The Determinants of Algerian Trade Balance using an ARDL Approach

محددات الميزان التجاري الجزائري باستعمال نموذج الانحدار الذاتي للفجوات الزمنية الموزعة

ARDL

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Abstract:

The purpose of this research paper is to find out empirically the essential factors that determine the Algerian trade balance in both short and long-period, by using the autoregressive distributed lag (ARDL) approach to co- integration and the associated error correction model (ECM) based on the annual data for the period (1980 - 2017).

The findings showed that Algerian trade balance has different determinants than many countries, and the natural resources availability factor is the main determinant of this balance, it confirms the reality that the Algerian economy is a rent economy. Furthermore to other determinants that have had its effect (real effective exchange rate, economic growth, Government spending).While there was no impact of foreign direct investment.

Keywords: Trade Balance; Determinants; ARDL; Algeria.
Jel Classification Codes: F10, C32, O55.

ملخص:

تهدف هذه الدراسة إلى استكشاف تجريبيا العوامل الرئيسية التي تحدد الميزان التجاري الجزائري في الاجلين القصير والطويل، وذلك باستخدام منهجية الانحدار الذاتي لفترات الابطاء الموزعة (ARDL) و نموذج تصحيح الخطأ المرتبط به (ECM)اعتمادا على البيانات السنوية للفترة (1980–2017).

أظهرت النتائج بأن للميزان التجاري الجزائري محددات تختلف عن كثير من الدول، حيث يعتبر

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عامل وفرة الموارد الطبيعية هو المحدد الرئيس لهذا الميزان مؤكدا حقيقة ريعية الاقتصاد الجزائري، إضافة إلى محددات أخرى كانت لها تأثيراتها (كسعر الصرف الفعلي الحقيقي، النمو الاقتصادي، الإنفاق الحكومي). في حين لم يكن هناك أي تأثير للاستثمار الأجنبي المباشر.

كلمات مفتاحية: الميزان التجاري، المحددات، نموذج الانحدار الذاتي لفترات الابطاء الموزعة، الجزائر.

تصنيفات JEL : F10، C32، O55.

1. INTRODUCTION

Foreign trade shows and expresses the current economic situation of any country, and it is considered as an indicator of its economic development and the effectiveness of its economic policies, as well as the realization of a relationship between trade terms and trade balance is the essential key to a effective trade policy; Thus, the study of factors that cause the balance of trade occur, has been the subject of many research work during the last decades. However, despite the large number of empirical studies of trade balance determinants, there is no consensus on the extent of their impact (BAHMANI-OSKOOEE & RATHA, 2004, p. 1377) .

1.1 Problematic of study

Taking into account the difference in the determinants of the trade balance across countries; it is necessary to ask the following question:

What are the main determinants of the Algerian trade balance, and are there differences in their effects?

1.2 Objectives of study

Given that the small number of studies that test the determinants of Algerian trade balance; this paper aims to partially filth is knowledge gap. Furthermore, the main objective of this study is to determine empirically the main factors affecting the Algerian trade balance, by applying the bound testing ARDL and the associated error correction model (ECM) to annual data covering the period of 1980 to 2017.

1.3 Study plan

The organization of the rest of this study will be as follows: section 2 gives the past literature review on the topic. Section 3 introduces the econometrical methodology and data. In Section 4 presents the results and discusses them. Finally, the conclusion is presented in Section 5.

2. Literature review

(Ali, 2017), It has investigated the short and long-term relationship between the Sudan's trade balance, exchange rate, cost of finance, credit to the private sector, real per capita gross domestic product, inflation rate and domestic investment by applying the bound testing ARDL and the associated error correction model (ECM), that data used were annual covering the period of 1970 -2014. The researcher finds that in the long-term, exchange rate, inflation and real per capita gross domestic product apply negative effects, while cost of finance, loan to the private sector and investment have positive effect on trade balance. Furthermore, the researcher doesn't find any short-term relationship between the explanatory variables and trade balance in Sudan.

(Ari & Cergibozan, 2016), This study used the Johansen cointegration test and vector error correction model(VECM)to show the short and long-run determinants of the Turkish trade balance to annual data for the period of the period 1987-2015.They reached that in the long-run an increase in real effective exchange rate improves trade balance, while an increase in Turkish (foreign) income improves (deteriorates) trade balance. In the short-term, real effective exchange rate has no impact on trade balance, while an increase in domestic and foreign income negatively affects the Turkish trade balance.

(Alhanom, 2016), this study investigated the long and short-term relationships between Jordan trade balance and its determinants, by applying the bound testing ARDL to annual data covering the period of 1970 to 2010. It comes up to a co-integration (long-run relationship) between balance of trade, real exchange rate, domestic income, foreign income. However, the analysis shows that real exchange rate is in significant determinant of Jordan trade balance in either the short or long-run. Compared to domestic income and foreign income appears to be an important determinant of trade balance in the long-run.

(Shawa & Shen, 2013), this study employed the Ordinary Least Square method (OLS) under the E-View 7.1 software to estimate the relationship between Tanzanian trade balance and its determinants to annual data for the period 1980-2012. They results that the major determinants of trade balance

for Tanzania are foreign direct investment, Human capital development, Household consumption expenditure, Government expenditure, Inflation, Natural resources availability and foreign income. Therefore, policy formulation should base on them in order to improve the trade balance in Tanzania.

(Saqib, 2013), The study examined the long-term relationship between fluctuation of exchange rate and trade balance in Saudi Arab. Employing the Purchasing Power Parity (PPP) model for the period of 1980 – 2008.The researcher came up to a significant long run relationship between the exchange rate fluctuation and trade balance for Saudi Arab in the long run but not in the short-run.

(Ray, 2012), The study identified the long and short-term relationship between the trade balance, real effective exchange rate, domestic consumption, foreign direct investment and foreign income in the case of India, over the period 1972-1973 to 2010-2011, by using several econometric techniques and tools like Augmented Dickey Fuller test, Johansen Cointegration test and VECM, OLS have been used to observe long run as well as short run causality among different macro-economic variables. The researcher has found accepted evidence that real effective exchange rate, FDI, domestic consumption and foreign income and foreign direct investment have significant positive impact on balance of trade whereas domestic consumption and real effective exchange rate impacted negatively on balance of trade in India.

(Waliullah & al, 2010),They have examined the short and long-term relationship between the balance of trade, income, money supply, and real exchange rate in the case of Pakistan's economy by applying the bound testing ARDL, that data used were annual covering the period of 1970-2005.They found that the findings provide clear and strong evidence that money supply and income play a main role in specifying the behavior of the trade balance, and the exchange rate regime can help get better the trade balance but will have a slight influence than growth and monetary policy.

(Duasa, 2007),The researcher has analyzed the long and short-term relationship between the trade balance, real exchange rate, income and money supply in the case of Malaysia, by using the bound testing ARDL to

annual data covering the period of 1974 to 2003. The researcher came up to clear and strong evidence that income and money supply do play a role in figuring out the long-run behavior of the Malaysian balance of trade, however there is no relationship between the trade balance and real exchange rate.

3. Methodology and Data
3.1 Methodology

We used the auto regressive distributed lag approach (ARDL) in this study so as to answer the problem presented about the determinants of the trade balance during the period (1980-2017).

3.1.1 An ARDL Approach: It is used in determining the long run relationship between series with different order of integration (Pesaran and Shin, 1999, and Pesaran et al. 2001). The reparameterized result gives the short-run dynamics and long run relationship of the considered variables (Nkoro & Uko, 2016, p. 68). This method has definite advantages in contrast to other cointegration procedures since it can be used regardless of whether the underlying variables are I(0), I(1) or fractionally integrated. Therefore, the bounds test excludes the uncertainty associated with pre-testing the order of integration. Secondly, it can be used in small sample sizes, whereas the Engle–Granger and the Johansen procedures are not reliable for relatively small samples. Taking into account that our sample size is limited with a total of 38 observations only, conducting bounds test will be appropriate. (Ali, 2017, p. 10)

3.1.2 Variables of Study: In order to explain the determinants of the trade balance in Algeria during the period (1980-2017), the proposed model relies on the trade balance as a dependent variable and on five independent variables (economic growth, real effective exchange rate, the natural resources availability, government expenditure, foreign direct investment), we clarify these variables as follows:

- **Trade Balance (TD):** It is measured as the ratio of the value of exports (X) to the value of imports (M) (ONAFOWORA, 2003, p. 3), and it is measured in this way to avoid negative values in the case of deficit, where if the ratio is greater than one there is a surplus, but if it is limited between one and zero, it means that there is a deficit in the trade balance.

- **Economic growth:** This indicator is measured by the evolution of the value of per capita gross domestic product GDP, we symbolized it (PER) .We expect a positive correlation between this indicator and the dependent variable.

- **Real effective exchange rate (REER):** It is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by the deflation of prices or index of costs. (The World Bank, 2012, p. 277)**.**The decline in the REER reflects the reduction in the cost of producing domestic goods and an increase in export competitiveness capacity, while the increase in REER implies that exports become more expensive and imports become cheaper; thus, an increase indicates a loss in trade competitiveness capacity (Falk, 2008, p. 7)**.**We expect a positive correlation between this indicator and the dependent variable.

- **The natural resources availability:** In our study, we relied to show this availability on the evolution of hydrocarbon exports as a percentage of total Algerian exports, and its symbol **(HYD)**.The expected correlation between this indicator and the dependent variable is positive; the more availability of the natural resources has a positive effect on the trade balance.

- **Government spending (G):** We expect an inverse relationship between the government spending and the dependent variable; so the increase in government spending, especially in the non-productive sectors, will lead to a negative impact on the trade balance.

- **Direct Foreign Investment (FDI):** Since foreign direct investment helps to improve trade, especially if the inducements of multinational companies are to export, we expect a positive relationship, this relationship may also be negative due to the high import of intermediate goods; and if the goal is to cover local needs. However, in this study, we assume a positive relationship between FDI and balance of trade.

3.2 Data: This study use annual time series covering the period from 1980 to 2017. The data and statistics were obtained from the World Bank statistics and data, the evolution of these variables during the study period as follows:

3.2.1 Balance of the Trade Balance (TB): We note From Figure1 that during the period 1980-1998, the Algerian trade balance recorded at the beginning of this period a slight deficit to a balance at its end. From 1985 to the end of this period, we observed a surplus in the trade balance, and its continued rise despite the existence of many crises underwent by the Algerian economy, especially the oil crisis of 1986 and the political and security crisis in the nineties, and this is mainly due to Algeria's strong reforms to restore internal and external balances under the auspices of both the international monetary fund and the World Bank. During the period 1999-2017, the Algerian trade balance achieved a continuous and low surplus compared to the previous period due to the high oil prices and the rapid rise of the import bill, to record a deficit at the end of the period due to the impact of the high import bill in light of the decline in oil prices after 2014.

Fig.1. The evolution of trade balance in Algeria during the period(1980-2017)
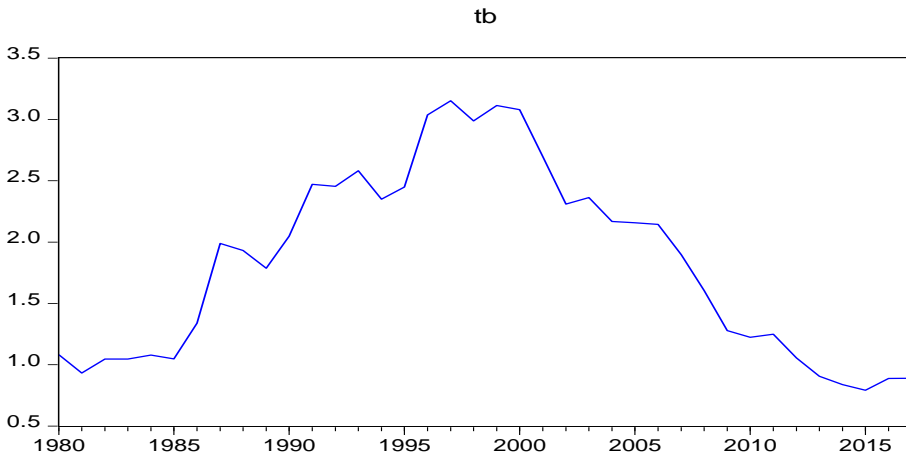
Source: outputs eviews10

3.2.2 Economic Growth (PER): Figure 2 shows the evolution of this indicator over two phases. From 1980 to 1994, there was a continuous decline in per capita income due to the repercussions experienced by Algeria as a result of low oil prices and troubles. During the period 1995-2017, it noticed a remarkable increase as a result of the reforms adopted and the development programs carried out by Algeria starting in 2001 to cope with the oil price boom, and this latter had a clear impact on the increase in per capita from gross domestic product.

Fig.2. Evolution of economic growth (real per capita GDP) during 1980-2017
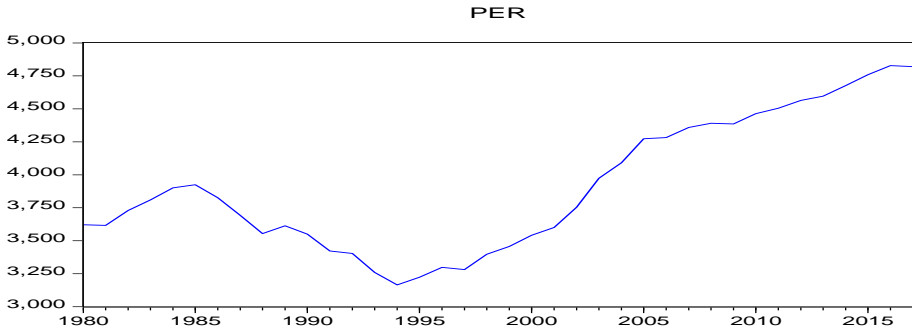
Source: outputs eviews10

3.2.3 Real effective exchange rate: In Figure 3 we note that there are two stages of the development of this indicator, the first of which was in the period 1980 to 1991, which although the real effective exchange rate was high, especially in 1985, it cannot be taken into account the relationship between the real effective exchange rate and the real value of the dinar due to Algeria's adoption of a fixed exchange rate regime, thus the exchange rate policy was not effective in that period, and then it declined and continued to decline until 1991. From 1991 to 2017, the real effective exchange rate in Algeria stabilized at around 100 pips as a result of monetary policy objectives during this period, which in theory backed up the competitiveness of the Algerian economy.

**Fig.3.** Evolution of the real effective exchange rate in Algeria during 1980-2017
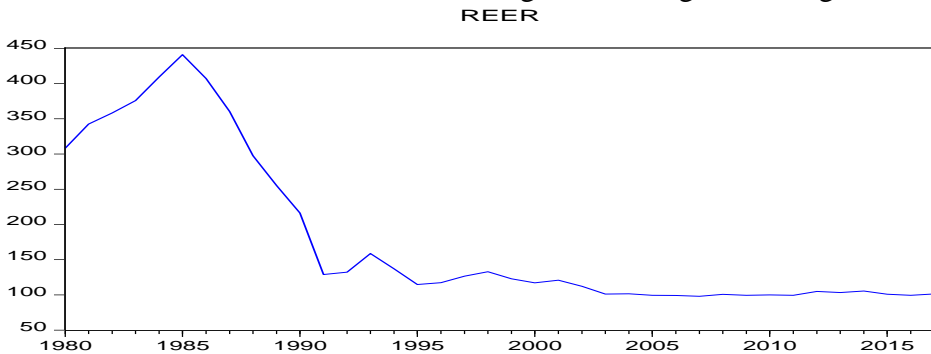
Source: outputs eviews10

3.2.4 Abundance of Natural Resources (HYD): From Figure (4), we note that the high percentage of the contribution of hydrocarbon exports to the total Algerian exports, which exceeded 92% during the study period because the

Algerian economy is completely based on hydrocarbon exports and the weaknesses of the exports out this sector.

Fig.4. Evolution of the hydrocarbon exports as a percentage of total exports in Algeria during 1980-2017
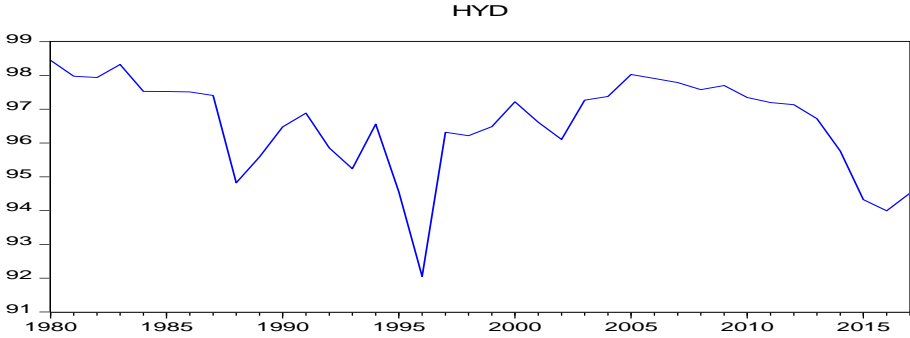
Source: Based on outputs eviews10

3.**2.5 Government Expenditure:** Figure 5 shows the continuous rise in government expenditure in Algeria during the study period, especially in the recent period, due to Algeria's adoption of huge development plans based on its own oil surpluses starting in 2001**.**

Fig.5. Evolution of government expenditure in Algeria during 1980-2017
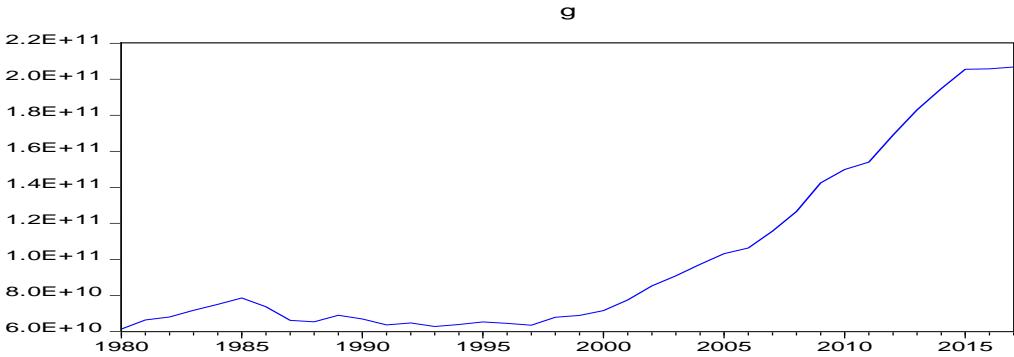
Source: outputs eviews10

3.2.6 Direct foreign investment: We note in Figure 6 that the net foreign direct investment in Algeria is limited and fluctuating during the study period, due to the weak indicators of the attractiveness of the Algerian economy to foreign direct investment**.**

Fig.6. Development of net foreign direct investment in Algeria during 1980-2017
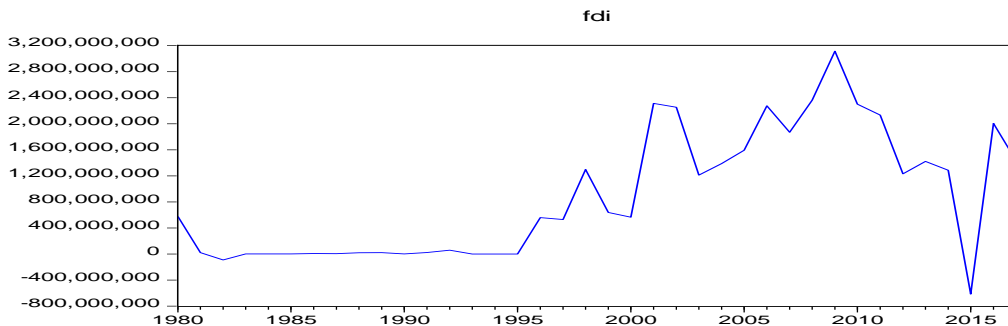
Source: outputs eviews10

4. Results and Discussion

4.1Time series Stationary test

Table 1.Unit root tests for Stationary

| UNIT ROOT TEST RESULTS TABLE (ADF)							
NullHypothesis: the variable has a unit root							
At Level							
		FDI	G	HYD	PER	REER	TB
With Constant	t-Statistic	-2.3750	0.6735	-2.6583	-0.6859	-1.8089	-0.7603
	Prob.	*0.1555*	*0.9898*	*0.0909*	*0.8371*	*0.3702*	*0.8185*
		n0	n0	*	n0	n0	n0
With Constant & Trend	t-Statistic	-3.6347	-1.1825	-2.7019	-1.4238	-1.6787	-0.9886
	Prob.	*0.0403*	*0.8992*	*0.2417*	*0.8366*	*0.7394*	*0.9335*
		**	n0	n0	n0	n0	n0
Without Constant & Trend	t-Statistic	-0.8191	1.5645	-0.5982	1.0766	-3.6578	-0.4138
	Prob.	*0.3541*	*0.9687*	*0.4514*	*0.9234*	*0.0006*	*0.5274*
		n0	n0	n0	n0	***	n0
At First Difference							
		d(FDI)	d(G)	d(HYD)	d(PER)	d(REER)	d(TB)
With Constant	t-Statistic	-6.2817	-2.5669	-6.3651	-3.1996	-3.5540	-4.3296
	Prob.	*0.0000*	*0.1091*	*0.0000*	*0.0282*	*0.0130*	*0.0016*
		***	n0	***	**	**	***
With Constant & Trend	t-Statistic	-6.2196	-3.4334	-6.2794	-3.3340	-5.2614	-4.9246
	Prob.	*0.0001*	*0.0627*	*0.0000*	*0.0770*	*0.0009*	*0.0017*
		***	*	***	*	***	***
Without Constant & Trend	t-Statistic	-6.3461	-2.1286	-6.3216	-2.9818	-2.9983	-4.3942
	Prob.	*0.0000*	*0.0337*	*0.0000*	*0.0040*	*0.0040*	*0.0001*
		***	**	***	***	***	***
Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant							

Source: outputs eviews10

We conclude from Table 1 that the trade balance (TB) series is nonstationary at the first level I (0) (i.e. the presence of the unit root)

according to the ADF test, because the probability values are greater than 0.1 and in all cases (fixed limit, fixed limit and general direction, without fixed limit and general direction) The TB series becomes stationary when the first difference is taken, which means rejecting the null hypothesis and accepting the alternative hypothesis, as the time series of both government spending (G) and economic growth (PER). While the rest are stationary based on ADF at the original level of data I (0) and when the first difference I (1) is taken (i.e., there is no root). Since the series contain a combination of I (0) and I (1), the suitable way to study the equilibrium relationships long-term is an ARDL approach.

4.1.1 Testing the appropriate gaps of the model: One of the most commonly used methods for selecting the appropriate gap is the use of information functions, of which these functions are SIC and AIC function, and according to this case and through Figure 7, the model that has chosen according to ARDL method is from the rank (4,4,4,3,2,3) according to the optimal slowdown test and based on the AIC criterion (Akaike time lag criterion),this means that the dependent variable (TB) has four degrees of delay, and similar to the variables (real effective exchange rate, Economic growth and foreign direct investment). The variable of natural resources abundance has one degrees of delay, but the government spending has two degrees of delay.

Fig.7. Testing the appropriate gaps of the model
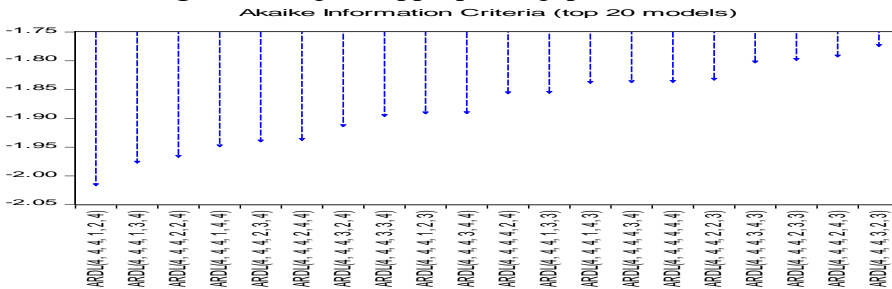
Source: outputs eviews10

The model takes the following formula:

$$\Delta TB_t = c + \sum_{i=1}^{4} \beta_{1i} \Delta TB_{t-1} + \sum_{i=1}^{4} \beta_{2i} \Delta RER_{t-1} + \sum_{i=1}^{4} \beta_{3i} \Delta PER_{t-1} + \sum_{i=1}^{3} \beta_{4i} \Delta HYD_{t-1} + \sum_{i=1}^{2} \beta_{5i} \Delta G_{t-1} + \sum_{i=1}^{3} \beta_{6i} \Delta FDI_{t-1} + \propto_1 TB_{t-1} + \propto_2 REER + \propto_3 PER_{t-1} + \propto_4 HYD_{t-1} + \propto_5 G_{t-1} + \propto_6 FDI_{t-1} + \varepsilon_t$$

Where: Δ:refers to the differences of the first order, **c**:fixed term, **t**:direction of time, $\boldsymbol{\varepsilon_t}$: random error ,($\boldsymbol{\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6}$):short-term correlation coefficients (correction of error), ($\propto_1, \propto_2, \propto_3, \propto_4, \propto_5, \propto_6$) : long-term relationship coefficients.

The null and alternative hypothesis of the model is:

H0: $\propto_1 =, \propto_2 =, \propto_3 = \propto_4 = \propto_5 = \propto_6 = 0$ (i.e. the long run relationship does not exist, against the alternative hypothesis H1: $\propto_1 \neq \propto_2 \neq \propto_3 \neq \propto_4 \neq \propto_5 \neq \propto_6 \neq 0$)

4.1.2 Cointegration Test and error correction model according to ARDL: After determining the rank ARDL (4,4,4,3,2,3) we can now extract the equation of long-term equilibrium and short-term response between independent and dependent variables, as it is shown on the tables (2, 3).

In order to verify the null hypothesis (the lack of common integration between the studied variables), we have to move towards conducting a "border test". As in Table 2, the results of the bottom of the table denies the null hypothesis, which states that there is no common integration relationship between the variables studied, because the calculated value of the test (F) of (8.130258) is greater than the highest value 4.15, which means that there is common integration relationship between the variables studied. Consequently, we reject the null hypothesis and accept the alternative hypothesis (the existence of a long-term equilibrium relationship).

The long-term parameters according to the results of the top part of table 1 indicate a significant effect of the real effective exchange rate, economic growth, abundance of natural resources and government spending on the Algerian trade balance during the study period at a 1% probability level for the first three variables, but the natural resources abundance was at the level of 10%. However, the increase in the real effective exchange rate by one unit leads to a decline in the Algerian trade balance by more than 0.44% in the long term, which is consistent with the hypothesis of the study, although Algerian exports outside the hydrocarbons represent a very small percentage from the total exports, as well as the exports of the hydrocarbon sector are not related to the price competitiveness of the country's economy, but they are subject to the OPEC logic in terms of oil production quotas and long-term contracts for natural gas, and their price is determined in international markets. The increase in economic growth (per capita GDP) in

one unit leads to a decline in the trade balance by more than 0.10% and it is contrary to the study hypothesis and the previous studies, but compatible with the reality of the Algerian economy because the increase in per capita will lead to an increase in effective aggregate demand, and this in turn affects the increase in the import bill due to the inability of the Algerian economy to meet or cover this demand. The effect of the abundance of natural resources was negative, i.e., if the exports of hydrocarbons increased by one unit, the trade balance in the study period decreased by 9.13% and it is contrary to the study hypothesis, but it is compatible with the reality of the Algerian economy, so the increase in the volume of Algerian exports has increased, and these revenues have inflated the import bill at a rate that exceeds the increase in exports consequently the relationship was inverted.

The impact of government spending on the Algerian trade balance was also negative, so when the government spending increased by one unit, the trade balance decreased by 0,0847E-12%, and therefore the relationship contrary to the hypothesis presented but compatible with the Algerian economic reality, because the increase in government spending In recent decades, the consumer demand has been stimulated as a whole, encouraging imports to cover this demand. The relationship between them has been inverse, and the foreign direct investment has no significant effect on the trade balance, and it is economically accepted because it is less important into the Algerian economy.

Table 2. Cointegration Test according to ARDL method

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER	-0.004481	0.000455	-9.851105	0.0000
PER	-0.001011	0.000205	-4.926325	0.0008
HYD	-0.072970	0.038603	-1.890273	0.0913
G	-8.47E-12	2.61E-12	-3.238659	0.0102
FDI	6.46E-11	6.65E-11	0.972172	0.3564
C	14.28036	3.682761	3.877623	0.0037

EC = TB - (-0.0045*REER -0.0010*PER -0.0730*HYD -0.0000*G +
0.0000*FDI
+ 14.2804)

F-Bounds Test		NullHypothesis: No levelsrelationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	8.130258	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
		FiniteSample: n=35		
ActualSample Size	34			
		10%	2.331	3.417
		5%	2.804	4.013
		1%	3.9	5.419
		FiniteSample: n=30		
		10%	2.407	3.517
		5%	2.91	4.193
		1%	4.134	5.761

Source: outputs eviews10

The (ARDL) test indicates that there is a significant long term relationship. The expression of this relationship in addition to the short-term relationship is shown in table 3 "error correction model", as it is clear from the table that the error correction coefficient of negative and significant value of (-1.233422) and with significant level Much less than 1%, i.e. there is a co-integral relationship between the studied variables, that is, a long-term equilibrium relationship between the studied variables in the short term. As we can see through the results that the negative and significant value of the error correction coefficient finds out the speed of return of trade balance variable towards its long-term equilibrium value in each time period of the imbalance year of the period (t-1) estimated (-1.23), Which is a relatively high adjustment factor, with other words when the Algerian commercial

balance during the short term in the previous period deviates from its long-term equilibrium value, the equivalent of 123% of this imbalance in period (t) is corrected until it reaches To balance in the long term after less than one year.

The results of the short-term response that there is a short-term response that goes from independent (interpreted) variables to the dependent variable. This corresponds to reality, so many phenomena do not respond immediately to their determinants but they should be the result of historical accumulations, which made the coefficient of determination very sufficient to explain the model by more than 96%.

Table 3. ARDL error correction model

ARDL Error Correction Regression
Dependent Variable: D(TB)
Selected Model: ARDL(4, 4, 4, 1, 4, 2)
Case 2: Restricted Constant and No Trend
Date: 03/22/19   Time: 11:13
Sample: 1980 2017
Included observations: 34

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TB(-1))	0.173504	0.096759	1.793164	0.1065
D(TB(-2))	0.426059	0.112935	3.772619	0.0044
D(TB(-3))	0.915793	0.127106	7.204972	0.0001
D(REER)	-0.006054	0.000899	-6.734045	0.0001
D(REER(-1))	-0.001765	0.000997	-1.771656	0.1102
D(REER(-2))	-0.003820	0.001224	-3.120871	0.0123
D(REER(-3))	0.009731	0.001174	8.287482	0.0000
D(PER)	-0.001180	0.000274	-4.299748	0.0020
D(PER(-1))	6.46E-05	0.000349	0.184932	0.8574
D(PER(-2))	0.002564	0.000336	7.635338	0.0000
D(PER(-3))	0.001525	0.000357	4.269949	0.0021
D(HYD)	0.038565	0.016497	2.337755	0.0442

D(G)	-1.40E-11	4.09E-12	-3.417596	0.0077
D(G(-1))	-8.20E-13	5.60E-12	-0.146397	0.8868
D(G(-2))	2.56E-11	5.94E-12	4.315027	0.0019
D(G(-3))	1.62E-11	5.46E-12	2.975406	0.0156
D(FDI)	-1.28E-11	1.92E-11	-0.669569	0.5199
D(FDI(-1))	-1.17E-10	2.20E-11	-5.301438	0.0005
CointEq(-1)*	-1.233422	0.126644	-9.739251	0.0000

R-squared	0.968475	Meandependent var	-0.004607
Adjusted R-squared	0.930646	S.D. dependent var	0.242100
S.E. of regression	0.063758	Akaike info criterion	-2.368123
Sumsquaredresid	0.060975	Schwarz criterion	-1.515156
Log likelihood	59.25808	Hannan-Quinn criter.	-2.077237
Durbin-Watson stat	3.093650		

Source: outputs eviews10

4.2 Residual Diagnostics

4.2.1 Contrast variation: The problem of Contrast variation of errors affects the efficiency of the parameters, i.e., it has no less variance than all the estimated parameters available, which affects the testing of the hypotheses of this model, and the most important tests for detecting this problem are the ARCH test, shown in Table 3. The model is free of variance problem, which is confirmed by the probability values of Fisher test (0.3710) in Table 4, respectively, which exceeds the 5% level of significance which leads to the rejection of the null hypothesis, Thus, the estimated parameters are efficient which gives reliable results attached to the hypothesis test.

Table 4. Contrast variation test

Heteroskedasticity Test: ARCH

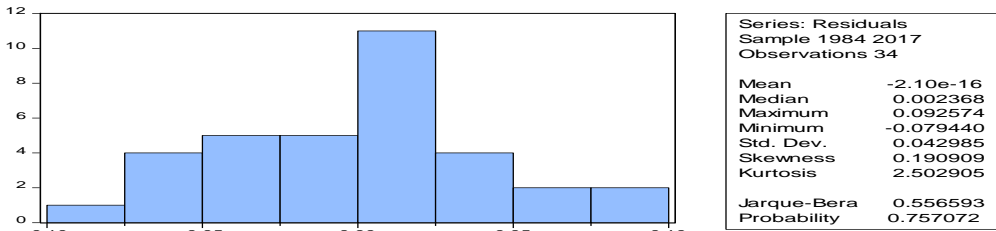|			
F-statistic	0.824228	Prob. F(1,31)	0.3710
Obs*R-squared	0.854680	Prob. Chi-Square(1)	0.3552

Source: outputs eviews10

4.2.2 Residual distribution test: Through Figure 4 and using the (Jarque-Bera) test, we make sure that the residue are distributed naturally, What

confirms this is the probability of (Jarque-Bera) Which is equal to 0.757072 which is greater than the 5% significant level.

Fig8. Residual distribution test

Series: Residuals	
Sample 1984 2017	
Observations 34	
Mean	-2.10e-16
Median	0.002368
Maximum	0.092574
Minimum	-0.079440
Std. Dev.	0.042985
Skewness	0.190909
Kurtosis	2.502905
Jarque-Bera	0.556593
Probability	0.757072

Source: outputs eviews10

4.2.3 Stability Test: In order to make sure that the data used in this study are free of any structural changes in it, one of the appropriate tests should be used for the most important: Cumulative sum of recursive residuals CUSUM, As well as the cumulative sum of squares of recursive residuals (CUSUM of Squares) .These tests are one of the most important tests to show the stability of the parameters in the short and long term, and if we use either of the two tests will give a graph showing the aggregation of errors, in Figures (9 and 10); Note that the aggregate values or the CUSUM is a median line (within confidence limits) in the sense that the estimators are constant over time (i.e., they do not differ) at a 5% level of significance. i.e. we do not have more than one equation which confirms that (variables are stable over the time period under study), as well as the CUSUM of Squares, it is also an intermediate line located within the boundaries of the critical zone (confidence boundary) , but the two lines are parallel (i.e., not far apart) as in the first test. Finally, we can be deduced from these tests that there is stability and harmony in the model between the results of the long and short term.

Fig 9. Cusum stability test of the model
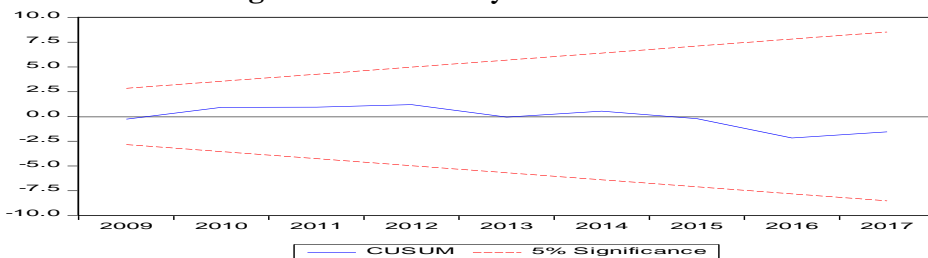
Source: outputs eviews10

Fig 10. Cusum of squares stability test of the model
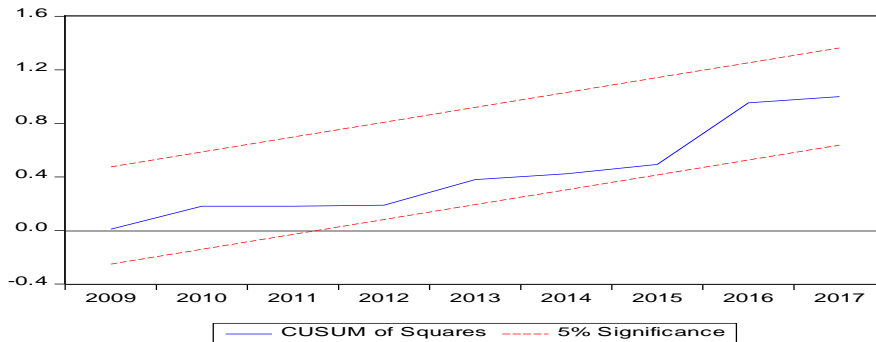
Source: outputs eviews10

5.CONCLUSION

In this study, we explained by using a standard model the determinants of the trade balance of Algeria in the period 1980-2017, and it was found that there was an effect for all study variables except foreign direct investment, by using the ARDL method The results are consistent with the reality of the Algerian economy.

From the above statistically and economically estimated model, it can be concluded that:

- There is a statistically significant effect of the real effective exchange rate, economic growth, abundance of natural resources, and government expenditure on the balance of trade balance of Algeria in the period 1980-2017, i.e., it is its determinants in Algeria, noting the non significance of the impact of foreign direct investment; a long-term equilibrium relationship was confirmed by having a common integration between the study variables;

- It was also found that the influential study variables have a statistical significance in their past and present times;

- It was also clear from the stability test of the model, that there is stability in the long and short term, and this shows that independent variables in the model explain the evolution of the balance in the long and short term.

- From the coefficient of determination, it was found that the independent variables account for more than 96% of the changes in the trade balance;

- The main determinant of the trade balance in Algeria during the study period is the abundance of natural resources, which corresponds to the

reality as The Algerian economy is rentier;

- Finally, it can be said (compared to previous studies) that the determinants of the Algerian trade balance differ from many developing and developed countries because of the different nature of their economy, and that the impact of these determinants on the trade balance was also different.

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