

**An Investigation of Granger Causality between Government Expenditures and Revenues:  
The case study of Algeria (1990-2017).**

**BENAZZA HANAA**  
MCB, University of Tlemcen  
(MECAS research lab)  
[hanou\\_21@hotmail.fr](mailto:hanou_21@hotmail.fr)

*Received: 03/03/2019*

*Accepted: 27/05/2019*

*Published 14 /06/2019*

**Abstract:**

The purpose of this study is to test statistically in granger sense for the existence of causality between government expenditures and revenues, and their effect on economic growth rates in Algeria based on annual time series data during 1990-2017. The results show that there is a unidirectional causality between government expenditures and revenues, from G.revenues to G.expenditures, and the both has a significant effect on Algerian economic growth in the medium term. Finally the study recommend the need to Accelerate the implementation of structural economic reforms, especially now as the economic conditions in Algeria don't allow the productive apparatus to respond to the increase in the volume of public expenditures.

**Keywords:** government expenditures, government revenues, Economic Growth, granger causality.

**Jel Classification Codes:** E62, O4.

**Corresponding author: BENAZZA HANAA, e-mail: [hanou\\_21@hotmail.fr](mailto:hanou_21@hotmail.fr)**

## **1. INTRODUCTION**

Since 1990, Algerian authorities have begun to implement a series of economic reforms to change the pattern of running the economy and reduce the subordination of fiscal policy to oil revenues; for this, the tax reform act has adopted in 1992 (Chibi.A, Benbouziane.M, and Chekouri.M, 2010). The public expenditures have been marked a remarkable development, reflecting the role of the state in various economic and social fields, and its contribution in realization of development demands, in which raising economic growth rates is one of the most important demands.

The size of public revenues is one of the most important determinants of the size of public expenditures, and the fact that Algeria relies heavily on hydrocarbons, as oil revenues have the lion's share of total public revenues, so this latter play an influential important role in public expenditures development.

In this context, this paper attempts to determine the causal relationship between government expenditures and government revenue: Are government expenditures affecting government revenues, or are government revenues affecting government expenditures in Algeria, or is it bidirectional causality? And is this affecting Algerian economic growth over the period under study?

## **2. Literature Reviews**

There are several studies that have investigated the causal relationship between government expenditures and revenues and their impact on economic growth, some of them found a unidirectional causality from revenues to expenditures as (Eita.J.H,& Mbazima.D, 2008, p. 214) which have investigated this causal relationship using granger causality test through (VAR) methods over the period 1977-2007. Some other studies found also an unidirectional causality but from expenditures to revenues as (Lojanica.N, 2015, pp. 79-88) which have investigated this causal relationship in Serbia using (ARDL) model, while the granger causality has been tested within the (VEC) model based on monthly time series data from M1:2003-M11:2014. In contrast, some other researchers found a bidirectional causality as (Al-zeaud.H, 2015, pp. 117-127) which have examined this causal relationship in Jordan using granger causality and VEC model methodology based on annual time series data from 1990-2011.

## **3. The Evolution of Government Budget (expenditures and revenues) and Economic Growth in Algeria (1990-2017)**

Over the period under study, we noticed an increase in the public expenditures compared to the preceding decade, which can be considered an expansive expansion policy. This is due to the economic, social and political reality witnessed by Algeria. The most largest value of (government expenditures/GDP) ratio was in 1994, where it reached 10.55%, that in this period the government expenditures increased at a decreasing rate, which was due to the government's commitment to control and rationalize public expenditures as stated in the economic stability and structural adjustment program.

However, the return of the rise in oil prices from the last third of 1999's, has added some financial comfort to this period, which has been exploited in the economic activity through a financial development policy, expressed by the increase in the public expenditures volume within the so-called: support for economic recovery program and supplementary program to support economic growth until 2009.

The ratio (government expenditure/GDP) rose from 10.27% in 1999 to 12.36% in 2008, this latter can be attributed to the increase in total government expenditures at a rate more than the rate of increase in GDP. As a result of this, the fiscal policy has significantly contributed to improving some of the macroeconomic indicators, the most important of these is the decrease in external debt to 4.88 billion dollars in 2007, and the increase in economic growth rates to acceptable levels of 6.8% in 2003, the unemployment rate has fallen to more than half during the last six years, inflation reached their lowest levels: 0.33% in 2000 and 1.64% in 2005.

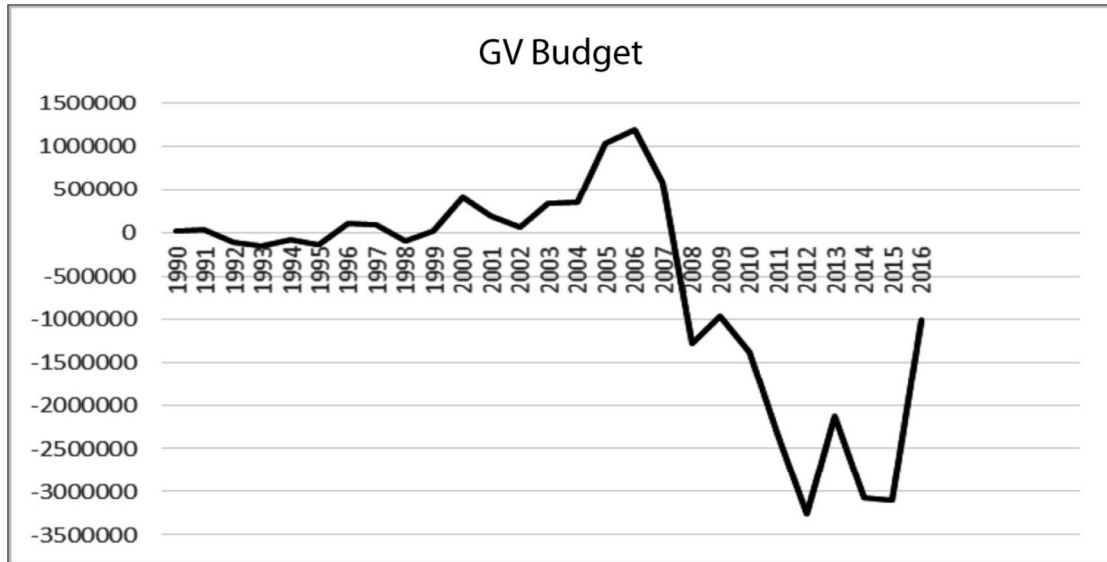
Petroleum levy play an important role in public revenues, thus covered public expenditures, this type of collection constitutes the main source of public revenues. Oil collection was steadily increasing from beginning 1990' until beginning 2003' except the fluctuation of 1993 and 1998.

The government budget had a surplus only in the period from 2000 to the middle of 2007, when oil prices were high and at their best level. The surplus budget reached the peak in 2006', but we noticed that the growth of deficit is obvious in the most of time and this is due to accumulation of these causes:

- The difficult control of the size of public expenditure, since the government budget depends on the petroleum collection, which is highly sensitive to the change ability of the global oil prices.
- The weakness of regular tax collection, which is due to the weak efficiency of the tax system.

The following figure-see figure1-show the government budget evolution from 1990-2016 (Boulila.H, Benbouziane.M, 2018, pp. 17-18)

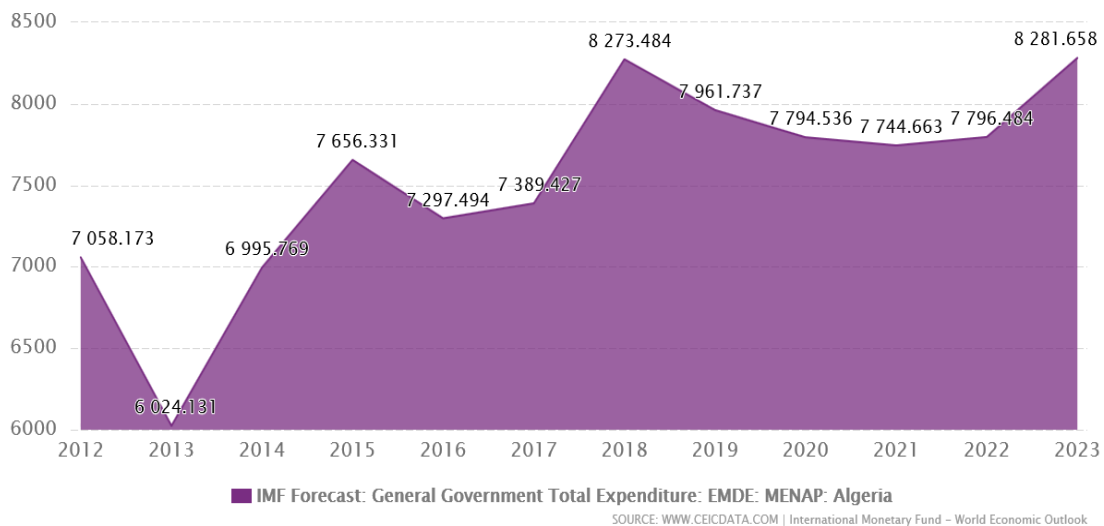
**Fig.1.government budget evolution 1990-2016**



Source: (Boulila.H, Benbouziane.M, 2018, p. 17)

Algeria recorded a Government Budget deficit equal to 6.40 % of the country's Gross Domestic Product in 2017. Government Budget in Algeria averaged 2.22 % of GDP from 1990 until 2017, reached an all time high level of 14.70 % of GDP in 2006 and a low level of 15 % of GDP in 2015 (trading economics).

**Fig.2.Algeria's forecast:GV expenditure 19990-2023**



Source: <http://www.tradingeconomics.com/algeria/government-spending>

#### 4. Research methodology

##### 4.1. Data collection:

Time series data from 1990-2017 of the related variables were collected from: World Bank data (2018) regarding to GDP Per capita (gross domestic product per capita) as indicator of economic growth, as for concerning government expenditures and revenues as variables of government budget taken from Reports of the Central Bank of Algeria (Algeria bank, 2002) (Algeria bank, 2007, p. 195) (Algeria bank, 2012, p. 244) (Algeria bank, 2017, p. 144).

##### 4.2. Model spécification:

In order to examine the effect of public expenditures and revenues on Algerian economic growth, we have estimating the following equation (Pfaf.B, 2008, pp. 1-32):

$$AX_t = A_1^* X_{t-1} + \dots + A_p^* X_{t-p} + \beta \varepsilon_t, \dots \dots \dots (1)$$

Where:  $X_t = [GDPPC_t, GEXP_t, GR_t]$

GDPPC: gross domestic product per capita.

GEXP: government expenditures.

GR: government revenues.

$\varepsilon_t$ : structural errors.

$A_i^*$ : structural coefficients matrix,  $i=1,2,\dots,p$

$\beta$ : structural error coefficients matrix.

The first step is to estimate the SVAR model by estimating the reduced form of VAR model as:

$$X_t = \sum_{i=1}^m A_i X_{t-i} + U_t, \dots \dots \dots (2)$$

Where:  $X_t = [GDPPC_t, GEXP_t, GR_t]$

$$u_t = \begin{bmatrix} u_t^{GDPPC} \\ u_t^{GEXP} \\ u_t^{GR} \end{bmatrix}$$

m: number of deceleration time.

t: current time.

A: matrix (n\*n) contains the regression coefficients of reduce form of VAR model.

n: number of variable in the model.

#### 5. Results and Discussion

##### 5.1 Stationary of time series (Unit Root Test):

In order to examine the stationary of time series, we have used the Augmented Ducky Fuller (ADF) and Fillips Peron) PP) test; the following table summarizes the results as below:

**Table.1.** Unit Root Test Results

variables	ADF(intercept & trend)		PP(intercept & trend)		result
	level	1 <sup>st</sup> diff	level	1 <sup>st</sup> diff	
GDPPC	-2.017429	-5.068677*	-2.858613	-8.114970*	I(1)*
GEXP	-4.894692*	/	-5.107890*	/	I(0)*
GR	-6.611797*	/	-6.927825*	/	I(0)*

**Source:** prepared by researcher depending on the statistical package EVIEWS7

**Notes:** \*, \*\*, significant level at 1%,5%.

The results show that each of the variables under study is integrated at different order, GDPPC stationary at first difference: I (1), each of the GEXP and GR is stationary at level: I (0), which means that there is no long run relationship between variables under study, so we can't apply any co- integration techniques.

### 5.2 Lag length selection test:

After determining the stationary level of all variables, we have to determine the lag length order obtained through unrestricted vector autoregressive via: Schwartz criterion (SC), Akaike information criterion (AIC), Hanan-quinn criterion (HQ) as show in table below:

**Table.2.** Lag Length Selection

Order lags	AIC	SC	HQ
0	4.418577	4.563742	4.460379
1	<b>4.219371*</b>	<b>4.412925*</b>	<b>4.275108*</b>
2	4.225432	4.467374	4.295103

Source: prepared by researcher depending on the statistical package EVIEWS7

Notes: \*: indicate the lag order selected by criterion.

Through the criterion values, the lag length order is (1) as the results show above.

### 5.3 Granger causality test:

After determining the lag length order, we have to determine the causality relationship between variables under study using granger causality test as show the following table:

**Table.3.** granger causality test results

H <sub>0</sub>	Obs	F-cal	Prob	Decission
GEXP does not cause GDPPC	27	0.13186	0.7	don'tReject H <sub>0</sub>
GDPPC does not cause GEXP	27	2.03188	0.1	<b>Reject H<sub>0</sub>***</b>
GR does not cause GDPPC	27	0.36024	0.5	don'tReject H <sub>0</sub>
GDPPC does not cause GR	27	0.42836	0.5	don't Reject H <sub>0</sub>
GR does not cause GEXP	27	1.81306	0.1	<b>Reject H<sub>0</sub>***</b>
GEXP does not cause GR	27	0.27741	0.6	don'tReject H <sub>0</sub>

Source: EVIEWS7 output.

The résultat show:

- ✓ The presence of one way causal relationship from GDPPC to GEXP at 10%, and from GR to GEXP at 10%.

### 5.4 Test the quality of the VAR model used:

#### ▪ Step1: test the serial correlation between residuals

In order to determine if there is a serial correlation problem in the model, we have using the BG-LM test as show in table below:

**Table.4.** BG-LM test results

H <sub>0</sub>	Lags	BG-LM test
No serial correlation between random errors	1	4.946836 <b>(0.035802)*</b>

Source: EVIEWS7 output.

**Notes:** the value between () is the P-value.\*: significant at 1%.

From table, we see that the p-value is more than 1%, so we accept  $H_0$ ; which means that there is no serial correlation between random errors.

▪ **Step2: test the normal distribution of random errors**

In order to determine if the random errors in the model are normally distributed, we have using the **Jarque-Berra test (JB)** as show in the following table and figure:

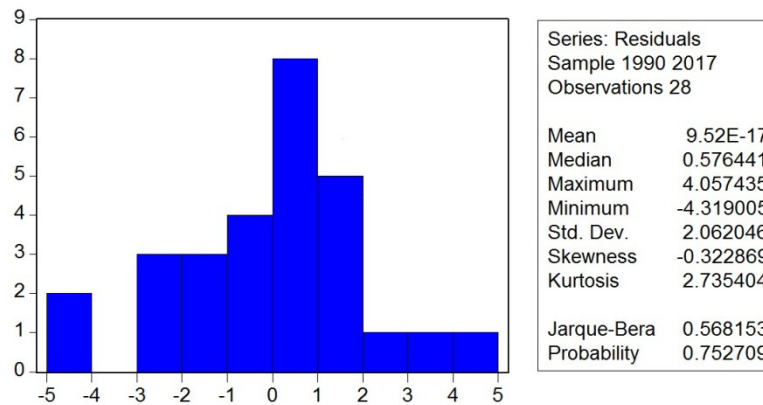
**Table.5.**Jacque –Berra test results

$H_0$	Test statistics
Normal distribution of random errors	0.5681 <i>JB</i> $\chi^2(2)$ <b>(0.7527)</b>

**Source:** EVIEWS7 output.

**Notes:** the value between () is the P-value.

**Fig.2.**JB test



**Source:** EVIEWS7 output.

From table (05) and fig (02), we see that the P-value is more than 5%, so we accept  $H_0$ , which means the random errors in this model are normally distributed.

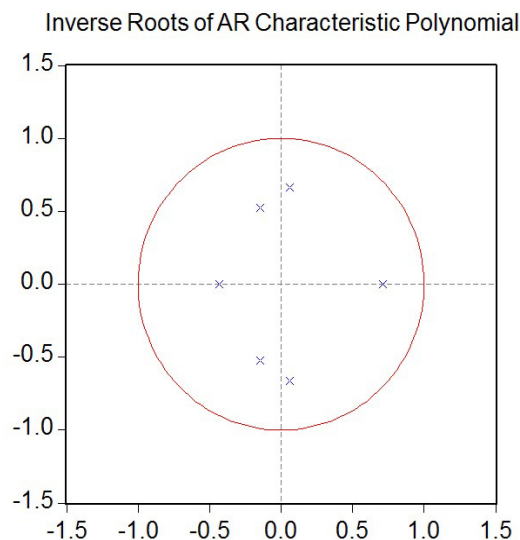
▪ **Step3: Structural stability test for regression coefficients**

The table (06) and fig (03) below, show that each absolute value of the root falls within the circle of the correct one, therefore, the model satisfies the condition of structural stability.

**Table.6.** structural stability test results

Root	Modulus
0.709229	0.709229
0.058033-0.664333i	0.666863
0.058033+0.664333i	0.666863
-0.143722- 0.523610i	0.542977
-0.143722+ 0.523610i	0.542977
-0.432821	0.432821

**Fig.3.** structural  
Stability test



Source: EVIEWS7 output

Based on the results of the three diagnostic test mentioned above (the three steps above) for the VAR model used, a decision can be made to use the VAR model to estimate the SVAR model.

### 5.5 Variance decomposition

Table (07) shows the results as below:

**Table.7.** Variance Decomposition results

Period	GDPPC	GDPPC	GEXP	GR
1		100.0000	0.000000	0.000000
2		<b>98.19979</b>	<b>1.605231</b>	<b>0.194980</b>
3		87.36777	9.372366	3.259868
4		86.02298	10.20777	3.769255
5		85.29049	10.03764	4.671868
6		85.23358	9.991397	4.775027
7		84.95100	10.11412	4.934884
8		84.80852	10.21634	4.975134
9		<b>84.76746</b>	<b>10.21979</b>	5.012747
10		84.76918	10.21557	<b>5.015244</b>

Source: EVIEWS7 output

As the results show in table above, each of the government expenditures and government revenues has a weak power in explaining the forecasting errors in economic growth (GDPPC)(below 11%) over period under study. Also, the government expenditures explain the forecasting error in GDP per capita more than the government revenues, so we can distinguish that

the government expenditures(GEXP) has higher predictive power (maximum ratio 10.21% in the ninth period) than the government revenues (maximum ratio 5.01%in the tenth period)to interpret forecast error in GDP per capita over the ten-year period.

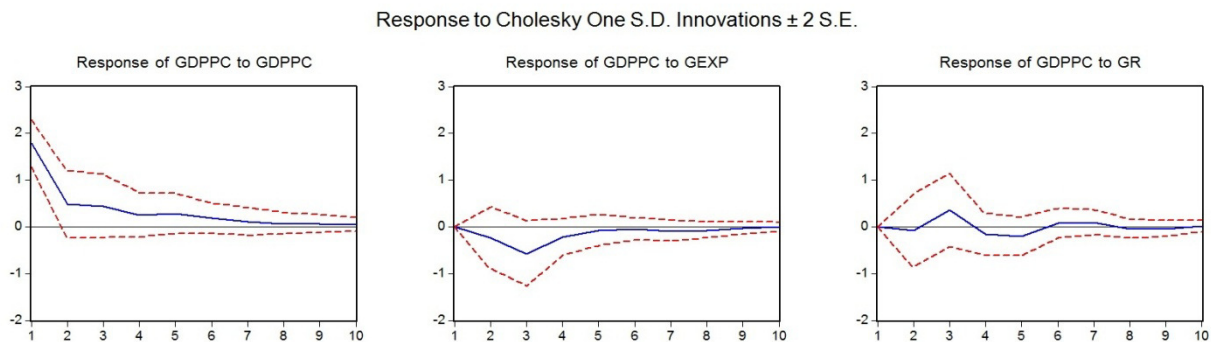
This can be explained by the strongly effectiveness of the government expenditures as compared to the government revenues in influencing the economic growth over 1990-2017.

### 5.6 Impulse response function

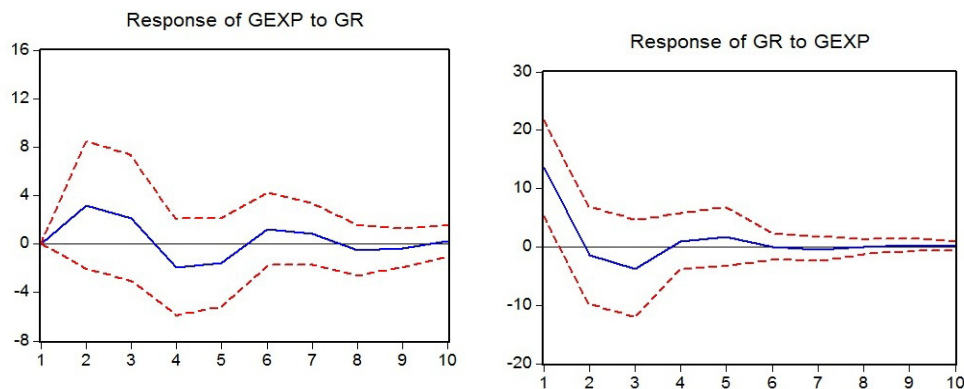
According to the estimates of ten-time response functions as show in fig (04):

**Fig.4.** impulse response function results

(A): Response of GDPPC to government expenditure and revenue



(B): Response of government expenditure (government revenue) to G. revenue(G. expenditure)



Source: EVIEWS7 output

The results show:

- ✓ Single positive structural shock in the government expenditures, will have a significant negative impact on real GDP per capita in the short, medium and long term.(see fig 4:A)
- ✓ Single positive structural shock in the government revenues ,will have significant positive impact on real GDP per capita in the meduim term only, this impact will be insignificant over the both short/long term. .(see fig 4:A)
- ✓ Single positive structural shock in the government revenues, will have significant positive impact on government expenditure in the short term, a negative impact in medium term, and it will be insignificant in long term .(see fig 4:B)



- ✓ Single positive structural shock in the government expenditures, will have a significant positive impact on government revenue in the short term, while in the medium term it have a significant negative effect, and it will be insignificant in long term .(see fig 4:B)

So, the results of impulse response function (fig4) indicate that the government expenditures has an impact on Algerian economic growth in the short term more than the government revenues, which is consistent with the variance decomposition results(table7).

## 6. CONCLUSION

The fact that Algeria relies heavily on hydrocarbons sector, as oil revenues have the lion's share of total public revenues, so this latter play an influential important role in public expenditures development. In this study, we have investigated this causal relationship between government expenditures and revenues, and their effect on Algerian economic growth over 1990-2017. The results showed the presence of uni-directional causal relationship between government expenditure and revenues, from G.revenues to G.expenditures in Algeria in the period under study. Through this results obtained, we recommend the need to follow an integrated monetary and financial policy and go hand in hand in the same direction in order to achieve the objectives of economic policy, including economic growth, Accelerate the implementation of structural economic reforms initiated since the implementation of the structural adjustment program, especially now as the economic conditions in Algeria don't allow the productive apparatus to respond to the increase in the volume of public expenditure, and the need to rationalize expenditures.

## Bibliography list

- Algeria bank. (2007). *annual report, economic and monetary evolution*. Algeria.
- Algeria bank. (2012). *annual report, economic and monetary evolution*. Algeria.
- Algeria bank. (2017). *annual report, economic and monetary evolution*. Algeria.
- Algeria bank. (2002). *Annual report , economic and monetary evolution in algeria*. Algeria.
- Al-zeaud.H. (2015). the causal relationship between government revenue and expenditure in jordan. *international journal of management and business research*, vol5(2) , 117-127.
- Boulila.H, Benbouziane.M. (2018). Austerity in Time of Crisis: a Solution or a Dangerous Idea? Evidence from Algeria. *Etikonomi: Jurnal Ekonomi*, Vol. 17 (1) , 17-18.
- Chibi.A, Benbouziane.M, and Chekouri.M. (2010). macroeconomic effects of shocks in algeria: an empirical study. *economic research forum*. Egypt.
- Eita.J.H, & Mbazima.D. (2008). the causal relationship between government revenue and expenditure in namibia. *MPRA paper* (p. 214). MPRA.
- Lojanica.N. (2015). government expenditure and government revenue- the causality on the example of the republic of serbia. *management international conference paper*, (pp. 79-88). Slovenia.
- Pfaf.B. (2008). VAR, SVAR and SVEC models: implementation within R-package vars. *journal of statistical software* , 1-32.
- *trading econpomics*. (s.d.). Consulté le 02 23, 2019, sur <http://www.tradingeconomics.com/algeria/government-spending>