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Assessing fiscal Sustainability based on Fiscal Reaction Function : case study ALGERIA

تقييم الاستدامة المالية بالاعتماد على دالة الفعل المالي: دراسة حالة الجزائر

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Abstract

This study examines the sustainability of fiscal policy in Algeria by exploring government's reaction to rising public debt accumulation via the estimation of a fiscal reaction function over the period 1980-2017 using The Autoregressive Distributed Lag Model (ARDL. Our findings suggest that government's fiscal behaviour is consistent with the intertemporal budget constraint, but the fiscal adjustment in primary balance debt appears to be very low Compared to the increase in public . In particular, evidence of significant fiscal pressures in recent years persists, largely driven by excesses in public expenditure. To ensure long term fiscal sustainability, the study supports that government should improve on her tax revenue generation and other source of income and ensure records of surplus budgeting.

Keywords

Fiscal Policy; fiscal sustainability ; Fiscal Reaction Function ; ARDL model;

JEL Classification Codes : : H61,H10 , E62

الملخص

تحاول هذه الدراسة فحص استدامة السياسة المالية في الجزائر من خلال استكشاف رد فعل الحكومة على زيادة تراكم الدين العام من خلال تقدير دالة الفعل المالي خلال الفترة 1980–2017 باستخدام نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة (ARDL) .تشير النتائج التي توصلنا إليها إلى أن السلوك المالي للحكومة يتماشى مع قيود الميزانية المؤقتة ، ولكن يبدو أن التعديل المالي في الرصيد الأولي للميزانية منخفض جدا بالمقارنة مع الزيادة في الدين العام. ولا تزال هناك أدلة على وجود ضغوط مالية كبيرة في السنوات الأخيرة ، مدفوعة إلى حد كبير في الإفراط في الإنفاق العام. ولضمان الاستدامة المالية على المدى الطويل ، تقترح الدراسة بأن تحسن الحكومة إيراداتها الضريبية وغيرها من مصادر الدخل وأن تضمن تحقيق فائض في الرصيد الأولي للميزانية

الكلمات المفتاحية

السياسة المالية؛الاستدامة المالية ؛ دالة الفعل المالي؛ نموذج الانحدار الذاتي للفجوات الزمنية الموزعة المتباطئة

تصنيف JEL: H61,H10 , E62

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I.INTRODUCTION:

Fiscal policy entails the deliberate measures by the government to influence the direction and the performance of the economy so as to achieve specific set objectives namely; fostering macroeconomic stability, methodical allocation of resources and acceptable and appropriate distribution of income. Fiscal policy adjustments are normally influenced through alterations in the composition and level of government expenditure, changes in tax income or changes in tax structure. The effects are either realized through automatic stabilization or discretionary changes through the fiscal budget. Automatic stabilizers are those elements of fiscal policy that reduce tax burdens and increase public output without discretionary government action.

The recent deterioration of the fiscal position of governments in several countries in the world has drawn attention to the long-run fiscal sustainability. The sustainability of fiscal policy and its implications has received considerable attention in the academic literature and policymaking circles for many years. A number of studies have done in USA and other Western European countries on fiscal sustainability. However, there are few studies in developing countries.

Fiscal sustainability becomes an important component of macroeconomic health analysis of countries. This is predicated on the fact that the usefulness of annual budgetary balances and the public debt figures for assessing the soundness of public finances has gradually gone into extinction

Fiscal sustainability of the government policies therefore, exists if the implementation of the government programs does not threaten the solvency of a country now or in the future. Also, solvency requires that the current and future expenditures and income are reduced into a common denominator or the financial ability of the government to service its debt obligations in perpetuity without being explicitly defaulted. Although, the issues surrounding fiscal deficits as well as national debts are certainly not new, but an important fact is that threats to fiscal sustainability have serious implications for macroeconomic growth and financial stability of a country as well.

This study augments the available literature on Algeria's fiscal policy and its sustainability, and goes beyond the issue of whether or not Algeria's fiscal policy has stable long run behavior, by exploring a number of research questions:

a.. Is Algeria's current fiscal profile sustainable?

b. Is the current fiscal policy satisfying the intertemporal budget constraint in the midst of economic challenges?

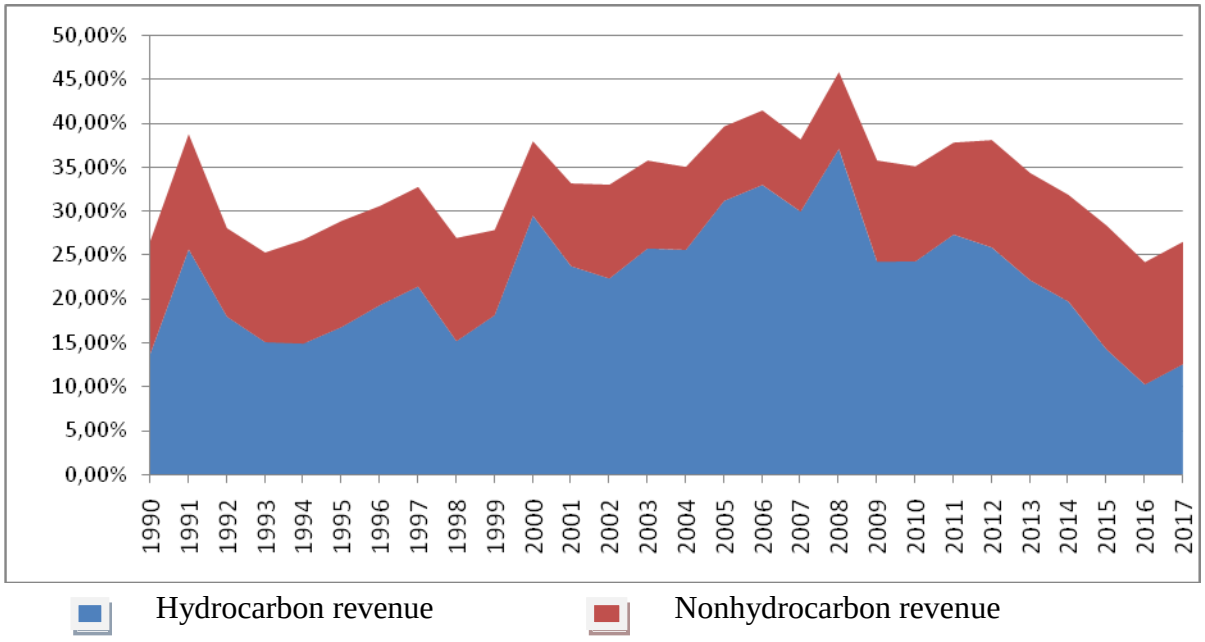
The objective is therefore to ascertain whether the link between public debt and primary balance over the period 1980 and 2017, and satisfy the intertemporal budget constraints. The study also explored the extent to which government reacts to debt build-up by estimating the fiscal policy reaction function. For this purpose, the study is divided into five sections. After introducing the topic in section 1, section 2 discusses fiscal policy in Algeria, section 3 provides a brief resume of theoretical and empirical background of fiscal sustainability section 4 explains the study methodology, introduces data, section 5 analyzes the empirical results , and finally section 6 concludes the study and draws some policy implications.

II. Fiscal policy and challenges facing Algeria:

According to the IMF the Real GDP growth slowed modestly to 3.5 percent in 2016 from 3.8 percent in 2015. Activity was supported by strong growth in the hydrocarbon sector, which benefited from new fields coming on stream and the return to full production of a major gas plant that was the target of a terrorist attack in 2013 .By contrast, growth in the non hydrocarbon sector particularly the agriculture and services sectors slowed, in part because of spending cuts, and reached its lowest level since 1999 hydrocarbon sector remains Algeria's primary growth engine, and, of course, the government spending itself is always waiting for a handout from the oil sector, reflecting the fact that the Algerian economy is still being held hostage to hydrocarbon revenues[1]. This is the harvest of the slothful dependence on oil rents in generating non-shameful growth rates since independence, and this period was long enough for structural distortions to be roosted in the whole economy.

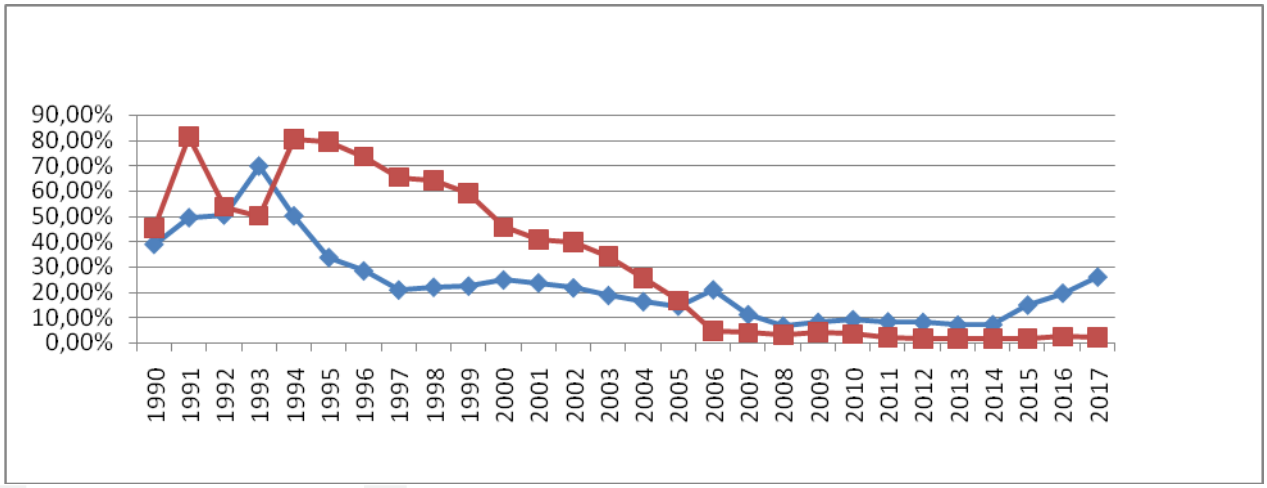
The fiscal policy adopted since 2001 led to a significant increase in public expenditure from 47 percent of non-oil GDP in 2001 to 52 percent in 2004. On the other hand, the nonhydrocarbon primary budget deficit increased to about 32 percent of NHGDP in 2004, compared with 29.5 percent in 2003, largely affected by the reduction of import taxes and Following a devastating civil war in the 1990s, Algeria experienced over a decade of the decline in non-tax revenue[2].

Figure(1): Hydrocarbon and nonhydrocarbon revenues (% of GDP) in Algeria, 1990-2017



Source: The National Statistical Office of Algeria (ONS), **Statistical Retrospective 1962-2011** and the **Ministry of Finance 2019 .**

Figure(2): Domestic and external debt (% of GDP) in Algeria, 1990-2017

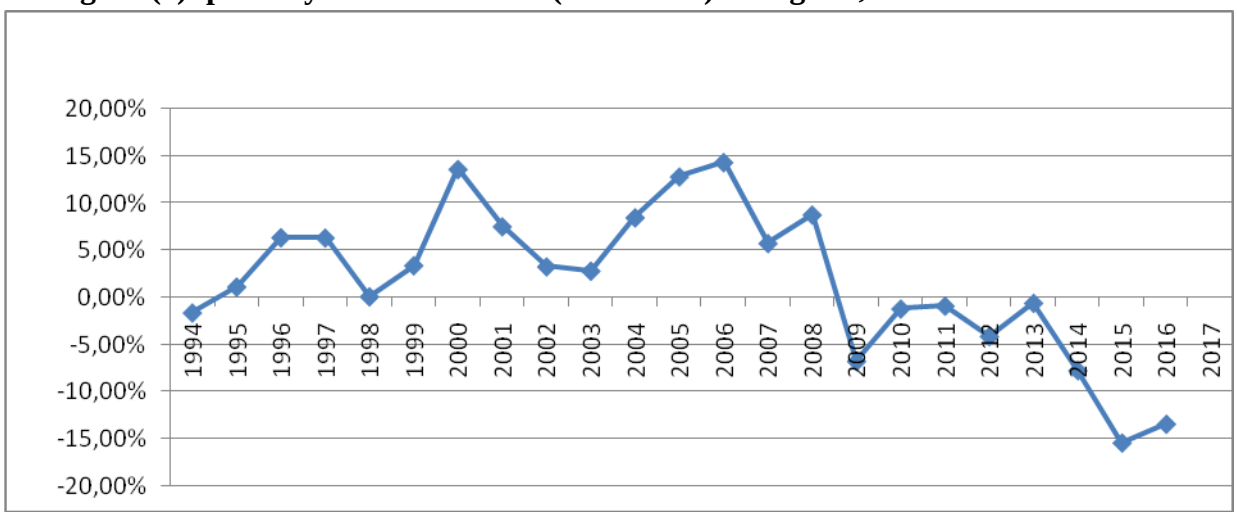


Source: The National Statistical Office of Algeria (ONS), **Statistical Retrospective 1962-2011** and the **Ministry of Finance 2019** .

Algeria's domestic debt consists of Treasury securities and restructured debt purchased from public enterprises. At end-2016, Algeria's domestic debt amounted to 3,407 billion dinar equivalent to 19.9 percent of GDP. Of this amount, 978 billion dinar consisted of regularly-issued Treasury securities with maturities ranging from 13 weeks to 15 years. Most of this debt is held by banks and insurance companies. The National Bond for Economic Growth, a local-currency bond issued by the government in 2016, accounted for another 569 billion dinar . The remaining 1,861 billion dinar resulted from government operations to support public enterprises. Most of these operations took place between 2009 and 2016. Government-guaranteed domestic debt amounted to 3,163 billion dinar, equal to 18.5 percent of GDP. External public debt is minimal and mostly owed to official bilateral creditors. At end-2016, Algeria's external public debt was equal to just US$1.6 billion (1.0 percent of GDP). Most of this debt is owed to official bilateral creditors and is on concessional terms. Algeria repaid the last of its debt to the IMF in 2005 and prepaid its outstanding balance to the Paris Club group of creditors in 2006. Since 2006, external debt has remained less than US$3 billion. In 2016, the African Development Bank (AfDB) provided Algeria a €900 million budget support loan—the AfDB's first loan to Algeria in 12 years[3].

In 2009, Algeria posted its first primary overall fiscal deficit of about 6.78 percent of GDP, mainly due to a sharp fall in hydrocarbon revenues, however, non-oil revenues grew by 20 percent, driven by the further modernization of th revenue administration and higher income tax collections. On the other hand, curren expenditure increased by 15 percent in 2009 as a result of additional maintenance costs of new infrastructure and employment support programs, while capital expenditure remaine stable in real terms[4]. After that, the primary budget deficit declined to 0.6 percent of GDP in 2013 from 4.13 percent in 2012, thanks to the consolidation measures adopted by the government in its 2013 budget However, in 2015, the primary overall budget defici rose to about 15.44 percent of GDP as a result of lower oil revenues and increased public expenditure[5]

Figure (3): primary overall balance (% of GDP) in Algeria, 1994-2017



Source: The National Statistical Office of Algeria (ONS**), Statistical Retrospective 1962-2011** and the **Ministry of Finance 2019**

Indeed, falling oil prices urged the Algerian government to acclimate to the new situation by abruptly adjusting its expenditure and revenue policies in order to stay the course during tough times. Past omission and lowering the gaze on such situation, stemming from mazes of geostrategic conflicts and hidden financial interests, unearth numerous bets and force the government to undergo austerity and tighten the public spending belt. The Revenue Regulation Fund (RRF) has been depleted due to the slump in oil prices[6] . But in October 2017 the Algerian government decided to change its macroeconomic strategy. As part of the new plan, monetary and fiscal policies would be eased simultaneously, an approach which has come to be known as quantitative easing. Instead of continuing to narrow the budget deficit every year until coming to balance by 2020, the target for a balanced budget was pushed back to 2022, with the budget for 2018 to be expansionary instead of contractionary as was previously planned. in addition, to permit the Bank of Algeria to purchase debt directly from the government.

III.Theoretical and empirical review on fiscal sustainability:

This section contains both theoretical and empirical review of literature on fiscal sustainability, fiscal reaction function

1. Theoretical overview

For a long time, the issue of sustainability has been addressed only in terms of the effects of public debt1 on the economy. According to Hume, public debt was likely to lead to injurious tax increases in the short term and possibly to default in the long term. Smith also considered that debt financing would lead to default. The consensus view was that debt financing was to be used only under exceptional circumstances, such as wars.2 At the beginning of the 1920s, when writing about the public debt problem faced by France, Keynes mentioned the need for the French government to conduct a sustainable fiscal policy in order to satisfy its budget constraint[7].

There is a general consensus on the definition of fiscal sustainability in the existing literature although there are a few controversies. Fiscal sustainability refers to the future implications of

current fiscal policies, in other words, the question of whether the government can maintain its current fiscal policies in the future without endangering its solvency. This policy might be either one in which the debt ratio does not increase or one in which the debt ratio increases when the dynamics of debt are under control[8]. Also, it is generally agreed that it is difficult to measure the level of fiscal sustainability.

2. Empirical review

The existing literature has adopted two approaches. One approach performs sustainability tests based on the intertemporal government budget constraints, and the other approach focuses on a set of sustainability indicators. Studies utilizing the first approach, in turn, can be divided into three groups: studies using the stationarity of debt process, studies using the cointegration relationship between fiscal variables, and studies using the reaction function between the budget deficit and government debt.

The empirical studies assessing the compliance to IBC can broadly be classified into two strands. (Hamilton & Flavin, 1986)[9]and (Wilcox, 1989)[10] following a univariate approach analyze the mean-reverting behavior of deficit and debt-GDP ratio series. Second, (Trehan & Walsh, C.E, 1991)[11] using multivariate approach involves examining the long-run relationship between the flows of revenues and expenditures

(Quintos, 1995)[12] refined the analysis by incorporating the possibility of structural changes that are associated with different degrees of sustainability and have also generalized the definition of sustainability to distinguish between strict and weak sustainability. With advancements in cointegration techniques, the long-run relationship between revenue and expenditure has been widely examined for assessing fiscal sustainability .

(Bohn H,1998)[13], (Bohn H,2007)[14] in his seminal work, however, challenges the time series literature on fiscal policy suggesting that stationarity-based sustainability tests are incapable of rejecting the consistency of data sets with with the transversality condition, which implies that the intertemporal budget constraint may be satisfied even if these particular time series tests are not. Moreover, the time series tests of sustainability do not explicitly identify the fiscal policy reactions underlying the data. As a result, they do not shed much light on the kind of policies that might deliver sustainability.

Bohn therefore, suggested an alternative fiscal reaction approach to fiscal sustainability. which represents an error-correction type policy .fiscal authorities take corrective measures in response to deterioration in debt position, rising debt ratios lead to higher primary surpluses relative to GDP indicating a tendency towards mean reversion. Accordingly, a stable and strictly positive feedback from debt stock to primary surplus is a sufficient condition for fiscal sustainability

IV. METHOD AND PROCEDURES:

1. model specification

The main hypothesis to be tested when estimating a fiscal reaction function is that the government adjusts the primary budget balance in response to changes in indebtedness so as to ensure the sustainability of the debt dynamics over time. Most fiscal reaction functions originate from the simple government intertemporal budget constraint and are empirically based, meaning that

there is not a single form for the fiscal reaction function. The fiscal reaction function also varies depending on researchers' arguments. We assume that the government's one-period budget constraint is[15]:

$$B_{t+1}= (1+r)\, B_t+G_t-T_t= (1+r)\, B_t-S_t \ldots\ldots\ldots\ldots\ldots\ldots (01)$$

Where Gt denotes government expenditure, rt is the real intrestrate,Tt is government revenues, and Bt is government debt, St is the Primary balance.

Solving equation (1) recursively forwards in time gives:

$$B_t= (1+r)^{-1}\, S_{t+1}+(1+r)^{-1}B_{t+1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (02)$$

$$B_t= (1+r)^{-2}\, S_{t+2}+(1+r)^{-1}\, S_{t+1}+ (1+r)^{-2}B_{t+2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (03)$$

$$Bt= \quad (1+r)\text{-}i\ St+i+ (1+r)\text{-}nBt+n \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (04)$$

Taking the limit as n tends to infinity:

$$B_t= \quad (1+r)^{-i}S_{t+i}+ \quad E_t\,(1+r)^{-n}B_{t+n} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (05)$$

The assumption behind the IBC is that that the second term giving the present value of the government debt in infinity is assumed to be zero:

$$E_t\,(1+r)^{-n}B_{t+n}=0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (06)$$

One can also use Equation (1) to derive Equation (07) for the change in the level of indebtedness measured against the yardstick of GDP , where we have omitted the time index from the parameters r and g to prevent clutter:

$$\Delta(B/Y)_t = ((r - g)/(1 + g))(B/Y)_{t-1} - (S/Y)_t \ldots\ldots\ldots\ldots (07)$$

where: r is real interest rate , g:is real economic growth rate, Y:is nominal GDP

Equation (07) leads immediately to the well known expression for the primary balance that will ensure the debt/GDP ratio remains unchanged:

$$(S/Y)_t = ((r - g)/(1 + g))(B/Y)_{t-1} \ldots\ldots\ldots\ldots\ldots\ldots (08)$$

If we commence from a position in which debt levels are considered acceptable, Equation (4) can be interpreted as a fiscal rule, with the rule defining the primary balance/GDP ratio required to keep to such a debt/GDP target. To study the actual behavior of government, one can estimate a fiscal reaction function of the analogous form[16]:

$$(S/Y)_t = \alpha(B/Y)_{t-1} +\varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots (09)$$

coefficient α is approximately (r - g)/(1 + g).

to allow for the possibility that government pursues short-run demand stabilisation can be added to the right-hand side of Equation (09) ,the output gap, $\hat{Y}$[17],. The basic fiscal reaction function is represented as:

$$(S/Y)_t = \alpha_1 + +\alpha_2(B/Y)_{t-1} + \alpha_3(\hat{y})_t + \varepsilon_t \ldots\ldots\ldots(10)$$

Amir kia (2008) noted that the main problem with studying the sustainability of the fiscal process in developing countries is that the tax revenue systems of these countries are frequently not well developed. Furthermore, tax revenues are not the only source of income. This is especially true for resource oriented countries, particularly oil-producing countries. Consequently, simply inspecting the spending-tax revenue relationship may be misleading. He added the energy income, ENERG in his study of Iran's Fiscal reaction function[18] . The basic fiscal reaction function is then represented as:

$$(S/Y)_t = \alpha_1 + \alpha_2 (B/Y)_{t-1} + \alpha_3(\hat{y})_t + \alpha_4(ENRG/Y)_t + \varepsilon_t \ldots\ldots\ldots(11)$$

Equation (9) can be rewritten as follows:

$$S_t = \alpha_1 + \alpha_2 b_{t-1} + \alpha_3 \hat{y}_t + \alpha_4 energ_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots(12)$$

Whith $s_t = (S/Y)_t$ primay balance to GDP ratio, $b_{t-1} = (B/Y)_{t-1}$ debt to GDP ratio, $\hat{y}_t = (\hat{Y}/Y)_t$ output gap to GDP ratio, energ=(ENRG/Y)t energy income to GDP ratio, and, ε_t error term which is assumed to be i.i.d. $N(0, \sigma 2)$.

A few important points are noted in interpreting the results of the empirical model for (12). The crucial information to look out for are the coefficient estimates for debt and energy. These are listed as follows[19]:

- A positive and statistically significant debt coefficient and a positive and statistically significant energy coefficient indicate fiscal sustainability.
- A positive and statistically significant debt coefficient and a statistically insignificant energy coefficient indicate fiscal sustainability. Primary surpluses increase in response to rising debt levels although income from energy exports are not channeled towards debt reduction.
- A positive and statistically significant debt coefficient and a negative and statistically significant ENERGY coefficient can still indicate sustainability, since primary surpluses are stillrising in response to debt.
- A statistically insignificant debt coefficient and a positive and statistically significant energy coefficient indicate fiscal sustainability. Although rising debt levels have no significant impact on primary balance and may lead to explosive growth in debt, this is compensated by rising revenues from energy exports.
- A statistically insignificant debt coefficient and a negative and statistically significant energy coefficient indicate lack of fiscal sustainability. Primary balances are not responsive to debt levels, while rising energy exports reduce primary balances further.
- Lack of statistical significance in both the debt and energy coefficients indicate lack of fiscal sustainability. Primary balances are not responsive to debt levels and income from energy are not channeled towards debt reduction.
- A negative and statistically significant debt coefficient coupled with a statistically insignificant energy coefficient indicates lack of fiscal sustainability. This is because primary

surpluses are falling in responsive to rising debt levels, while income from oil and gas fail to support the primary surplus position.

- A negative and statistically significant debt coefficient and positive and statistically significant energy coefficient indicate fiscal sustainability. While primary balances are deteriorating in response to rising debts, this is compensated by energy income.
- A negative and statistically significant debt coefficient and statistically insignificant energy coefficient indicate lack of fiscal sustainability. Rising debt levels erode the fiscal balance but this is not compensated by energy income

2.Data sources and Definition of Variables

In the present study, we employ annual data covering the period 1980-2017 to estimate fiscal reaction function of Algeria . The use of annual data is informed by the available frequency of the data for the variables. Also, the choice of study period is so significant in the Algeria 's history, being the period that witnessed political transformations . The data set includes the following variables which are used in ratio to GDP:

S: primay balance is defined as total revenue minus total expenditure without interest expenditure, The data was obtained from the Algerian National Statistical Office (ONS) and the Ministry of Finance.

b: debt is nominal debt accumulation in one year, The data was obtained from the Algerian National Statistical Office (ONS) and the Ministry of Finance.

$\hat{Y}$: output gap is obtained by generating value from the nominal GDP, by using the Hodrick-Prescott (HP) Filter.

Energ: energy income is the rvenue collected from hydrocarbon sector, The data was obtained from the Algerian National Statistical Office (ONS) and the Ministry of Finance.

V.STUDY RESULTS:

The study adopts the standard econometric techniques by first testing for unit roots. Secondly, the Bounds Testing autoregressive distributed lag (ARDL) method was employed, since the technique is robust and indifferent about the order of integration of the economic and financial time series.

1. Stationarity Test:

Given the recent developments in time series modelling, unit root tests of the variables in the model were performed to determine their time series properties or characteristics. The order of integration of the series was ascertained using the Phillips-Perron (PP) test statistic. The results of the unit root tests are provided in Table 1

Table. (1):Result of the Unit Root using PP test

variable	Level			First Difference			Order of integration
	none	constant	Constant and linear	none	constant	Constant and linear	
s	-2.70**	-2.62	-2.78				$I_{(0)}$
b	-0.97	-0.89	-1.86	-7.75**	-7.53**	-7.56**	$I_{(1)}$
enrg	0.27	0.28	0.54	-6.83**	-6.76**	-6.66**	$I_{(1)}$
y	-2.78**	-2.73	-2.78				$I_{(0)}$

Note: (**) indicates rejection of the null hypothesis of non-stationary at 5 percent significance level based on the MacKinnon critical values.

Source: Author's Computation

As shown in table1: the results of unit root test, using pp test provide evidence that debt and energy income series contain a unit root in level, mean while the primary balance, and output gap are stationary at level, that is I(0) the unit root test showed that primary balance was stationary at level, that is I(0). For the first differenced specification, the test reject the null of unit root, indicating the debt and energy series are integrated of order one I(1)

2.ARDL Cointegration Results

Given the mixture of stationary and non-stationary variables in the model as established from the standard four unit root test, the ARDL co-integration technique is the ideal method to estimate the fiscal policy reaction function of Algeria. The lag length criteria and model selection is considered by Akaike Information Criteria (AIC). This study also examines the existence of the long run relationship among the relevant variables. The results are represented in Tables 3. The ARDL analysis results in the optimal selection with the order ARDL (2, 0, 2, 2). The order of the model represents the optimal model for each variable. The ARDL specification for the fiscal reaction function model, which is formulated below:

$$\Delta s_t = \alpha_1+\alpha_2 s_{t-1}+\alpha_3 b_{t-1}+\alpha_4 y_{t-1}+\alpha_5 energ_{t-1}+\sum_{t=0}^{q1}.\Delta\beta_1 s_{t-i}+\sum_{t=0}^{q2}.\Delta\beta_2 b_{t-i}+\sum_{t=0}^{q3}.\Delta\beta_3 y_{t-i}+\sum_{t=0}^{q4}.\Delta\beta_4 energ_{t-i}+\varepsilon_t$$

Where,

Δ denotes the first difference operator

β_1, β_2, β_3, β_4:coefficient of short-run relationship(the error correction model)

α_1, α_2, α_3, α_4, α_5: coefficient of long -run relationship

q:the upper limit of lag length of the variables.

A. Co-integration Test (the bound test)

The construction of the co-integration bounds test entails the evaluation of F statistics against the critical values. The calculated F-statistic = 4.22 and is greater than the lower bound critical value of 2.79 and the upper bound critical value of 4.08 at the 5% level of significance. Therefore, we reject the null hypothesis of no long-run relationship. Therefore, the conclusion is that there is cointegration or a long-run relationship between the variables fiscal reaction function model.

Table (2): Result of the bounds test

ARDL Bounds Test **Sample: 1980 2017 Included observations: 37** **Null Hypothesis: No long-run relationships exist**		
Test Statistic	**Value**	**K**
F-statistic	**4.222627**	**3**
Critical Value Bounds		
Significance	**Lower Bound**	**Upper Bound**
10%	**2.37**	**3.2**
5%	**2.79**	**3.67**
2.5%	**3.15**	**4.08**
1%	**6.65**	**4.66**

Source: Author's Computation

B. Long-run and Short-run Estimation

According to the results presented in the table 03, long run relationship between primary balance, public debt, the public debt coefficient is positive and statistically significant at the level of 5%, indicating that government react systematically to rising public debt ratio to ensure fiscal sustainability. The government responds to the change in the public debt balance by raising the primary balance of the budget, so when The public debt rises by 1%, the government moderate primary balance to GDP by 0.018%, which is a weak percentage and indicates the weak relationship between the public debt and the primary balance in the long run.

It can be said that Algeria has implemented a financial sustainability strategy to properly deal with public debt, which is a positive sign that the government is making efforts to generate surpluses in the primary balance of the budget in order to pay off the debt installments and its interests. The estimated coefficient of variable ENERG is positive, but is statistically insignificant., according to Amir Kia, the energy income is not used for investment and debt reduction[20], implying an irresponsible fiscal policy in Algeria . In sum, this section provides evidence that the fiscal policy in Algeria is unsustainable and irresponsible in terms of energy income. An estimated positive and highly significant coefficient for the output gap $\hat{y}$ indicates a strong countercyclical behavior of

deficits in Algeria . The parsimonious short run error correction model linked to the long run function was also estimated and the results are reported in table 4. The results show that the parameter of the error correction was approximately -0.905 and statistically significant, which is a further indication of a stable long-run relationship which explains a restoration of about 90% of any shock within a year that arises in the system.

Table (3)Long-run relationship coefficient results

variable	coefficient	Std.error	t-stastic	prob
b	**0.018552**	**0.008914**	**2.081267**	**0.0474**
energ	**0.078705**	**0.069019**	**1.140343**	**0.2645**
y	**0.340800**	**0.018666**	**18.25781**	**0.0000**
c	**-0.035057**	**0.018040**	**-1.943254**	**0.0629**
S=-0.035+ 0.018b+0.078energ+0.34y				

Source: Author's Computation

Table (4): Short-run relationship coefficient results

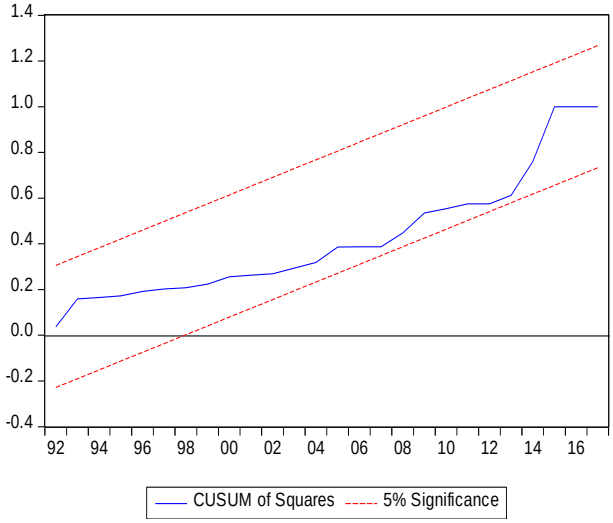
variable	coefficient	Std.error	t-stastic	prob
D(s(-1))	**0.341453**	**0.173332**	**1.969934**	**0.0596**
D(energ)	**0.021138**	**0.059997**	**0.352320**	**0.7274**
D(energ(-1))	**-0.188484**	**0.059702**	**-3.157091**	**0.0040**
D(y)	**0.325338**	**0.018620**	**17.47217**	**0.0000**
D(y(-1))	**-0.084790**	**0.054739**	**-1.548985**	**0.1335**
cointEq(-1)	**-0.905583**	**0.183475**	**-4.935718**	**0.0000**

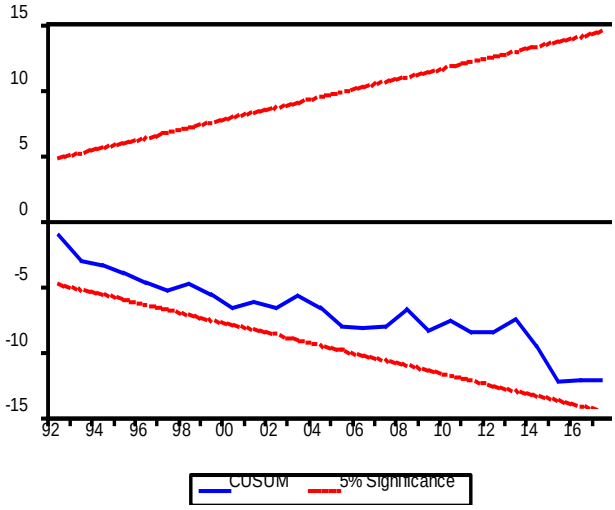
Source: Author's Computation

C. Diagnostic and stability tests of the model

to analyze the stability of the long-run coefficients, the cumulative of the recursive residuals (CUSUM) as well as the cumulative sum of squares of recursive residual (CUSUMQ) were investigated empirically. This is graphically represented in Figure 1, which portray the plots of CUSUM and CUSUMQ test statistics as resting neatly within the boundaries at 5% significant level. Hence, this confirms the stability of the long-run coefficient of variables in the model.

Figure (04): CUSUM and CUSUM SQUARE test





Source: Author's Computation

we conducted the residual diagnostics of the reaction function model. The residuals are normally distributed in the model as evidenced by the non-rejection of the null hypothesis using the Breush-gofrey derial correlation LM test, also reports that there is no auto correlation in the model. The Lagrange Multiplier serial correlation test also confirms that there is no serial correlation in the model. The model also appears not be heteroscedastic as it passes the Breush-Pagan-gofrey heteroscedastricity test, as reported in table 5:

table (5): Stability diagnostic checks

Test	Null hypothesis	Test statistic	P-value	Conclusions
Jarque–Bera	Residuals are normally distributed	0.11	0.945	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore the residuals of the model are normally distributed
Breush-gofrey derial correlation LM	No autocorrelation	1.80	0.40	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore the model does not suffer from autocorrelation
Breusch Pagan–Godfrey	No heteroscedastricity	10.24	0.33	Do not reject Ho as PV is greater than the L.O.S at 5%, therefore there is no Heteroscedastricity in the model

Note: L.O.S denotes level of significance

Source: Author's Computation

VI.CONCLUSION:

The study focused on assessing the sustainability of fiscal policy in Algeria in the long run by estimating the fiscal reaction function, to ensure whether the authorities follow appropriate financial policies to avoid excessive public debt accumulation. Our results show, there is a long-run relationship between primary balance of the budget and public debt, wich means that financial authorities interact systematically with increasing public debt ratios, by generating future surpluses of primary balance of the budget, despite the increase in the latter in comparison to the increase in The public debt ratio is small, which means the adjustment is very low.

Algeria is facing in recent years a significant increase in the proportion of public debt, especially the domestic debt. This is due to a decrease in energy revenues, after the drop in oil prices in the middle of the year 2014. and this requires Algeria to undertake a set of reforms and policies that we can offer as follows:

-Activating the tools for controlling public expenditures, control institutions and criteria for evaluating the performance of spending programs, and reintroducing the budget control law.

-The necessity of increasing the return from ordinary tax collection through reforming the tax administration, designing more efficient tax systems.

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