Modeling the relationship between an agricultural production and GDP in Algeria

تقدير العلاقة بين الانتاج الزراعي والناتج الداخلي الخام في الجزائر

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Abstract:)

This study aims to diagnose the situation of the agricultural sector in Algeria by studying its importance in the national economy and its place in the development plans. We also tried to assess the performance of the agricultural sector in Algeria through the problematic issue, "How the impact of agricultural production on the economic growth in Algeria 1985-2015" In order to answer our questions, we used a set of economic measurement tools and statistics in line with available World Bank data. In the applied part, we focused on the statistical analysis of the variables related to the study, and follow the behavior of the variables of agricultural output and economic growth.
The results of the analysis showed that the agricultural sector contributed during the study period (1985-2017) in the development of the national economy along with the rest of the other sector

***Keys words*: Algerian economy; agricultural sector ; ECM models**

***JEL classification codes*:**C22; H89; Q11 ; O21

ملخص:

تهدف هذه الدراسة إلى تشخيص وضع القطاع الزراعي في الجزائر من خلال دراسة أهميته في الاقتصاد الوطني ومكانته في خطط التنمية .حاولنا أيضًا تقييم أداء القطاع الزراعي في الجزائر من خلال مشكلة إشكالية ، "كيف تأثير الإنتاج الزراعي على النمو الاقتصادي في الجزائر 1985-2015" من أجل الإجابة على أسئلتنا ، استخدمنا مجموعة من أدوات القياس الاقتصادي والإحصاءات بما يتماشى مع بيانات البنك الدولي المتاحة .في الجزء التطبيقي ، ركزنا على التحليل الإحصائي للمتغيرات ذات الصلة بالدراسة ، واتباع سلوك متغيرات الإنتاج الزراعي والنمو الاقتصادي.
أظهرت نتائج التحليل أن القطاع الزراعي ساهم خلال فترة الدراسة (1985-2017) في تنمية الاقتصاد الوطني إلى جانب بقية القطاعات الأخرى.

الكلمات المفتاحية: الاقتصاد الجزائري ; القطاع الزراعي ; نماذج تصحيح الخطأ

تصنيف JEL: C22; H89; Q11 ; O21

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1-Introduction

The agricultural sector is receiving attention from most countries in the world, both developed and developing. The agriculture sector is a major pillar of the national economy and is one of the most important sources of national income. This is because of the important and vital role it plays in achieving economic development. In the gross domestic product at the time of increasing the per capita share, as well as the provision of employment positions for various social groups, especially rural areas, also provides food needs of the population and achieve food security and reduce the volume of imports.

The agricultural sector in Algeria is a sensitive sector in economic development due to the role it plays in the economic and social development and development of rural areas. Thus, the National Bureau of Statistics (ONS) ranks it in the first rank out of 19 sectors and is considered one of the main alternatives in economic development.

In order to enable the agricultural sector in Algeria to achieve the important role, it has adopted many economic, political and commercial reforms in recent years, adopting market economy and trade identification, reforming the monetary system and exchange rate policy, and adopting many policies of agricultural support and encouragement of the agricultural sector On the training of workers in the management of the agricultural sector

Problematic search:

In this context, the present study, entitled "Agricultural production and its effect on economic growth in Algeria 1985-2015", is used to diagnose the nutritional problem because it is urgent to call for research and investigation. , And therefore ask the following sub-questions:

What is agricultural production?

-What are the most important economic and development policies that drive the agricultural sector in Algeria?

-What is the contribution of the agricultural sector in different sectors?

-Is there a common long-term integration relationship between study variables?

research assumes:

To answer the questions, we can base our research on the following hypotheses:

 What is meant by agricultural production is all that is produced by both plant and animal.

Algeria applied a number of development plans to promote the agriculture sector within the framework of the development plans 2000 and the 2008 plan.

 The agricultural sector contributes to growth through job creation and contributes to food needs.

 We expect a long-term correlation between the study variables (agricultural production and economic growth).

research goals:

Through this study, we aim to achieve the following objectives:

-Highlight the role played by the Algerian agricultural economy in economic development.

-Demonstrate the most important natural and human potential available to Algeria to make a quantum leap in the development of the agricultural sector.

-Trying to provide a modern study on the agriculture sector in Algeria because of its importance.

-Address the forms of support provided by agricultural policy after 1990**.**

research importance.

The importance of the study lies in the diagnosis and analysis of the prospects of the agricultural sector and its importance in achieving economic development through the increase in the role of investing in the private sector by providing suitable conditions for the exploitation of the potential of the sector in Algeria.

To keep abreast of developments in the policy of support applied by both developed and developing countries, especially Algeria, while highlighting its importance in the development of the agricultural sector in the light of international economic developments.

The importance of the agricultural sector in the Algerian economy:

The importance of the agricultural sector in Algeria can be represented by the contribution of agricultural activity to GDP, its contribution to the employment of new opportunities and the achievement of food security and thus the achievement of a portion of the resources derived through foreign trade.

The first requirement: the contribution of agriculture to the gross national product.

The contribution of the agricultural sector in GDP is one of the most important economic indicators that measure the success of any national strategy to develop this sector in achieving the established goals. This contribution affects the growth and increase of the total income, which affects the increase in the share of individuals from this income. The most important indicators showing the economic growth of any country. The agricultural output in Algeria between 2010 and 2015 has been affected by the impact on the gross domestic product (PIB) in the same period as shown in table 1

Tab 1Development of the contribution of agricultural output to the GDP in Algeria (2010-2014).

2014	2013	2012	2011	2010	years
17205.00	17771.00	15843.00	14519.80	11991.60	GDP
1771.50	1654.00	1421.70	1183.20	1015.30	AG
10.30	09.30	09.00	08.10	08.50	AG percapita

Statistical analysis of the study variables

In this section, we will attempt to analyze the economic relationship between the agricultural output index and the economic growth index during the study period, using graphs and time series. This is to determine the type of changes that occur in the values of the two phenomena in time periods in order to extract the expected values. These series extend from 1985 to 2015 with the help of some statistical indicators represented in the parameters of central tendency and dispersion received, which enable us to draw some results to know the nature of the variables of study

1-2 Descriptive Study of Raw String Data Gross Domestic Product (GDP):

The series represents the annual indicator of the gross domestic product in Algeria, which is set at 31 observations from 1985 to 2015, the highest value of 5.78E + 12 years 2015 due to high levels of inflation and following the petroleum shock and its consequences and lowest The value of 2.66E + 12 registered in 1960 due to the sudden rise in prices of petroleum products, the values of the series within the range of 3.12E + 12, which is relatively large, indicating the spacing of the two values, and this series average arithmetic of 3.73E + 12 with median 3.36E + 12 Ie, the curve of the chain is swerved to the right, the standard deviation of 1.03E + 12L One difference is the average coefficient of 27.61%, which indicates the fluctuation of the values of the violent, GDP series and makes sure that the value of intermediate variation coefficient of 30.65%, the cause of heterogeneity in the values due to inflation over the years of schooling.

To reduce the inflation of values we use one of the mathematical methods, including: the logarithm Nbiri, square root, growth rate, percentage of total, ..., we will use the logarithm method because it is more used and because the raw values of the variable study is positive and the series. Become ^{LG_t} .LGDP

1-3 The descriptive study of the logarithm data:

the highest value of 27.56 and the lowest value of 26.04, the values of the series within the range of 01.52, which we consider appropriate for the values. This

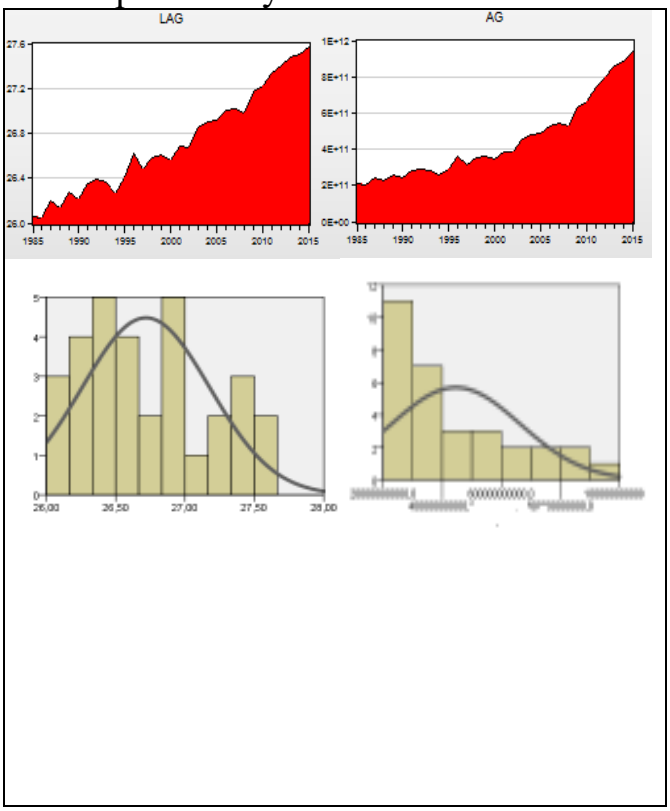
series has an average mean of 26.71 with a median of 26.61, ie, the chain curve tends to be symmetrical, $(\overline{X} \approx Me)$ with a standard deviation of 0.46 to be the average difference coefficient of 01.72% which indicates a low volatility in the string values.

1-4 The descriptive study of the logarithm data:

the highest value of 29.38 and the lowest value of 28.60, the values of the series within the range of 0.78 which we consider appropriate for the values. This series has an arithmetic mean of 28.91 with a mean of 28.84 ie that the chain curve tends to be symmetric, $(\overline{X} \approx Me)$ with a standard deviation of 0.26 The average difference is 0.89%, which indicates a low volatility in the string values. This is confirmed by the value of the difference coefficient of 0.90%

RESULTS And/ Or Conclusion :

Descriptive study of AG_t LAG_t



LAG_t	AG_t		
31	31	Valid	N
0	0	missing	
26,71	4.46E+11	mean	
26,61	3.63E+11	Median	
0,46	2.17E+11	Standard eviation	
1,52	7.36E+11	Interval	
27,56	9.40E+11	Maximum	
26,04	2.04E+11	Minimum	
1.72%	48.65%	Mean	CV
1.72%	59.77%	Median	

As a result, we found that the variables were characterized by a kind of homogeneity after the use of the Nepherian logarithm method (the value of the difference coefficient for all variables decreased significantly). $CV = 1.72\%,\ 0.89\%\ \pi\pi\ 15\%$

- With this result we can study the stability of these series of variables.

II -stability study:

The two time series stabilize: If their values oscillate around a constont mean $E(Y_t) = \mu$, random variables are not included in the interpretation of time series changes, and the variation is independent of time $Var(Y_t) = \sigma^2$ all time series observations have the same weight in the analysis.

To test the stability of the time series, we follow the qualitative and quantitative tests described in the following steps:

2- 1 The qualitative tests:

These tests are on the graphs of the series and the curve of the function of self-correlation

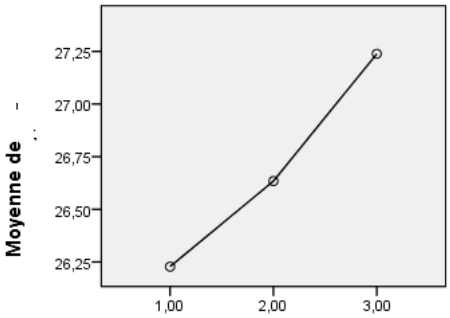
A- equality of the average and homogeneity of variance tests :

In this case, the series is divided into three consecutive periods (1 period = 10 years) and we compare the mean of each period.

The results were rejecting the zero hypothesis $(H_0 : \bar{Y}_1 = \bar{Y}_2 = \bar{Y}_3)$ and accepting the alternative hypothesis $(H_1 : \bar{Y}_1 \neq \bar{Y}_2 \neq \bar{Y}_3)$ because: $(Sig = 0.000\ \pi\ 0.05)$ the heterogeneity of the arithmetic average during the study period.

In the previous steps, the null hypothesis was rejected $(H_0 : \sigma_1^2 = \sigma_2^2 = \sigma_3^2)$ and the alternative hypothesis $(H_1 : \sigma_1^2 \neq \sigma_2^2 \neq \sigma_3^2)$ was accepted because: $(Sig = 0.031 \pi\ 0.05)$ the heterogeneity of variation during the study period.

Homogeneity of mean and variance



	Statistique[a]	ddl1	ddl2	Sig.
Welch	79,196	2	18,142	,000

a. Distribution F asymptotique.

Test d'homogénéité des variances

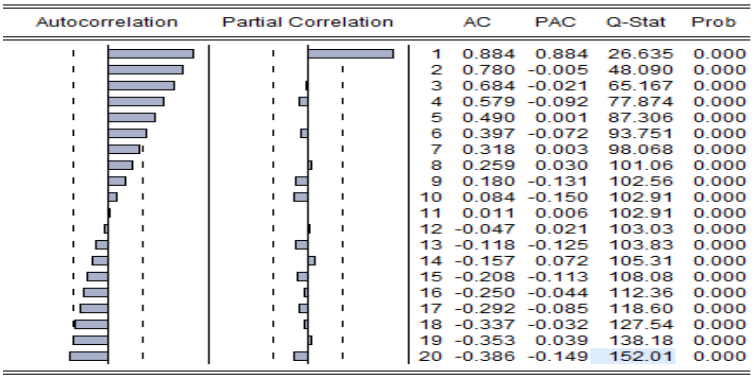
Statistique de Levene	ddl1	ddl2	Signification
3,934	2	28	,031

Outputs of SPSS

B- Study of the auto -correlation function of series:

- The ACF curve of LAGt :

, When analyzing the self-correlation function of the condom, we observed values outside the estimated confidence range $\pm 1.96\sqrt{1/31} = \pm 0.352$, and the Ljung-Box test shows the significant significance of the Pk coefficients, $Q_c = 152.01\ \phi\ Q_t = 31.41$ rejecting the zero hypothesis $(H_0 : P_k = 0)$ and accepting the alternative hypothesis that the self-correlation coefficients are significantly different from zero $(H_1 : \exists \rho_k \neq 0)$ due to a problem Auto-correlation of errors, which leads to instability of the time series.

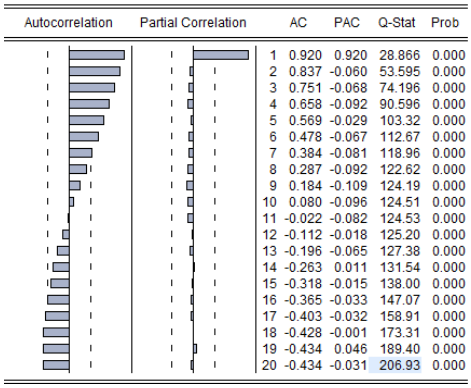


Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.884	0.884	26.635	0.000
		2	0.780	-0.005	48.090	0.000
		3	0.684	-0.021	65.167	0.000
		4	0.579	-0.092	77.874	0.000
		5	0.490	0.001	87.306	0.000
		6	0.397	-0.072	93.751	0.000
		7	0.318	0.003	98.068	0.000
		8	0.259	0.030	101.06	0.000
		9	0.180	-0.131	102.56	0.000
		10	0.084	-0.150	102.91	0.000
		11	0.011	0.006	102.91	0.000
		12	-0.047	0.021	103.03	0.000
		13	-0.118	-0.125	103.83	0.000
		14	-0.157	0.072	105.31	0.000
		15	-0.208	-0.113	108.08	0.000
		16	-0.250	-0.044	112.36	0.000
		17	-0.292	-0.085	118.60	0.000
		18	-0.337	-0.032	127.54	0.000
		19	-0.353	0.039	138.18	0.000
		20	-0.386	-0.149	152.01	0.000

Outputs of eviews

- The ACF of curve LGDP:

When analyzing the self-correlation function of the condom, we observed values outside the estimated confidence range $\pm 1.96\sqrt{1/31} = \pm 0.352$, and the Ljung-Box test shows the significant significance of the Pk coefficients, $Q_c = 206.93$ ϕ $Q_t = 31.41$ rejecting the zero hypothesis $(H_0 : P_k = 0)$ and accepting the alternative hypothesis that the self-correlation coefficients are significantly different from zero $(H_1 : \exists \rho_k \neq 0)$ due to a problem Auto-correlation of errors, which leads to instability of the time series.



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.920	0.920	28.866	0.000
		2	0.837	-0.060	53.595	0.000
		3	0.751	-0.068	74.196	0.000
		4	0.658	-0.092	90.596	0.000
		5	0.569	-0.029	103.32	0.000
		6	0.478	-0.067	112.67	0.000
		7	0.384	-0.081	118.96	0.000
		8	0.287	-0.092	122.62	0.000
		9	0.184	-0.109	124.19	0.000
		10	0.080	-0.096	124.51	0.000
		11	-0.022	-0.082	124.53	0.000
		12	-0.112	-0.018	125.20	0.000
		13	-0.196	-0.065	127.38	0.000
		14	-0.263	0.011	131.54	0.000
		15	-0.318	-0.015	138.00	0.000
		16	-0.365	-0.033	147.07	0.000
		17	-0.403	-0.032	158.91	0.000
		18	-0.428	-0.001	173.31	0.000
		19	-0.434	0.046	189.40	0.000
		20	-0.434	-0.031	206.93	0.000

2-2 . Quantitative tests:

The unit root tests are represented in:

- Dickey-Fuller (DF) (1979)؛
- (ADF) Augmented Dickey-Fuller؛ (1981)
- (P-P) Phillips-Perron (1988)

Kwiatkowski-Phillips-Schmidt-Shin KPSS (1992)

Unit root tests are designed to examine the properties of the time series under study, to ascertain the extent of their dormancy, and then to determine the degree of integration of each variable separately. It not only permits the detection of an instability, but also determines the type of non-stability, and thus determines the best way to return the chain stable.

- We will summarize the Extended Dicky-Fuller test (ADF-1981) because it is recommended to use it in time variance differences models to eliminate the problem of self-correlation of errors, and its model: p is the delay period and is set to the lowest standards: Akaike (AIC), Hannan-Quinn (H-Q), Schwarz (SC)

LAGt serie :

p	AIC	SC	HQ
0	-2.132946	-1.992826	-2.088120
1	-2.112749	-1.924156	-2.053684

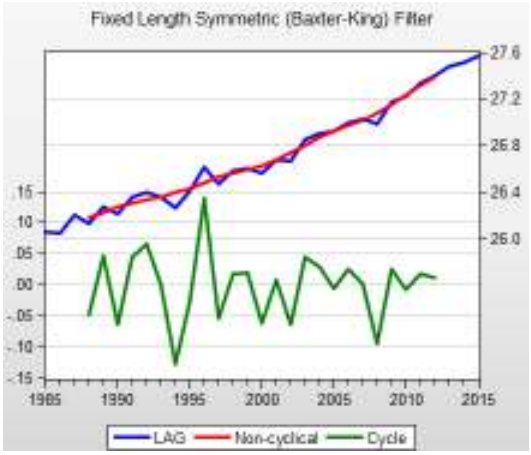
and lag length is $\rho=0$: ، The model of testing will be

$$\Delta Y_t = \lambda Y_{t-1} - \sum_{j=1}^{2} \phi_{j+1} \Delta Y_{t-j} + bt + c + \varepsilon_t$$

Null Hypothesis: LAG has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.126422	0.1186
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.



.The root of the unit in the string is at 5%. It is a DS model : $b \neq 0$, $c \neq 0$, $\phi=1$ and the statement shows the existence of the general direction vehicle (time, it is unstable red line)

LGDPserie :

and lag length is $\rho=0$: ، The model of testing will be

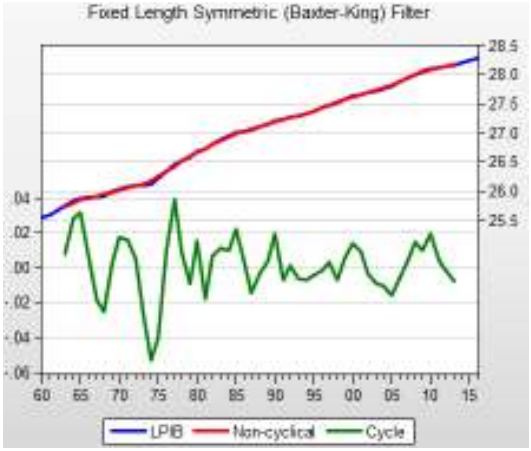
$$\Delta Y_t = \lambda Y_{t-1} - \sum_{j=1}^{2} \phi_{j+1} \Delta Y_{t-j} + bt + c + \varepsilon_t$$

p	AIC	SC	HQ
0	-5.090716	-4.950596	-5.045890
1	-5050533	-4.861940	-4.991468

Null Hypothesis: LPIB has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.404217	0.3701
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.



The root of the unit in the string is at 5%. It is a DS model : $b \neq 0$, $c \neq 0$, $\phi = 1$ and the statement shows the existence of the general direction vehicle (time, it is unstable red line)

Result: Through qualitative and quantitative statistical tests: Pk correlation coefficients, Ljung-Box test, ADF test, the time series stability hypothesis was rejected. The series LGDP LAG have a unit root at their original level. $I(0)$

III –convert the no stationary of the two series :

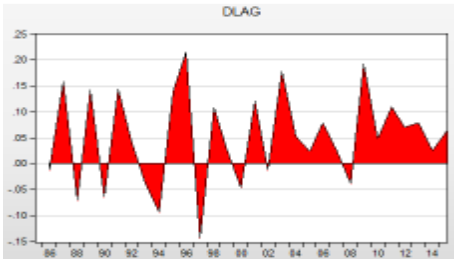
The results of the previous tests resulted in the instability of the two series of time, and the best practical way to remove the instability is to conduct the first or second class differences according to the results of statistical tests and become the general form of the new time series became $D^{\rho}(\text{LGDP}_t) = \text{LGDP}_t - \text{LGDP}_{t-\rho}$ and $D^{\rho}(\text{LAG}_t) = \text{LAG}_t - \text{LAG}_{t-\rho}$ / Where: We re-conduct the previous statistical tests:

3-1 Descriptive study of the two series:

The new time series lost one obs after applying the first order difference to 30 observations

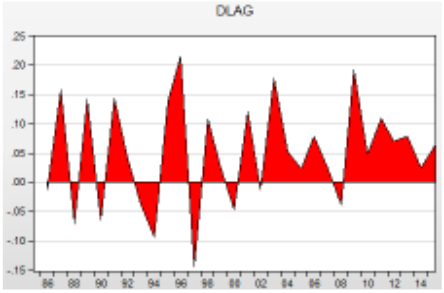
DLAG serie :

- We note from the time series statement we find that it took a form different from the original form, where the curve is approaching the parallel axis of the joints, which indicates the lack of effectiveness of the trend. We conclude in principle that the serie has gradually stabilized over time.



DLGDP series :

- We note from the time series statement we find that it took a form different from the original form, where the curve is approaching the parallel axis of the joints, which indicates the lack of effectiveness of the trend. We conclude in principle that the serie has



gradually stabilized over time.

3-2 unit root test for series:

DLAG :

- The results of the unit root tests (ADF) applied to the first-order differentials of the time series under study, the rejection of the null hypothesis $H_0 : \phi = 1$, and the acceptance of the alternative hypothesis $H_1 : \phi \neq 1$ that stability of DLAG at 1st dif the change in the level was expressed at a significant %5 level.

Null Hypothesis: DLAG has a unit root
Exogenous: Constant
Lag Length: 1 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.472510	0.0001
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

DLGDP :

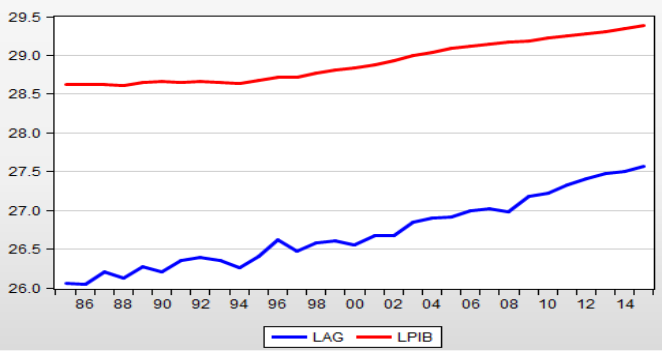
The results of the unit root tests (ADF) applied to the first-order differentials of the time series under study, the rejection of the null hypothesis $H_0 : \phi = 1$, and the acceptance of the alternative hypothesis $H_1 : \phi \neq 1$ that stability of DLGDP at 1st dif the change in the level was expressed at a significant %5 level

Null Hypothesis: DLPIB has a unit root
Exogenous: Constant
Lag Length: 0 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.427962	0.0181
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Result: Since the variables under study are stationary at the same level I(1) , they mean that they can converge in the long term. To ensure this, we conduct co-integration tests



3-3 co-integration test(Engle-Granger) 1987:

This test requires that the time series have the same degree of complementarily, but if the opposite is true, they do not have a common integration.
The E-G method is called two-step because it is done in two phases:

-In the first step, the test begins by estimating the regression of the long-term relationship between the variables studied according to the economic theory: In the method of the least squares OLS, $Y_t = \alpha_0 + \alpha_1 X_t + \varepsilon_t$ called the regression equation of co-integration :

Dependent Variable:
Method: Least Squares
Date: 04/27/18 Time: 12:49
Sample: 1985 2015
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.75821	0.591493	23.26012	0.0000
LAG	0.567188	0.022135	25.62353	0.0000

R-squared	0.957699	Mean dependent var	28.91218
Adjusted R-squared	0.956240	S.D. dependent var	0.266618
S.E. of regression	0.055773	Akaike info criterion	-2.872708
Sum squared resid	0.090209	Schwarz criterion	-2.780193
Log likelihood	46.52698	Hannan-Quinn criter.	-2.842551
F-statistic	656.5654	Durbin-Watson stat	0.756500
Prob(F-statistic)	0.000000		

Dependent Variable: LAG
Method: Least Squares
Date: 04/27/18 Time: 12:47
Sample: 1985 2015
Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-22.10062	1.905294	-11.59958	0.0000
LPIB	1.688505	0.065897	25.62353	0.0000

R-squared	0.957699	Mean dependent var	26.71775
Adjusted R-squared	0.956240	S.D. dependent var	0.460020
S.E. of regression	0.096231	Akaike info criterion	-1.781800
Sum squared resid	0.268549	Schwarz criterion	-1.689284
Log likelihood	29.61790	Hannan-Quinn criter.	-1.751642
F-statistic	656.5654	Durbin-Watson stat	0.789883
Prob(F-statistic)	0.000000		

$$\begin{cases} LAG_t = -22.10 + 1.68 \times LGDP_t + \varepsilon_{1t} \\ LGDP_t = 13.75 + 0.56 \times LG_t + \varepsilon_{2t} \end{cases}$$

In the second step, the residuals expressing a linear mix generated by the regression of the long-term equilibrium relationship are estimated. The residual survival ε_t is tested to verify that the linear mix is at its first level or co integrated at I (0)

According to test E-G rejection Hypothesis (H0) and acceptance of alternative hypothesis (H1). ε_{1t} is stationary so variable LAG has a long run relationship with LGDP	Null Hypothesis: RESID01 has a unit root Exogenous: None Lag Length: 0 (Fixed) t-Statistic Prob.* Augmented Dickey-Fuller test statistic -3.145103 0.0027 Test critical values: 1% level -2.644302 5% level -1.952473 10% level -1.610211 *MacKinnon (1996) one-sided p-values.
According to test E-G rejection Hypothesis (H0) and acceptance of alternative hypothesis (H1). ε_{2t} is stationary so variable LGDP has a long run relationship with LAG	Null Hypothesis: RESID02 has a unit root Exogenous: None Lag Length: 0 (Fixed) t-Statistic Prob.* Augmented Dickey-Fuller test statistic -2.962006 0.0044 Test critical values: 1% level -2.644302 5% level -1.952473 10% level -1.610211 *MacKinnon (1996) one-sided p-values.

3-4 Vector Error Correction Model (VECM):

Economic variables characterized by long-term co-integration tend towards stability or so-called equilibrium. Because of some changes, the status of the variables temporarily shifts from its course. Therefore, the error correction model is used to reconcile the long and short term behavior of economic

relations. The error correction model expresses an adjustment path that allows for short term changes to be introduced in the long term relationship.
If we have two variables for the study called the ECM error correction model, it is estimated in two stages :
In the first stage, the long-term model is estimated in the ordinary least squares method

$$Y_t = \hat{\alpha}_0 + \hat{\alpha}_1 X_t + e_t$$

In the second phase we estimate the relationship of the dynamic model (short run) in the OLS method with : $e_{t-1} = Y_{t-1} - \hat{\alpha}_0 - \hat{\alpha}_1 \times X_{t-1}$
The final formula of ECM becomes:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_{1,i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{2,i} \Delta X_{t-i} + \lambda \times \left(Y_{t-1} - \alpha_0 - \alpha_1 \times X_{t-1}\right) + U_t$$

We call λ The coefficient of the adjustment between the short and long term, where this variable is stationary if the absolute value is less than one and its reference is negative because it reflects the correction of the model in a previous period. error «correction term (ECT) and we call it also The coefficient of the speed adjustment between the short and long term, where this variable is stationary if the absolute value is less than one and its signal is negative and significante because it reflects the correction of the model in a previous period.

IV –Causality :

The causal method is a pilot approach that helps to test the economic relationship between the variables and then determine the direction of the causal relationship between them ie knowledge of the dependent variable and independent variable according to the following equations:

$$LAG_t = \alpha_1 + \sum_{i=1}^{p} \beta_{1,i} LAG_{t-i} + \sum_{i=1}^{p} \beta_{2i} LGDP_{t-i} + \varepsilon_{1,t}$$

$$LGDP_t = \alpha_2 + \sum_{i=1}^{p} \beta_{3,i} LAG_{t-i} + \sum_{i=1}^{p} \beta_{4,i} LGDP_{t-i} + \varepsilon_{2,t}$$

Pairwise Granger Causality Tests
Date: 04/27/18 Time: 13:09
Sample: 1985 2015
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LPIB does not Granger Cause LAG	30	6.73676	0.0151
LAG does not Granger Cause LPIB		0.43578	0.5148

In the first line we reject the null hypothesis H0 and accept the alternativeH1 assumption that causality exists from LGDP to LAG $prob = 0.01\, \pi\, 0.05$ or $F_c = 6.73\, \phi\, F_t = 2.04$

In the second line we accept the null hypothesis and reject the alternative assumption that there is no causality of LAG towards LGDP. : $prob = 0.51\, \phi\, 0.05$ or $F_c = 0.43\, \pi\, F_t = 2.04$

Note: Based on the above, we found causality in a single direction

Agricultural production model(LAG):

$$\Delta LAG_t = \beta_0 + \sum_{i=1}^{\rho}(\beta_{1,i} \times \Delta LAG_{t-i}) + \sum_{i=1}^{\rho}(\beta_{2,i} \times \Delta LGDP_{t-i}) + \lambda \times (LAG_{t-1} - \alpha_0 - \alpha_1 \times LGDP_{t-1}) + U_t$$

Dependent Variable: DLAG
Method: Least Squares
Date: 04/27/18 Time: 13:19
Sample (adjusted): 1987 2015
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLAG(-1)	-0.378110	0.183320	-2.062572	0.0497
DLPIB(-1)	0.646035	0.685634	0.942245	0.3551
ECM(-1)	-0.363700	0.172866	-2.103946	0.0456
C	0.056926	0.021541	2.642732	0.0140

R-squared	0.372578	Mean dependent var	0.052642
Adjusted R-squared	0.297287	S.D. dependent var	0.090975
S.E. of regression	0.076263	Akaike info criterion	-2.181826
Sum squared resid	0.145400	Schwarz criterion	-1.993233
Log likelihood	35.63648	Hannan-Quinn criter.	-2.122761
F-statistic	4.948525	Durbin-Watson stat	2.070378
Prob(F-statistic)	0.007829		

A-Statistical analysis

All long term estimators are significant statistical while short-term estimators $\Delta LGDP_{t-1}; \Delta LAG_{t-1}$ have no statistical significance

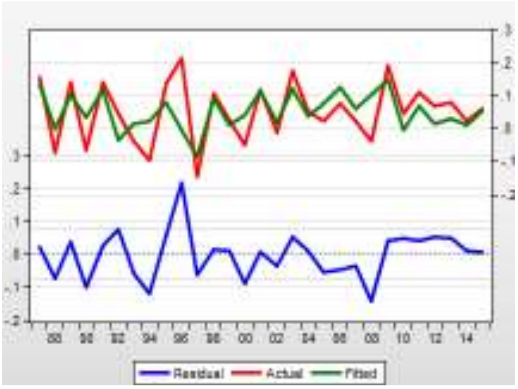
the error Correction term has a statistical significance λ=-36 which means the existence of causality from LGDPt-1 to LAGt-1 of some in the long term and its negative sign and this corresponds to economic theory

the long run relationship will be corrected almost every two years and nine months as follows : $2.77 = \frac{100}{36}$

the critical value of Fisher is $F_t = F_{3;51}^{0.05} = 2.99\,\pi\, F_c = 4.94$ indicating that the model has a statistical significance which means causal presence from Δ LGDPt-1 to ΔLAGt-1 in the short term

The determination of the model has reached a level, $R^2 = 37.25\%$، which we consider to be low This is due to the weak contribution of agricultural production to economic growth in Algeria

B-residual diagnostics:



From the comparison of the original and estimated series, we can observe the almost perfect congruence between the actual and the fitted. This result gives us an idea of the accuracy of the estimated model; the Residual Curve randomizes on this comma axis To give us an idea of the lack of auto-correlation

Date: 04/27/18 Time: 15:24
Sample: 1985 2015
Included observations: 29
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.037	-0.037	0.0448	0.832
		2	-0.234	-0.235	1.8638	0.394
		3	0.051	0.034	1.9555	0.582
		4	-0.056	-0.114	2.0677	0.723
		5	-0.138	-0.134	2.7844	0.733
		6	-0.064	-0.129	2.9449	0.816
		7	0.121	0.055	3.5453	0.830
		8	-0.021	-0.067	3.5646	0.894
		9	-0.077	-0.065	3.8317	0.922
		10	-0.115	-0.205	4.4604	0.924

*Probabilities may not be valid for this equation specification.

Analysis of the AC function of residul , all values fall within the estimated confidence range. $\pm 1.96\sqrt{1/29} = \pm 0.363$ ، The Ljung-Box test shows the significance of auto-correlation $Q_c = 4.4604 \pi Q_t = 1830$. We accept the null hypothesis $(H_0 : P_k = 0)$ that the coefficients of the AC function are not significantly different from zero ,so the model has not auto-correlation

In this research we followed the performance of the Algerian agricultural sector and its impact on economic growth. We used the World Bank data from 1985-2015. We also relied on some statistical and standard tools. The study was divided into two theoretical and applied chapters.

The results of the study reached the following elements:

.1Algeria was interested in the development of the agricultural sector immediately after independence through several development programs adopted by the government to establish a national economy far away from vital sectors such as agriculture. As a result of the inconsistency between the objectives of the agricultural development plans and the means allocated to them on the one hand and the policy of public agriculture on the other, In the implementation of the national plan for agricultural development in the year 2000, where we consider this stage recovery stage increased the price of fuel increased the gross domestic product, and decreased debt and improved security situation, characterized by the period large amounts programmed as a financial envelope of the development programs applied.

.2For the applied side, and for modeling the statistical relation of the variables of the study of the Algerian agricultural sector, it is shown that:

•Through qualitative and quantitative statistical tests: Pk correlation coefficients, Ljung-Box test, ADF test, the time series stability hypothesis was rejected. The chains are thus unstable at their original level.

•Through Angel Granger's joint integration test, we found a common correlation between study variables

8. RESULTS And/ Or Conclusion

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