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UNIVERSITY OF GAZIANTEP

GRADUATE SCHOOL OF SOCIAL SCIENCE

DEPARTMENT OF ECONOMICS

# THE EFFECT OF EXCHANGE RATES ON ECONOMIC GROWTH

# (A CASE STUDY OF ALGERIA) FROM (1996 - 2014)

# TIME SERIES MODEL

MASTER'S THESIS

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MAY, 2017

# DEDICATION

This Research Thesis is dedicated to Almighty Allah who granted me the physical and psychological health to successfully complete this program, and also to my lovely mum and my Late Dad (May his gentle soul rest in perfect peace) for their contribution of the best legacy I must acquire in order to succeed in life. And also I would like to thank my brother, my sister.

## APPROVAL PAGE

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***The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.***

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## *Abstract*

This study evaluates the effect of Exchange Rates on Economic Growth (A Case Study of Algeria). The time series data were used during the period 1996 to 2014. I take the augmented dickey fuller test (ADF), philipps-perron test (PP), Johansen Test for Cointegration, and Vector Error Correction Model (VECM), with the support of other estimation techniques test of (Jarque – Bera) to test the normal distribution model, and the test of goodness of the model with auto correlation between second degree error (LM) and test of self-regression condition with (ARCH) error .was employed to show the effect of exchange rate on economic growth in Algeria. The explanatory or independent variables in this study are Real Exchange Rate (REXR), Broad money (BM), and Exports (EXP), while the Gross Domestic Product (GDP) was used as dependent variable. The results shows that there is a positive relationship between real exchange rate and economic growth at both the short-run and long-run. The results reveals that appreciation in the value of Algerian Dinar promotes economic growth at both the short-run and long-run. It also reveals that (BM) have negative relationship with (GDP) at both the short-run and long-run .and Export happens to be positively related to (GDP) at both the short-run and long-run .to reach the goal of the study which is to find out the relationship between the change in the exchange rate and economic growth in theory and practice . we came to several conclusions that the dinar exchange rate affects also it is influenced by both economic growth, broad money, the export across multiple channels such as interest rate, monetary policy.

Based on the findings of this study, the researcher recommended that, since dinar appreciation increases economic growth at both the short-run and long-run, then the policy of dinar depreciation in order to increase exports and employment in the economy might not be the suitable policy for Algeria .the best idea is to allow the exchange rates to be determined by the forces of demand and supply. Algeria should also establish a very strict measures on import in order to protect and expand our local industries. This can be easily done by providing an export subside and also imposes the importing tariffs. This will increases patronization of products made in Algeria and also make Algerian dinar stronger, thus boosting a nation's economy. And finally the researcher recommended that the Central Bank of Algeria should guide the exchange rate in the economy considering its shock effect in all time.

Key words: exchange rates, economic growth, financial policy.

## *KISA ÖZET*

Bu çalışma döviz kurlarının ekonomik gelişme üzerindeki etkisini (Cezayir Örneği) değerlendirmektedir .Zaman serisi verileri "1996 dan 2014"e kadar olan zaman periyodları esnasında kullanıldı. (Jarque - Bera) 'nın diğer tahmin teknikleri testinin desteğiyle, artmış dickey fuller testi (ADF), philipps-perron testi (PP), Eşbütünleşme için Johansen Testi ve Vector Error Correction Model (VECM) Normal dağılım modeli ve Cezayir'de döviz kurunun ekonomik büyüme üzerindeki etkisini göstermek için, ikinci derece hata (LM) ile öz-regresyon koşulu (ARCH) hatası arasındaki test arasında otomatik korelasyonlu modelin iyilik testi kullanıldı.Cezayirdeki döviz kurunun ekonomik gelişme üzerindeki etkisini göstermek için bu kullanılmıştırBu çalışmadaki açıklayıcı veya bağımsız değişkenler, Reel Kur (REXR), Geniş Para (BM) ve İhracat (EXP), Gayri Safi Yurtiçi Hasıla (GSYİH) bağımlı değişken olarak kullanılmıştır. Sonuçlar, hem reel döviz kuru hem de kısa vadede ve uzun vadede ekonomik büyüme arasında pozitif bir ilişki olduğunu göstermektedir. Sonuçlar, Cezayir Dinarı'nın değerindeki değerlenmenin hem kısa hem de uzun vadede ekonomik büyümeyi teşvik ettiğini ortaya koyuyor. Aynı zamanda, (BM) hem kısa hem de uzun vadede (GSYİH) ile negatif ilişkiye girdiğini ortaya koymaktadır. İhracat hem kısa hem de uzun vadede (GSYİH) ile olumlu bir şekilde ilişkilidir. Teorik ve pratikte döviz kurundaki değişim ile ekonomik büyüme arasındaki ilişkiyi ortaya koyan çalışmanın amacı. Dinar kurunun hem ekonomik büyümeden hem de geniş paradan, faiz oranı, para politikası gibi çok kanallı ihracattan etkilendiğini etkilediği yönündeki birkaç sonuca vardık.

Araştırmacı, bu çalışmanın bulgularına dayanarak, dinar değerlenmesinin hem kısa hem de uzun vadede ekonomik büyümeyi arttırdığından, ekonomide ihracatı ve istihdamı artırmak için dinar değer kaybetme politikasının, Cezayir için uygun bir politika, en iyi fikir, döviz kurlarının arz ve talep güçleri tarafından belirlenmesine izin vermektir. Cezayir, yerel sanayilerimizi korumak ve genişletmek için ithalat konusunda da katı bir önlem almalıdır. Bu, bir ihracat sübvansiyonu sağlayarak kolaylıkla yapılabilir ve ithalat tarifelerini de empoze eder. Bu, Cezayir'de üretilen ürünlerin patronizasyonunu artıracak ve ayrıca Cezayir dinarını güçlendirecek ve böylece bir ülkenin ekonomisini artıracaktır. Ve son olarak araştırmacı, Cezayir Merkez Bankası'nın tüm zamanlardaki şok etkisini göz önüne alarak ekonomideki döviz kuruna rehberlik etmesini önerdi.

Anahtar kelimeler: döviz kurları, ekonomik büyüme, finansal politika.

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IMF: International Monetary Found

GDP: Gross Domestic Product

REXR: Real Exchange Rate

BM: Broad Money

EXP: Export

GI: Government Investment

PI: Private Invesment

M2g: Liquidity Growth

ToT: Term Of Trade

EXR: Exchange Rate

INR: Interest Rate

IFR: Inflation Rate

IFS: International Financial Statistic

ECM: Error Corection Model

ARDL: Auto Regressive Distributed Lag

APEC: Asia-Pacific Economic Cooperation

GLS: Generalized Least Square

GMM: Generalized Method Of Moments

OLS: Ordinary Least Square

ADF: Augmented Dickey-Fuller

P-P: Philips-Perron

LGDP: Level Gross Domestic Product

DGDP : Differenced Gross Domestic Product

LREXR: Level Real Exchange Rate

DREXR: Differenced Real Exchange Rate

LBM : Level Broad Money

LEXP: Level Export

DEXP: Differenced Export

AIC: Akaike Information Criterion

VAR: Vector Autoregressive

VECM: Vector Error Correction Model

J-J: Johansen- Jesuilus

WB: World Bank

SBIC: Schwarz' Bayesian Information Criterion

HQIC: Hannan-Quinn Information Criterion

US: United State

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## Chapter one:

### 1.1 Introduction:

The developed countries have been staid the only dominant on the global economic, through its control of foreign exchanges, which has been adapted due to its requirements. These exchanges are not held, except by the existence of the signal or a measure of the exchange operation which is known as the exchange rate. The exchange rate occupies much space in Economic Studies, since it is the main tool has a direct impact on the relationship between local prices and foreign prices. It identifies strength of currency and international importance by being enjoying Percentage of stability and occupies an important place in international trade that are gaining international acceptance when setting by external transactions.

This is the scale of the major implications of macroeconomic policy in the developing and developed countries equally, since majority of economies are open on the other world, this will require creation of the framework that identifies the exchange rate through the exchange between units of local and foreign currency. It appeared the concept of the foreign exchange market, which is determined the price of the currency as a commodity is being sold and buys according to the law of supply and demand, with having this market rate of exchange has exposed too many fluctuations caused initially from the flexible exchange rate system. This context appeared many theories that attempted to give an explanation for these fluctuations under close interconnection between internal and external economic policies of countries in the world.

Studies have shown the presence of several reciprocal influences between the real exchange rate and economic growth, as economic development takes much space from the interest in economic policy-makers. As it has an impact on the development and welfare of communities by increasing the national production and economic development has opened a great debate about its relationship of the exchange rate, economic growth develops as exchange applied system, whether fixed system or orbit or belongs to middleware Systems, like other countries Algeria, expanded to achieve high rates of economic growth as Algeria.

A country with Rentier economy, they tried since independence exploit the natural its components to improve the economic its status by adopting a several economic policies which first moved from a planned economy to a market economy and raised the monopoly of foreign trade and applied reforms and changes were imposed the circumstances of globalization and financial liberation especially after the resort to the IMF, With the increasing partnership between the Algerian and foreign institutions.

The Algerian economy became in more sensitive condition to external economic and to volatility of global exchange rates, Algeria attempted since it started to suffer the imbalance in the balance of payments avoiding the bad its economic indicators and taking appropriate monetary and fiscal measures that are consistent financial predicament. It was necessary to encourage the production outside the scope of fuels, and application of effective exchange rate policy to support the flexible Algerian exports and therefore attract investment opportunities from abroad and achieve high rates of economic growth.

## 1-2 Historical background of Algeria:

The Algerian economy has witnessed numerous changes since independence and contributed significantly to change ideological and strategic conception then a change of the decisions and regulations (systems), the Algerian economic corporation of its different sectors is reckoned a beating heart of the national economy despite it was and still a laboratory for a number of experiments and imported systems. The current reality for management in the Algerian economy binds us to come back to the historic reality to explain the state which we reached currently, so we will try via our interventions to refer to the following axes:

### Firstly: Stage of self-management for the Algerian economy:

Algeria came out of wars in 1962 and its economy is semi-destroyed, after independence the functionaries left their posts at administration and important jobs (90% of old employees and foreigners) leaving the establishments and administrations behind in a careless manner where (800) thousand people left the establishments within (6) months. Such escape has aimed at creating problems to the newly independent Algeria beside the objective problems which have faced them such as unemployment which stepped 70% , poverty and the industry, agriculture and trade were frail and semi-divested at ratio 98% including the marginalization and illiteracy.at that time the various categories of laborers tried to fill the cap which the foreigner managers left for the purpose of protecting the national economy and continuation of the productive process at the corporations to meet the society needs and this responsiveness of the laborers facilitated the operation of embodying the self-management of the economy.

**Second: Stage of the socialistic management of the Algerian economy:**

This stage was established where it depends upon the base of the socialistic system which is based on the general ownership for the product means and intervention of the state, central planning and fulfilment of general interest and the laborers should play an important role in managing and watching these companies then the laborer becomes takes the attribute of the manager, productive .The gross financial deficit which the socialist corporations knew during this period was clear where it rose from (408000) dinar in (1973) to (1 880 000) dinar in(1978)from which we see the expansion of the deficit ,according to this we find out that the establishment ,corporation does not live on excess money attained (surplus money)but by banking estimates nearly hampers the economic development via scarcity of financial resources which determine the product of the common materials as the building materials.

**Third: Stage of the free management (capital) of the Algerian economy:**

The crises which the Algerian economy has witnessed in 1986 was very dangerous to the national economy where the price of drum of petrol came down and its value deteriorated in addition to bad management of the corporation or establishment, for these consequences Algeria tries to look for the best ways to build a contemporary national economy and getting out the national establishment from bureaucracy towards freedom to issue its special decisions to manage its financial and material resources and then discussing the case of the capitalistic order that is the independence of the establishment , at the beginning of 1988 the stage of application started after studying projects and laws which the government outlined conditions and plans.(Mahmud,ouargla30.com,2012).

### 1.3: The Algerian economy in the shadow of current world economic changes:

Assessing and outlook of Algeria between (1996-2010) by a group of the experts the international expert Dr. (Abdurrahman mabtul) says that the economic and social policy "between" (2004-2008) should consider the agreements between Algeria and Europe including the zone of exchange.by the way the Algerian economy was attended with difficulties in other words the economy of Algeria was exposed to hardships in (1994) where the energy of Algerian financial payment stopped and entering the debt rescheduling as result of collapse of petrol and gas prices and Asian economic crises in (1998) where the reserves of Algeria from the operation were in state of dissolution as a piece of sugar.

| Time | 1991/1996 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Growth average approximately | 0 | 2 | 4 | 3 | 6 |

Now a days, Algeria witness several changes throughout various which Algeria signed with the European community to build a zone for free exchange where it represents a good gain after a period of indecision in addition to negotiations with the world trade organization. (Mahmud, ouargla30.com, 2012).

## 1.4 Research Problem

How exchange rate is influenced by the Algerian dinar on economic growth during the period (1996-2014)?

Is there a relationship between the Algerian dinar exchange rate and economic growth?

## 1.5 Research Hypotheses

To answer these questions can be asked the following assumptions:

- H0 : There is significant effect of real exchange rates on economic growth.
- H1 : There is no significant effect of real exchange rates on economic growth.

## 1.6 Objective of the Study

This study aims mainly:

- To examine the exchange rate instability in Algeria.

- Evaluate the impact on the economy of the country.

- Highlighting and revealing the nature of the relationship between the exchange rate and economic growth.

-Knowledge the most important developments in the exchange rate of dinar and economic growth during the period 1996-2014.

## 1.7 The importance of studying

The importance of the study go back to the importance acquired by exchange rate in terms of influence and be influenced by economic growth, which occupies the exchange rate leading role in the economic activity, in addition being a phenomenon very complex summons the removal of some ambiguities especially what relate to the Algerian dinar, and contribute to the raising uncertainty about changes on the economic and highlight the relationship between them.

## 1.8 The Scope of the study

The study population represent in the case of Algeria's economy for monitoring the most significant changes on the economic policy of Algeria especially in price policy as for period, the study included the time period from 1996 until 2014 (19 years), Which has accompanied application of Algeria _ a number of reforms and measures touched the most important macro-economic policy and economic recovery programs.

## 1.9 The study methodology:

In order to answer the previous questions, and test the validity of the assumptions we used several methods mentioned in the search:

Descriptive approach describes and interprets the phenomenon drawing conclusions where it was used in the theoretical aspect of the study when we discussed to the macroeconomic variables and the relationship that brings them, and also in the practical side when exposed to exchange rate of the dinar Algerian policy.

Experimental method and analytical approach that has been based upon to study the case of Algeria, where these two approaches depends on the documents and statistics in order to identify the factors affecting the behavior of the variables of the study and find explanation for the relationships that are generated them.

# Chapter two: Literature Review

## 2.1 Introduction:

With a view to provide a conceptual framework and convenient policy recommendations in this study, it is important to present a theoretical framework which bolster this study, in addition to the various theories that will be discussed in this chapter, empirical literature is also presented. The goal of presenting empirical literature is to explore work done by others and kind of methods of research applied in this field with a view to determine any existing gaps in literature. This chapter is divided into two sections. The first section deals theories that expound the relationship between exchange rates and economic growth and the second section deals with empirical literature that explore the findings of other studies with respect to other countries on similar topic. The assessment of literature and concluding remarks are provided towards the end of the chapter.

## 2.2 Theoretical Literature

This section display the basic theories on effect of exchange rates and economic growth. The theories analyzed in this section depend of the traditional exchange rate approach, Structuralist approach.

### 2.2.1 Traditional Approach to Exchanges Rates

This approach carry that currency depreciation have expansionist effect on economic growth. This view is popularly known as the traditional view. It states that currency devaluation will cause domestic made product to be inexpensive abroad, so will boost the demand of such product, leading an exports to become elevated. (Salvatore, 2005).

Moreover, the view that currency devaluation have expansionist effects on output, this will relieve balance of payments frustrations, expands the output, eradicate unemployment and improves trade balance (Acar, 2000).

When a country depreciates its currency, it will generate competitiveness of its exports which will yield a strongest economic growth.

### 2.2.2 The Structural Approach

Contrary to the traditional approach, structuralism approach argues that currency decreases might have a contractionary effect on output and unemployment, more especially for countries that are economically less developed. This approach detect how currency decreases might lead to a lowering in output. Decreases of the currency can result a contractionary effect on output in many ways, however increase in the cost of imports is an important matter and requires much attention, essentially in a country that its local firms depend on imported raw materials. Meanwhile, consumption increases the cost of imports in particular, and the cost of domestic production in general through imported inputs. (Acar, 2000).

If the costs of input high, it is possible that the cost of production will become higher as well, and also the firms will pass this unto the consumers. This is because, the only alternative available to the firms was to increase the prices of their product, this increases the public price level leading to an inflation in the society. (Acar, 2000).

Moreover notes that "decreasing imports in this context mean inadequate inputs required for production. Eventually, as a result of incomplete inputs and increasing costs, production will slow down, leading to a contraction in total supply". In this case, currency depreciation would be unfavorable, because low production leads to disengagement of unemployment, thus, decreases the output, and finally insufficient output decreases economic growth.

## 2.3 Empirical Literature

A lot of researchers (Chen, 2012; Genye, 2011; Ugurlu, 2006) examined the effect of exchange rate on economic growth using different methods and countries. They came to different conclusions depending on the country, method and time of study. This section presents the different studies done, the method used, the countries of research and results obtained. The section is divided according to literature from developing countries, developed countries, and country sample Algeria.

### 2.3.1 Empirical literature from developing countries

Genye (2011) analyzed the effect of currency devaluation and economic growth in Ethiopia. During the period (1980 -2010).the type of data they used GDP per capita growth (dependent variable), Education, Private investment, Public expenditure, Net trade demographic, Exchange rate, Drought of famine, and War (independent variable).The findings of the study was that there is education, private investment, openness and public expenditure have a positive impact on GDP per capita growth .and the relationship between GDP per capita growth and exchange rate, demographic factor ,and war have a negative relationship. Finally in this study the general impact of devaluation currency on economic growth. But its impact may convert between different types of institutions. Devaluations can promote old and established institutions and discourage new one or vice versa.

Abounoori and Zobeiri (2010) the effect of exchange rate gap effect on economic growth in Iran. Data obtained from (50)years, they using annual time series data during the period (1961- 2007).In this study, the researcher was used Gross domestic product (GDP)( dependent variable), Government investment(GI) , Private investment(PI), Liquidity growth (m2g) ,Term of trade(TOT), Real exchange rate gap (RER Gap)(independent variables),The cointegration vector coefficient show positive relations among GDP, and GI,PI,TOT while the negative relationship between GDP, and RER Gap and M2g have a positive relationship . The findings of the study was that of all estimated coefficient are statistically significant, and the result of error correction model for represented increases in short run. Thus, adopting the convenient exchange rate policy in order to regulate real exchange rate may have important role to increasing output capacity and economic growth.

Ali(2013), the impact of emerging financial markets, the stability of exchange rates in the Arab countries (Egypt's case study) during the period (2000-2010), aimed this study was to clarify the effect of the emerging financial markets, on the stability of exchange rates of Arab States ,And following the descriptive and standard approaches the researcher has obtained, that the fluctuations in the exchange rates, Arabian countries is caused mainly the arising out markets, were affected through many limitations such as average inflation, the degree of opening up to the outside world, the conditions of the trade's exchange, net foreign investment inflows in the financial portfolio, economic growth, and the researcher arrived to the conclusion that net foreign investment inflows in the portfolio and the terms of trade for are to play an important role in explaining fluctuations in exchange rate of the Egyptian pound. But the other variables haven’t got any explaining impact on the exchange rate of the Egyptian pound.

McPherson and Rakovski (2000) analyzed the exchange rates and economic growth in Kenya during the period (1970-1996).using time series data .a number of econometric approaches was applied consisting of: single equation regressions, a system of simultaneous equations, and Var model and cointegration techniques were used in this study. The findings of the study is the relationship between real money growth and real income growth is a positive relationship, and the coefficient is not significant statistically.

Adeniran, Yusuf, and olatoke (2014) a research carried examined the impact of exchange rate fluctuation on the Nigerian economic growth over a period (28) years from (1986-2013) .time series estimation he was used. The data obtained from central bank of Nigeria bulletin various issue, and the types of data used the sourced from central bank of Nigeria statistical bulletin of various issues. In this study using some indicators macro-economic, gross domestic product(GDP)(dependent variable) ;exchange rate(EXR),interest rate(INR)and inflation rate (IFR)(independent variables).the findings of the study was that there is positive relationship between gross domestic product and exchange rate, interest rate and inflation has negative relationship with gross domestic product .finally ,the government should encourage the policy of export promotion strategies in order to get rid of the deficit problems ,as well as the government should provide security for foreign investors to attract investment in the country sample Nigeria.

In conclusion, the observed studies from developing countries predicted mixed results in connection with the effect of exchange rate on economic growth. The findings of the studies shows that economic growth interact differently to undervaluation or overvaluation of the currency in different countries. Similarly, exchange rate decreases had a negative impact on economic growth, while in other countries, a positive effect exists. Though, a general conclusion on the impact of exchange rate on economic growth in developing countries cannot be easily ascertained.

### 2.3.2 Empirical literature from developed countries

Lily et al (2012) analyzed the effect of exchange rates on economic growth in Malaysia using the time series data spanning from (1971-2009).and the data obtained from international financial statistics (IFS), and central bank of Malaysia. The findings of the study was that the relationship between exchange rates and economic growth positive relationship. In addition, a research carried of error correction model (ECM) based auto regressive distributed lag (ARDL) also reveal the exchange rates have a same causal impact towards economic growth.

Ito and Krueger (1999), a researcher using the balassa-samuelson hypothesis, by evaluating the relationship between exchange rate and economic growth in Asia – pacific economic cooperation (APEC) countries. The findings of the study, the relationship between economic growth and real exchange rate in Korea, Indonesia, japan, and Taiwan have a positive correlation relationship. In other countries: Mexico, Australia, and Singapore, the overall correlation has the same sign as the partial correlation. Both Korea and japan experienced high real exchange rate appreciation. The positive relationship between economic growth and the real exchange rate appreciation was discovered in japan and Chile .on the other hand, Thailand and Malaysia experienced high economic growth with exchange rate depreciation, although the level of depreciation was relatively small.

Schnabl (2007),examined the exchange rate volatility and growth in small open economies at the EMU periphery in Europa during the period (1994-2005).The researcher using the dynamic panel data estimation model the generalized least square(GLS)estimations, and generalized method of moments(GMM)estimations. Panel GLS and GMM estimations trace the impact of exchange rate volatility on growth for 41 countries at the EMU periphery from 1994-2005. The findings of this study suggests a negative relationship between fluctuations in exchange rates and

the impact on growth. And the positive relationship between exchange rates stability on growth is particularly strong for emerging Europe.

Chen (2012) analyze the impact of the real exchange rate in economic growth among provinces in China. In this study, the researcher used the generalized method of moments (GMM) estimator. Data obtained from (28) Chinese provinces for the period (1992–2008), panel data estimation was used. The findings of the study was that there is a positive impact of real exchange rate increase on economic growth in the provinces. The generalized method of moments method used in this study shows an excellent performance on limited samples. The findings of the study proved that currency increase elevate economic growth, and this supports the Balassa-Samuelson Hypothesis that there is a positive relationship between real exchange rate and economic growth. Finally, the results are not acceptable with Rodrick (2008) who discovered that decrease have positive effect on economic growth using data from developing countries depending a maximum of 184 countries for the period of year (2000-2004) for developing countries.

Ugurlu (2006) analyzes the real exchange rate and economic growth in Turkey during the period (1989-2005).the researcher used quarterly data. The findings suggest that an overvalued domestic currency may initially result in increased output in the short run but in the long run harmful effect occurs. And the relationship between real exchange rate and gross domestic product have a positive relationship.

In conclusion , then assessed studies in the developed countries are inconclusive, the above mentioned empirical literature obtained from developed countries shows a mixed results about the effect of exchange rates on economic growth . Lily et al (2012) for examples concerned the autoregressive distributed lag (ARDL) that there a positive relationship between exchange rates and economic growth. Chen (2012) used the balassa-samuelson hypothesis that there exists a positive effect of exchange rates on economic growth. On the other hand, Schnabl (2007) suggests a negative relationship between fluctuations in exchange rates and impact on growth. But they had positive relationship between exchange rates stability on growth is particularly strong for emerging Europe. Ugurlu (2006) also confirmed increased output in the short run but in the long run harmful effect occurs. Although, a general conclusion on the effect of exchange rates on economic growth in developed countries cannot be easily ascertained.

### 2.3.3 Empirical literature from Algeria:

Bin Al-Zawai & Naamoun (2011), The behavior of the real exchange rate and the effect of its deviation from its equilibrium level on economic growth in Algeria in the period (1970-2007), The study aims to determine the effect of the deviation of the real exchange rate from its equilibrium level on economic growth in Algeria by formulating a statistical model and using an exploratory approach, The study concluded that there is a causal relationship between the deviation of the real exchange rate from its level of equilibrium and economic growth and the negative effect of this variable on the performance of the economy as a whole, The main reasons for this deviation are the increase in demand for imports with a slow increase in exports outside hydrocarbons as well as the rise in the general price level.

Bouzid (2015), Exchange Rate Changes and their Effect on National Reserves Algeria Case Study (1999-2014), This study aims at clarifying the effects of changes in the main exchange rates on the national reserves in Algeria, And the descriptive approach was followed on the theoretical and analytical side in the applied side ,The study concluded that the fluctuations in the exchange rates of the dollar and the euro lead to significant financial losses incurred by the Algerian economy, which is mainly the erosion of the foreign exchange reserves of Algeria.

Fawzia (2016), the Implications of the Change in the Exchange Rate on Macroeconomic Variables The Case Study of Algeria during the Period (2000-2015), The importance of the exchange rate has emerged as a policy that contributes to the development of the national economy, where they are effective because they have a positive impact on macroeconomic variables, So, Algeria is interested as other countries in the world, policy of the dinar exchange rate, which witnessed many amendments. This study followed the descriptive and analytical approach to

arrive at a knowledge of the relationship between exchange rate changes and macroeconomic variables. This study concluded that the dinar exchange rate is affected and affected by Of economic growth, and inflation and the movement of international funds through several channels such as interest rate, monetary policy, foreign exchange reserves, oil prices, etc.,

## 2.4 Assessment of literature

This study hypothesis is drawn from the traditional approach to exchange rates. The rationality behind the chosen of this theory was because most of the empirical evidences seems to support its postulations. In this study, the researcher used economic growth (GDP) as a dependent variable while Real exchange rate (REXR), Broad money (BM), and Export (EXP) are regarded as an independent variables.

## 2.5 Summary of the chapter

In this chapter, the theoretical literature reviewed shows the link between exchange rate and economic growth. The first part of this chapter evaluates the theoretical literature in relation to exchange rate and economic growth. It included the traditional exchange rate approach which holds that devaluation of a nation's currency is expansionary to the economy; while on the other hand, the structuralist approach holds that devaluation of currency has contractionery effect.

The second part of this chapter evaluates the empirical studies conducted by previous researcher on similar point of discussion in developing countary, developed country ,and Algeria. The reviewed studies adopted several quantitative models to test the effect of exchange rate on economic growth. Majority of the studies concluded that exchange rate depreciations have positive or negative effect to growth in developing country ,developed country, and Algeria.

# Chapter three: Reaserch Methodology

## 3.1 Introduction

This chapter providing the analysis framework used in this study by sets the model used to examine the effect of exchange rate on economic growth in Algeria from 1996-2014 . this chapter also included model specification,definition of variables,stochastic error term,estimation techniques ,sources of data and method of data in this study.

## 3.2 Model Specification

In analyzing the effect exchange rate on Algerian economic growth, the explanatory or independent variables in this study are Real Exchange Rate (REXR), Broad money (BM), Export (EXP), while the Gross Domestic Product (GDP) was used as dependent variable. The ordinary least square (OLS) as an approach for computing the unknown parameters in a linear regression model will be employed in this study as an estimation technique. The method of OLS is extensively used in similar research when making a regression analysis, this is because of mathematical simplicity and much reliable result than any other econometric technique (Guajarati, 2003), and therefore, the function can be expressed as follows:

$$Log\ GDP = f\ (Log\ REXR,\ Log\ BM,\ Log\ EXP)$$

The above function can be specified in linear form of econometric relationship as follows: $Log\ GDP_t = B0 + B1\ Log\ REXR_t + B2\ Log\ BM_t + B3\ Log\ EXP_t + U_t$

Where GDPt (Gross Domestic Product at time t), B0 (Constant parameter), B1REXRt (Real Exchange Rate at time t), B2BMt (Broad Money at time t), B3EXPt (Export at time t), Ut (Error Term at time t) and B1, B2, B3, and B4 are regarded as coefficients of the variables for evaluating the economic growth.

### 3.3 Definition of varieble

#### 3.3.1 Gross Domestic Product

Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. Though GDP is usually calculated on an annual basis, it can be calculated on a quarterly basis as well. GDP includes all private and public consumption, government outlays, investments and exports minus imports that occur within a defined territory. Put simply, GDP is a broad measurement of a nation’s overall economic activity.

Gross domestic product can be calculated using the following formula:

**GDP = C + G + I + NX**

Where: C is equal to all private consumption, or consumer spending, in a nation's economy, G is the sum of government spending, I is the sum of all the country's investment, including businesses capital expenditures and NX is the nation's total net exports, calculated as total exports minus total imports (NX = Exports - Imports).

#### 3.3.2 Real Exchange Rate

The real exchange rate (REXR) is the weighted average of a country's currency relative to an index or basket of other major currencies, adjusted for the effects of inflation. The weights are determined by comparing the relative trade balance of a country's currency against each country within the index. This exchange rate is used to determine an individual country's currency value relative to the other major currencies in the index, such as the U.S. dollar, Japanese yen and the euro.

### 3.3.3 Broad Money

Broad money, which usually refers to M3, is a measure of a country's money supply that includes more than simply physical money such as banknotes and coins (narrow money). It is the most inclusive definition of the money supply. It also includes bank money (demand deposits at commercial banks), and any cash held in easily accessible accounts. Broad money consists of components that are still very liquid, while the non-cash components can be rapidly converted into cash. There is no unique 'correct' measure of a country's money supply. What economists have are several measures which are classified along a spectrum between narrow or broad monetary aggregates.

### 3.3.4 Export

An export is a function of international trade whereby goods produced in one country are shipped to another country for future sale or trade. The sale of such goods adds to the producing nation's gross output. If used for trade, exports are exchanged for other products or services in other countries.

## 3.4 Stochastic Error Term

Error term is a statistical model that is created in a situation whereby the actual relationship between the dependent variable and independent variables was not fully represented, therefore, the error term in this regard, is the amount at which the equation may differ during empirical analysis as a result of this incomplete relationship.

### 3.5 Estimation techniques:

can avoid the adverse effects for the time series analysis ways are in accurate and that gives the misleading them conventional gradient views in cases of the absence of dormancy a recipe for the time series, and that lead to the what is known as pseudo-gradient in spite of the fact that coefficient of determination is high, this is because the temporal data there is by instability of the direction.

### 3.5.1 The Unit Root Test Stationery

It is modern statistical methods in determining the stationery of the data is unit root tests through the following equation:

$$YT=PYt-1+Ut$$

It represents: (YT) variable in the timeline (t), and (Ut) the stochastic error term, which is characterized by a mean equal to zero ($\mu=0$) constant variation ($\sigma^2 = 1$) and cov (Ut = 0). (Attia, 2005).

When you are (p= 1) statistically acceptable, it indicates a lack of stationery and the data suffers from the root of unit. If the estimation techniques is stable, has to be processed by taking the differences. To deal with (Yt) if it is unstable, it is taken form the differences of degree (1, 2... d) to make it stable. And thus being said about time series as complete (Integrated) class (d), and is referred by the symbol Yt~I (d). And that recent for Applied Economic Studies used in the estimation techniques, shows that more efficient and the methods used to data that are suffering from the root of unit treatment.

### 3.5.1.1 Augmented Dickey-Fuller Test

Because the simple DF test is correct only in the event that the time series of the variables self-downhill of the first class, but otherwise in the residuals from the simple regression model will be self-linked which makes outcomes confirmed is accurate and to avoid that be selected augmented Dickey Fuller expanded (ADF) and so through the addition of slowing down the values of the variable into the equation as follows: $\Delta \boldsymbol{y_t} = \boldsymbol{B y_{t-1}} + \sum_{j=1}^{k} \boldsymbol{Bj}\, \Delta \boldsymbol{y_{t-1}} + \boldsymbol{E_t}$

And relies Dickey Fuller test the enlarged (ADF) to the root of unit is based on the estimate of templates:

A-(no fixed limit and the direction of time), as in the following form: $\Delta \boldsymbol{y_t} = (\boldsymbol{\rho - 1}) \boldsymbol{y_{t-1}} + \sum_{j=1}^{k} \boldsymbol{\rho_j}\, \Delta \boldsymbol{y_{t-1}} + \boldsymbol{E_t}$

B-(without the direction of time), and also in the following form: $\Delta \boldsymbol{y_t} = \boldsymbol{\alpha} + (\boldsymbol{\rho - 1}) \boldsymbol{y_{t-1}} + \sum_{j=1}^{k} \boldsymbol{\rho_j}\, \Delta \boldsymbol{y_{t-1}} + \boldsymbol{E_t}$

C-(with a fixed time limit and direction), as in the following form: $\Delta \boldsymbol{y_t} = \boldsymbol{\alpha} + \boldsymbol{\beta T} + (\boldsymbol{\rho - 1}) \boldsymbol{y_{t-1}} + \sum_{j=1}^{k} \boldsymbol{\rho_j}\, \Delta \boldsymbol{y_{t-1}} + \boldsymbol{E_t}$

It represents :( α) fixed limit, and (T) Time trend, and represents (K) for delay.

It includes expanded Dickey Fuller test (ADF) in three stages, and could be clarified as follows: (Shani, 2011)

First stage: includes the following steps:

1- Model estimation (c) in the following dickey – fuller test the expanded models: $\Delta \boldsymbol{y_t} = \boldsymbol{\alpha} + \boldsymbol{\beta T} + (\boldsymbol{\rho - 1}) \boldsymbol{y_{t-1}} + \sum_{j=1}^{k} \boldsymbol{\rho_j}\, \Delta \boldsymbol{y_{t-1}} + \boldsymbol{E_t}$

2. Test the null hypothesis (Ho: p=1), which provides for the existence of the instability of the model unit root against the alternative hypothesis (H1: p<1) which provides for the stationery of the model using statistical test (ADFtp)

And after which it is compared with a calculated value for critical value of (ADFtp). because of the absence of a standard table especially for these critical values, so it is calculated according the way (MacKinnon)used for finding critical values in the unit root tests correspond to integration , and this is by relying on the following equation:

$$C \cdot \boldsymbol{V}(\boldsymbol{K}, \boldsymbol{a\ Model}, \boldsymbol{N}, \boldsymbol{e}) = \boldsymbol{b_0} + \boldsymbol{b_1}\left(\frac{\boldsymbol{1}}{\boldsymbol{N}}\right) + \boldsymbol{b_2}\left(\frac{\boldsymbol{1}}{\boldsymbol{N}}\right)^{\boldsymbol{2}}$$

They represent:

C.V: The critical value.

K: The number of variables.

a Model: a sample without a fixed time limit and direction.

b: The model without the direction of a time.

c: Model with a fixed limit and the direction of time.

N: views (sample size)

e: level of significance (0.01, 0.05, And 0.10).

b0, b1, b2 : transactions.

And that the decision rule of statistical states, that in a situation where the calculated value of the statistical test is less than the critical value reject the null hypothesis (Ho) and accept the imposition of the alternative (H1) In case of refusal (Ho: ρ=1) can be proved that stable form in the opposite case, we move on to the next step.

3-Testing the null hypothesis which states that (B =0) informed that (p=1), against the alternative hypothesis, which states that (B ≠0) note that (p =1). And that are written as follows:

$$Ho :( \alpha, B, P) = ( \alpha , 0, 1)$$

$$H1 :( \alpha, B, P) = ( \alpha , B, 1)$$

And after which it is compared with the calculated value for the critical value (ADF). In case of refusal (Ho), move on to the next step, but in the opposite case, move on to the second phase, which involves estimating and testing the model b.

4-Testing (Ho: p=1) and by using a normal distribution. if (Ho) rejected a statistically, in this case can be proved that the model(c) is stable and does not suffer from the root of the unit, but otherwise means that there is unit root, in this case must be re-estimation process and testing of the model (c) and in such a manner variances differences commencing first class and then the second and so on……

Phase2: this phase includes the following steps:

1- Estimate model b

$$\Delta y_t = \alpha + (\rho - 1) y_{t-1} + \sum_{j=1}^{k} \rho_j \Delta y_{t-1} + E_t$$

2- Tests $Ho: p=1$

$H1: p<1$

And that this testing is done through the use of statistical test ADFtp, also passed us formerly in the second step of the first phase. And it is then compared with the calculated value for the critical value of ADFtp, which is calculated according to the model MacKinnon that described previously. Upon rejection of the null hypothesis

Ho, this indicates that the model is stable, while the odds that we move on to the next step.

3- Testing the null hypothesis, which states that: (α=0) knowing that the (p=1), against the alternative hypothesis which states that: (α≠0) knowing that (p=1) and which is written as follows:

$$Ho\ (\alpha, p) = (0, 1)$$

$$H1\ (\alpha, p) = (\alpha, 1)$$

And that this done through the use of statistical test for (ADFtp), and by comparing the critical value, and if the null hypothesis is rejected, we move to the next step. The opposite turn to the third phase of tests, which include testing and estimating model (a).

4- Testing the null hypothesis (Ho: p=1) and this done through the use of a normal distribution. When (Ho) have rejected statistically, this situation indicates that stable according to the model (b) data, but otherwise shows that the time series data is stable, and thus must be re-estimating process and test data according to the model (b and form distinctions differences at that begin from first class (d=1) and then the second degree (d=2) ….and so on.

Phase 3: this phase includes the following steps

1- Sample estimation (a)

$$\Delta y_t = (\rho - 1) y_{t-1} + \sum_{j=1}^{k} \rho_j \Delta y_{t-1} + E_t$$

2- Testing: $Ho: p=1$

$$H1: p<1$$

As it passed us in the preceding steps, and by using ADFtp of statistical test and compared with the calculated value of the critical value for ADFtp, which is calculated depending on how MacKinnon.

In the case of rejection of the null hypothesis, this indicates that the data is stable according to the model (a), and otherwise it shows that the data is stable non stationery and she is suffering from the root of unit. In this case, you must re-apply all the previous stages and the various steps form the differences so that we can have access to the stable state of the data time series used. Thus, we can say that integrated data from class (d) and symbolized by the symbol yt~I (d). In another command, you must identify the optimal extents of a slowdown in time (j), and through the use of standard Akaike Information Criterion (AIC).

### 3.5.1.2 The Philips-Perron test

Distribution of testing Dickey Fuller enlarged based on the assumptions that an independent random error term statistically and includes a fixed contrast. So when you use a method of Dickey Fuller expanded we must make sure that the error term is not linked and it includes a fixed contrast. Phillips and Perron (1988) developed a downloaded generalization of the way Dickey Fuller expanded to allow the existence of a self-link in the error term, and Phillips Perron method is a modification of a test of Dickey Fuller takes into account the restrictions fault somewhat fewer.

Which allows reducing the random mistake is not to be independent in a few and distributer distribution is not congeners. This test is based on the root of the unit first and then calculate the statistical value is converted to eliminate the effects of autocorrelation on the probabilistic distribution of the statistical test (Perron, 1988) test is conducted in four stages:

- Estimate by OLS the three models to test Dickey - Fuller statistics associated with the account.

- Variance estimation short term.

$$\boldsymbol{\sigma^2 = \frac{1}{n} \sum_{t=1}^{n} e_t^2}$$

- estimating the debugger laboratories $\mathbf{Su^2}$called long-term variability and extracted through a common variation of residue previous models, where:

$$\mathbf{Su^2 = \frac{1}{n} \sum_{t=1}^{n} e_t^2 + 2 \sum_{i=1}^{L} \left(1 - \frac{i}{L+1}\right) \frac{1}{n} \sum_{t=i+1}^{n} e_t \, e_{t-1}}$$

In order to assess this variability it is necessary to find the number of delays i estimated in terms of views n.

- Statistically Philips-Perron account:

$$\boldsymbol{t^* = \sqrt{K} * \frac{\rho - 1}{\sigma} + \frac{n(K-1)\,\sigma}{\sqrt{K}}} \quad \text{Whereas: } \mathbf{K = \frac{\sigma^2}{Su^2}}$$

The test is used Phillips Peron formulas and values spreadsheet itself, which takes test Dickey Fuller, where the first version without a constant limit and without time Direction and take a second fixed limit only to the assumption that the average chain does not equal zero, and the third formula shall take the fixed limit with the direction schedule. If (t) is greater than the calculated (t) Tabulated, it means that smooth running stable. (Salamy, 2013).

### 3.5.2 The joint Integration Testing (Co-interaction Test)

Joint integration is defined as accompany the association between the two series (Yt, Xt) or more, so the fluctuations: one leads to the cancellation of fluctuations in any other series that can be of two chains is stable if taken them separately, but they are stable as a group. And requires the occurrence joint integration in the case to be two series (Yt, Xt) are mutually complementary first order separately mind be residuals resulting from estimating of the relationship between the two integrated zero grade .that is , until the joint integration exists between (Yt, Xt)must meet the following condition:

$$Y_t \sim I(1)$$

$$X_t \sim I(1)$$

$$Yt = a + b\,X_t + U_t$$

$$Ut \sim I(o)$$

It is noted in this case that the indiscriminate reduction represented in the residuum, (Ut) measures the deviation estimated the relationship in the short-term orientation for the equilibrium in the long-term, and the above found that the joint integration is the statistical expression of the relationship of long-term equilibrium. If there are two variables that are of common feature integration, the relationship between them is destined to put the balance in the long term, despite the possibility of convenient deviations from the this trend in the short term , these deviations are reflected in the residuum of according to this logic:

***Ut= yt - bxt***

***Yt= - (a + bxt)***

The system will be placed in the balance when (Ut = 0) and be off balance when (Ut ≠ 0). (Attia, 2005).

Stationary is regarded as a quality of a process where the statistical parameters (mean and standard deviation) of the process do not change with time (Challis and Kitney, 1991).

### 3.5.2.1 Johansen- jesuilus Test

Johansen jesuilus presented year (1990) test relies on self-estimating the vector regression model (Var) Vector Autoregressive model using the greatest possible function Maximum Likelihood Function, and this test is appropriate to small-sized samples.

Furthermore suit them with ties that contain more than two variables, and more importantly, it determined there was more than a common the vector for integration. This test of the relationship between rank (π) and the characteristics of the root of the unit, which is a test Dickey Fuller, but in a multi-regression. As the existence of co-integration of time-series requires that no longer be matrix with full rank (0<r (π) = r <n).

If the rank the matrix includes information between long-term of the time series variables and also represents the number of independent and predictable written combinations. You can determine the presence of co-integration whether by rank.

If the rank (Rank $\pi = 1$) there is a single common the vector integration, the variables are not integrated with each other, and if the rank is (Rank $\pi = 0$), then, that all of these variables contain unit root. , But if the matrix with full rank, all static variables did not have the root of unity. In other cases in which the rank is $(1 < \text{Rank } \pi < n)$ and here there is several vectors Joint Integration.

- The vectors of the mutual integration identify in the methodological frame of Johansen - Jesuilus through two tests:

### **3.5.2.1.1** The **Trace Test (trace λ)**

It takes the following form: $\boldsymbol{\lambda\, trac} = -\boldsymbol{T}\ \sum_{\boldsymbol{i=r+1}}^{\boldsymbol{n}} \boldsymbol{Log}\ (\boldsymbol{\lambda i})$

(T) is the volume of the sample, r is number of mutual integration vectors, and λi is the smallest values of auto-vectors.

If the null-hypothesis test $r = 0$ competes in front of alternative hypothesis $r \leq 1$. When the calculated value of maximum probability average is less than the critical value, it accepts the null-hypothesis. It means that the vectors of mutual integration are equal to zero. But if the calculated value is more than zero (the critical one), it accepts the alternative hypothesis. It means that the number of vectors is more than zero of which it means that mutual integration exists among the relation variables.

### 3.5.2.1.2. Maximum Eigenvalues test (max)

It takes the following form: $\boldsymbol{\lambda \max = -T\ Log\ (1 - \lambda i)}$

If the calculated value for the average of the maximum probability is more than tabular, (the critical one) refuses the null-hypothesis r = 0 and accepts the alternative hypothesis r =1. It is what provides for having at least one vector for mutual integration and vice versa, accepting null-hypothesis and refusing alternative one. (Jesuilus, 1990).

## 3.5.3 Vector Error Correction Model (VECM)

The concept of error correction is the way to correct that depends not only on standard the explanatory variables are changing, but the deviation from the scope of the explanatory variable is equilibrium relationship for the variable. And that after the confirmation of existence of the joint integration between the two variables, the model most suitable to estimate the relationship between them is error correction model, so that added much error, which represents residuals regression equation for long-term model used in the study with a gap of time slowing the model differences are correct, and this is what is known as short-term equation. If we started with two variables (Yt, Xt) it was estimated relationship between them using the following formula: $\boldsymbol{Yt\ a0+a1Xt+\ Et}$

Permission can get a new variable called an end error correction, which is the residuum (ET). (Somaya, 2010) $\boldsymbol{ET= Yt- a0-a1Xt}$

-Using this formulation can reduce error correction model the following about: (Attia, 2005). $\boldsymbol{\Delta Yt\ = B_0 + \sum_{i=1}^{K} Bj\ \Delta Xt_{t-1} + \emptyset(\ Yt - a_0 - a_1 Xt)_{t-j} + Z_t}$

Whereas: ΔYt = the first difference of the variable (Yt, Yt-1). And (j) No time gap to differences in the independent variable (Xt) and (k) = the number of listed from time gaps. And (ΔX t-j) = the first differences of the explanatory variable. If j = 3 there are three differences as follows:

$$\Delta Xt\text{-}1=\Delta Xt\text{-}1 - \Delta Xt\text{-}2$$

$$\Delta Xt\text{-}2=\Delta Xt\text{-}2 - \Delta Xt\text{-}3$$

$$\Delta Xt\text{-}3 = \Delta Xt\text{-}3 - \Delta Xt\text{-}4$$

The differences should be included which have significant effect only in the estimated formula for measuring short-term relationship, but the differences that have a non-significant effect are excluded.

∅ = the speed of edited factor, which indicates a change in the amount of the dependent variable as a result of deviation value of the independent variable in the short-term equilibrium value in the long term by one unit. It is expected that this factor is negative, because it refers to the rate at which it is moving towards a short-term relationship for a long-term relationship .it notes here that in the case of many of the time lags to be the first negative experience with market monitoring for statistical significance limit correction. You may try the patch alone (Et-1, Et-2) We find that the ∅ parameter in both a positive or negative and its impact non-significant, that while found that marked correction extent (Et-3) is negative and has a statistical significance, then monitor the third correction parameter in the estimated the relationship model error correction limit.

In this case, it said that the behavior of the variable is takes three periods (months or seasons or years) until it reaches a long-term balance.

### 3.5.4 Natural Distribution Tests

This test aims to uncover the possibility of the function coefficients of auto-correlation distribution for the remainders according to the natural distribution. There are a lot of natural distribution tests. We choose of them the following:

#### 3.5.4.1 Jarque – Bera Tests:

Jarque – Bera Test depends on the symmetry operators (Skewness) and flattening (Kurtosis) there it is written as follows :**(** Domanski, 2010)

$$\mathrm{JB} = \frac{\mathrm{n}}{6}\ \beta_1^{1/2}\ +\ \frac{\mathrm{n}}{24}\ (\beta_2\ -3)^2$$

The following hypothesis is tested

$$H_0 =\ \beta_1^{1/2} =\ \beta_2 - 3 = 0$$

If it was $JB < \chi_a^2$ Accept the premise H0 this means that distribution is normal.

If it was $JB > \chi_a^2$ Accept the premise H1 this means that distribution is not normal.

### 3.5.5 Quality of Model Tests

In the sake of the study and appropriate quality of model, there should be performing the following tests: (Zaid, 2014)

### 3.5.5.1 Auto-Correlation Test among the Errors of the Second Mark "LM"

Auto-correlation is tested and measured among the errors for the degree more than one, and feature distribution or square distribution $\chi 2$.

$$LM=n* R2.$$

R2: is restriction coefficient.

n: is number of views.

When the calculated value is less than critical value and has chi-square distribution, auto-correlation will be refused towards random error.

### 3.5.5.2 Auto-Regression Test is Stimulated to have no Conditional Contrast (ARCH):

It is a test for contrast homogeneity depending on the relation among squares of the errors for the previous time periods as it relies on the feature distribution or chi square distribution $\chi 2$.

### 3.6 Sources of Data

This study uses the yearly coverage the period 1996 to 2014 (i.e 19 years). Gross Domestic Product ,Real Exchange Rate ,Broad money and Export are obtained from world bank data (WB). High quality and reliable data are highly necessary to obtain for the success of very good research. (Gujarati ,2003).

### 3.7 Method of Data Analysis

Descriptive as well as econometric methods are used to discuss in this study. In the descriptive analysis, statistical and time series properties such as maximums,minimums, means, standard deviation and correlation are considered. These measurements are adopted to show the trending behavior of GDP with respect to exchange rate and other variables. Moreover ,in this part . emphasis is given on examining the effects of exchange rate on economic growth using the STATA 9 and EVIEWS 8 softwares.

# CHAPTER FOUR: PRESENTATION AND ANALYSIS OF EMPIRICAL FINDINGS

## 4.1 Introduction

The main goal of this chapter was to respond on the questions put in the first chapter in this research work. The results obtained from this chapter analysis the effect of exchange rates on economic growth in Algeria for the period of 1996 to 2014. And know the form, direction and strength between economic growth as dependent variables inside the model and some independent variables which are expected to participate in explaining the behavior of this function. This chapter is divided into subsections, the Unit Root Test is presented first by using Augmented Dickey-Fuller Method and Philips-Perron Method, then followed by cointegration tests, and finally followed by the Vector Error Correction Model (VECM). Finally, changing the data from its un-harmonic form into logarithmic one is for the purpose of building up standardized models that clarify the role of explanatory variables which its restriction completes with some economic variables that are expected to have influence on economic growth inside Algeria.

## 4.2 Data

**Table (1): shows the annual value for each of the (GDP, REXR, BM, EXP) the unit ($)**

| year | GDP | REXR | BM | EXP |
|---|---|---|---|---|
| 1996 | 10.67156 | 2.07379 | 1.165679 | 10.1452 |
| 1997 | 10.68285 | 2.106932 | 1.261488 | 10.17289 |
| 1998 | 10.68294 | 2.12768 | 1.291649 | 10.03663 |
| 1999 | 10.687 | 2.093478 | 1.144486 | 10.11528 |
| 2000 | 10.7387 | 2.071716 | 1.150188 | 10.35334 |
| 2001 | 10.73834 | 2.085816 | 1.732807 | 10.30288 |
| 2002 | 10.75404 | 2.05347 | 1.256528 | 10.30433 |
| 2003 | 10.83164 | 2.007824 | 1.212352 | 10.41426 |
| 2004 | 10.93108 | 2.009406 | 1.019167 | 10.53371 |
| 2005 | 11.01367 | 1.990359 | 1.067948 | 10.68766 |
| 2006 | 11.06829 | 1.989606 | 1.293247 | 10.7568 |
| 2007 | 11.13026 | 1.984072 | 1.363438 | 10.80299 |
| 2008 | 11.233 | 2.002854 | 1.205125 | 10.914 |
| 2009 | 11.13739 | 1.99794 | 0.68492 | 10.68604 |
| 2010 | 11.20738 | 2 | 1.131889 | 10.79222 |
| 2011 | 11.30106 | 1.997457 | 1.299006 | 10.88976 |
| 2012 | 11.32024 | 2.020431 | 1.038895 | 10.88718 |
| 2013 | 11.32161 | 2.014055 | 0.924796 | 10.84298 |
| 2014 | 11.32944 | 2.022818 | 1.159076 | 10.81415 |

**Resource :world bank data.(WB,2017)**

-From the table (1) I changed the data to logarithmic data, for the (GDP) variable is the most important indicator of economic development and the contribution of the economic sectors to the components of this output in the country expressed in statistical figures. Gross domestic product (GDP) represents the final value of goods and services produced within the country within a given period of time, usually one year. The table shows that the Algerian economy is gradually booming from one year to another year. The statistical data in Table (1) indicate the increase in the value of GDP from the year 1996 to the year 2014. Which reached the highest rate in the year (2014). Because of the high value of oil prices globally. And in 1996 it reached the lowest point. This is due to the rise in the value of economic growth. To the relative improvement in the security and economic situation of the country and the increase in oil revenues exported as a result of the rise in oil prices globally.

- For the independent variable (REXR). Economic literature indicates that the study of the exchange rate aims to find the means and procedures that will stabilize the value of the local currency against foreign currencies as different as possible .There is a lack of monetary stability in the Algerian economy and the reason is the decline in foreign currency reserves in Algeria. In these circumstances, the policy of the state to devalue the Algerian dinar to get rid of financial problems. Thus, the Algerian economy stabilizes. Real exchange rates in some years are rising and falling. Due to global financial crises. And in the year 1998 it reached its highest value. In 2007 it took the lowest value.

-From the table above, the value of (BM) increased from 1996 to 2001 due to the increase in the value of oil. The source of the Algerian economy is limited to oil only. . From 2002 to 2005, the value of (BM) decreased, due to the decline in foreign investment. In 2009, the value of broad money declined to its lowest value.

- In the end, exports are gradually booming until 2008, i.e. the increase in Algerian exports. After 2008, exports slowed down due to a global financial crisis. . After 2008, the export sector flourished because the Algerian government supported the sector's foreign trade as a cancellation of the state monopoly of commercial activity. This gave some kind of authority to local exporters to exercise their activities more freely. There is a positive relationship between EXP and GDP.

## 4.3 DESCRIPTIVE STATISTICS

Table (2) below presents the summary statistics of the variables used in this study to define GDP. It depicted the number of observations, means, standard deviations, minimum and maximum values of each variable.

**Table (2): Summary descriptive statistics**

| variables | Obs | mean | Std. dev. | min | Max |
|---|---|---|---|---|---|
| **Year** | 19 | 2005 | 5.62 | 1996 | 2014 |
| **GDP** | 19 | 10.98 | 0.25 | 10.67 | 11.32 |
| **REXR** | 19 | 2.03 | 0.04 | 1.98 | 2.12 |
| **BM** | 19 | 1.17 | 0.20 | 0.68 | 1.73 |
| **EXP** | 19 | 10.55 | 0.30 | 10.03 | 10.91 |

**Resource: Author's Computation Depending on the program STATA 9.**

The above table (2) shows that all the variables have 19 observations. The mean or average values of all variables are positive value. Standard deviations of all variables are positive. The maximum and minimum values of almost all the variables shows that the distance between highest and smallest values, particularly the subject matter in this study, GDP with minimum value of 10.67 to 11.32 maximum value, Real Exchange Rate with minimum value 1.98 to 2.12 maximum value, Broad Money the minimum value have 0.68 to 1.73 maximum value, and finally Export the minimum value have 10.03 to 10.91 maximum value.

## 4.4 Data visualization

### 4.4.1 Gross Domestic Product (GDP)

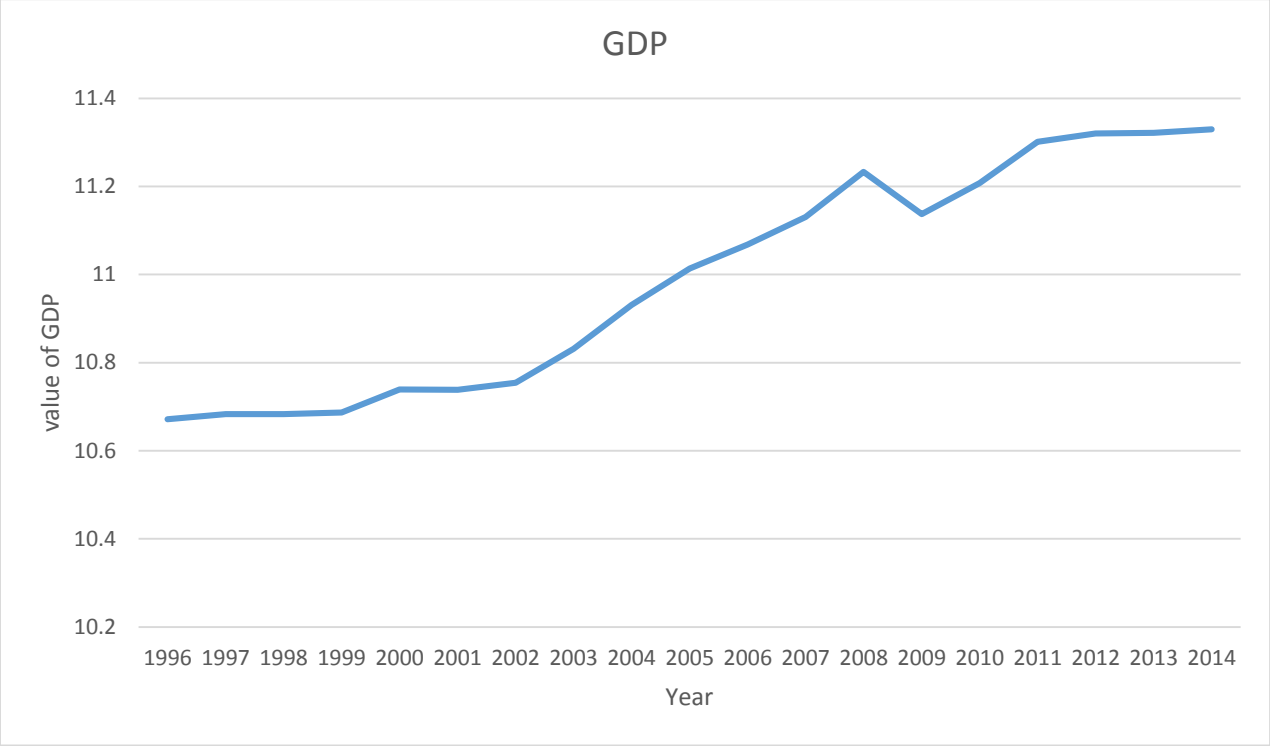



Figure (1): Gross Domestic Product (GDP) in Algeria from 1996 to 2014

-from the figure (1) above that the value of Algerian economic growth gradually increased from one year to another year. Because the Algerian government has supported the sector trade and the high value of oil prices is another reason for Algerian economic growth.

### 4.4.2 Real Exchange Rate (REXR)

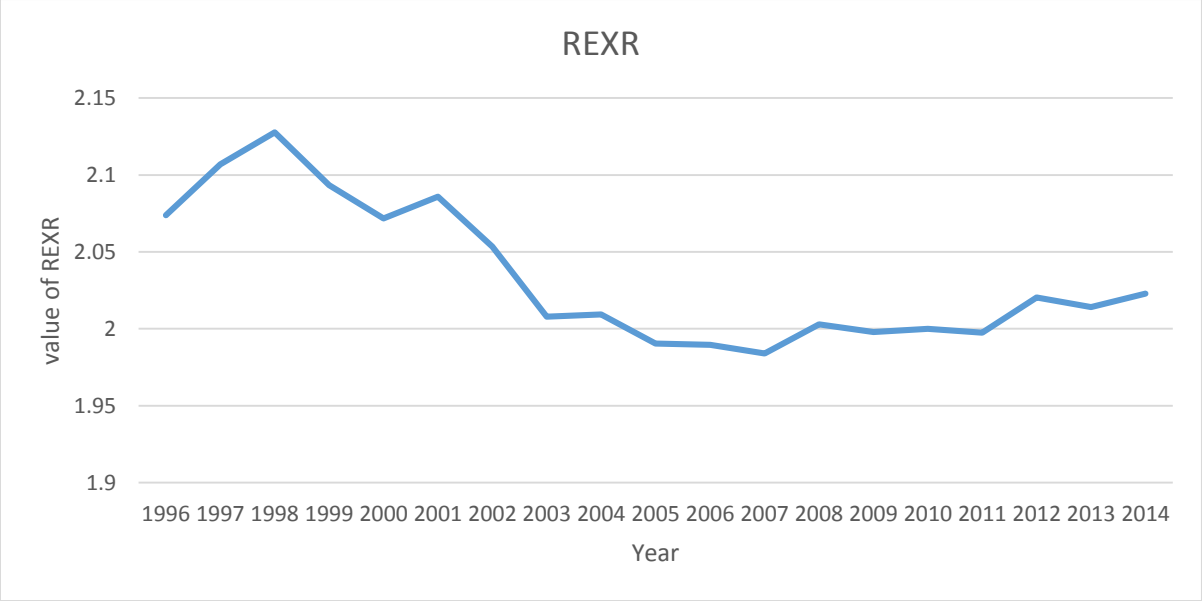



Figure (2): Real Exchange Rate (REXR) in Algeria from 1996 to 2014

-In figure (2) above, the value of the real exchange rate rises and falls until one year due to the devaluation of the Algerian dinar against the US dollar. There is a fluctuation in the Algerian economy. After (2013), the Algerian economy slowly booming. In (1998), the real exchange rate rose to its highest point. In late (2007), the value of the exchange rate fell to its lowest value. The reason for the decline of the Algerian dinar against the US dollar.

### 4.4.3 Broad Money (BM)

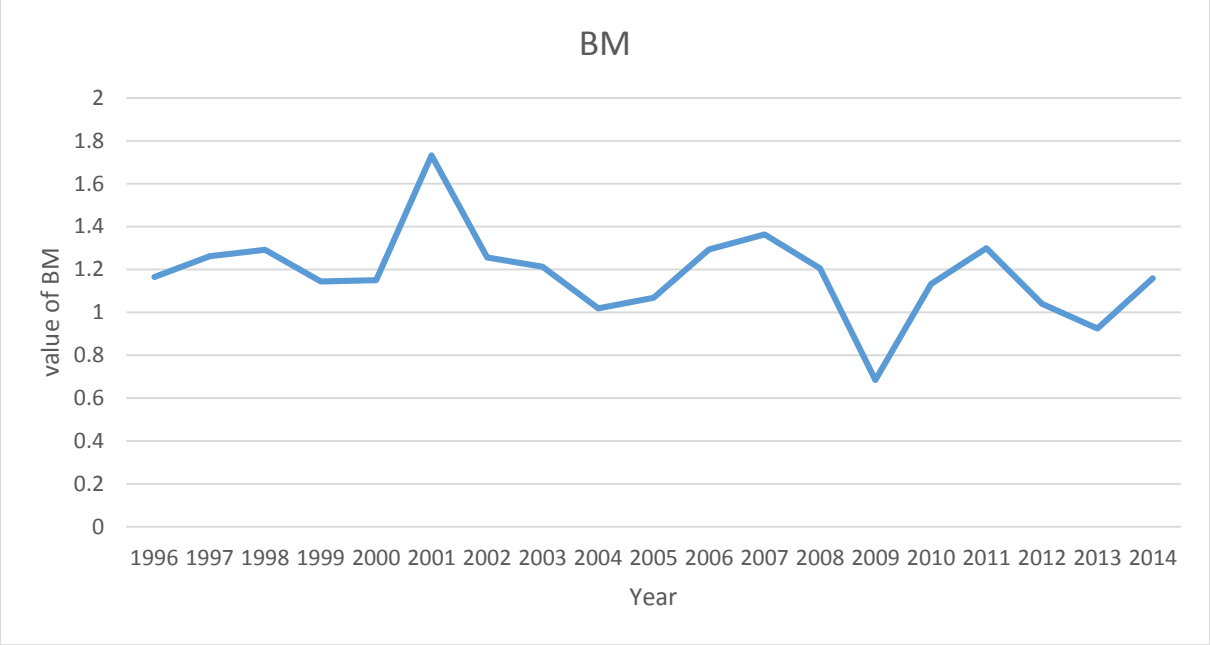



Figure (3): Broad Money (BM) in Algeria from 1996 to 2014

-In figure (3) above, it shows us that the data takes up and down. For example, the year 2001 has the highest value. In the year 2009 it reached the lowest value. The reason is the fluctuations in the banking sector of the Algerian economy.

### 4.4.4 Export (EXP)

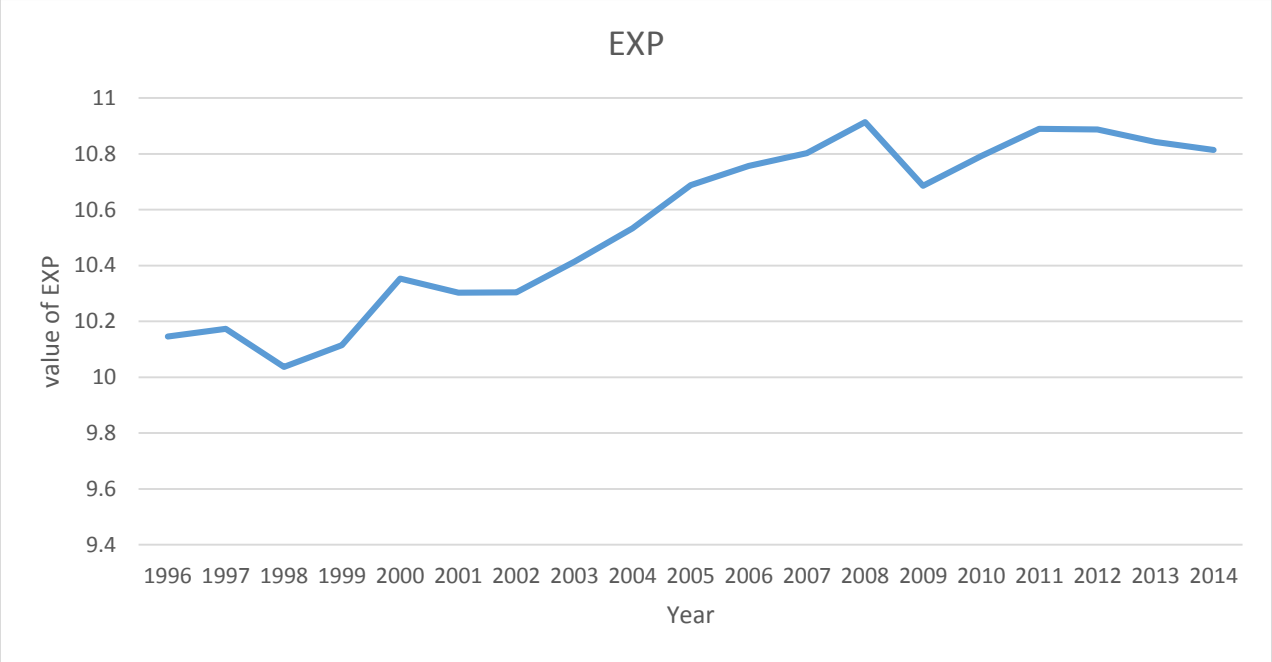



Figure (4): Export (EXP) in Algeria from 1996 to 2014

- In Figure (4) shows that the value of exports increased gradually due to restrictions on imports and encouraging citizens to use local materials. And the high value of oil has a positive impact on economic growth. The government reduced taxes on the domestic sector or internal companies.

## 4.5 The Unit Root stationery Test Results

The clarification of the results of the time series analysis in the study location for testing its stability by time through its stability by running the unit root tests and limiting its grade stability as using the test of both augmented Dickey Fuller and Phillips Perron. This is by the first equation. It is by Dickey Fuller's and Phillips's regression estimation which contains of the firm restriction and general direction. It is a broader model. Table (3) explain the test results of the unit root of the dependent variables which are the economic growth and explanatory variables. They have effect on dependent variable.

**Table (3) Summary of the results of the unit root tests for time series stability**

| Order of integration | Variable | ADF test (Fixed limit and general trend) at a significant level of 5% | PP test (Fixed limit and general trend) at a significant level of 5% | Results |
|---|---|---|---|---|
| **Level** | LGDP | -2.21 | -2.25 | Unstable |
| **1st Differenced** | DGDP | -3.82 | -3.80 | Stable at the first difference |
| **Level** | LREXR | -1.10 | -1.10 | Unstable |
| **1st Differenced** | DREXR | -4.17 | -7.85 | Stable at the first difference |
| **Level** | LBM | -4.52 | -7.55 | Stable at level |
| **Level** | LEXP | -1.76 | -1.85 | Unstable |
| **1st Differenced** | DEXP | -4.22 | -5.83 | Stable at the first difference |

**Source: From the work of the researcher based on the program Eviews 8**

From the table (3) that the Augmented Dickey-Fuller (ADF) and the Philips –Perron (P-P) results. The tests has a null hypothesis (H0) of unit root i.e. non-stationary and alternative hypothesis (H1) of no unit root i.e. stationary. The computed Test Statistic absolute value of ADF and PP was compared with the absolute 5% critical value, if the tests statistic value is greater than 5% critical value, we then reject the null hypothesis that the series have unit root and not stationary.

- For the (GDP) represents a general level of (LGDP) and it is not identical with the value of 5%. After taking the first difference (DGDP) it will conforming to a value of 5% i.e. stable at the first difference , For the ADF and P-P test.

-As for the level real exchange rate (REXR), it will also be unconfirmed at 5%, i.e. (LREXR) unstable. It is necessary to take the first difference (DREXR) to conforming the level of 5%, the stable of one difference, For the ADF and P-P test.

-As for the Broad Money (BM), they will be identical at 5%. Because its value at the level (LBM) is high. We don't need to take the first difference, it is stable at 5%. For the ADF and P-P test.

-Finally for the exports (EXP), the value of the level (LEXP) is unstable. It needs to take the first difference (DEXP) to be stable at 5%, For the ADF and P-P test.

## 4.6 Testing For Cointegration

By having on unit root test results, we perform estimating mutual integration by using Johansen –Jesuilus model as table (4) explain the tests of effect and great value of the suggested model. The table summarizes the results of the test of the combined integration between economic growth, real exchange rate, broad money and export of data on an annual basis for the period 1996-2014.

**Table (4): Summary of the results of the test of J-J in Algeria "between" (1996-2014).**

Date: 04/11/17 Time: 01:27
Sample (adjusted): 1998 2014
Included observations: 17 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP EXP BM REXR
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.919146 | 74.21009 | 47.85613 | 0.0000 |
| At most 1 * | 0.683489 | 31.45330 | 29.79707 | 0.0319 |
| At most 2 | 0.348826 | 11.89652 | 15.49471 | 0.1620 |
| At most 3 * | 0.237244 | 4.603899 | 3.841466 | 0.0319 |

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.919146 | 42.75679 | 27.58434 | 0.0003 |
| At most 1 | 0.683489 | 19.55678 | 21.13162 | 0.0818 |
| At most 2 | 0.348826 | 7.292624 | 14.26460 | 0.4551 |
| At most 3 * | 0.237244 | 4.603899 | 3.841466 | 0.0319 |

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

**Source: From the work of the researcher based on the program Eviews 8**

From the table (4) summarizes the results of the test of the combined integration between economic growth, real exchange rate, cash supply and exports of data on an annual basis for the period 1996-2014.the results of refusing the hypothesis of non-integration vectors show (i.e. having long-term relations) and results of refusing the hypothesis saying that there is no mutual integration. Existence of one integration vector at least indicates having long-term relation among the variables. If the explain results of test effect show in the table (4), it is that the calculated value for the average of the maximum ability is (31.45330). It is bigger that the critical value (29.79707) in the level 5%. This means the possibility of refusing null-hypothesis is (H0=B0=0) saying, "No vector existence is for mutual integration (r = 0). Thus accepting the alternative hypothesis (r = 1) that a number of vectors exist for co-integration. Next, there is no false regression problem. Thus the trace (λ) clear about having no constant vector for mutual integration. After that, refusing null-hypothesis is not possible where it is obvious that the calculated aver as the test results of the maximum value proved, the table (4) has vectors of mutual integration. If the calculated value for the maximum probability average is (4.603899), it is greater than critical value (3.841466) in the level 5%. Thus the max (λ) makes clear about having no second vectors for the mutual integration. Following that, the refusal of null-hypothesis is not possible. As it is shown that the average calculated possible value is (19.55678), it is less than critical values (21.13162) in the level 5%.age value of probability is (11.89652) less than the critical values (14.26460) in the level 5 %.

## 4.7 vector error correction model (VECM)

After making sure about the time series for the study model variables, there is not stability in a level and is available in a different one. Of the investigation, it is realized that is a definite mutual integration. It is obvious that there is relation of long-term balance among dependent and explanatory variables.

**Table (5) Summary of the results of the vector error correction model**

Dependent Variable: D(GDP)
Method: Least Squares
Date: 04/11/17 Time: 02:00
Sample (adjusted): 1998 2014
Included observations: 17 after adjustments
D(GDP) = C(1)*( GDP(-1) + 0.353666662537*BM(-1) - 1.26918526976 *EXP(-1) - 4.14674256629*REXR(-1) + 10.4242488293 ) + C(2)*D(GDP( -1)) + C(3)*D(BM(-1)) + C(4)*D(EXP(-1)) + C(5)*D(REXR(-1)) + C(6)

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C(1) | 0.877292 | 0.302979 | 2.895554 | 0.0146 |
| C(2) | -1.408814 | 0.667632 | -2.110165 | 0.0586 |
| C(3) | -0.076988 | 0.055624 | -1.384073 | 0.1938 |
| C(4) | 0.653329 | 0.351865 | 1.856761 | 0.0903 |
| C(5) | 0.867668 | 1.042837 | 0.832026 | 0.4231 |
| C(6) | 0.067046 | 0.016993 | 3.945552 | 0.0023 |

| | | | |
|---|---|---|---|
| R-squared | 0.670266 | Mean dependent var | 0.038035 |
| Adjusted R-squared | 0.520387 | S.D. dependent var | 0.051051 |
| S.E. of regression | 0.035355 | Akaike info criterion | -3.576191 |
| Sum squared resid | 0.013750 | Schwarz criterion | -3.282116 |
| Log likelihood | 36.39762 | Hannan-Quinn criter. | -3.546959 |
| F-statistic | 4.472044 | Durbin-Watson stat | 2.456435 |
| Prob(F-statistic) | 0.018070 | | |

**Source: From the work of the researcher based on the program Eviews 8**

The value of the error correction coefficient reaches (0.87). It has the possible value (0.0146), and it is less than 5%. The adaptation restriction and reaching balanced condition appeared in a long extent. It may take place in the speed (0.87) for economic growth. It means that the distance from the balance is exactly (87%) throughout one season according to annual data.

### 4.8 Model Estimation results

After terminating the first stage, it is investigated about time series stability for dependent and explanatory variables and changing unstable time series to stable ones after transforming all dependent and independent variable data to logarithmic form. This is for the data homogeneity and depending error models in the estimation for obtaining accurate and inequitable information. The second stage comes. It is the model form which takes the following shape: Conformation of the model, this is after taking the differences of the unstable time series. We find that estimation results had come in the following manner:

$$GDP_t = \beta_0 + \beta_1 REXR_t + \beta_2 BM_t + \beta_3 EXP_t + Ut$$

By applying the following model after taking the differences for the unstable time series, the results of the evaluation may occur as follows:

**GDP = -3.92 + 2 REXR- 0.15 BM + 1.04 EXP+ Ut**

**Table (6) Summary of model estimation results**

Dependent Variable: GDP
Method: Least Squares
Date: 04/11/17 Time: 02:14
Sample (adjusted): 1996 2013
Included observations: 18 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| BM | -0.152985 | 0.066013 | -2.317491 | 0.0350 |
| EXP | 1.044566 | 0.087677 | 11.91381 | 0.0000 |
| REXR | 2.004814 | 0.600967 | 3.335983 | 0.0045 |
| C | -3.929647 | 2.065972 | -1.902082 | 0.0765 |

| | | | |
|---|---|---|---|
| R-squared | 0.962620 | Mean dependent var | 10.98845 |
| Adjusted R-squared | 0.955144 | S.D. dependent var | 0.255810 |
| S.E. of regression | 0.054178 | Akaike info criterion | -2.808409 |
| Sum squared resid | 0.044029 | Schwarz criterion | -2.609580 |
| Log likelihood | 30.67989 | Hannan-Quinn criter. | -2.774759 |
| F-statistic | 128.7627 | Durbin-Watson stat | 1.872235 |
| Prob(F-statistic) | 0.000000 | | |

**Source: From the work of the researcher based on the program Eviews 8**

In view of the results of the estimate presented in Table (6), we find the following:

1-About the regression's equation of the resume test is noticed that the value of calculated F-statistic came equal to (128.7627). It is a pivotal value in each resume level. This P-value makes sure about what comes equal to (0.000000). It is an affair through which we can refuse the null-hypothesis in the interests of the alternative hypothesis saying that one of the regression coefficients at least differs from zero resume. Following that, the pivotal equation is as gross in the influence on the dependent variables and accurate description in restricting function of the economic growth in Algerian economy.

2- For the input extent of the explanatory variables in pointing out the behavior of the dependent variable, of the value of function restriction, $R^2$ becomes obvious to us, which is equal to 0.96. It means that 96% of the changes happened in the dependent variable. It is the economic growth that turns to explanatory variables and the remainder turns the variables which their measurement and errors are not possible in estimation.

3- The value of Durbin-Watson Stat which reaches (1.872235). It is a value close to (2) of which it means that the model has got rid of auto-correlation problem among the test. It should accept the null-hypothesis and refuse the alternative hypothesis so that the null-hypothesis can provide amount for the non-existence of auto-correlation problem.

4-Having reflective relationship between economic growth and broad money, it means when broad money rises, it causes huge averages to rise inside economy of which causes domestic currency value to reduce. After that, it causes economic growth to reduce.

5-Having direct relationship between exports and economic growth: When exports rise, they cause the situation of payments scales to be improved inside economy, finally, it causes economic growth to rise.

6- Indeed, the reflecting exchange system often is negative and positive on economic growth according to dependent exchange system of the country with no cancel the nature of financial system, monetary system and trade system of the country where these systems work negatively on exchange system effect in economic growth.

So, homogeneity among these systems and exchange system helps positively effect stand out for the exchange rates in economic growth. It becomes clear through the data of table (6) that there is direct relationship between real exchange rates and economic growth in Algeria throughout the period of the study.

-This model assumes a group of ordinances of which the most important are:

**A-There Is no Auto-Correlation among the Errors**

$$\boldsymbol{cov(\varepsilon_t\ ,\varepsilon_s) = E(\varepsilon_t\ \varepsilon_s) = 0}$$

Table (7) that the value of F reaches (0.495525). It owns tangible statistic mark which is probability F = 0.6203. Thus, for the Chi-Square value which reaches (1.345858) is not tangible either when the probability Chi-Square values reaches (0.5102). In both cases, we accept null-hypothesis (Ho=Bo=0) and refuse alternative hypothesis (H1=B1≠0). This means having no auto-correlation up to random error.

**Table (7): Results of the self-correlation test between errors (LM(**

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.495525 | Prob. F(2,13) | 0.6203 |
| Obs*R-squared | 1.345858 | Prob. Chi-Square(2) | 0.5102 |

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 04/11/17 Time: 03:16
Sample: 1996 2014
Included observations: 19
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXP | 0.032255 | 0.097003 | 0.332516 | 0.7448 |
| REXR | 0.265167 | 0.683359 | 0.388034 | 0.7043 |
| BM | -0.025222 | 0.077038 | -0.327403 | 0.7486 |
| C | -0.852438 | 2.320838 | -0.367297 | 0.7193 |
| RESID(-1) | -0.119108 | 0.330676 | -0.360197 | 0.7245 |
| RESID(-2) | -0.326137 | 0.329684 | -0.989240 | 0.3406 |

| | | | |
|---|---|---|---|
| R-squared | 0.070835 | Mean dependent var | -1.83E-15 |
| Adjusted R-squared | -0.286537 | S.D. dependent var | 0.049458 |
| S.E. of regression | 0.056098 | Akaike info criterion | -2.671351 |
| Sum squared resid | 0.040911 | Schwarz criterion | -2.373107 |
| Log likelihood | 31.37784 | Hannan-Quinn criter. | -2.620877 |
| F-statistic | 0.198210 | Durbin-Watson stat | 1.940371 |
| Prob(F-statistic) | 0.957568 | | |

**Source: From the work of the researcher based on the program Eviews 8**

## B-Contrast Persistence for the Random Error Restriction

$$var(\varepsilon_t) = E(\varepsilon_t^2) = \sigma_\varepsilon^2$$

Table (8) that the value of (F) reaches (0.846343). It possesses logic statistic mark when (Prob. F = 0.3713), it is bigger than (0.05%). Thus, for Chi-Square which reaches (0.904302) is not abstract either. When the Probability Chi-Square values reach (0.3416), we accept null-hypothesis (Ho=Bo=0) and refuse replacement hypothesis (H1=B1≠0) in both cases. It means contrast persistence is a number of series of error restriction.

**Table (8): Results of self-regression test conditional on heterogeneity of conditional variation of errors ARCH**

Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.846343 | Prob. F(1,16) | 0.3713 |
| Obs*R-squared | 0.904302 | Prob. Chi-Square(1) | 0.3416 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/11/17 Time: 03:19
Sample (adjusted): 1997 2014
Included observations: 18 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.002894 | 0.001032 | 2.804416 | 0.0127 |
| RESID^2(-1) | -0.235311 | 0.255781 | -0.919969 | 0.3713 |

| | | | |
|---|---|---|---|
| R-squared | 0.050239 | Mean dependent var | 0.002412 |
| Adjusted R-squared | -0.009121 | S.D. dependent var | 0.003756 |
| S.E. of regression | 0.003773 | Akaike info criterion | -8.217366 |
| Sum squared resid | 0.000228 | Schwarz criterion | -8.118436 |
| Log likelihood | 75.95630 | Hannan-Quinn criter. | -8.203725 |
| F-statistic | 0.846343 | Durbin-Watson stat | 1.964407 |
| Prob(F-statistic) | 0.371252 | | |

**Source: From the work of the researcher based on the program Eviews 8**

## C- There is no problem for multi-linear

To clarify the relation among independent variables according to Klein test. Indeed, multi-correlation (multi-linear) is not in dangerous case when simple correlation coefficient square is smaller than the restriction coefficient among the independent variables in the model. The multi-linear case is not dangerous in the model according to Klein test, and accepting it is possible. Table (9) explain this case where we notice that the highest coefficient square of the correlation in the described correlations is between REXR (Real Exchange rates) and EXP (Exports), and it is equal to (0.87).Finally, the highest square of simple correlation coefficient is equal to (0.75) in the described. It is less than the coefficient restriction value (0.96). Therefore, the models previously are considered of the statistic, economic and measurement side.

**Table (9): Relationship between independent variables according to correlation matrix**

| correlations | | | |
|---|---|---|---|
| **variable** | **REXR** | **BM** | **EXP** |
| **REXR** | **1.000000** | **0.346044** | **0.877061** |
| **BM** | **0.346044** | **1.000000** | **0.284805** |
| **EXP** | **0.877061** | **0.284805** | **1.000000** |

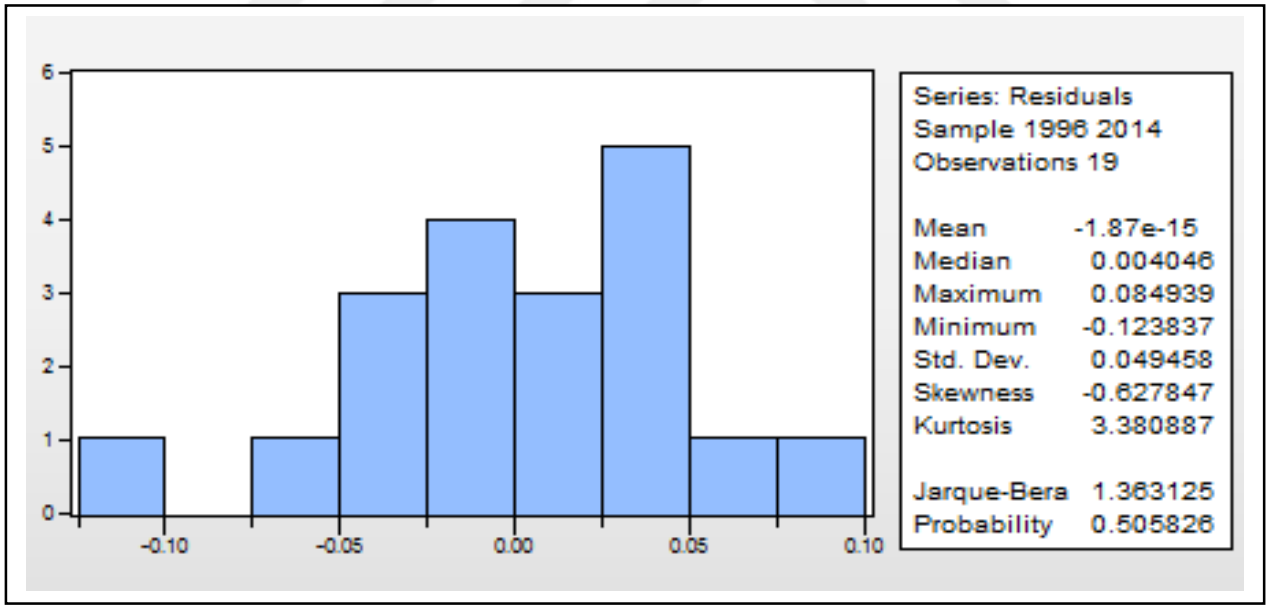
**Source: From the work of the researcher based on the program Eviews 8**

**D-The Distribution of the Odd lot**

$$\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$$

It is clear through jarque - Bera test that the statistic value is (0.50) bigger than (5%). Then the value of (JB< is χa2). Next, the graphical shape takes the ring shape. The Skewness Stat is near to zero which reaches towards (0.6). Thus; the value of Kurtosis coefficient reaches (3.3), and it is close to (3). Therefore, we will accept the null-hypothesis saying that the regression remainders of the average is distributed with a natural distribution.

**Table (10): results of jarque – bera tests**




**Source: From the work of the researcher based on the program Eviews 8**

# Chapter five: summary, conclusion and recommendation

## 5.1: Summary

The first chapter in this study introduction, historical background of Algeria, the Algerian economy in the shadow of current world economic changes, research problem, research hypothesis, objective of the study, importance of studying, scope of the study and study methodology.

Second chapter Introduction, theoretical literature both approach traditional and structural, empirical literature from developing, developed country and Algeria, assessment of literature and summary of the chapter.

Third chapter was given introduction, model specification, definition of variables, stochastic error term, estimation techniques, and sources of data and method of data analysis.

Fourth chapter introduction, descriptive statistics, data, data visualization, unit root stationery test results, testing for cointegration result, vector error correction model and models estimation results.

Chapter five consists of Summary, Conclusion, and quantitative Recommendations and methodology Recommendations.

## 5.2 Conclusion

This study analyzed the effect of Exchange Rate on Economic Growth (A Case Study of Algeria) 1996-2014. With the aid of Cooperation and Vector Error Correction analysis, the effect of exchange rate on economic growth. The results shows that there is a positive relationship between real exchange rate and economic growth in the results find that appreciation in the value of Algerian dinar promotes economic growth in Algeria. As well as the negative relationship between broad money and economic growth . Finally they have a positive relationship between exports and economic growth.

## 5.3 Recommendations

1- That according to **ADF** and **PP** tests by unchangeable restriction and general direction that the time series for broad money in accordance to stable measurement analysis is 5% in the significant level. The time series for economic growth and real exchange rate and the exports do not give the constant conforming grade in the level. It becomes conforming after taking the first difference from.

2- According to the results of the test of the combined integration between economic growth, real exchange rate, broad money and exports of data on an annual basis for the period (1996-2014).The results of refusing the hypothesis of non-integration vectors show (i.e. having long-term relations) and results of refusing the hypothesis saying that there is no mutual integration.

3- For the input extent of the explanatory variables in pointing out the behavior of the dependent variable, of the value of function restriction, ($R^{2)}$ becomes obvious to us, which is equal to (0.96). It means that (96%) of the changes happened in the dependent variable. It is the economic growth that turns to explanatory variables and the remainder turns the variables which their measurement and errors are not possible in estimation.

4-The value of Durbin-Watson Stat which reaches (1.872235). It is a value close to (2) of which it means that the model has got rid of auto-correlation problem among the rest. It should accept the null-hypothesis and refuse the alternative hypothesis so that the null-hypothesis can provide an amount for the non-existence of auto-correlation problem.

5-There should be performing a thorough study about Algerian economy generally for knowing the problems that it suffers of which economic growth sector specifically for finding the solutions.

6-There must be award greater care about private sector of the country side for more financial investments, investing work and establishing productive surpluses for the purpose of exporting and activating a role in Foreign Trade.

7-There must to be activating and activate different charged bodies for promoting Foreign Trade outside the fuel sector for development necessity to re-qualify the economic institution in a level that it is capable of competing and not only producing.

8-An attempt of special exchange politic crystal tries to promote the exports out of the fuels in Algeria, and it concords with financial and monetary policy particularly and macroeconomic politic usually.

9-There has to be work on proceeding the reconciliation, motivating macroeconomic stability, continuing economic growth, reinforcing central bank independence for practicing a mission practically after that its availability in legal texts. Attempting to combine the parallel exchange market with official market is for interest from the amount of the existent money that is in it.

10- Government should maintain a reasonable level of exchange rate.

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