept of fiscal sustainability with the assumption of requiring a desirable level of debt ratio.

² According to the literature, debt sustainability is considered similar to the concept of fiscal sustainability.

(Growth Domestic Product), taking into account the government's budget constraints (see, e.g., (Bohn, 1998; Byrne, Fiess, & MacDonald, 2011; Fincke & Greiner, 2011; Polito & Wickens, 2005; Stoian & Câmpeanu, 2010)). Equation 1 represents the evolution of the debt-to-GDP ratio:

$$\begin{aligned} d_t &= g_t - t_t + (1 + r_t + \theta_t)d_{t-1}, \\ d_t &= -s_t + (1 + \gamma_t)d_{t-1} \end{aligned} \tag{1}$$

d_t where represents the debt-to-GDP ratio, g_t represents expenses excluding interest payments as a percentage of GDP, t_t represents the revenue-to-GDP ratio, r_t represents a real interest rate, and θ_t represents the GDP growth rate. As a result, s_t indicates the primary budget balance-to-GDP ratio, and γ_t represents a discount rate that indicates the difference between the real interest rate and the growth rate. This equation shows that a certain amount of primary surplus is necessary to maintain a certain level of debt-to-GDP ratio in a dynamically efficient economy where the real interest rate is higher than the real growth rate. Equation 1 can be transformed into Equation 2 by successive substitution, where n represent a term period and i is a particular period.

$$d_t = \frac{1}{(1 + \gamma)^n} E_t(d_{t+n}) + \sum_{i=1}^n \frac{E_t(s_{t+i})}{(1 + \gamma)^i} \tag{2}$$

Initially, the literature focused on whether the fiscal policy could satisfy the intertemporal budget constraint. It is generally accepted in the literature that the intertemporal budget constraint is sustainable if the current public debt can be offset by the present value of the primary surplus, as shown below in Equation [A1] 3 when the present value of actual debt (the first part in Equation 2) should be zero in the limit, in other words, an increase in the substantial debt to GDP ratio should be less than an increase in the real interest rate (see, e.g., (Bohn, 1998; Uctum & Wickens, 2000; Wilcox, 1989)). Subsequently, fiscal policy will be sustainable when the debt-to-GDP ratio can grow at a rate equal to the primary surplus-to-GDP ratio.

$$d_t = \sum_{i=1}^n \frac{E_t(s_{t+i})}{(1 + \gamma)^i} \tag{3}$$

Some studies suggest that the intertemporal budget constraint is maintained if the debt process, which corresponds to Equation 2, is stationary (Uctum & Wickens, 2000; Wilcox, 1989). Others use the cointegration relationship between budgetary variables, such as public spending and revenues, and show that the intertemporal budget constraint is valid if the budgetary variables are cointegrated (Bravo & Silvestre, 2002; Hakkio & Rush, 1991). These standard approaches have the advantage of efficiently performing sustainability tests through a simple econometric model in a long-term perspective. However, these approaches assume an exogenous and constant economic environment (Alesina & Passalacqua, 2016); for example, the assumption that the interest rate is regular, thus, limiting the approach's effectiveness in providing appropriate policy implications to respond to future changes in the political environment, such as ageing populations or fluctuations in interest rates. Bohn (1998); Bohn (2007) and Bohn (2008) use the response function between budget deficit and public debt to overcome the limitations of previous studies mentioned above. The author examines how governments react to an increase in public debt. According to his analytical framework³, the primary budget balance is a function of public debt. Equation 1 can be rearranged in the form of Equation 4 by assuming $d_t = d_{t-1}$ in the long term (see, e.g., (Byrne et al., 2011; Fincke & Greiner, 2011; Greiner, Koeller, & Semmler, 2007; Redžepagić & Llorca, 2007; Stoian & Câmpeanu, 2010; Valderrama, 2005)).

$$s_t = \gamma_t d_{t-1} \tag{4}$$

Bohn (1998); Bohn (2007) and Bohn (2008) provide direct evidence of corrective actions by examining the response of the primary budget balance to changes in the debt-to-GDP ratio after removing the temporary effect of increased government spending $Gvar_t$ and temporary economic cycle fluctuations $Yvar_t$, which accounts for changes in revenues. The author uses American data economy in the Equation 5, where α is a constant and μ_t a white noise.

$$s_t = \alpha + \beta d_{t-1} + \gamma_t Gvar_t + \lambda Yvar_t + \mu_t \tag{5}$$

When the debt-to-GDP ratio increases, the government raises primary budget surpluses to respond to the accumulation of debt and ensure the intertemporal budget constraint. The main strength of this approach is that it does not require any assumptions about the discount rate, and therefore, erroneous results caused by an inadequate choice of the discount rate are excluded. However, this approach focuses on the long-term

³ A large body of research has used Bohn's response function to explore fiscal sustainability.

relationship between the deficit and public debt, and therefore, it still has a limit in providing short-term policy implications.

The second approach involves finding appropriate sustainability indicators that allow for verification of whether current fiscal policy will be sustainable in the long-term (see, for example, (Blanchard, 1990; Buiters, 1985; Croce & Juan-Ramon, 2003; Polito & Wickens, 2005; Uctum & Wickens, 2000)). They consider the budget deficit to be sustainable if the debt-to-GDP ratio is maintained at a targeted level, and they measure the deviation of the recorded deficit from the sustainable deficit. These indicators are simple and transparent, and they can clearly guide policy makers and shape the trend of fiscal policy. However, it is difficult to find an optimal debt level or to reach consensus on the targeted debt level (Wyplosz, 2005). This problem is more persistent in emerging countries, as they tend to prioritize short-term economic growth and expansion of social security instead of long-term fiscal policy sustainability.

3. Empirical Literature Review

The empirical literature on the determinants of budget sustainability is not clearly comparable, despite the growing interest in public finance. Existing literature primarily tries to study the effect of specific factors on budget sustainability, but it generally analyses the effect of these independent factors on the budget balance or debt rather than on budget sustainability itself. Some studies focus on the main factors that contribute to budget consolidation success, but they do not analyse the determinants of budget sustainability itself. This section examines the main determinants of the latter in existing empirical literature, grouped into two categories: public budget and borrowing constraints, and finally, political constraints.

3.1. Public Budget and Borrowing Constraints

Several studies have explored the relationship between certain economic variables and budgetary viability through intertemporal budget constraints, a nested generations model, and borrowing constraints. This literature assumes that the condition of fiscal sustainability is to meet the government's intertemporal budget constraint (Equation 3). Hall and Sargent (2011) demonstrate that growth rate and interest payments could be crucial in determining sustainable debt. They examine the contributions of these factors to the evolution of the debt-to-GDP ratio by analysing data from the United States after World War II and find that interest payments have had a more significant effect than growth rates since the 1970s. Sakuragawa and Hosono (2011) argue that growth rates could significantly impact the sustainability of public finances. They show that a projected higher growth rate contributes to stabilising the debt-to-GDP ratio in the long term, using a budgetary sustainability simulation for the case of Japan. Aspromourgos, Rees, and White (2010) theoretically explain the role of interest rates. They show that nominal interest rates paid on debt and nominal growth rates are crucial in determining the sustainable budget balance. Low-interest rates will support the government in achieving a sustainable budget balance⁴, given that monetary policy could intervene and affect the interest rate.

Several studies highlight that borrowing constraints linked to accessibility to capital markets are a potential determinant of budgetary sustainability in emerging economies. Byrne et al. (2011) explore the effect of the global capital market shock on budgetary sustainability by empirically analysing a sample of 15 industrialised countries and 27 emerging countries. They show that the US interest rate, an indicator of borrowing liquidity in the global markets, and budgetary sustainability are closely associated with emerging economies since they finance their public debts from the international capital market. This result indicates that borrowing constraints in the global markets could be one of the main determinants of budgetary sustainability for emerging economies.

Another line of research considers the impact of population ageing on the sustainability of public finances. Faruqee and Mühleisen (2003) evaluate the effect of demographic changes on Japanese public finances. They argue that population ageing leads to slow economic growth and high debt levels. They, therefore, suggest that further fiscal adjustments are necessary for retirement and healthcare systems to make public finances sustainable. Similarly, the European Commission (2009) also highlights the role of population ageing in the European Commission (2009). It argues that population ageing impacts the labour market and economic growth and will increase ageing-related expenditures. It calculates the sustainability indicator considering the infinite horizon, including the concern for additional expenses from population ageing. It shows that all European Union countries should implement reforms to reduce the long-term fiscal challenge risk.

3.2. Political Constraints

Political constraints may also have significant implications for budget sustainability. Redžepagić and Llorca (2007) examine the role of political determinants of budget sustainability by using political factors, such as the electoral budget cycle and government fragmentation, in Bohn (1998) reaction function. Kontopoulos

⁴ They use the sustainable budget balance formula, where y_t is the GDP growth rate:

$$d_{t+1} = \left(\frac{i_t - y_t}{1 + y_t} \right) d_t$$

and Perotti (1999) argue that government fragmentation could play a key role in determining the effects of budget policy. They show that the higher number of decision-makers in the policy-making budget process, such as the number of parties in a coalition government and the number of ministers, could result in higher spending and higher deficit using a sample of 20 OECD (Organisation for Economic Co-operation and Development) countries during the period [1960-1995].

4. Morocco's Deficit and Public Debt Trends

After a sharp contraction of economic activity in Morocco between 2007 and 2010, the GDP growth rate has been above its potential and has been in a full-employment phase for five years. The analysis of the relationship between GDP growth and the output gap⁵ shows two periods of contraction (one period related to the post-crisis and one related to the contraction of agricultural GDP in 2016) and a period of expansion. It is interesting to observe the position of discretionary fiscal policy, measured by the cyclically adjusted primary balance, with respect to the evolution of the output gap. The primary balance here is adjusted to remove the effects of automatic stabilizers (revenues and expenditures produced automatically without discretionary actions of the government).

For example, in 2011, production improved and the output gap became positive⁶, yet the primary balance deteriorated. This indicates that there was a discretionary expansion of fiscal policy after 2011. We can conclude first that discretionary fiscal policy was more restrictive before 2011 and more expansionary after 2011. Secondly, the government took measures to reduce budget deficits during the recession. Lastly, we can say that the government tolerates deficits during periods of growth Figure 1.

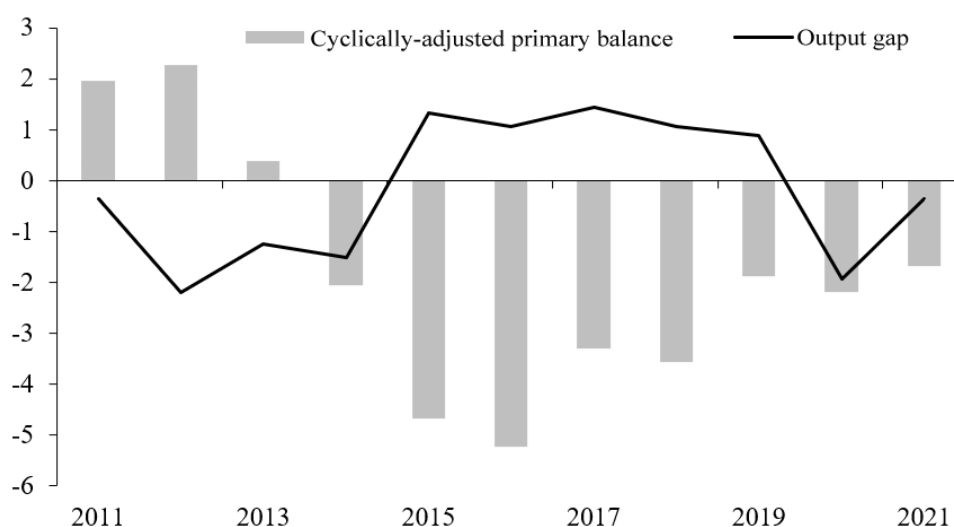


Figure 1. Output Gap and fiscal policy interactions (%GDP cyclically-adjusted).

In the short term, the budget impulse is the year-to-year change in the budget position⁷. The budget impulse was negative consecutively from 2006 to 2008 and from 2013 to 2017, meaning that last year's budget position was wider than this year's budget position, indicating that the orientation of the budget policy is becoming less expansionary or more restrictive, that is, also periods of budget consolidation. On the other hand, the budget impulse was positive from 2009 to 2012, meaning that the budget policy therefore becomes more expansionary Figure 2.

In the aftermath of the structural adjustment program implemented by Morocco, from 1990 to 2010, macroeconomic and monetary policies favoured stability and preservation of fundamental balances over economic growth. This policy resulted in a reduction of public debt to 50% of GDP (Figure 3), and was capped off by Morocco's attainment of an investment-grade rating from rating agencies in 2010. However, after 2010, the situation changed dramatically due to rising oil prices and weak growth of about 3% on average, and the trend of public debt began to increase, reaching 64.69% of GDP in 2016. Medium-term projections suggest that the increase in the debt rate should slow down in the coming years, provided that GDP growth exceeds its current level according report from IMF report since 2017. On average, the debt of emerging countries is lower than that of Morocco, and this is partly due to Morocco's relatively weak GDP growth. However, the economic growth figures of developing countries attest to the well-controlled burden of debt.

⁵ See Appendix 1 HP filter.

⁶ See Appendix 2 Long period output gap, Appendix 3 Primary balance and long period output gap.

⁷ To measure the change in budget position, we apply the following transformation:

$$\begin{aligned} \text{Fiscal stance}_t &= - \text{Cyclically adjusted Primary Balance}_t, \\ \text{Fiscal impulse}_t &= \text{Fiscal stance}_t - \text{Fiscal stance}_{t-1}. \end{aligned}$$

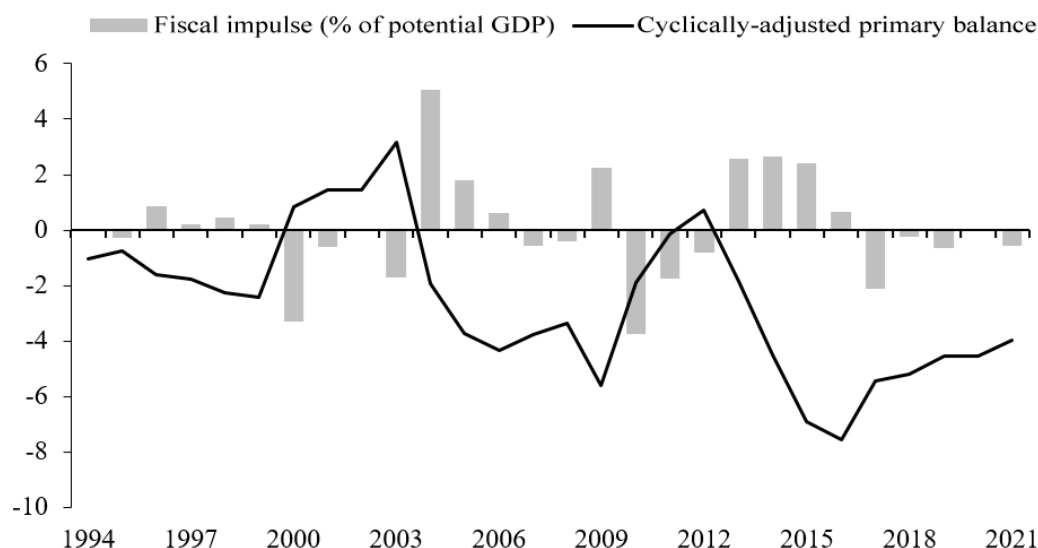


Figure 2. Fiscal stance in Morocco.

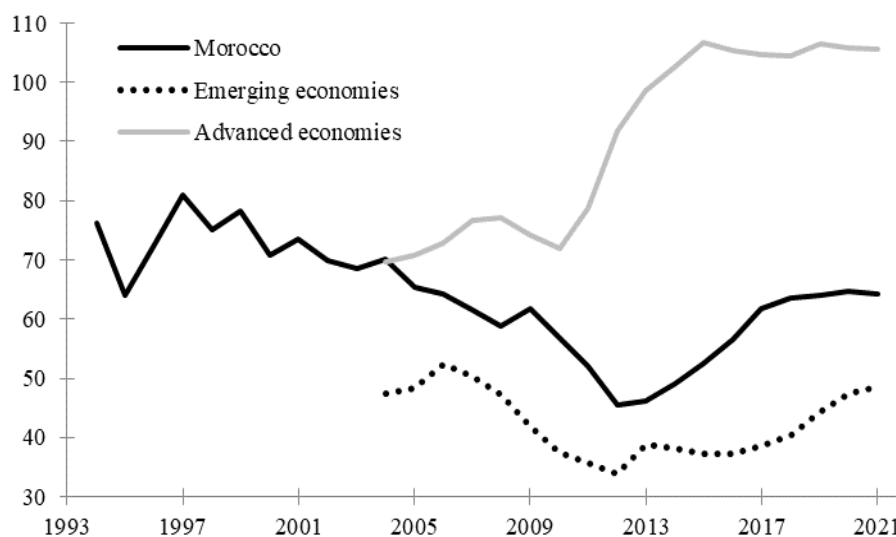


Figure 3. Position debt for Morocco vs emerging and developed economies.

Source: International Monetary Fund Outlook Database 2021.

In the 80s and 90s, the national economy was in a critical phase in terms of financial health, which was exacerbated by the dependence of economic activity on the agricultural sector, which proved the inability of this growth model to consolidate macroeconomic balances. On the other hand, since the year 2000, Morocco has adopted strategic economic diversification policies that have allowed it to finance more lucrative investments in the economy and recorded higher GDP growth. As a result, Morocco was able to reduce its debt to 53% of GDP, proving that public debt weakens economic growth by putting pressure on public savings and also inducing a rise in the interest rates applied to loans taken by the country from international financial markets. This is true if public debt exceeds a given critical threshold (generally 70% for Morocco) (Reinhart, Reinhart, & Rogoff, 2012).

5. Empirical Specification and Data Properties

In this section, we adopting Bohn (1998); Bohn (2007) more flexible approach that imposes no restriction on the form, we examine the sustainability questions of Morocco's budget policy using two alternative approaches. First, we present a sustainability approach through the analysis of the long-term cointegration relationship between public expenditure and revenue to evaluate the existence of a long-term balance relationship between public expenditure and revenue, as well as between the public deficit and public debt. In a second approach, we present the specification of the regression model that allows us to assess the sustainability of budget policy. Generally, the sustainability of budget policy is often studied through two different empirical methods. The first involves cointegration tests, including Johansen cointegration tests of

time series. The last is Bohn (1998) regression. All of these methods emphasize budget stability from a long-term perspective.

5.1. Cointegration Model

Many studies have used tests based on the cointegration relationship between public expenditures and revenues (public debt and primary balance) (e.g., literature such as Hakkio and Rush (1991); Quintos (1995); Trehan and Walsh (1988); Trehan and Walsh (1991). This test is based on the following assumption: when public expenditures and revenues are all stationary at I(1), and if their linear combination is stationary at I(0), then the two variables converge, satisfying the intertemporal budget constraint of the state, meaning a long-term sustainable budget policy. We use the test developed by Johansen (1988); Johansen (1991); Johansen (1995) and Johansen, Mosconi, and Nielsen (2000) which are based on a multivariate framework to analyse the cointegration of the series. We consider the following cointegration regression:

$$R_t = \alpha + \beta G_t + \mu_t \tag{6}$$

R_t and G_t denote public revenues and expenditures, respectively. μ_t (*iid*) are disturbance terms that satisfy standard assumptions. Furthermore, an alternative to Equation 6 can be tested through the budget reaction function inspired by Bohn (1998).

$$s_t = \alpha + \gamma d_{t-1} + \mu_t \tag{7}$$

where d is the public debt and s is the government's primary balance. Given the non-stationarity of each time series, the question is whether a linear combination of these two series will be stationary. Suppose a variety exists between government revenue and expenditures (public debt and primary balance). In that case, they become co-integrated, implying that these variables are drawn to a stable long-term relationship, and any deviation from this relationship reflects short-term imbalances (temporary). A note worth mentioning about the above Equations 6 and 7; if one of the coefficients ((β, γ)) is positive and significant, it would be a sufficient condition indicating the sustainability of the budget policy, also meaning that the government satisfies its intertemporal budget constraint. Bohn (1998) questions the validity of the traditional sustainability tests mentioned above (cointegration test). Bohn (2007) points out that the lack of cointegration between the series does not prevent the persistence of sustainability concerning the intertemporal budget constraint.

5.2. Bohn's Model

In this context, Bohn presents a new budget reaction function to assess the sustainability of fiscal policy. This new methodology is based on the corrective adjustment of the primary surplus in response to changes in public debt. The main objective of Bohn's test is to see if governments adjust their primary surplus to changes in public debt. Equation 6 in Bohn's test is actually a budget reaction function, theoretically based on Barro (1979) budget smoothing hypothesis. Bohn's test is based on the idea that fiscal policy is sustainable if governments take corrective measures in response to changes in public debt by adjusting their primary surplus. The Bohn (1998) procedure determines if a government takes corrective measures to conform to its intertemporal budget constraint by analysing the relationship between the primary surplus (budget surplus) $(\frac{S}{Y})_t$ and the debt ratio $(\frac{D}{Y})_{t-1}$. Bohn posits that if $(\frac{S}{Y})_t$ reacts positively to $(\frac{D}{Y})_{t-1}$, this could be interpreted as a signal indicating that the government is taking the necessary measures to ensure the sustainability of the budget policy. The relevant equation for analyzing this relationship for Morocco's budget policy can be written as:

$$\left(\frac{S}{Y}\right)_t = \alpha + \beta_1 \left(\frac{D}{Y}\right)_{t-1} + \beta_2 GVAR_t + \beta_3 YVAR_t + \mu_t \tag{8}$$

We use $GVAR_t$ and $YVAR_t$ ⁸ as proposed by Bohn (1998) which should help account for temporary public expenditures and economic cycle factors, respectively. They stem from Barro (1979) budget policy model. Furthermore, these variables also help to account for the potential impact of omitted variables. They are calculated by:

$$GVAR_t = \frac{G_t - G_t^*}{Y_t}, \quad YVAR_t = \left(\frac{1 - Y_t}{Y_t^*}\right) \left(\frac{G_t^*}{Y_t}\right) \tag{9}$$

⁸ It is necessary to theoretically explain the significance of the two variables $GVAR_t$ and $YVAR_t$. For the variable $GVAR_t$, the debt-to-GDP ratio increases when temporary real public expenditures increase $(G_t - G_t^*)$. Empirically, temporary public expenditures manifest themselves in exceptional times (e.g., bank failure crisis). It is negative rather than zero in normal times (Barro, 1979). That is, the debt-to-GDP ratio tends to decrease in normal times (growth) and increase greatly during crisis periods (rare, due to procyclical fiscal policy). For the variable $YVAR_t$, the debt-to-GDP ratio increases when real GDP (Y_t) is lower than normal production (Y_t^*) - that is, when $Y_t/Y_t^* < 1$. However, if there are permanent changes in the production level, it is difficult to measure the temporary decrease in production.

where G_t and Y_t respectively indicate the real net public expenditure excluding interest payments and real GDP for period t , and the upper index (*) denotes the long-run trend estimated by the HP filter (Hodrick–Prescott). Note that $GVAR_t$ increases with temporary spending and $YVAR_t$ tends to decrease with the output gap. In Equation 8, β_1 should be positive if the budget policy adheres to the intertemporal budget constraint, while β_2 and β_3 should display negative signs. In other words, the surplus would decrease if the government spent more than usual, or if the economy is in a contraction period. Based on the discussion so far, we

formulate our regression equation by including the primary budget balance ratio $\left(\frac{S}{Y}\right)_{t-1}$ in Bohn's original model (Equation 8) to account for the effect of the deficit in period $(t-1)$ of the budget policy.

$$\left(\frac{S}{Y}\right)_t = \alpha + \beta_1 \left(\frac{D}{Y}\right)_{t-1} + \beta_2 GVAR_t + \beta_3 YVAR_t + \beta_4 \left(\frac{S}{Y}\right)_{t-1} + \mu_t \tag{10}$$

We estimate both models in Equation 8 and 10 for comparison purposes. The econometric modelling that follows uses data on government revenue, government expenditure, primary balance, public debt, and real GDP. The remaining variables are calculated using Equation 9 to obtain $GVAR_t$, $YVAR_t$. The data is annual for the period [1980-2020], taken from the International Monetary Fund (2021). Table 1 reports some descriptive statistics of the series of Morocco's fiscal policy sustainability model.

Table 1. Descriptive statistics.

Variable	$\log G_t$	$\log R_t$	s_t	d_{t-1}	$GVAR_t$	$YVAR_t$	Y_t^*	G_t^*
Mean	20.977	20.899	-2.135	64.680	-0.000	0.001	5.86E+	1.46E+
Median	20.653	20.753	-1.779	64.253	0.001	-0.001	5.47E+	1.06E+
Maximum	21.767	21.632	3.151	80.842	0.035	0.018	8.58E+	2.97E+
Minimum	20.484	20.439	-7.562	45.443	-0.033	-0.008	4.57E+	7.91E+
Standard. dev.	0.497	0.454	2.419	8.865	0.019	0.006	1.25E+	7.63E+
Jarque bera	4.616	4.673	0.537	1.191	0.133	6.128	4.669	5.038
Prob.	0.099	0.097	0.765	0.551	0.935	0.047	0.097	0.081
No. obs.	41	41	41	41	41	41	41	41

Note: The variables $GVAR_t$ and $YVAR_t$ are estimated using potential GDP Y_t^* and potential spending level G_t^* (both in millions \$). These two series are estimated using the HP filter method. (*) indicates that the variable is cyclically-adjusted.

5.3. Results

A preliminary step in properly specifying the cointegration test is to check the stationarity properties of the series, accepting or rejecting the unit root hypothesis. To this end, we present the stationarity results of the budget policy series performed by the ADF (Augmented Dickey-Fuller) test in Table 2 (The number of lags was chosen so that the residuals are uncorrelated).

Table 2. Analysis of the series stationarity (ADF test).

Variable	I (0)	I (1)	I (2)
$\log G_t$	3.319 (-1.950) (0.999)	-3.939 (-1.950) (0.000)*	—
$\log R_t$	-1.834 (-3.537) (0.668)	-3.353 (-1.950) (0.001)*	—
s_t	-1.293 (-1.950) (0.177)	-5.101 (-1.950) (0.000)*	—
d_{t-1}	0.097285 (-1.951) (0.707)	-6.149 (-1.950) (0.000)*	—
$GVAR_t$	-3.233 (-1.951) (0.002)*	—	—
$YVAR_t$	-7.056 (-1.951) (0.000)*	—	—

Note: The values in parentheses are the p -value of the Augmented Dickey-Fuller test. (*) indicates that the parameter is statistically significant at 1%. All the variables contain unit roots at level I(0), except $GVAR_t$ and $YVAR_t$, which are stationary at level.

The unit root tests show that the four budget policy series are non-stationary, confirming the persistence indicators: revenue, expenses, primary balance, and public debt, are integrated of order I(1), meaning that their contribution to GDP growth is non-stationary, however their variation is stationary. This result meets the

⁹ See Appendix 4 for further details on the sustainability model data.

condition of cointegration between two series to examine the long-term sustainability of the budget policy. The two variables and are stationary at level I(0), allowing for viable coefficients by the models of Equations 8 and 10.

5.3.1. Cointegration Method Result

In order to test the existence of cointegration, we present the Vector Autoregression (VAR) test to determine the appropriate number of lags for the cointegration test. Using a multivariate information criterion. Table 3 shows the results of the test for the lag structure. Based on the results, three out of five approaches indicate an appropriate order of 1 lag for the relationship between public revenue and spending.

Table 3. Appropriate lag order test (Spending and taxes).

Nbr. lag	LogL	LR	FPE	AIC	SC	HQ
0	13.08	NA	0.002	-0.739	-0.645	-0.709
1	87.50	133.94	1.5e-5*	-5.433	-5.153*	-5.343*
2	90.88	5.638	1.6e-5	-5.392	-4.925	-5.242
3	93.01	3.268	1.8e-5	-5.267	-4.613	-5.058
4	98.30	7.412	1.7e-5	-5.354	-4.513	-5.085
5	100.45	2.720	1.9e-5	-5.230	-4.203	-4.901
6	104.23	4.285	2.1e-5	-5.215	-4.001	-4.827
7	107.52	3.291	2.4e-5	-5.168	-3.767	-4.719
8	119.44	10.327*	1.6e-5	-5.696*	-4.108	-5.188

Note: (*) indicates the lag order selected by the criterion.
 LR: sequential modified LR (likelihood-ratio test) test statistic (each test at 5% threshold). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Also, the test shows that the appropriate lag order for the relationship between the primary balance and public debt is 1, suggested by different approaches Table 4.

Table 4. Appropriate lag order test (Primary balance and debt).

Nbr. lag	LogL	LR	FPE	AIC	SC	HQ
0	-171.17	NA	526.81	11.94	12.04	11.97
1	-136.46	62.230*	63.48*	9.825*	10.11*	9.914*
2	-132.80	6.057	65.34	9.848	10.32	9.996
3	-131.09	2.591	77.49	10.01	10.67	10.21
4	-129.99	1.516	96.85	10.21	11.06	10.47
5	-124.63	6.656	91.53	10.11	11.15	10.43
6	-122.78	2.040	112.42	10.26	11.49	10.64
7	-122.02	0.741	152.86	10.48	11.89	10.93
8	-116.54	4.532	155.87	10.38	11.99	10.88

Note: (*) indicates the lag order selected by the criterion.
 LR: sequential modified LR (likelihood-ratio test) test statistic (each test at 5% threshold). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Given the non-stationarity of the model's series, the relevant question is whether a linear combination of these series is stationary. Using the Johansen cointegration test, we test the long-term cointegration relationships between government revenues and expenditures (primary balance and public debt). This approach estimates the long-term attraction set in a VAR context that integrates both the different models' short- and long-term dynamics. The results of the various cointegration tests are presented in Table 5. The test results suggest that the series are cointegrated.

Table 5. Johansen's cointegration test.

Variable	Cointegration assumptions	Trace test	Critical value at 5%	Prob.	Max-Eigen	Critical value at 5%	Prob.	Cointeg
$\log G_t$ and $\log R_t$	No relation	13.50	15.50	0.098	13.13	14.26	0.075	None
	At least one	0.377	3.841	0.540	0.377	3.841	0.539	None
s_t and d_{t-1}	No relation	14.23	15.50	0.077	12.41	14.27	0.096	None
	At least one	1.827	3.842	0.176	1.827	3.841	0.18	None

Note: Both statistics (Trace and Max-Eigen) show no cointegration at the 5% level. We test the cointegration relationship between public spending and public revenues, similarly for primary balance and public debt.

We find evidence of a lack of cointegration in the relationship between government revenue and expenditure as well as the relationship between primary balance and public debt, showing that there is no cointegration at the 5% threshold. Therefore, the hypothesis of no cointegration cannot be rejected at the 10%

threshold, as the Johansen test shows that the long-term relationship of the two relationships has been proven. Overall, the test results reject the cointegration hypothesis at the 5% threshold and accept the presence of cointegration at the 10% threshold. However, our conclusion about the long-term relationship between government revenue and expenditure (primary balance and public debt) through the Johansen test is concerning, as it means that Morocco's long-term budget policy is likely to be unsustainable. Based on the Johansen cointegration tests, we conclude that the Moroccan government's intertemporal budget is imbalanced. In other words, the country's budget policies were not viable for the period from 1980 to 2020. However, it is difficult to give a 10% threshold confirmation to the two long-term relationships, therefore the Bohn regression model will allow us to support our results and conclusions.

5.3.2. Bohn Model Result

To accurately assess the sustainability of Morocco's budget policy, we estimate the reference model (Equations 8 and 10 using the OLS (Ordinary Last Squares) method. The results of the basic model estimation are reported in Table 6. We first found that the estimated responses of public surplus to changes in public debt are positive but statistically not significant.

Table 6. Bohn model of government surplus reaction.

Variable	Model (1)	Model (2)
$\left(\frac{D}{Y}\right)_{t-1}$	0.100 (0.1134)	0.106 (0.1111)
$GVAR_t$	-54.043 (0.0077)*	-51.783 (0.0161)*
$YVAR_t$	-0.554 (0.8769)	-0.605 (0.8676)
$\left(\frac{S}{Y}\right)_{t-1}$	Na Na	0.062 (0.7324)
Constant	-0.261 (0.7699)	-0.267 (0.7679)
Observations	41	41
R ²	0.214	0.217
Breusch-Godfrey test	1.948 (0.1302)	3.145 (0.0303)*

Note: (*) means statistically significant at the 5% level. The Breusch-Godfrey test rejects the hypothesis of the existence of autocorrelation of the residuals up to order four. The test shows a non-significant p-value at the 5% *, 10% ** level. At the 5% level, the null hypothesis of homoscedasticity is accepted.

Therefore, the estimates from both models (1) and (2) in the table suggest that the long-term sustainability condition is more questionable. Thus, the null hypothesis $\beta_1 = 0$ cannot be rejected, which means that the sustainability condition is violated. With this type of budget policy, it is possible for public debt to increase over a long period, as primary surpluses would not systematically respond to the debt-to-GDP ratio. Given this behaviour over the analysis period. The coefficients of $GVAR_t$ and $YVAR_t$ are negative, as discussed in the model specification, however, the coefficient of $YVAR_t$ is statistically not significant, while $GVAR_t$ is statistically significant. These results show that temporary public spending tends to reduce primary surpluses ($\beta_2 < 0$) and primary surpluses display counter-cyclical with respect to production ($\beta_3 < 0$). Thus, we can conclude that primary surpluses seem to have responded systematically to temporary fluctuations in spending and more or less of production throughout the study period. Our estimation results seem to suggest that we cannot confirm that the budget policy is sustainable in the long term. The estimation proves to be delicate and the results from both methods are inconclusive; the study's time limit likely constitutes an obstacle to overcome.

6. Conclusion

In the case of Morocco, the findings of this study have significant implications for the country's economic growth and development prospects. Morocco's economy is heavily dependent on agriculture, tourism, and remittances, which are all susceptible to external shocks and business cycle fluctuations. As such, it is crucial for the government to adopt sustainable fiscal policies that can buffer the adverse effects of economic cycles and promote long-term economic growth. The findings of this study suggest that the result of unsustainable fiscal policy in Morocco is caused by pursuing procyclical fiscal policies, which could be damaging the long-term economic growth prospects. The adoption of sustainable fiscal policies, as recommended by this study, would require significant changes in the country's budget policy framework. This would include a shift away from a focus on short-term budget management to a more long-term approach that takes into account the country's economic cycles and investment needs.

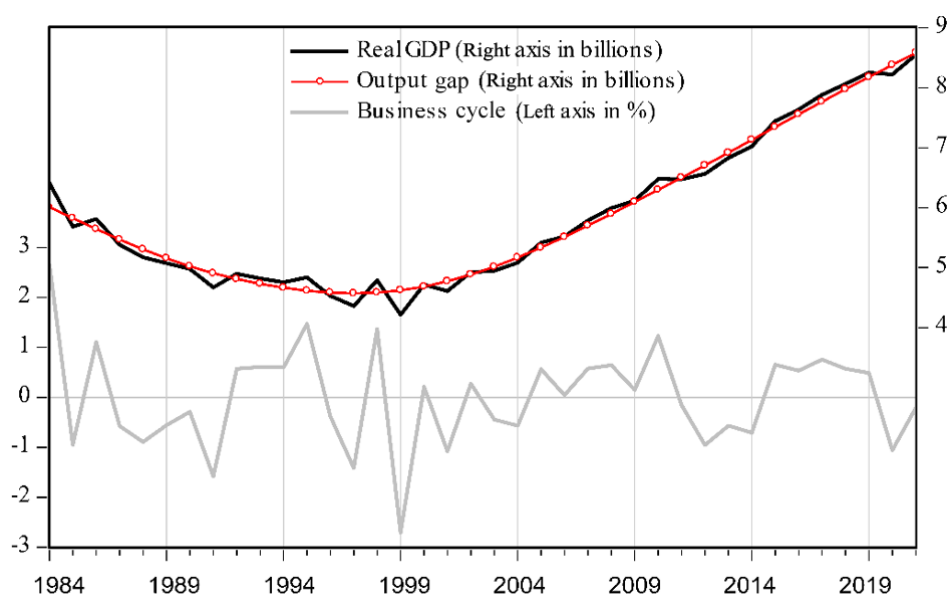
Additionally, the implementation of fiscal rules to limit the size of budget deficits and debt levels, as well as the improvement of transparency and accountability in fiscal policy decision-making, would be critical for achieving sustainable economic growth in Morocco. This would require a concerted effort by the government to prioritize the long-term sustainability of public finances over short-term political expediency. In conclusion, this study indicates the urgent need for Morocco to improve transparency and accountability in fiscal policy decision-making would be critical for achieving sustainability.

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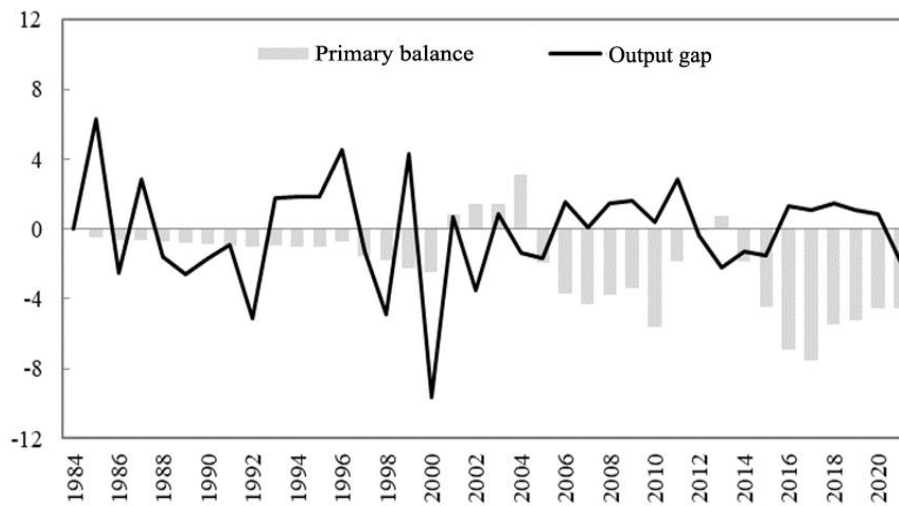
APPENDIX



Appendix 1. Potential GDP - Hodrick-Prescott filter ($\lambda=100$).



Appendix 2. Output gap (% GDP).



Appendix 3. Primary balance and Morocco's output gap (%GDP).

Appendix 4. Identification of fiscal policy sustainability variables.

Variable	Description	Transformation	Source
$\log G_t$	Public expenditure net of interest payments	Logarithm of public spending	WEO database 2020, IMF.
$\log R_t$	Public revenue	Logarithm of government revenue.	WEO database 2020, IMF.
s_t	Primary balance (Public deficit)	% Real GDP.	WEO database 2020, IMF.
d_{t-1}	Real public debt.	% Real GDP	WEO database 2020, IMF.
$GVAR_t$	The gap in temporal and potential expenditure.	With are potential expenses.	Our own estimates.
$YVAR_t$	Fluctuation in government spending relative to the business cycle.	With is potential GDP.	Our own estimates.