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THEME

The Determinants of the Algerian exchange rate : The Impact of the Dollar and the Euro

Dissertation submitted in candidacy for the degree of doctorate
In econometrics and Banking

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Abstract :

The study focused on Algerian exchange rate and its determinants, in addition, it investigates the impact of the U.S dollar and the Euro on the Dinar during the period of (1999-2018). For this purpose it was noted an overview about exchange rate and its determinants through analysing the development of exchange rate, the situation of the balance of payments, foreign exchange reserve and money supply also the evaluation of the dollar and the euro is analysed.

The Toda-Yamamoto causality approach has been applied to take into consideration the following variables: exchange rate, the balance of payment, exchange reserve and money supply. However, the Structural Vector Auto-Regression model (SVAR) has been applied to demonstrate the impact of the dollar and the euro on the dinar.

The tests results confirmed the no existence of causality relationship between USD/DZD and MM while it shows the existence of unidirectional causality from BOP to USD/DZD and unidirectional causality from EXR to USD/DZD. Moreover, the shock to the USD/EUR is the most impactful and significant shock on USD/DZD. Unlike the shock on EXR does not lead to significant effects on USD/DZD, while the shock on BOP and MM leads to significant effect on USD/DZD.

Keywords : exchange rate, ER determinant, SVAR model, Todo-Yamamoto causality,

ركزت الدراسة على سعر الصرف الدينار الجزائري و محدداته، إضافة الى البحث في تأثير كل من الدولار الأمريكي و الأورو على الدينار خلال الفترة (1999-2018). لهذا الغرض تم الاشارة لنظرة عامة حول سعر الصرف ومحدداته من خلال تحليل تطور سعر الصرف وحالة ميزان المدفوعات، احتياطي الصرف الأجنبي و الكتلة النقدية و كذلك تحليل تطور كل من الدولار و الأورو.

وقد تم تطبيق نموذج Todo-Yamamoto للسببية مع الأخذ في الاعتبار المتغيرات التالية: سعر الصرف ورصيد ميزان المدفوعات، احتياطي الصرف الأجنبي و الكتلة النقدية. كما تم تطبيق نموذج الانحدار الذاتي الهيكلي (SVAR) لتبيان اثر الدولار و الأورو على الدينار.

أكدت نتائج الاختبارات وجود علاقة سببية في الاتجاهين بين سعر الصرف والكتلة النقدية بينما وجود علاقة سببية أحادية الاتجاه بين كل من ميزان المدفوعات اتجاه سعر الصرف و من احتياطي الصرف اتجاه سعر الصرف علاوة على ذلك الصدمة الهيكلية في سعر صرف الأورو مقابل الدولار هي الأكثر تاثيرا على سعر صرف الدينار عكس صدمة احتياطي الصرف التي اثرها يكاد يكون منعدما في حين الصدمة في كل من ميزان المدفوعات و الكتلة النقدية اثرت على سعر صرف الدينار.

الكلمات المفتاحية: سعر الصرف، محددات سعر الصرف، نموذج SVAR، نموذج Toda-Yamamoto للسببية.

L'étude s'est concentrée sur le taux de change algérien et ses déterminants, en outre, elle examine l'impact du dollar américain et de l'euro sur le dinar au cours de la période (1999-2018). À cette fin, il a été noté un aperçu sur le taux de change et ses déterminants à travers l'analyse de l'évolution du taux de change, la situation de la balance des paiements, la réserve de change et la masse monétaire ainsi que l'évaluation du dollar et de l'euro est analysée.

L'approche de causalité Toda-Yamamoto a été appliquée pour prendre en compte les variables suivantes: le taux de change, la balance des paiements, la réserve de change et la masse monétaire.. Cependant, le modèle d'auto-régression vectorielle structurelle (SVAR) a été appliqué pour démontrer l'impact du dollar et de l'euro sur le dinar.

Les résultats des tests ont confirmé l'absence de relation de causalité entre USD / DZD et MM tout en montrant l'existence d'une causalité unidirectionnelle de BOP à USD / DZD et une causalité unidirectionnelle d'EXR à USD / DZD. De plus, le choc sur l'USD / EUR est le choc le plus impactant et le plus significatif sur l'USD / DZD. Contrairement au choc sur l'EXR n'entraîne pas d'effets significatifs sur l'USD / DZD, tandis que le choc sur la BOP et le MM conduit à un effet significatif sur l'USD / DZD.

Mots clés : Taux de change, les déterminants du taux de change, SVAR model, Toda-Yamamoto causalité

Dedication

I dedicate this work to my dear parents ***DAHMANI BEKHEREDJE*** *and* ***BEN MARZOUGA WAHIDA*** *for their vital support in my education. It is also dedicated to my sisters:* ***WAHIBA, AMIRA and FADHILA****, to my brother* ***MOHAMED ABD ELAZIZ*** *for their crucial assistance during my long education, to my grandmother* ***FADHILA***

I also dedicate it to my lovely husband ***IDRISS*** *for his remarkable motivation and support.*

It also dedicated to all my friends and colleagues especially ***Chahinez Kandouci*** *and* ***Azeddine Ouadi****.*

Finally, this thesis is dedicated to all my uncles and aunts and all relatives for their help to achieve this work.

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Special thanks be delivered to my parents for the great efforts and support that led to my life and academic accomplishment;

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General Introduction :

1.1. Back Grounds of Study :

Since the breakdown of the Bretton Woods Arrangements, there was a variety of exchange rate policies adopted by several countries. Accordingly, a massive interest has been emerged in identifying the relevant determinants of exchange rate as well as modeling of exchange rate behavior is one of the unsolved issues of research to be dealt with. Due to the crucial significance of the exchange rate in an economy.

The exchange rate is one of the economic and financial indicators that reflects the quality of a country's economic performance. Furthermore, the exchange rate is a very sensitive economic variable. This fact is a consequence of the internal and external influences to which it is exposed, in particular due to the expansion of the cycle of foreign trade and the development of markets. The focus of economists and specialists in international finance through their numerous studies on exchange rate regimes and the factors that control their identification is on the rise. Thus, the theoretical and empirical literature continues to develop in order to address the volatility in distressed markets and an adequate accumulation of foreign exchange reserves to meet the international capital markets.

Nzotta (2004) defines foreign exchange as the value of foreign nation's currency in terms of the home nation currency. In finance, the exchange rates (as also known as the foreign exchange rate or forex rate) between two currencies specify how much one currency is worth in terms of the other.

Devaluation is tall in a fixed exchange rate, which reduces the value of a currency in terms of other currencies. So what we are trying to do in this study is to determine how the reduction value of a currency with respect to the currency of another country affect the record of all monetary transactions between a country and another, whether visible or invisible in a period of time. This is very important because no nation can exist on its own no matter how independent or self-sufficient it can be, it is important to have a relationship with other nations which can be characterized by goods and services going one way and foreign exchange going the other way. When accessing the nation involved, a record of gains and losses may have been kept. As such, a nation's foreign exchange and balance of payments can help slowdown, accelerate or decelerate walking growth progress and development. This will also have a positive or negative effect on the citizens since it deals mainly with economic relations.

Our nation Algeria is currently facing serious problems regarding its foreign exchange rating (which is very low in comparison to other countries) and its balance of payment, which is in a surplus due to hydrocarbon exports. As a result of this the government look for solution to encourage other goods exports.

1.2. Statement of the Research Problem:

Foreign exchange is the key factor of a nation's life. It is also a factor to look into when comparing a country's relationship with other nations. This factor directly or indirectly is affected by a host of other factors which are of sever importance in any nation. Consequently, this factor can be seen as essential to the growth and development of the nation.

Currently these factors can be said to have crippled the Algerian economy and made life uncomfortable and unbearable for its citizens. These factors have brought the country to a level where growth and development appear to be an illusion.

Currently the nation's exchange rate has fallen so low due to unfavourable nature of the competing power of nation's currency with foreign currencies of the world, and due to the devaluation of the dinar.

Much controversy had also been degenerated by the devaluation of our Dinar. Relevant literature and opinion on this issue are of the view that exchange rate policy plays an important role in maintenance of internal and external balance, on the other hands, other writers argued the devaluation is not the best policy for the less developed country because of many diverse results.

1.3. Research Question:

This work is guided by the following research questions:

- ***What is the nature of the causal relationship between the exchange rate of Algerian dinar against U.S dollar and its determinants?***

- ***How far can the Dollar and the Euro influence the Algerian Dinar?***

1.4. Objectives of the Study:

The general objective of the study is to demonstrate and to understand the relationship between the exchange rate and its determinants, as well as to know the effects of the Dollar and the Euro exchange rates fluctuation on the economy in general, and on the Dinar in particular.

1.5. Research Hypothesis:

Hypothesis will be tested in other to allow success of this work. The hypothesis includes:

- There is a causal relationship between dinar's exchange rate and its determinants.

- The Dollar and the Euro have an impact on dinar's exchange rate.

1.6. Scope of Study:

This study is limited to exchange rate and its determinants also the impact of the Dollar and the Euro on the Dinar with reference to the Algerian economy. It covers a period of 18 years i.e. from 2000 up to 2018 by applying Todo-Yamamoto causality approach to identify the causality relationship between the Algerian exchange rate and its determinants, moreover, using the SVAR model to demonstrate the impact of Dollar and Euro on dinar by using the E_views software.

1.7. Significance of Study:

The exchange rate of any nation is the heart and foundation of any governments' development. This very controversial factor is not doing well in Algeria. Naturally, since our economy is import-dependent and as such dependent on other nations, this affects us greatly especially since foreign exchange is involved in every sector of the economy. It is the significance of this study therefore; to make known the relationship between exchange rate and its determinants, policy implications and recommendations, which will be of immense help to policy makers, and government especially as regard to the transaction of the exchange rate and balance of payment in Algeria. It is also of importance to students and lecturers and the entire public who is interested in the subject matter and its utilization in whichever way.

1.8. The study structure:

The study is constructed as follow:

The first chapter is a theoretical framework about exchange rate where we illustrate the important theories that determine the exchange rate, identify the foreign exchange market also the exchange rate policies and regimes. Moreover, the theoretical basics about exchange rate determinants.

The second chapter is literature review of the previous studies in the same field of our study, mentioning their research methods and their findings. We illustrate them by the historical order.

The third chapter is concerned the case of Algeria, we attempt to identify the historical evolution of the Algerian exchange rate, then it well be addressed to the developments of its determinants. Furthermore, it develops an empirical model, and describes the econometric procedure as well as the empirical data. In addition, it presents results of the empirical analysis in detail.

Finally comes the conclusion, which consists of a summary about our study and reached results also, some proposed recommendations.

First Chapter

Theoretical Framework

The Theoretical Framework

Introduction:

Each country has trade relations with the outside world. It needs a currency to facilitate the exchange process because of; the different currencies (each country has its own currency). Thus, there is a problem to determining which currency to be used in transactions, and how it is measured. The study of exchange rate shows us the way to simplify the transactions through converting currencies to one agreed currency, which will be used in the exchange process.

Depending on the subject of the study we will be allocate this chapter to the theoretical framework for the exchange rate and its determinants, which deals in the first part with the exchange rate. The second part deals with the different exchange rate regimes and classification; in the final section, it will present the theories of exchange rate determination.

1) Basics About Exchange Rate:

The various commercial and financial transactions between countries consider the exchange rate one of the most important factor to facilitate their progress. So that there is, a party opposed to the foreign currency and another party called for foreign currency. This shows the importance of the exchange rate in international transactions. To illustrate this, we address the following points:

1.1) Definition:

Is defined as the number of units of foreign currency that must be paid for one unit of the national currency (T.Letrech, 2007).

The exchange rate is a key macroeconomic variable in the context of general economic policymaking and of economic reform programmes in particular (Obadan, 2006). Economist and financial experts are yet to agree on a single theory that defines the exchange rate (Musyoki, Pokhariyal and Pundo, 2012). However, Fernando & Shelly (2012) define exchange rates as the price of one country's currency in terms of another country's currency; the ratio at which two currencies are traded for each other. Gottheil (2005) affirmed that exchange rate is the number of unites of foreign currency that can be purchased with one unit of domestic currency (O.Ugbed, 2013).

The price of a nation's currency in terms of another currency. An exchange rate has two components, the domestic currency and a foreign currency, and can be quoted either directly or indirectly, in a direct quotation; the price of a unit of foreign currency is expressed in terms of domestic currency. In indirect quotation, the price of a unit of domestic

currency is expressed in terms of the foreign currency. An exchange rate that does not have the domestic currency as one of the two currency components is known as a cross currency, or cross rate[1].

1.2) The Exchange Rate Functions:

Aside from factors such as interest rates and inflation, the exchange rate is one of the most important determinants of a country's relative level of economic health. Exchange rate plays a vital role in a country's level of trade, which is critical to every free market economy in the world. For this reason, exchange rates are among the most watched analysed and governmentally manipulated economic measures. Some of the ER functions are summarized as follows (A.Elhosseni, 1999):

a) **The measuring function**: local producers depend on the ER to measure the prices of domestic goods and compare them with their counterparts in the global market, and therefore the ER represents them the link between domestic prices and world prices.

b) **Developing function**: it means, the ER is used to increase specific exports of certain areas. The exchange rate helps to promote exports, and on the other hand may lead to breakdown of some industries and substitute them with imports due to low prices of this latter versus domestic prices, and thus ER helps influence on foreign trade among countries.

[1] /http://www.investopedia.com/terms/e/exchangerate.asp

c) **Distributing function**: Thanks to its association with foreign trade. The ER helps to re-distribution of wealth between countries, for example, if we have two states A and B so that the high currency A compared to the currency of the country B, and this latter imports grain from state A. This would result an increase in exchange reserve currency of the country A. Therefore, the ER affects on the balance of exchange reserves with central banks in other countries by changing in the exchange rate.

1.3) Types of Exchange Rate:

1.3.1) Real Exchange Rate (RER):T

The various definitions of the real exchange rate can mainly be categorized under two main groups. The first group of definitions id made in line with the purchasing power parity. The second group of definitions, on the other hand, is based on the distinction between the tradable and non-tradable goods. Although they can coincide in some very special cases, these definitions usually give different results (A.N.Kipici & M.Kesriyeti, 1997).

- Purchasing power parity: according to this definition, the RER can be defined in the long run as the nominal rate (e) that is adjusted by the ratio of the foreign price level (P^f) to the domestic price level (P). Mathematically, it can be shown as:

$$r_{ppp} = e\frac{P_f}{P}$$

In term of this definition, the decline in the $\mathbf{r_{ppp}}$ can be interpreted as the real appreciation of the ER.

- The definition on the basis of tradable and non-tradable goods: this definition takes the relative price of the tradable and non-tradable in the country as an indicator of the country's competitiveness level in the foreign trade. The rationale behind this definition is that the cost differential between the countries is closely related with the relative price structures in these economies.

  Under the assumption that the prices of the tradable will be equal all around the world. Mathematically, it can be represented as:

$$r_r = \frac{P_t}{P_n} = e\frac{P_t^*}{P_n}$$

In this definition, $\mathbf{P_t}$ and $\mathbf{P_t^*}$ stand for the domestic and international prices of the tradable respectively, while the prices of the non-tradable are denote by $\mathbf{P_n}$. in this definition, the decline of $\mathbf{r_r}$ indicates the real appreciation of the domestic currency.

1.3.2) Nominal Exchange Rate[2]:

The nominal exchange rate is simply the price of one currency in terms of the number of units of some other currency. This is determined by fiat in a fixed rate regime and by demand and supply for the two currencies in the foreign exchange rate market in a floating rate regime.

[2] /http://articles.economictimes.indiatimes.com/2003-01-28/news/27532328_1_real-exchange-reer-nominal-effective-exchange-rate. Jan 28,2003.

1.3.3) Nominal effective exchange rate[3]:

The exchange rate, which weighted average of nominal exchange rates of a nominal currency excluding tendencies for change in prices of a country under consideration with respect to prices in countries partners in trading, is called a nominal effective exchange rate (NEER). The NEER does not reflect the price changes in the observed country relatively to price changes in the trading partners.

The NEER allows to define the extent by which the exchange rate of the nominal currency changed relatively to exchange rates of the trading countries compared to a base year. However, the change in the NEER does not reflect changes in the purchasing power of the currency, nor to what extent the competitiveness of goods produced in this country and showing an export potential changed during a specific period of time.

1.3.4) Real Effective Exchange Rate[4]:

The nominal effective exchange rate adjusted to the change in price levels corresponding to a relative change in prices in countries – partners in trading is called the real effective exchange rate (REER)

The REER is calculated as a weighted average of RER of the nominal currency to the currencies of its main trading partners. For example, if the exchange rate of one country appreciates relative to the currency of the neighbouring country with the higher inflation rate and depreciates at the same time relative to the currency of another country partner with the lower

[3] /anex IV, « Real Affective Exchange Rate Calculation Methodology », Balance of Payments of Kyrgyz Rpublic for 2002.
[4] /anex IV, source obviously mention.

inflation rate, the REER will reflect the exchange rate of the national currency of the country as a weighted average of these changes.

1.4) Foreign Exchange Market:

The market in which participants are able to buy/sell exchange and speculate on currencies. Foreign exchange markets are made up of banks, commercial companies, central banks, investment management firms, hedge funds, and retail forex brokers and investors. The forex market is considered to be the largest financial market in the world.

Because the currency markets are large and liquid, they are believed to be the most efficient financial markets. It is important to realize that the foreign exchange market is not a single exchange, but is constructed of a global network of computers that connects participants from all parts of the world[5].

The market participants that comprise the FX market can be categorized into five groups: international banks, bank customers, non-bank dealers, FX brokers, and central banks. ***International banks*** provide the core of the FX market. Approximately 100 to 200 banks worldwide make a market in foreign exchange, i.e., they stand willing to buy or sell foreign currency for their own account. These international banks serve their retail clients.

The *bank customers*, in conducting foreign commerce or making international investment in financial assets that requires foreign exchange.

[5] / http://www.investopedia.com/terms/forex/f/foreign-exchange-markets.asp

Non-bank dealers are large non-bank financial institutions, such as investment banks, mutual funds, pension funds, and hedge funds, whose size and frequency of trades make it cost- effective to establish their own dealing rooms to trade directly in the interbank market for their foreign exchange needs.

Most interbank trades are *speculative* or *arbitrage* transactions where market participants attempt to correctly judge the future direction of price movements in one currency versus another or attempt to profit from temporary price discrepancies in currencies between competing dealers.

FX brokers match dealer orders to buy and sell currencies for a fee, but do not take a position themselves. Interbank traders use a broker primarily to disseminate as quickly as possible a currency quote to many other dealers.

Central banks sometimes intervene in the foreign exchange market in an attempt to influence the price of its currency against that of a major trading partner, or a country that it "fixes" or "pegs" its currency against. Intervention is the process of using foreign currency reserves to buy one's own currency in order to decrease its supply and thus increase its value in the foreign exchange market, or alternatively, selling one's own currency for foreign currency in order to increase its supply and lower its price.

2) Exchange Rate Regimes and Classification:

Does the choice of exchange rate regimes matter? Few questions in international economics have sparked as much debate yielding as little consensus. Over the thirty years since the breakdown of Bretton Woods, countries have adopted a wide variety of regimes. Moreover, how might one go about classifying countries as belonging to one category or the other, and how should a country's exchange rate regime be classified?

2.1) Exchange Rate Regimes:

The exchange rate regime is the way a country manages its currency in respect to foreign currencies and the foreign exchange market. Exchange rate regimes are typically divided into three broad categories:

- Fixed exchange rate (hard ER pegs)
- Intermediate exchange rate (pegged ER)
- Floating exchange rate (flexible ER, soft pegs).

2.1.1) Fixed Exchange Rate:

a. Definition:

In a fixed exchange rate system, the government or Central Bank intervenes in the currency market so that the ER stays close to an "exchange rate target". The Central Bank is unable to affect the ER through monetary policy. However, the Central Bank can use fiscal expansion to create an excess demand for the currency causing a rise in domestic output. The Central Bank will then purchase foreign assets to increase the money supply, and prevent the interest rate from rising causing an appreciation.

Due to these limitations, the government of a country with a fixed exchange rate will want to control the amount of currency they let it and out. This will prevent any unwanted destabilization of the domestic currency.

b. Types of hard pegs:

- *Dollarization*: a foreign currency acts as legal tender; in other words, use another country's currency s sole legal tender. Monetary policy is delegated to the anchor country. Dollarization reduces the time-inconsistency problem (subject to the perceived probability of a re-introduction of domestic money) and real exchange volatility. Under dollarization external shocks cannot be buffered by ER movements, imposing costs if business cycles are asynchronous; while seigniorage revenues decline. The issue is that the lender of last restore function must be shifted to the fiscal authority (A.Ghosh).e.g. Ecuador, Panama.

- *Currency Union*: a group of countries using a common currency issued by a common regional Central Bank. A currency union reduces the time inconsistency problem by requiring multinational agreement on policy, and reduces RER volatility. Member countries suffering asymmetric shocks lose a stabilization tool. The cost depends on the extent of asymmetric costs and the availability and effectiveness of alternative adjustment tools. The issues of currency union are that the unknown responsiveness of wage/price setting behaviour and migration/investment pattern to the altered regime. Potential sensitivity of voting equilibrium to distribution of shock (A.Ghosh). E.g. CFA franc zone, ECCU.

- *Currency Board*: legally commit to exchange rate domestic currency for specified foreign currency at fixed rate. In other words, a fixed ER regime (mostly enshrined in law) is complemented by a minimum backing requirement for domestic money in foreign currency. The time inconsistency problem is reduced (subject to the perceive probability that the regime is abandoned) and RER volatility is diminished. External shocks cannot be buffered by ER movements, imposing costs if business cycles are asynchronous. The scope for lender of last resort activity is restricted to excess reserve holding and fiscal mechanisms. Require high reserve holdings. Lender of last limits, exist strategy if used as a transitory regime. E.g. Hong Kong (1983), Argentina (2001).

c. Advantages of Fixed ER:

- Provide a nominal anchor for monetary policy.

- Reduce transactions costs and ER risk (international trade and investments).

d. Disadvantage of fixed ER:

- The Central Bank has no independent monetary policy because it has no ER to adjust and its interest rates are tied to those of the anchor-currency country (M.Stone, 2008).

- Loss of ER as a shock absorber consequence for output and employment.

- Loss of lender of last restore.

- Danger of speculative attacks and crashes.

2.1.2) Intermediate regimes:

a. Definition:

fixed rate against a single currency or a currency basket. The ER can be pegged to the anchor within a narrow (+1 or -1 percent) or a wide (up to +30 or -30 percent) range, and, in some cases, the peg moves up or down over time usually depending on differences in inflation rates countries (M.Syone,2008). *Potential benefits:* The time inconsistency problem is reduced through commitment to a verifiable target, Devaluation option provides potentially valuable policy tool in response to large shocks, reduces RER volatility. *Potential drawbacks:* Provides a target for speculative attacks. Avoids RER volatility, but not necessarily persistent misalignments. Does not by itself place hard constraints on monetary and fiscal policy, but thus provides only a partial solution against time inconsistency problem; the credibility effect depends on accompanying institutional measures and record of accomplishment. *Issue:* doubt about sustainability in the presence of full capital mobility. Can be vulnerable to financial crises, which can lead to a large devaluation or even abandonment of the peg, and this type of regime tends not to be long lasting.

e.g. single currency peg: Malaysia, Nepal.

Currency basket peg: Malta, Fiji.

b. Types of peg:

- *Crawling peg*: a rule based system for altering the par value, typically at predetermined rate or as a function of inflation differentials. *Potential benefits:* an attempt to combine flexibility and stability. Often used by (initially) high inflation countries pegging to low inflation countries in attempt to avoid trend real appreciation. *Potential costs:* at the margins, a crawling peg provides a target for speculative attacks. Among variants of fixed ER, it imposes the least restrictions, and may hence yield the smallest credibility benefits. *Issue:* exit strategy, either to hard peg, or greater flexibility. E.g. Bolivia.

- *Bands:* exchange rate is flexible within a percent band, endpoints defended through intervention, typically with some intra-band intervention. An attempt to mix market-determined rates with ER stabilizing intervention in a rule based system. *Potential benefits:* provides a limited role of ER movements to counteract external shocks and partial expectations anchor retains ER uncertainty and thus motivates development of ER risk management tools. *Potential drawbacks:* on the margin, a band is subject to speculative attacks. The characteristics of the band (firm or adjustable, secret or public, width, strength of intervention requirement). E.g. Denmark (± 2025%), Hungary (±15%).

The pegged ER regime is most common under developing countries as well as communist countries. It is somewhat similar to a fixed ER; however, a pegged rate has a wider range of value versus fixed ER.

2.1.3) Floating Exchange rate:

a. Definition:

a country's currency is set by the foreign exchange market through supply and demand for that particular currency relative to other currencies. In a floating ER system, the value of the currency is affected by everyday markets for supply and demand. Therefore, trade and capital flows play a big role in determining the currency's value.

There are two different types of floating ER system. Managed (dirty) float and free (clean) float and this depends on whether or not there is government intervention.

- *Free float*: the ER is determined in the market without public sector intervention. *Potential benefits:* adjustment to shocks can be take place through ER movements. Elimination the requirement to hold large reserves. *Potential drawbacks:* does not provide an expectations anchor. ER regime places no restrictions on monetary and fiscal policy; time inconsistency problem arises unless addressed by other institutional measures.

- *Managed float*: ER are determines in the foreign exchange market, and the authorities can and do intervene, but are not bound by any intervention rule. Often accompanied by a separate nominal anchor, such as an inflation target. *Potential benefits:* the arrangement provides a way to mix market determined rates with ER stabilizing intervention in a non-rule based system. *Potential drawbacks:* does not place hard constraints on monetary and fiscal policy. Absence of

rule conditions credibility of monetary authorities. Limited transparency.

The ER can be stabilized through both monetary and fiscal policy:

- Through monetary policy when there is an excess in money supply the government would purchase domestic assets to weaken the currency and push the interest rate down.

- Fiscal expansion causes an appreciation of the currency that forces the government to purchase foreign assets. This will increase the money supply preventing the currency appreciation.

2.2) Exchange Rate Classification:

Because the ER regime is an important part of every country's economic and monetary policy, policymakers need a common language foe discussing ER matters. After all, an ER regime that looks soft to one observer may look hard to another, which reflects, among other things, a lack of information among different players about foreign exchange markets, and about purchases or sales of foreign exchange by Central Banks.

The IMF has developed the most widely used language and terminology for classifying ER regimes, as part of its mandate to oversee the ER policies of its member countries. Historically, ER regimes reported by the IMF were based on a country's own classification that is a ***de jure***

regime. Nevertheless, starting in 1999, the IMF also began to report ***de facto*** –that is, observed –ER regimes based on the IMF staff's assessment of available information. In addition, a comparison of de jure and de facto regimes shows a fair number of discrepancies (M.stone, 2008).

The de jure and the facto classification are supposed to capture the same concept –the nominal exchange rate (NER) regime. if most government do what they say and say what they do, one would thus expect substantial overlap. There is a distinction between what countries declare as their official de jure regime, and their actual de facto exchange rate practices. (Reinhart and Rogoff 2004).

The difference between these two classifications is that, de jure classifications are what the countries say they do, and focus on the stated policy intentions of the monetary authorities; difficulties arise when policy practices diverge from promises. De facto classification are what the countries actually do, and are based on actual movements of ER (and sometimes, other variables), but are backward-looking and may capture ER policy very imperfectly (A.Ghosh).

The table (I.1) bellow compares the de jure and de facto classifications. Along the diagonal of the matrix, both classifications coincide; off-diagonal elements represent divergences between the two classifications. The overlap is greater for the pegs (where almost seventy percent are classified in the same way), whereas, the distinction between floats and intermediate regimes is hazier. Overall, the overlap is substantial: almost 65 percent of the observations are classified identically under the two schemes.

Table (I.1): distribution of De jure and De facto Classifications

	De Facto Classification		
	Pegged	intermediate	Floating
De Jure Classification			
Pegged Regimes	2265	378	178
Intermediate Regimes	432	270	179
Floating Regimes	124	233	254
Total	2821	881	611
Percentage Consensus	80.3	30.6	41.6

Source: Atish Ghosh et al, **Exchange Rate Regimes: Classification and Consequences,** p10.

The off-diagonal entries provide an indication of the importance of soft pegs and hard floats. Conditional on the facto classification being correct, soft pegs are observations classified as de jure pegs but de facto floats. There are 178 observations in this category (6% of all de jure pegs),

while a further 378 (13% of all de jure pegs) are classified an intermediate regimes under the de facto classification. At the other end of the spectrum, de jure float that behave like de facto pegs –hard floats or "fear of floating" cases –account for 124 observations (about 20% of all de jure floats). A further 233 observations (or 38% of de jure floats) would be classified as an intermediate regime under the de facto classification.

What is behind the discrepancy between what is said and what is done? It probably reflects the desire of countries to be perceived as market friendly, as well as a reluctance to be seen as committed to particular level of ER.

3) Theories of Exchange Rate Determination:

Many theories there have been written in respect to the main determinant of future exchange rates. Although the majority of these theories give adequate reasons in order to explain what actually determines the rates between the currencies, we can argue that there are many factors that may cause a currency fluctuation. Consequently, there is little that can be alleged in respect to the theory that better answers the question of what finally determines the exchange rates.

Here below, we will refer to the main theories regarding the determinants of the exchange rates.

3.1) Purchasing Power Parity (PPP):

This concept has been widely used to measure the equilibrium values of currencies and is often the one an economist will first turn to when asked if a currency is over- or undervalued or not.

Absolute and relative PPP:

The economist "Gustav Cassel" has drafted this theory in 1922, when he published his book "Money and Foreign Exchange Rate" after 1914 (H.Abd EL Adhim).

The starting point of the traditional PPP hypothesis is the so-called Law of One Price (LOOP). Consider a two-country world in which the home and foreign country each produce a homogenous traded good. Absent any impediments to international trade, such as transportation costs and tariffs, the LOOP says that the homogenous good should sell for the same price in the home and foreign country. In other words, the PPP states

that using a unit of a currency; let us say on euro, which is the purchasing power that can purchase the same goods worldwide. The theory is based on the LOOP, which argues that a euro price of a good be multiplied by the exchange rate (€/US$) then it will result in an equal price of the good in US dollars. E.g. if we assume that the exchange rate between the € and the US$ states at 1/1.2, then goods that cost 10 €in the EU should cost 12 US$ in the USA. Otherwise, arbitrage [6] profit will occur.

When converted at market exchange rate:

$$P_t^i = S_t P_t^{i*} \qquad (I.1)$$

where P^i denote the price of the homogenous good ***i, S*** *is* the nominal exchange rate (home currency price of one unit of foreign currency) and, as before, an asterisk denote a foreign magnitude. The mechanism that forces the LOOP condition is arbitrage. Thus, if the domestic price level is greater than the quotient of the foreign price level and the exchange rate it would be profitable to ship the good from the foreign to the home country. The continuation of this process would ensure that the LOOP was eventually restored (i.e. prices would fall in the home country and rise in the foreign country).

If it is further assumed that there are ***n*** goods produced in each country and each of these goods has as its counterpart a homogenous equivalent in the foreign country, then by summing across the ***n*** goods a measure of the overall price level in each country may be obtained as:

[6] / Financial transaction involving the simultaneous purchase in one market and sale in a different market with a profitable price (Barron's 1994).

$$\boldsymbol{P_t = \sum_{i=1}^{n} \alpha^i P_t^i} \qquad \text{(I.2)}$$

And:

$$\boldsymbol{P_t^* = \sum_{i=1}^{n} \alpha^i P_t^*} \qquad \text{(I.2')}$$

Where $\boldsymbol{\alpha}$ denote the weight used to aggregate the individual prices, $\boldsymbol{\sum_{i=1}^{n} \alpha_i = 1}$ and it is assumed the weight are identical across countries. Using these price levels we may derive the condition of absolute PPP as:

$$\boldsymbol{S_t = \frac{P_t}{P_t^*}} \qquad \text{(I.3)}$$

Absolute PPP (APPP) says that a country's nominal exchange rate is determined as a ratio of the overall price levels in the home and foreign country. Therefore, a country with a relatively high price level will have a depreciated exchange rate relative to its trading partners. As in the simple LOOP condition in (eq I.2), arbitrage is the mechanism which ensure APPP holds and therefore APPP is usually thought of as a long-run relationship (i.e. after the arbitrage process has been completed).

Inflation differentials between countries will also be eliminated in terms of their effect on the price of the goods because the PPP will adjust to equal the ratio of their price levels[7]. More specifically, as stated in their book (Lumby S. & Jones C. 1999) "*the currency of the country with the higher rate of inflation will depreciate against the other country's currency by approximately the inflation deferential".*

It can argue that the theory, although it describes in a sufficient way the determination of the exchange rate, is not of good value, mainly because of the following disadvantage. First, it presupposes that goods are

[7] /University College Dublin, prepared for Encyclopaedia of World Trade.

identical across countries[8]. It is not hard to imagine many instances where this is not the case. e.g. a washing machine produced in the home country is unlikely to be identical to a washing machine produced in foreign country, even if it is produced by the same company. A second key assumption necessary to derive (I.3) is that the weight –the α's- used to construct the price levels are the same across countries. This may not be too unreasonable for countries at a similar level of development[9] . However it is clearly unreasonable for countries at different levels of development and, furthermore, the weights used are likely to evolve over time. A third issue relating to the construction of derive (I.3) is the absence of transaction costs for those involved in arbitraging goods across countries. It is relatively easy to modify PPP to allow for constant transportation costs or other impediments to trade, by introducing a factor π. For example:

$$\boldsymbol{S_t = \pi + p_t - p_t^*} \qquad \text{(I.4)}$$

Where π represent the cost of shipping the good(s) into the home country.

An alternative version of PPP, referred to as relative PPP, is obtained by expressing variables in terms of changes:

$$\boldsymbol{\Delta S_t = \Delta p_t - \Delta p_t^*} \qquad \text{(I.5)}$$

Where a **Δ** denotes a first difference operator. Relative PPP indicates that countries with relatively high inflation will experience a depreciating currency. Compared to absolute PPP this variant of PPP is relatively uncontroversial.

[8] /good i produced in the home country is a perfect substitute for good i produced in the foreign country.
[9] /the kind of basket of goods consumed in, say, France and Italy is probably similar, although by no means identical.

A final issue relating to the construction of absolute PPP concerns the assumption earlier that all goods entering the overall price levels are traded. Few aggregate price measures include only traded goods and that is especially true of the price measures many researchers have used to test PPP. The issue of whether a price measure that includes non-traded goods is suited to a test of PPP has long been debated in the international finance literature. For example, a number of the original proponents of APPP advocated the use of only traded goods prices in the computation of PPP (e.g. Pigou 1920; Angell 1922; Viner 1937) while another group advocated using a price measure that covers a broad range of commodities, including non-traded goods (e.g. Hawtrey 1919; Cassel 1928). Frenkel notes that those who advocated a PPP computation based only on traded goods prices emphasize the role of commodity arbitrage, while an asset approach to the determination of exchange rate underpins the view of those who propose a broader price measure an x percent rise in the supply of money should lead to an equiproportionate rise in all prices in n economy, both traded and non-traded. For example, Samuelson (1964) underscores the view that the equilibrium exchange rate is determined by a spatial arbitrage process from which non-traded goods are excluded.

On the other hand, the asset view of PPP takes it as given that arbitrage forces the LOOP and argues that if the PPP hypothesis only applies to traded goods then:

*"the purchasing power parity doctrine presents but little interest ..... (it) simply states that prices in terms of any given currency of the same commodity must be the same everywhere .... whereas is essence is the statement that exchange rates are index of monetary conditions in the countries concerned". (*Bresciani-Turrono 1934).

The extreme asset view of PPP advocates the separation of exchange rate determination from traded prices and recommends a focus on non-traded prices:

"*Strictly interpreted then, prices of non-internationally traded commodities only should be included in the indices in which purchasing power are based."* (Graham 1930).

3.2) The monetary approach:

Before a detailed examination of the flexible and sticky price models is undertaken in this section, a brief description of monetary approach is presented. Exchange rates have been characterized by extreme volatility ever since the advent of the "*float*" in 1973 (Moosa 1994). This has engendered a great deal of interest and research in exchange rate determination. The flexible, and sticky price monetary approaches, have emerged as important tools for exchange rate analysis. They derive their name from their assumptions, which are associated with the monetary approach to BoP (Johnson 1973). Their assumptions are that there exists a stable money demand function, uncovered interest parity condition, and purchasing power parity condition, and that the fluctuations of the exchange rates, and interest rates fluctuations are the main sources of the exchange rates, and interest rates are fluctuation are the main sources of monetary disturbances (Baxter 1994). However, they differ on the mechanisms by which they influence the exchange rates, and interest rates. Monetary theorists also suggest that in the absence of substantial transaction costs, the law of one price, i.e. PPP and interest rate parity, will hold in international markets (Bilson 1978). In addition, all versions of the

monetary models assume that there are no transaction costs in capital markets, and that there are no obstacles to capital mobility.

Although, the monetary re used extensively in existing empirical work (McDonald and Taylor 1994), the empirical results are mixed (Sarantis 1994). Early tests of these models by Bilson (1978), Hodrick (1978), and Frankel (1979) were supportive of the flexible price monetary model. A number of research examined the monetary models for the post-1978 period, and indicate that the models did not perform well (McDonald and Taylor, 1992). Perhaps the most serious challenge to the monetary models is that they are not used to represent a long-run equilibrium between the exchange rate and the monetary variables (Meese 1986, boothe and Glassman 1987, and McNown and Wallace 1989). One explanation for these dismal results relates to the fact that the assumptions underlying the monetary models – stable monetary demand function, PPP and UIP – may not be valid in the real world. Goldstein et al (1980) and Alber (1973) have suggested that UIP may not hold in the reality because of various country risks, lack of market integration, failure of instantaneous PPP, errors in measuring expected exchange rate depreciation, and risk premium. The assumption of a stable money demand function albeit appealing, does not lend support to the model in reality. The reason is simply that the underlying economic structures of the two countries may undergo a variety of changes thereby making the money demand functions unstable over time. Finally, the PPP concept per se is controversial in the sense that there is not any agreed upon price index to be used in computing the parity (Frenkel 1976). When the results of a theory seem to hinge crucially on an assumption such as the PPP, then if the assumption is dubious, the results are suspect. The debate in the literature is whether the

index should pertain to traded goods only or whether it should cover the broadest of commodities.

These criticisms notwithstanding, McDonald and Taylor (1994); McNown and Wallace (1994); and Van Der Berg and Jayantti (1993) have demonstrated that the monetary models do have some long-run validity. The study by McNown and Wallace (1994), was primarily motivated by the wors of Abuaf and Jorion (1990), and Choudhry, McNown and Wallace (1991), who found some evidence favourable to long-run PPP. Of particular interest is the approach adopted by McDonald and Taylor (1994). They tested for the long-run validity of the model using Johansen's cointegration procedure (Johansen 1988 and Johansen et al 1990) and modelled the short-run dynamics via an Error Correction Model (ECM).

3.2.1) The flexible Price approach:

Frenkel (1976), Mussa (1976), and Bilson (1978) propose the flexible price monetary approach. It assumes that prices are fully flexible, and PPP holds instantaneously. It also assumes the existence of a stable monetary equilibrium between real money demand and real money supply. Finally, the money supply and real income variables are assumed to exogenously determined. The model embodies the following equation:

$$\boldsymbol{M_t = P_t + \alpha Y_t - \beta i_t} \qquad \text{(I.5)}$$

$$\boldsymbol{M_t^* = P_t^* + \alpha Y_t^* - \beta i_t^*} \qquad \text{(I.6)}$$

And

$$S_t = P_t - P_t^* \qquad \text{(I.7)}$$

Where $\mathbf{M_t}$ and $\mathbf{M_t^*}$ are the log of the domestic and foreign money supplies respectively; $\mathbf{Y_t}$ and $\mathbf{Y_t^*}$ are the log of domestic and foreign real incomes; $\mathbf{i_t}$ and $\mathbf{i_t^*}$ are the domestic and foreign interest rates, respectively; $\mathbf{S_t}$ is the log of the spot exchange rate (home price of foreign currency); $\mathbf{P_t}$ and $\mathbf{P_t^*}$ are the log of the domestic and foreign price levels, respectively; and $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ are parameters representing the interest rate and income elasticities respectively across countries.

Equation (I.5) and (I.6) are the money market equilibrium conditions for the home and foreign countries respectively, and represent log versions of typical Cagan (Cagan 1956) demand for money function. Equation (I.7) is the PPP hypothesis. Solving for $\mathbf{P_t}$ and $\mathbf{P_t^*}$ in eq (I.5) and (I.6), and substituting into equation (I.7), and adding a disturbance term, yields the final reduced-form exchange rate equation:

$$S_t = \gamma_0 + \gamma_1(M_t^* - M_t) + \gamma_2(Y_t^* - Y_t) + \gamma_3(i_t^* - i_t) + \varepsilon_t \qquad \text{(I.8)}$$

Where $\boldsymbol{\varepsilon_t}$ is the random error term, and all other variables are previously defined. If the FLMA is correct, it is expected that $\boldsymbol{\gamma_1=1}$, $\boldsymbol{\gamma_2<0}$, $\boldsymbol{\gamma_3>0}$.

McNown and Wallace (1994) argue that:

According to the monetary approach, increase in home (foreign) money supply and interest rates, the latter by reducing the demand for money cause a depreciation (appreciation) for the domestic currency. Increases in home (foreign) real income, by increasing the demand for

money, cause the domestic currency to appreciate (depreciate) (McNown and Wallace 1994).

The positive effect of changes in the domestic interest rate on the exchange rate reflects the fact that an increase in the latter reduces the demand for money, which in turn leads to a rise in the domestic price level. In this way money market, equilibrium is maintained. However, given that PPP holds, the domestic price level can only rise if the exchange rate depreciates (McDonald and Hallwood 1994). A rise in income increases the transactions demand for money and, with a constant nominal money supply, money market equilibrium can only be restored if the domestic price level falls; this in turn can only occur given a strict PPP assumption, if exchange rate changes (Ibid 1994).

To summarize, the flexible-price monetary approach is based on PPP and flexible price and is helpful for analyzing the long-run trend of the exchange rate. It is the simplest one among the asset market approach.

3.2.2) The Sticky Price (Overshooting) Approach:

This approach is attributed to Dornbusch (1976) and Frankel (1979). All of the assumptions underlying the FLMA still hold, with the exception of instantaneous PPP. Both Dornbusch and Frankel argue that in the short-run prices are more likely to be sticky, due to "menu costs" and imperfect information, and as a consequence PPP does not hold instantaneously. For e.g. Frankel assumes that the adjustment of the exchange rate to its equilibrium level depends on the real interest rate differential, such that PPP holds only in the long-run. Thus, in an environment where PPP does

not hold instantaneously, the current exchange will deviate from its long-run level such that the following relationship holds (Sarantis 1994).

$$(\boldsymbol{P_t - P_t^*}) - \boldsymbol{S_t} = \left(\frac{\boldsymbol{1}}{\boldsymbol{\delta}}\right)[(\boldsymbol{i_t - \pi_t}) - (\boldsymbol{i_t^* - \pi_t^*})] \quad \text{(I.9)}$$

Where π_t and π_t^* are the inflation rates in the home and foreign countries respectively. Assuming that equilibrium values are given by their current levels, replacing equation (I.5) by (I.8) and then substituting for P_t and P_t^* from equation (I.5) and (I.6), i.e. the monetary equilibrium conditions and adding a disturbance term, we obtain the reduced-from SPMA equation:

$$\boldsymbol{S_t = \beta_0 + \beta_1(M_t^* - M_t) + \beta_2(Y_t^* - Y_t) + \beta_3(i_t^* - i_t) + \beta_4(\pi_t^* - \pi_t) + \varepsilon_t} \quad \text{(I.10)}$$

If the SPMA model is correctly specified, the coefficients of the variables entering the FLMA have the same interpretation. However, the fundamental distinguishing feature separating the two models is the presence of home and foreign country inflation rates, the impacts of which are expected to be negative (i.e. $\beta_4<0$).

The sticky price monetary approach explains the determination and changes of exchange rates in a more realistic way. It also provides government with the ground for intervening the economy since otherwise the over-fluctuation of exchange rates will do greater damage to the economy.

3.3) The Portfolio Approach:

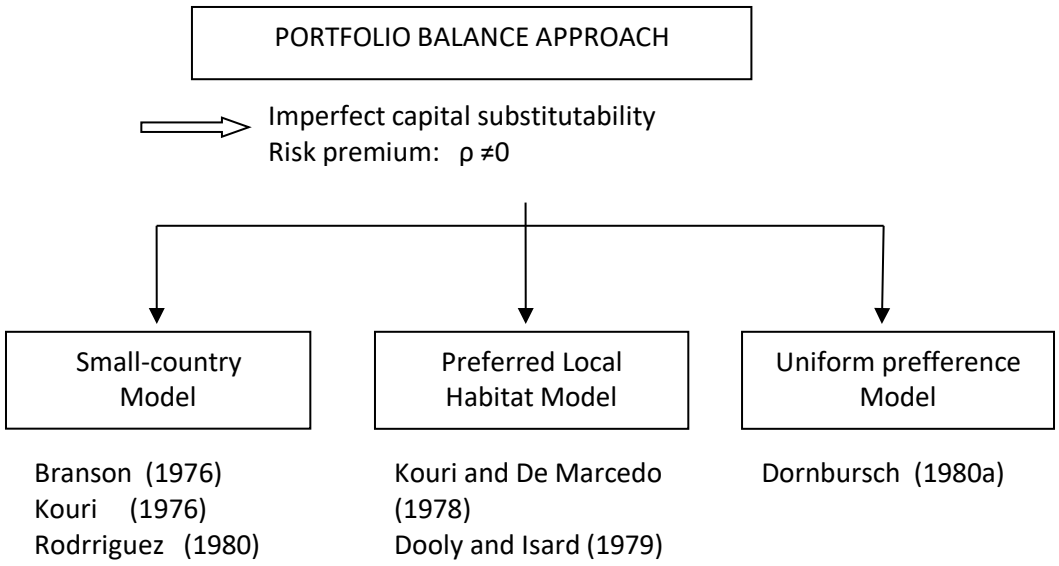


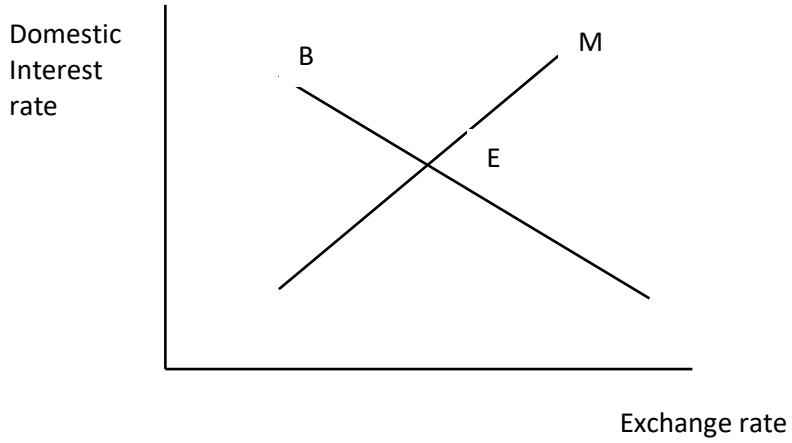
Figure I.1: portfolio balance model and assumption.

The portfolio balance approach takes into consideration the diversification of investors' portfolio assets.

Diversification is a technique that attempts to reduce risk by investing both among various financial instruments and across national borders, to mention just a few.

For example, here below we consider a combination of domestic and foreign money and domestic and foreign bonds, the implications of which are illustrated in the following figure (I.2).

Figure (I.2): Portfolio balance approach.



Both the **M** and the **B** lines show combinations of domestic interest rates and ER. The upward line **M** is in agreement with the equilibrium in the money market and the downward line **B** is in agreement with the equilibrium in the bond market. Point **E**, which is the intersection of **M** with **B**, represents the combination of interest rate with the ER that gives equilibrium to both the money and bond markets.

What the theory argues is that an increase in the money supply will lead to a depreciation of the ER0 the extent of the depreciation depends upon the slope of the curves **M** and **B**.

For example, if we consider an increase in the domestic money supply, we will anticipate that a lower interest rate and/or a higher ER can only absorb the excess supply, which in turn will result in the reduction of bonds. To this end, line M will move the right and line B will move to the left.

3.3.1) The Portfolio-Balance equation:

We retain our assumption that there are no barriers segmenting international capital markets, but we relax the assumption that domestic and foreign bonds are perfect substitutes. Thus, investors allocate their bond portfolios between the two countries in proportions that are functions of the expected rates of return (J.Frankel, 1983).

There are many reasons why tow assets can be imperfect substitutes: liquidity, taw treatment, default risk, and exchange risk. However, at the level of aggregation relevant for most macroeconomic models, and under our assumption of perfect international bond markets, the last of these is the most important. We assume that there is only one respect in which domestic and foreign bonds differ: their currency domination. Investors, in order to diversify the risk that comes from exchange rate variability, balance their bond portfolios between domestic and foreign bonds in proportions that depend on the expected relative rate of return (or risk premium):

$$\boldsymbol{B_j/EF_j = \beta_j(i - i^* - \delta\Delta e)} \qquad \text{(I.11)}$$

Here $\mathbf{B_j}$ is the stock of domestic denominated bonds held by investor **j**; $\mathbf{F_j}$, the stock of foreign denominated bonds held; and E, the exchange rate. $\mathbf{B_j}$ is a positive valued function; for concreteness let it be $\exp[\boldsymbol{\alpha_j + \beta_j(i - i^* - \delta\Delta e)}]$[10]. An increase in the interest differential or a fall in the expected rate of depreciation induces investors to shift their portfolios out of foreign

[10] /if portfolio-balance behaviour is the outcome of the maximization of expected utility by risk-averse investors, then we are implicitly assuming in (16) that the variance of currency values, and covariance with other forms of real wealth, are stationary over time. Only the expected rate of return is assumed to vary.

bonds and into domestic bonds. (note that $\mathbf{B_j}$ and $\mathbf{F_j}$ can be negative, which will be the case if agent j is a debtor.)

We assume at first that all active participants in the market have the same portfolio preferences, as represented by the function **β**. This assumption allows us to add up individual asset demand functions into the aggregate asset demand equation (I.12):

$$\frac{\boldsymbol{B}}{\boldsymbol{EF}} = \boldsymbol{\beta}(\boldsymbol{i} - \boldsymbol{i}^* - \boldsymbol{\delta}\Delta\boldsymbol{e}) \qquad \text{(I.12)}$$

Where:

$$\boldsymbol{B} \equiv \sum_{\boldsymbol{j=1}} \boldsymbol{B_j} \qquad \text{and} \qquad \boldsymbol{F} \equiv \sum_{\boldsymbol{j=1}} \boldsymbol{F_j}$$

B and **F** are the net supplies of bonds (domestically denominated and foreign denominated, respectively) in the market. If one market participant is in debt to another, the asset and liability will cancel out. All that matters are the supplies of outside assets in the market.

A relation like (I.1.2) between asset supplies and expected rates of return is not by itself a theory of exchange rate determination, as Dooley and Isard (1979) have pointed out. Even if the interest rates are omitted or taken as exogenous, expectations must be specified. For example, if the expected rate of either depreciation $\delta\Delta e$ or the expected future exchange rate δe_{+1} is determined, then the ER is uniquely determined. However, specifying that expectations be formed rationally is not sufficient to determine the ER uniquely; as in so many rational expectations problems, the assumption of stability is also required. The simplest possible portfolio-balance model would specify static expectation: $\delta\Delta e=0$. Then the ER is simply determined by relative bond supplies and the interest differential:

$$e = -\alpha + \beta(i - i^*) + b - f \qquad \text{(I.13)}$$

Where $b \equiv \log B$and $\equiv \log F$. equation (I.13) is estimated bellow[11].

So far, we have not been very precise about the definitions of **B** and F. If the market consists of the whole world, and residents of all countries have the same portfolio preferences, then "the supplies of outside assets in the market" include only government-issued liabilities held by the private sector[12]. In (I.12) **B** must be interpreted as net domestically denominated government indebtedness and F as net foreign-denominated government indebtedness. **B** and **F** will be the same as domestic and foreign government debt, respectively, under the assumption that government s issue debt denominated exclusively in their own currencies.

The proposition that residents of all countries have the same portfolio preferences implies that the indebtedness of residents of one country to residents of the other has no effect. This proposition holds in several recent finance papers ([13] and is represented by "the uniform preference" branch of portfolio-balance models in figure (I.1.) these papers derive the asset demand functions as the outcome of maximization of expected utility by risk-averse agents. The proposition that all agents have the same portfolio preference follows from the assumption that they all consume the same good, or basket of goods[14].

[11] /Kouri (1976) considers the alternatives of static and rational (or perfect foresight) expectations.
[12] /the argument is made in Frankel (1979a). For an empirical test of perfect substitutability based on equation (17) see Frankel (1982b).
[13] / Grauer, Lizenberger, and Stehle (1976); Frankel (1979a); Fama and Farber (1979); and Dornbusch (1980a)
[14] /at the opposite extreme, Solnik (1974) derives asset-demand functions as the outcome of maximization by agents who consume only goods produced in their own countries.

This interpretation of equation (I.12) contrasts with macroeconomic models of portfolio balance that take asset demand functions as given. The majority of these models, though they maintain our assumption that no barriers discourage residents of any country from participating in the world market, make the assumption that domestic residents are the only ones who wish to hold domestically denominated assets[15]. The domestic country is assumed to be too small for its assets to be of interest to foreign residents.

One motivation for this assumption is to simplify the accounting – it allows the identification of a capital inflow or outflow with an increase or decrease in the supply of foreign assets in the home market by assuming away the problem of currency of denomination of capital flow. The second motivation for the assumption is that, under floating ER, it leads to the result that a current account deficit causes a depreciation of the home currency, since the counterpart to the current account deficit is a capital inflow: the reduction in the supply of foreign-denominated assets in the market leads to a rise in their price in terms of domestic currency

Thus as an alternative to (I.12), we aggregate (I.13) aver all domestic residents only:

$$\frac{B_H}{BF_H} = \beta_H(i - i^* - \delta\Delta e) \qquad \text{(I.14)}$$

Where $\mathbf{B_H}$ is defined as the sum of all domestic bonds held by home residents (identical to **B**, under the small-country assumption), $\mathbf{F_H}$ is defined as the sum of all foreign bonds held by home residents (equal to the accumulation of past current account surpluses under the small-country

[15] /Branson (1976), Kouri (1976a), Flood (1979), Branson, Halttunen, and Masson (1977). Porter (1979), Dornbursch nd Fisher (1980), and Rodriguez (1980). Among others , assume that domestic assets are not held by foreigners.

assumption), and β_H is the asset demand function shared by all home residents. Assuming static expectations, the ER equation is:

$$\boldsymbol{e = -\alpha_H - \beta_H(i - i^*) + b - f_H} \qquad \text{(I.1.5)}$$

Where $\boldsymbol{b \equiv \log B}$ and $\boldsymbol{f_H \equiv \log F_H}$.

The small-country assumption [16] is particularly unrealistic if the domestic country is the USA. One alternative is to assume that the foreign country is the small country – that domestic residents do not hold foreign bonds. Then (I.15) replaced by:

$$\boldsymbol{e = -\alpha_F - \beta_F(i - i^*) + b_F - f} \qquad \text{(I.16)}$$

Where $\mathbf{b_F}$ is defined as the log of domestic bonds held by foreign residents (equal to the accumulation of past foreign current account surpluses under the small-country assumption)[17]. Equations (I.15) and (I.16) are estimated below.

That residents of both countries hold assets issued by both countries. But the (cumulated) current account will still have the expected effect on the ER, provided domestic residents wish to hold a greater proportion of their wealth as domestic assets and foreign residents wish to hold a greater proportion as foreign assets.(such models are classified under the name "preferred local habitat" in figure (I.1) this is because the current account will redistribute world wealth in such a way as to raise net world demand for the surplus country's assets, thus raising the price of its currency. We

[16] / the assumption that foreign residents de not hold domestic bonds.
[17] /Shafer (1979) assumes that the foreign country is the small country, that is, the foreign accumulated current account surplus is the supply of domestically denominated bonds.

would have to specify a separate asset-demand function for foreign residents:

$$\frac{B_F}{EF_F} = \beta_F(i - i^* - \delta\Delta e) \qquad \text{(I.17)}$$

Where $\beta_H \geq \beta_F$ for all values. Equation (I.14) for the home country and (I.17) for the foreign country could each be solved independently for the ER and regressed in logarithmic form, were data on $\mathbf{B_H}$, $\mathbf{B_F}$, $\mathbf{F_H}$, and $\mathbf{F_F}$ available. Unfortunately, data on the four-way breakdown[18] are difficult to obtain. Only the two-way breakdowns can be attempted: between domestically and foreign-denominated bonds ($B \equiv B_H + B_F \; versus \; F \equiv F_H + F_F$) and between domestically and foreign-held wealth ($W_H \equiv B_H + EF_H \; versus \; W_F \equiv B_F + EF_F$).

The nonlinear nature of (I.14) and (I.17) prevents solving for the ER as a function of **B**, **F**, $\mathbf{W_H}$, and $\mathbf{W_F}$. However, the signs to be expected in such a relation are clear. An increase in the supply of foreign bonds **F** lowers their relative price **E**. An increase in the supply of domestic bonds **B** raises **E**. An increase in foreign wealth $\mathbf{W_F}$ raises the overall world demand for foreign assets and thus raises their relative price **E**. Finally, an increase in home wealth $\mathbf{W_H}$ raises the overall world demand for domestic assets and thus lowers **E**.

In summary, the portfolio balance approach points out the imperfect substitution between home assets and foreign assets and takes the current account into consideration. These make the approach more realistic and helpful for decision-making.

[18] /who owns how much of which asset

3.4) Balance of payment theory:

According to the balance of payments theory, the nominal exchange rate comes from the reconciliation of supply and demand arising from the operations of the current account. Imports and exports are dependent on the relationship between the general level of external prices and therefore on the exchange rate.

A country's balance of payments is a statistical document, presented according to the rules of double-entry accounting, which collects and orders all economic and financial transactions between residents and non-residents.

This approach is developed by Mendel (1960) and Fleming (1962), who confirms that the dynamics of exchange rates depend essentially on the state of the balance of foreign trade. It maintains that the exchange rate is determined by an equilibrium in the market for goods. According to this vision, the currency is asking to buy goods and foreign services is the supply of foreign currency corresponds to export earnings.

Thus, a country with a surplus trade balance had a strong currency while a country with a deficit trade balance had a weak currency.

The role of the exchange rate, in this framework is to balance the balance of payments in the long term, maintaining reserves at a minimum level required to overcome the inevitable fluctuations of the trade balance in the short term.

What can be expected of ER regimes in the future?

One school holds that the benefits of currency blocs – groups of countries using a single currency (probably the U.S.dollar, the Yen, or the Euro) are so overwhelming that the number of independent currencies will inevitably dwindle, perhaps to the single digits. This would simplify cross-country transactions but preclude each country in a bloc from operating an independent monetary and exchange rate policy.

Another school stresses the benefits of a floating ER and independent monetary policy and predicts the continued existence of a large number of national currencies tethered to various nominal anchors. Whether a large number of floating ER currencies remain, or whether they coalesce into a small number of bloc currencies, will have very different implication for businesses, policymakers, and owners of surfboard shops (M.Stone).

3.5) The short-run, medium-run and the long-run in macroeconomic analyses

It may be useful to point out that the expressions short-term, medium-term and long-term (or the short-run, medium-run and long-run) used in theories of exchange rate determination do not indicate the same thing in macroeconomic analyses. In the context of exchange rate determination, the long-run is the period long enough so that the trend of the exchange rate more or less coincided with the path predicted by PPP. In the short-run, exchange rates are asset prices influenced by expectations, determined along with other asset prices such as interest rates by the stock equilibrium in the financial markets. Yet the current account does manage

to have some influence on the exchange rate. First, in the short-run, it influences the exchange rate via expectations. In the medium-run dynamic adjustment process, it changes the stock of foreign assets and affects the exchange rate determined by the stock equilibrium in the financial market. In addition, the exchange rate does show some tendency to move in the direction that would cause CA imbalances to disappear. In other words, the current account explains some of the medium-run divergences from the long-run trend. In macroeconomic analyses, the long-run, medium-run and short-run mean something different. The long-run has a distinct definition in macroeconomic analyses; it is the "steady state" or "stationary state" where all nominal prices move at the same rate and all real variables are constant. We never actually reach such a state. The dynamic variables (variables that are functions of time and change with time) are constant in the short-run, only the directions of their change (differential of dynamic variables with respect to time) are endogenous. All real dynamic variables come to a halt in the long-run stationary state. Each short-run equilibrium corresponds to a given level of the dynamic variable. Short-run equilibrium usually signifies equilibrium in both the real and financial sides of the economy (in contrast to signifying only the asset market equilibrium in the theory of exchange rate determination). One could see the dynamic variable as taking the economy to the new long-run equilibrium by carrying a corresponding short-run equilibrium on its shoulders. The economy is initially in a long-run equilibrium, and then some exogenous change pushes it out of this equilibrium. Dynamic variables begin to change, until the new long-run equilibrium is reached. This adjustment process from the initial steady state to the new steady state is sometimes called the medium-run. Often the rea l stock of foreign exchange is a dynamic variable. It changes through time in response to CA

imbalances. In such a model, the current account is in balance in the long-run steady state (instead of the medium-term as in the theory of exchange rate determination). Another example of a dynamic variable is the stock of capital used in production. A model without such a dynamic adjustment process to the long-run is called a “static model”, and a model with such an adjustment process is called a “dynamic model”. The IS LM equilibrium is often laid out as a static model. If the model incorporates dynamics, IS LM equilibrium is the short-run equilibrium corresponding to each level of the dynamic variable changing through time. The Dornbusch overshooting analysis uses a dynamic model with the price level as the dynamic variable.(S.Kaji)

Conclusion:

This chapter has been addressed into three sections explained the exchange rate and its determinants, It was found that there are several theories about exchange rate determination that explain the measurements of exchange rate changes. Also, the determinants differ according to the exchange rate regime and policy followed by the country.

The first section dealt and focused on the exchange rate with reference to its function and the different types, which identified it. The second section has been allocated the exchange rate regimes and classification, taking in consideration the case of developing countries. The final section provides an overview of theories of exchange rate determination.

Second Chapter

Literature Review

Literature review

Introduction:

The prime focus of this chapter is the review of all literature concerning the subject matter of all literature review is an account that been published by scholar that are accredited. It reviews the critical points of current knowledge and methodological contribution to the subject matter. We will mention them by their historical order.

The evaluation of the relationship between the exchange rate and its fundamentals has been the subject of numerous studies. The majority of these studies have been devoted to explaining and forecasting exchange rate levels.

1) Older Previous Studies:

The first attempts to analyze the behavior of exchange rates were made by Rudiger Dornbusch (1973), Richard Meese (1979) and Kenneth Rogoff (1983). The traditional macroeconomic approach, as it may have been developed by Mundell (1963), Fleming (1962) or Dornbusch (1976), establishes that a restrictive monetary shock leads to a nominal and real appreciation of the currency. The wealth effects model and the portfolio model explain changes in exchange rates by the dynamics of asset accumulation through external imbalances (Kouri 1976, Calvo and Rodriguez 1977 or Bransonet Henderson 1985, or Bleuze and Sterdynaik 1988). In these two models, the aim of the State's intervention is to control the money supply through its monetary policy, while contemporary practices rather consist in fixing the interest rates (PTI) or purchasing power parity (PPP).

Moreover, the models of the new open macroeconomics, which have developed since the 1990s, relying more on the microeconomic characteristics of agents. Dornbusch (1976), explained the abusive instability of exchange rates by the speed of asymmetric adjustment between prices in the goods market and prices in the asset market (monetary and financial).

Drawing on Mundell-fleming's studies, Dornbusch explained that a monetary shock could be a consequence of an over-adjustment of the nominal exchange rate relative to its long-run equilibrium value. Expansionary monetary policy causes nominal depreciation, unlike expansionary fiscal shocks; they are often followed by instantaneous nominal and real appreciation.

Frenkel's model, highlights the interest of real interest rates in the determination of the exchange rate, Frankel demonstrated that the exchange rate has a negative relationship with the interest rate spread and a positive relationship with the inflation rate gap. Moreover, as the PPP is verified in the long term. Mark (1985), suggests that macroeconomic fundamentals, money supply, prices and income levels have an effect on the exchange rate for a period of up to two years. Obstfeld and Rogoff (1995) have shown that the increase in the money supply in the market leads to nominal depreciation. Macroeconomic studies show that a national shock to the currency supply of a country with a strong economy, which can influence the world economy, can lead to a strange decrease in interest rates.

- **TESTS OF THEORIES OF EXCHANGE RATE DETERMINATION**

BRUCE BRIrrAIN 1977

THE PURPOSE OF THIS PAPER is to determine whether monetary factors have been the major source of exchange rate fluctuations since rates were floated in 1972 or whether goods and capital market disturbances

were the major cause. A second purpose is to determine which of the monetary factors contributing to exchange rate change was most important. Was the major source of monetary disturbance variation in short term money market conditions unaccompanied by variation in expectations about the future course of monetary variables? Or were changes in expectations more important?

Tests of these propositions are based on a simple model of exchange rate determination whose general specification was suggested by Dornbusch (1975), and Frenkel (1976). The model formalizes Aliber's (1974) discussion of competing theories of exchange rate change and generates each of Aliber's models as a specific form of the general case.

The empirical tests differ in specification from tests constructed by Bilson (1976) and Arndt and Pigott (1976) who estimate specific behavioral equations. I have attempted to falsify models of exchange rate change by observing relations among changes in spot exchange rates, changes in forward exchange rates and changes in interest rate differentials. I made this choice to exploit the evidence available from Citibank's exchange and interest rate data base that includes daily bid and offered rates for ten currencies with six different contract maturities. This data base covers the period, January 1974 to the present.

The obvious drawback to this approach is that interest rate movements must be assumed to reflect only autonomous movements in money market conditions when, in fact, these changes may be the result of other disturbances. Without this assumption, the empirical results distinguish only between exchange rate change that is expected to be temporary and change that is expected to be permanent. The empirical

results show that monetary disturbances-either of a short term nature or involving changes in the expectations about the future course of monetary variables may be an important source of exchange rate variability. Nonetheless, some of the characteristics of exchange rate fluctuation that are predicted by the monetary models are not present in the data. This suggests that the simple monetary models must be developed further before we have a representative picture of how exchange rates are determined.

- **Fluctuations in the Dollar: A Model of Nominal and Real Exchange Rate Determination**

PETER HOOPER* AND JOHN MORTON* Board of Governors of the Federal Reserve System, USA 1982

This paper develops and estimates empirically a model to explain movements in the dollar's foreign exchange value during the flexible exchange rate period of the 1970s. The design of the model has been influenced significantly by the large fluctuations in real exchange rates observed during that period. The empirical application is to the dollar's weighted average exchange rate against the currencies of ten major industrial countries. The underlying theory, outlined in Section I, draws from both the monetary and portfolio balance approaches to exchange rate determination. We begin with the sticky-price monetary model developed by Dornbusch (1976) and extended by Frankel (1979b) to allow for sustained inflation differentials across countries. The Dornbusch-Frankel model is modified to allow for shifts in the long-run equilibrium real exchange rate and the existence of exchange risk premia.

Shifts in the equilibrium real exchange rate are related to movements in the current account through an expectations mechanism that is consistent with long-run portfolio balance. Unexpected changes in the current account are assumed to provide information about shifts in underlying determinants that necessitate offsetting shifts in the real exchange rate in order to maintain current account equilibrium in the long run.' Current account equilibrium is defined by the rate at which domestic and foreign asset holders wish to accumulate (or decumulate) domestic assets net of foreign assets in the long run, where nominal asset stocks are assumed to be growing in long run equilibrium. The expectations relationship between the current account and exchange rate is distinguished from the more conventional relationship underlying the portfolio balance model, in which (assuming static expectations) current account flows affect exchange rates through their impact on wealth stocks and the currency composition of portfolios across countries.* This conventional relationship is also included in our model, through the specification of the exchange risk premium as a function of factors that affect changes in wealths and asset supplies.

Their empirical results are given in Section II and their conclusions in Section III. The results indicate that real factors were at least as important as monetary factors in causing fluctuations in the weighted average dollar during the 1970s. The equation estimates suggest that the current account affected the exchange rate predominantly through its impact on expectations about the long run equilibrium real exchange rate. This result is substantially a reflection of the period from the end of 1976 to the end of 1978 when the dollar depreciated steadily in real terms as the United

States ran a series of large current account deficits. Although they found no statistically significant evidence of risk premia, the effect of short run private portfolio rebalancing, in principle, would have worked in the opposite direction during that period, causing the dollar to appreciate.

- ***Michael L. Mussa (1984)*** his essay named "**The Theory of Exchange Rate Determination**" develops an integrated model of exchange rate behavior that synthesizes many recent and older contributions to the theory of exchange rate determination. Since the task of exchange rate theory is to explain behavior observed in the real world. He clarified the existence of a great deal more to be done in this area. The optimum currency area literature is basically concerned with the same question from a normative point of view.

  He suspected that we had to abandon simple rational expectations concepts as we addressed these questions and recognized diversity of views, and imperfect information which did not permit knowledge of the model or of the expectations of others. We must analyzed how alternative market arrangements utilized information, transmit it between individuals, and in the process help them to form a more coherent view of their environment. In saying this, he is obviously indebted to Roman Frydman.

  Finally, he add that we have more or less exhausted the implications of the portfolio balance model. We need to move on from postulated asset demand and supply functions to a more careful consideration of the structure of financial assets, and of other arrangements that facilitate exchange and mediate between borrowers and lenders. My contribution to the Hawkins-Levich-

Wihlborg volume is a first step in this direction. The work of Lucas, Helpman, Razin, Svensson, Stockman, and others should also be mentioned in this context. Toward this end, much more empirical work needs to be done on the nature of financial intermediation between different countries.

He summarized that, work on exchange rates is not finished. We need much less advocacy of simple-minded notions and much more painstaking, time-consuming work. He expect that such work will ultimately turn us against the current system of flexible exchange rates in favor of a more orderly monetary system.

- **REAL AND MONETARY DETERMINANTS OF REAL EXCHANGE RATE BEHAVIOR**

Theory and Evidence from Developing Countries*

Sebastian EDWARDS University of California, Los Angeles, CA 90024, USA National Bureau of Economic Research, Cambridge, MA 02138, USA 1988

The purpose of this paper has been to analyze RER behavior in developing countries. For this purpose, the paper started with the presentation of a dynamic model of a small open economy with a dual exchange rate system. The model, although highly stylized, provided a number of important testable implications. The aim of the empirical part of the paper was to analyze whether, as the theoretical model suggests, real exchange rate movements have historically responded to both real and nominal disturbances. In order to carry out the analysis an equation for real

exchange rate dynamics was postulated. This equation captures in a simple and yet powerful way the most important features of our theoretical analysis: (1) discrepancies between actual and equilibrium real exchange rates will tend to disappear slowly if left on their own; (2) nominal devaluations are neutral in the long run, but can be potentially helpful to speed up the restoration of real exchange rate equilibrium; (3) macroeconomic disequilibria affect the real exchange rate in the short run; (4) the long-run equilibrium real exchange rate responds to changes in fundamentals. In addition, the model provided us with a list of such fundamentals and the way in which they affect the equilibrium real exchange rate.

This dynamic equation was estimated using pooled data for a group of 12 countries. The estimation was done using a fixed effect procedure with country specific fixed terms. The results obtained provide broad support for the model of section 2. In these countries short-run real exchange rate movements have responded to both nominal and real disturbances. In particular expansive and inconsistent macroeconomic policies have inevitably generated forces towards real overvaluation.

The estimation also indicates that the autonomous forces that move the RER back to equilibrium operate fairly slowly, maintaining the country out of equilibrium for a long period of time. These results, in fact, indicate that if a country is indeed in disequilibrium, nominal devaluations can greatly help to speed up the real exchange rate realignment.

This analysis can be extended in several ways. One of the most interesting directions is related to estimating indexes of real exchange rate misalignment and, in turn, to use those indexes to investigate whether real

exchange rate disequilibrium has indeed been associated to poorer economic performance. A possible - and rather simple - way of doing this is the following. First, from the estimation equation the coefficients of the long-run equilibrium real exchange rate equation can be obtained. Second, using estimated equilibrium 'sustainable' values of the fundamentals, estimated equilibrium RERs can be generated for each country. Third, RER exchange rate misalignment can then be defined as the difference between these estimated equilibrium RERs and actual RERs. Fourth, average indexes of RER misalignment can then be calculated for each country. Finally, these average indexes of misalignment can be used to estimate whether it has been the case that countries exhibiting larger misalignments have performed worse, with other things given, than those countries with the smaller degree of RER misalignment. This last step can be performed using cross-country regressions analysis.

2) Studies of the 1990's:

- ***Pierre-Richard Agenor (1990)*** in his IMF working paper named "**Parallel Currency Markets in Developing Countries: Theory, Evidence, and Policy Implications**" reviewed theoretical and empirical developments in the analysis of informal currency markets in developing countries. The basic characteristics of these markets were highlighted, and alternative analytical models to explain them were discussed. The implications for exchange rate policy --including imposition of foreign exchange restrictions, devaluation, and unification of exchange markets-- in countries with a sizable parallel market were also examined.

  He stated that there are some general policy implications that emerge from the present Literature (at that time before the A990's). Exchange and trade restrictions were largely Ineffective as long-term policies to maintain the viability of an (overvalued) exchange rate or to "impose" balance of payments adjustment. In these circumstances, the emergence of parallel exchange market is a normal outcome. Although "socially beneficial" In some aspects, parallel currency markets generate a variety of costs. In particular, they increase the potential to avoid the Inflation tax on domestic cash balances. Furthermore, unofficial exchange rates have a substantial impact on domestic prices, and play an important role in the transmission mechanism of macroeconomic policies. Permanent unification of official and parallel foreign exchange markets cannot be achieved by attempting to eliminate the spread via devaluation of the official exchange rate alone. Such a policy is also inherently inflationary. Attempts at exchange market unification by

floating the currency are likely to be accompanied by an inflation burst, which results not so much from the depreciation of the official exchange rate (since prices will have already reflected the more depreciated parallel rate), but rather from the loss of the implicit tax on exports upon unification. To be successful, unification must be accompanied by a relaxation of exchange restrictions and by supportive financial policies.

- ***John T. Harvey (1991)*** in his article titled **A Post Keynesian View of Exchange Rate Determination**. He explained through his presented model, all the salient features of the post-Bretton Woods float, especially short-run volatility and medium-run misalignment. It makes use of uncertainty, historical time, and irreversible decision making, and shows these to be important features of the real world. But one element is lacking: empirical verification. While the nature of the short-run determinants may be such that they do not lend themselves to statistical testing, it may be possible to examine the medium-run determinants. Until this work is begun, however, perhaps the above model offers a starting point for a Post Keynesian theory of exchange rate determination.

- ***Justin Tevi (1996)*** stated in his study named: "**A LONG-RUN MONETARY MODEL OF EXCHANGE RATE DETERMINATION FOR GHANA**", that The problem of Ghana is that there was an apparent absence of a valid framework for analyzing exchange rate movements in Ghana This problem was reflected and reinforced by the Ghanaian monetary authorities use of what could be termed an ad hoc approach to formulating exchange rate policy. An ad

hoc exchange rate approach is demanded as one, which draws on several aspects of exchange rate theories without an explicit reliance on any particular theoretic mode1 appropriate to Ghana's economic conditions. This means that exchange rate policy in Ghana is formulated on an eclectic basis by drawing on different aspects of the variety of exchange rate theories identified in the literature. For example, in order to improve Ghana's extremal accost, the government devalued the Cedi in 1983.

In his research, the Ghanaian economy is examined with respect to fiscal, monetary and exchange rate policies to establish its basic characteristics. An in-depth review of the theoretical underpinnings of the monetary models is presented. Additionally, the tenability of the assumptions of the monetary models for Ghana is evaluated. The empirical evidence suggests that the use of the sticky price monetary mode1 is more appropriate. This thesis reports the existence of co-integrating relationships among the exchange rate, and the monetary variables in the case of Ghana.

He came out with several important results emerged from his study. As a preliminary step for testing for long-run relationships between the exchange rate and the monetary variables, the short-run dynamics of the exchange rate is modified using an ECM. The results of the ECM revealed that real incomes impact significantly on the exchange rate adjustment in the short-run whereas, relative money supplies, interest rates and inflation rates have less significant effects on short-run adjustments in the exchange rate. The coefficient of the error correction

term indicates a fairly hi& speed of adjustment of the actual to the equilibrium exchange rate. Additionally, the sequential Chow and CUSUMSQ tests show that the ECM is relatively stable for most of the time. The co-integration results provide concrete evidence that there is one statistically significant co-integrating vector between the exchange rate and domestic and foreign money supplies, real income, short-term interest rate, and the inflation rates in Ghana. In his research suggested that the sticky price monetary model could explain long-run relationships between the exchange rate, and the monetary variables in Ghana.

He cited that the finding of the co-integrating vector is consistent with the findings of other researchers notably, McNown and Wallace (1994) who applied the model to Chile, Argentina and Israel, and Hendrik and Jayanetti (1993) who tested the long-run validity of the model for India and Sri Lanka.

Through his findings of the research paper, he made some suggestions: (1) the model provides a plausible description of the long-nm equilibrium exchange rate; (2) the equilibrium exchange rate is not strongly linked to the underlying instruments of monetary policy (money supply and interest rates) in the short-run, but is directly linked to them in the long-m. The sticky price monetary model may therefore serve as a useful reference in the formulation of long-run exchange rate policy for Ghana; and (3) non-monetary factors such as speculation may be important in explaining short-run exchange rate behavior.

3) Latest Previous Studies

3.1) From 2000 up to 2010:

- ***I.Martinez-Zarzoso and F.Nowak-Lehmann (2003)*** analyzed which are the determinants of Mercosur-European Union trade flows and to forecast trade potentials between the two blocs. With this aim, they applied a gravity model to annual bilateral exports between 20 countries: Mercosue+Chile and the 15 current members of the EU.

  Their results showed that exporter and importer incomes, as expected, had a positive influence on bilateral trade flows. Income elasticities were close to unity as predicted by the theory. Exporter population had a large and negative effect in exports showing a positive absorption effect, whereas importer population had a large and positive effect on exports, indicating that bigger countries import more than smaller countries.

  They investigated the role that infrastructure variables, income differences and exchange rates played as explaining bilateral trade flows in a panel data framework. This framework, which allowed for trading-pair heterogeneity, was shown that statically superior to the standard model. Their findings supported the hypothesis of the importance of these variables since they were all statistically significant and presented the expected sign, part from the importer infrastructure variable that was not significant. Their results concerning infrastructure might have some important implications for economic policy. Viewing infrastructure as an international public good rises the question of how the cost of infrastructure should be shared between trading partners. For

Mercosur-EU trade it seemed that only exporter infrastructure fostered trade, therefore, investing to improve the trading-partner infrastructure appeared not to have spill-over benefits for the investor.

When testing intra-bloc trade effects, both preferential dummy variables presented a positive sign and were statistically significant, suggesting that belonging to one of the two preferential arrangements fostered trade. However, since in their study they were not considering the difference between trade creation and trade diversion (Endoh 2000), these results have to be taken with caution.

With reference to potential trade estimates, their results showed that the potential for Mercosur exports exceeded the actual export value in 1996 for each single country, but in previous years, they observed a mixed picture. This could be interpreted as a positive starting point for the future trade liberalization arrangements between both blocs on the side of Mercosur.

- ***Bouteldja & Benbouziane (2006)*** aimed through their paper is give a theoretical background of the movement of exchange rates and the role of news. The first section showed how exchange rates have been volatile during the last sixteen years.. The second section put into perspective the relationship between exchange rates and national price levels, whereas the third section considered the relationship between exchange rates and interest rates. The implementation of 'News' to the (Efficient Markets Hypothesis) EMH framework is discussed in section four, then it should be more appropriate to implement exchange rate models. In this section, the attempt was to build a model of exchange rate determination as a news format into the EMH framework. Thus, the

research is carried out for both monetarist and portfolio balance theories, in order to explain the behavior of each variable within the model taken. They concluded, in section five, showing how cointegration technique could be used for testing the long run equilibrium relationship in exchange rate determination models.

The poor performance of exchange rate models to explain exchange rate behavior, concerning this high volatility and variability, has raised many questions about the reasons for this failure. To some extent, this failure is due to the imperfect foresight of stances of monetary and fiscal policies and, of the consequences of those policies for inflation rates, interest rates, and other economic conditions. Another explanation that may have caused exchange rate movements, could be "news" that would not have been anticipated, since the new information plays a predominant role in determining the exchange rate pattern. In addition, the statistical tests that have been used indicated that the explanatory power of exchange rate models has been extremely poor during this period.

- ***Bouatrous & Kara (2007)*** claimed in their research named "**the impact of changes in the exchange of the euro against the dollar on the Algerian economy"** that the improvement in the exchange rate of the euro against the US dollar at the level of international financial markets emerged effects not only on the European economies themselves, but on the economic partners of the European Union countries, including Algeria, which depend in evaluating its debts and all its financial and commercial transactions on the two currencies together.

They stated that the negative effects of the fluctuation of the value of the euro, starting from May 2003, on the Algerian economy remained relatively limited due to the exchange reserves that Algeria possessed, which were acceptable on the one hand, resulting from the improvement in oil prices in the international market. Which is a non-controlled internally variable in most cases, and because of the policy adopted by the Bank of Algeria in the area of managing this reserve of foreign exchange. However, it is based on the US dollar on the other hand, which enabled it to contain this change in the international exchange markets, especially those related to the euro and the dollar.

- ***Eduardo et al (2010)*** provided empirical evidence supporting the validity of both short and long run versions of the Monetary Approach of Exchange Rate determination for the Mexican peso–U.S. dollar exchange rate from 1994 to 2007 using a cointegrated SVAR model. They estimated not only the long-run relationship, between the variables of the monetary model for the exchange rate, but also the very short run effects which have been often ignored in previous empirical work. they showed that there are robust short and long-run relationships between the Mexican monetary aggregates and the exchange rate, which ultimately responds to what Bilson's variant of MAER predicts.

  The empirical evidence derived from the estimation of a cointegrated SVAR for the Mexican economy (1985.1–2007.4) showed that the peso-USD exchange rate fluctuations depend on the fundamentals in the direction suggested by MAER. Specifically, they provided empirical evidence supporting the validity of both short and long run versions of the monetary approach of exchange rate

determination (MAER) for the peso-U.S. dollar (USD) exchange rate from 1994 to 2007 using a cointegrated SVAR model. They claimed that the empirical approach allowed to estimate not only the long-run relationship, between the variables of the monetary model for the exchange rate, but also the very short run effects which have been often ignored in previous empirical work on the topic. The results showed that there are robust short and long-run relationships in the monetary model for Mexico and that exchange rate movements in the nominal exchange rate ultimately respond to fundamental shocks as Bilson's variant of MAER predicts.

3.2) From 2010 up to 2015

- ***Saeed et al (2012)*** their study undertook an econometric analysis of determinants of exchange rate for US Dollar in terms of Pakistani Rupee within the framework of monetary approach. They used monthly data from January 1982 to April 2010 for Pakistan relative to USA to examine the long run and short run behavior of PKR/USD exchange rate and relationship of exchange rate behavior with relative monetary variables. Stock of money, foreign exchange reserves and total debt of Pakistan relative to United States along with Political instability in Pakistan as a dummy variable were taken as determinants of PKR/USD exchange rate during the managed floating regime in Pakistan. They applied ARDL approach to co-integration and error correction model. According to the results, they confirmed that stock of money, debt and foreign exchange reserve balance all in relative terms are significant determinants of exchange rate between Pakistani Rupee and US Dollar.

Moreover, Political instability has a significant negative effect on the value of domestic currency.

- ***Mirchandani (2013)*** investigated in her study various macroeconomic variables leading to acute variations in the exchange rate of a currency. She attempted to review the probable reasons for the depreciation of the Rupee and analyzed different macroeconomic determinants that have impact on the volatility of exchange rate and their extent of correlation with the same. The researcher found that Indian Rupee has shown high volatility and that because India was receiving capital inflows even amidst continued global uncertainty in 2009-11 as its domestic outlook was positive. With domestic outlook also turning negative, Rupee depreciation was a natural outcome. Apart from lower capital inflows, uncertainty over domestic economy has also made investors nervous over Indian economy, which has further exaggerated depreciation pressures. She expected the Rupee remained highly volatile**.**

- ***Djouadi (2013)*** undertook in his study the management of the Algerian dinar exchange rate in light of the external economic shock to the euro and the dollar. He claimed that Algeria, since independence in 1962, has achieved economic booms compared to its counterparts from developing countries. Especially, at the level of monetary policy, but despite this, Algerian foreign trade constitutes a cumbersome obstacle to the stability of the state's general economic situation and monetary policy in particular, because of the severe impact caused by the exchange rate of the Algerian dinar against the euro and the US dollar fluctuations, which is called the external shock of the exchange rate.

For example, in 2009 and with the outbreak of the Greek debt crisis and the European Union affected by it, and due to the decline in the value of the US dollar in 2009 by about 0.08 cents against the euro than it was in 2008. Algeria lost about 30 billion dollars, which is nearly half of its oil revenues (i.e. that represents more than 65% of the total state revenues), and the total deficit in the general budget reached approximately (- 9.76% in 2009 after it exceeded (+ 13.5%) as the 2008 surplus. Furthermore, The trade balance has also declined from a surplus of more than 40 billion dollars in 2008 to less than 8 billion in 2009, and this critical economic positioning of Algeria between the exchange of the dollar and the euro rates hinders the independent development that Algeria has sought since the independence of the state in 1962.

- ***Boucheta* (2014)**: The objective of his research is to seek an exchange rate of reference for the Algerian economy. To achieve this goal, he initially approached the theoretical basis of the exchange rate to define its determinants, and then he addressed the exchange rate policy in Algeria and the economic situation to see if there is compatibility between the exchange rate policy adopted by Algeria and its economic policy. In a second step, he proposed to address the appropriateness of using the theory of "Dutch disease" to analyze the phenomenon of deindustrialization, which characterizes the economic trajectory of Algeria in recent years. Hence, the major interest lies in MDD how mobilized the analytical tools to understand the effects of a boom in resource allocation, the factorial distribution of income and the real exchange rate. Next, he tried to determine a real exchange rate

equilibrium of the Algerian dinar using cointegration techniques to search if there is a long-term relationship between exchange rates and fundamentals of Algerian economy.

For this purpose, he applied theoretical model to the Algerian economy using ECM models: the model of Edwards. He has completed his study by proposing an econometric model.

3.3) From 2016 up to 2020:

- ***Daoudi & Ghettas (2016)*** tried in their study to recognize which macroeconomic variables that affect the Algerian dinar in the short-run and the long-run. For this aim, they used an annual data of Algerian macroeconomic during the period from 1970 to 2011 to build a VAR model of Algerian dinar determinations. Their model was based on cointegration test, Error Correction Model (ECM) and Granger causality test. The results of their study showed that there was a positive impact but weak for each of government expenditures, oil prices and real GDP. Also, there was a negative impact but weak foe each of FDI and trades openness.

- ***Tabache & Chetbani (2016)*** measured the exchange rate, and estimated the relationship between the Algerian Dinar exchange rate and a number of macroeconomic variables during the period 1993-2041. They adopted in their study the Multiple Leaner Regression model. The most important result indicated that the exchange rate affected by a set of economic variables. A 1% increase of GDP leads to decline exchange rate by 0.695%, 1% increase of money supply leads

exchange rate to rise by 0.289%, 1% increase in trade opening leads to increase exchange rate by 0.301%, and 1% increase of trade exchange cause 0.256% increase of exchange rate.

- ***Bensmina & Rezki (2016)*** tried in their research to identify the impact of the US dollar fluctuation on Algerian foreign trade in light of oil price volatility.

since Algeria uses both «euro» and «dollar» in settlements of its trade, the exchange rate between them affect its external (foreign) trade, that's why it was addressed to study the impact of «dollar» volatility as an exchange rate against the «euro» on Algerian exports and imports and also on trade balance, this is in light of the fluctuation of oil prices.

As observed, the lack of integration of Algerian exports, which makes the country's economy highly vulnerable to economic crises. Especially, since Algeria's exports are denominated in the dollar and its imports are done in the euro, which makes the exchange rate policy in Algeria not greatly affect trade transactions with the outside world. That is why their study focused on the changes in the exchange rate of the dollar against the euro on these exchanges instead of the fluctuation of the exchange rate of the dinar against other currencies.

- ***Lebbaz (2016)*** in his paper research entitled "**The path of the exchange rate policy in Algeria**" aimed to track the Algerian dinar exchange rate policy from the date of issuance of the national currency in April 1964 until December 2015, and standing on the most important features of the followed policies in determining the value of the Algerian dinar.

His study has started with a theoretical part of which he checked the most important concepts related to the exchange rate like policies, theories and systems in order to provide the theoretical base allowed a deeper understanding of the phenomena interpreted the exchange rate, and then project it of Algeria case. Then he has devoted the second part to study the track of exchange rate policy in Algeria with some analysis, he kept track the most important measures and reforms that have defined the exchange rate policy and their most important effects on the Algerian dinar.

The study was concluded by a set of recommendations and suggestions that aimed primarily at achieving the basic conditions to float the currency in order to reach an acceptable level of liberation, as well as procedures that deepen and raise the efficiency of the exchange market in Algeria.

- ***Mekhnane.O & Mekhnane.A (2017)*** determined and evaluated the economic variables that influence the exchange rate in Algeria during the period 1990 - 2014, by estimating the model to measure the impact of macro-economic variables on the exchange rate, and between the explanatory variables that were used in the study, we find exports, imports, interest rates, inflation rate and GDP. They used Multiple Leaner Regressive (MLR).

- ***Saadi & Derbal (2018)*** tried to identify the impact of changes in the Euro-Dollar exchange rate on the exchange rate policies in the Maghreb countries during the period from 2000 to 2015. Especially as these countries have signed agreements with the EU in the framework of the

Euro-Mediterranean Partnership, which increased the terms of trade between them, the study revealed a positive relationship between the euro and the Moroccan dirham and the Tunisian dinar. Whereas, in the case of Algeria the results of the econometric study showed that the effects of fluctuations of the euro is limited because it has a significant amount of foreign exchange reserves at that time due to the rise of oil price in the international markets.

- ***Alioui (2018)*** identified the main determinants of real exchange rate in Algeria from 1974 to 2013 by applying El badawi's (1998) model which include (the real effective exchange rate, terms of trade , openness and foreign exchange reserves) to the Algerian dinar using a Vector autoregressive model 'VAR'. Her results showed that movement in terms of trade and openness were very important in explaining the real effective exchange rate in Algeria.

- ***Boufellioun & Lanseur (2018)*** identified the determinants of exchange rates in Algeria from 1968 to 2016. They applied an estimation model Vector Error Correction model (VECM). The chosen variables were the gross domestic product, the rate of inflation, the money supply; the interest rate; the trade balance and the foreign exchange reserve. They claimed in their results that the exchange rate is determined by, the money supply, the trade balance and the foreign exchange reserve.

- ***(Medjnah, 2019)*** determined determinants that affect the exchange rate. He analyzed the effect of economic variables on the exchange rate (exports, imports, interest rate, inflation rate, GDP) during the period from 1990 to 2O15. He applied the Autoregressive Distributed Lag (ARDL).The study concluded that there was a long-term equilibrium relationship between the exchange rate and the other macroeconomic variables in the study.

- ***Bouchemal.M and Homida.M (2020):*** The objective of thier study is to learn about the development of foreign exchange reserves in Algeria and to show the effect of foreign currency reserves on the exchange rate of the dinar / dollar in Algeria during the period 1990-2019, To study and describe the relationship between the variables of the study, they applied an analysis using the basic compounds (APC), To achieve this goal, the stability of the time series was examined through the application of the Dicky Fuller test. The Johannes method was used to test a long-term stable relationship, and through the tests the results showed the existence of the integration of the joint between these two variables, that is, there is a single long-term relationship between the reserve cash and the exchange rate in Algeria.

Conclusion:

Many researchers and scholars from a wide range of nationalities have been increasingly interested in the relationship between ER movements and their influence on trade performance and BoP. This topic is currently one of the "crucial topics" in the field of trade and finance. However, the focus of the existing studies on the developed countries and the lack of consensus among researchers about the impact of ER volatility on the growth of international trade performance and the position of BoP raise the question the question whether or not the already found results could be applied to the developing countries such as Algeria.

This chapter dealt with the previous studies concerned the same field of our study with an illustration of their applied methods and the results of their findings. We will continue in the next chapter with our empirical evidence.

Third Chapter

The Empirical Study

The Empirical Study

Introduction:

Algeria dependence on hydrocarbon in its exports, the high volumes of its imports and its managed floating ER system are issues to tempting to conduct an empirical study, which investigates the relationship between the exchange rate and its determinants.

It is also our intention in this study to explore the impact of the dollar and the euro on the dinar.

For that purpose, we divided this chapter to many sections, which will deal first with an overview of Algeria's exchange policy. Second it reveal the evolution of exchange rate determinants during the period of study (1999-2018). Then, we deal with an empirical study by applying Todo-Yamamoto causality approach and applying SVAR model to analyse the impact of the dollar and the euro on the dinar using E_Veiws software, where we interpret the results.

Finally, I will discuss our findings and results, also some recommendations have been given.

1) Overview of Algeria's exchange Policy and Exchange Rate :

1.1) Algerian Exchange Policy:

Exchange policy has objective s how to determinate exchange rate of national currency. The exchange rate is the price at which one currency can be exchanged against another. The monetary value of the most common is the bilateral exchange rate quoted by market operator or exchange published by a newspaper. The bilateral exchange rate of the Dinar/Dollar was fixed at 4.49 in 1974 was jump up in 2000 to 83.

Assessing the value of a currency on the foreign exchange market by studying one or more bilateral exchange rates, can be deceived in the same way that estimating the general price level considering only the price of one or several baskets product. As any index, the bilateral exchange rate of a currency can be combined in various ways to construct an index of effective exchange rate. Policies establishing the exchange regulations of the national currency have known four main phases:

1.1.1) From 1961 to 1978:

After independence, Algeria was attached to France. The currency was freely convertible and transferable. Unfortunately, after the massive capital flight and imbalance in the balance of payment, monetary authority instituted in 1963, the exchange control on all transactions with the rest of the world.

This change has been accompanied by various measures to control foreign trade, for example: the quota of foreign trade, the creation of the National Board of Trade, the control of all operations of export and import.

These measures were followed in April 1964 by the establishment of the national monetary unit "Algerian dinar" whose value was set at 180 mg of fine gold. The Algerian dinar (DA) has replaced the new franc (NF) for parity 1DA=1NF. With regard to other currencies were valued on the basis determines the rate of the dinar is equivalent with the French franc as part of the Bretton Woods system[1].

The disadvantage of this system appeared as soon as the devaluation of the French franc relative to the U.S.dollar in August 1969. This led to a decline in the value of the Algerian dinar for other major currencies, and to the collapse of the Bretton Woods[2]. As a result, most states have initiated their currencies to float, and the withdrawal of gold trading of the global market. Algeria as not in isolation from the events was necessary to review the exchange rate policy in the year 1973 (A.Mokrani).

For political reasons, Algeria has decided to attach the value of his currency to a basket of currencies selected according to its important trading partners. The value of the dinar is administratively determined based on changes in the basket of currencies. The price of each currency is assigned by weighting coefficient giving the importance of external trade expressed in the same currency. Through the table below, we try to show the important currencies in the basket, and the weight coefficient of each currency:

[1]/ The Bretton Woods system was a international monetary framework of fixed exchange rates after World War II. Drawn up by the U.S. and Britain in 1944. It created the International Monetary Fund (IMF), as well as the International Bank for Reconstruction and Development (IBRD), a precursor for the modern World Bank.

[2] / The Bretton Woods system ended on August 15, 1971, when President Richard Nixon ended trading of gold at the fixed price of $35/ounce

Table (III.1): The basket of currencies in 1973.

Currency	%
U.S Dollar (USD)	40.15
French Franc (FRF)	29.2
German Mark (DEM)	11.5
Italy (ITL)	4
Pound £ (GBP)	3.82
Belgian Franc (FB)	2.5
Swedish Franc (CHF)	2.25
Spanish Albezitas (ESP)	2
Dutch Alfloren (NLG)	1.5
Canadian dollar (CAD)	0.75
Danish Alcorcon (DKK)	0.2
Norwegian Alcorcon (NOK)	0.1
Austrian schilling (ATS)	0.5
Swedich Alcorcon (SEK)	1.5

Source: central Bank of Algeria.

From the table above we notice that the U.S Dollar was assigned a relatively large weight equalizes 40% , due to its importance in hydrocarbon export receipts (about 95% of national export revenue from hydrocarbon, which is evaluated by U.S dollar in international market) and debt-services payments—with adjustments taking place from time to time. Then French Franc about 29%.

The attachment of the dinar to a basket of currencies, offers the advantage of stabilizing the nominal effective exchange rate, but leaves a variability bilateral price against the currencies in the basket this will increase the risk of changes to decision maker.

1.1.2) From 1978 to 1988

This stage is characterized by the implementation of a new management system for public companies, including the Socialist Management of enterprises (GSE), the general statute worker (TMS) and the lunch of economic development plans. The aim is to stimulate productive investment and facilitate foreign trade operations. Many legal texts came to regulate investment.

This period is marked by the total monopoly of the state on the economy. All productions operations and marketing offices are confided to the state. Legal texts have set the terms of access to foreign exchange market.

All imports registered under the monopoly are subject to GIA (Global Import Authorization) and any product is not in this context requires an import license.

The public and private enterprises cannot benefit from the retrocession of the foreign currency generated by their activities with the rest of the world, with the exception of the mixed-economy companies; the amount of retrocession is fixed at 20%.

1.1.3) From 1988 to 1994

The events that have shaken the Algeria in 1988 have given birth to a beginning of a break with the socialist mode of management. As well as new reforms to economic and legal character came, give a new breath to the Algerian economy, among as:

- ✓ The law on the autonomy of enterprises (1988).
- ✓ The law on currency and credit (1990).
- ✓ The law on the price.

The objective of these new reforms was to break with the monopoly of the state on foreign trade, to rehabilitate the private companies, to gradually provide management autonomy to public enterprises for their permit to operate a good transition to a market economy, finally to ensure the autonomy of the Central Bank in relation to the Public Treasury.

The reforms recommend: that private firms can access the official exchange market through the chamber of commerce, 1991 the lunch of a partial convertibility (current account), the realization of full convertibility in 1993.

1.1.4) From 1994 till Now

Access to the official market of exchange is made possible by the IMF to all economic operators (public or private) following the signature by the Algeria in 1994 of a first agreement on the rescheduling of a portion of its debt. The exchange rate regime of this period is a system of managed floating. The exchange rate varies according to supply and demand of the market for interbank exchange.

In other words, it is freely determined according to the law of supply and demand for foreign currency on the interbank foreign exchange market, which has been established by a regulation of the Bank of Algeria in December 1995. On the legal plan this market is defined as:"the place where the banks and financial institutions negotiate freely of operations for the purchase of sale currency against the national currency, for their account or for their client".

The determination of exchange rates of dinars is based on the offer and the demand for foreign exchange. The supply of foreign currency on the interbank foreign exchange market comes from:

- ✓ Of the interventions of the bank of Algeria , during the operations for purchase of national currency.

- ✓ On the part of export earnings non-hydrocarbon, that any exporter resident in Algeria is required to surrender against the national currency;

- ✓ Of the financial credits or borrowing in currency, contracted by the banks and financial institutions for their account or for their customers;

The demand of foreign currency on the interbank market is used to cover the common operations of banks and financial institutions as well as those of their customers. These operations are limited to funding operations that require the non-hydrocarbon, to the coverage of imports and the payment for the services of external debt. The market for interbank exchange of the dinar consists of two compartments: the first is the foreign exchange transactions in cash and the second the foreign exchange transactions in the long term.

Nowadays, the market of interbank exchange of dinar remains incomplete. Although the market for foreign exchange transactions had been planned in the regulation of the Bank of Algeria in 995, but the market still unfindable. Thus, in this market, there are no derivative products. This shows well the under development of the Algerian banking system.

We can summarized the mission of the Bank of Algeria in the following points:

- ✓ It must monitor the operation of the interbank market;
- ✓ It must ensure the regulatory compliance of operations for the purchase and sale of foreign currency;
- ✓ It must continuously ensure compliance with the prudential ratios of the various banks that occur on the foreign exchange market.

Concerning the operation of the market for interbank exchange, currently interbank exchange supposed to operate continuously, n other words, the exchange rate for the dinar can vary instantly. Contrariwise, before restoration of interbank exchange market, the exchange rate for the dinar was determined, following the fixing for a period of one week. However, the Bank of Algeria can intervene in the revenue of hydrocarbon levels to avoid the exchange-rate undesirable. The convertibility of the dinar is regulated and limited to only operations of the current account and the payment of expenses of health and education, when these two operations are carried out abroad.

1.2) Overview of Algerian dinar:

The management of exchange rate has been a critical issue for the economic policy and researchers, especially in developing countries. Until the end of the Bretton-Woods system in 1973, from January 1974, the exchange rate of the Algeria dinar was pegged to basket of currencies.

The substantial appreciation of the U.S Dollar during the first half of the 1980s led to a strong rise in the real value of the Algeria dinar (of about 50% during 1980-85), thus undermining the competitiveness of the non-hydrocarbon, sector and stimulating imports.

In 1986, Algeria's economy experienced the reverse oil shock, and the government responded to the dramatic erosion of export revenue by borrowing abroad and intensifying import restrictions. In parallel, the Bank of Algeria let the Algeria dinar depreciate against the basket by 31% between 1986 and 1988 (Y.Guechari).

Restrictions imposed on the allocation of foreign exchange accompanied by policies of import quota increased demand for foreign exchange in the informal market, driving the parallel market premium to about 400%.

This rigid system was replaced in 1988 by a system of foreign exchange allocation to the five public commercial bank within a part of an attempt to realign domestic relative prices and increase openness, the Bank of Algeria let the dinar depreciate by more than 100% to DZD 22 per USD.

During 1991-94, the rate of nominal depreciation average 4% annually, bringing the value of the Algeria dinar to about DZD 24 per USD on the official market. This relative stability of the nominal rate did not correspond to economic fundamentals: adverse terms of trade shocks and expansionary fiscal and monetary policies resulted in inflation being persistently higher than in Algeria's trading partner. The Algeria dinar, therefore, appreciates by 50% in real terms between October 1991 and end-1993.

In 1994, the authorities put in place an adjustment program. One of the immediate objectives of the program was to correct the previous real appreciation of the Algeria dinar. Along with broad trade liberalization measures, including on trade-related payments, a two-step devaluation of the Algerian dinar (in total 70%) took place between April and September 1994. The spread between the parallel market and official exchange rate fell to about 100% during this time. In 1995, the managed float regime was implemented through fixing sessions between the Bank of Algeria and commercial banks (see above).

Between 1995 and 1998 the REER[3] appreciated by more than 20%, followed by a depreciation of 13% between 1998 and 2001; Following 16 months of real depreciation since early 2002, due to the appreciation of the Euro against the U.S.Dollar, the authorities intervened in the foreign exchange market in the second half of 2003, the Algerian dinar to realign the REER to its end-2002 level instead of its end-1995 level; between June and December 2003, the Algerian dinar depreciated against the U.S.dollar by 11.5% and the REER depreciate by 7.5%. between February 2004 and December 2007, the Algerian dinar depreciated further more against U.S.dollar. the Bank of Algeria continues to operate a managed float of the Algerian dinar. The main aim is to maintain exchange-rate stability particularly with the U.S.dollar and the Euro. To curb the rising inflation, Bank of Algerian allowed the currency to appreciate against the dollar during 2008 when it average DZD 65/USD1. Since then they have allowed the currency to depreciate to around DZD73/USD1 to reduce the demand for imports.

It is in such a context of volatility of exchange rates of major currencies as of May 2013 that the average price of dinar versus the U.S. dollar experienced a depreciation of 2.66 % for the first nine months compared to the same period of 2012, rising from 77.0781 in 2012 to 79.1291 in 2013, after an appreciation in 2012. At the same time, the average exchange rate of dinar versus euro for the first nine months of 2013 depreciated by 2.09 % compared to the same period of 2012, rising from 102.082 in 2012 to 104.2136 in 2013.

[3]/ Real Effective Exchange Rate.

In total, due to the depletion of the inflation differential between Algeria and its fifteen (15) main trading partners to a level of 3.35% in September 2013 versus 6.23% in December 2012 and due to the increase in relative prices, the real effective exchange rate of the dinar depreciated only by 1.72% on average in the first three quarters of 2013 compared to the same period of 2012. Despite the situation of deficit of the balance of payments that marked the period under review, the real effective exchange rate of the dinar remains appreciated by about 5% through September 2013 compared to its equilibrium level determined according to the fundamentals.

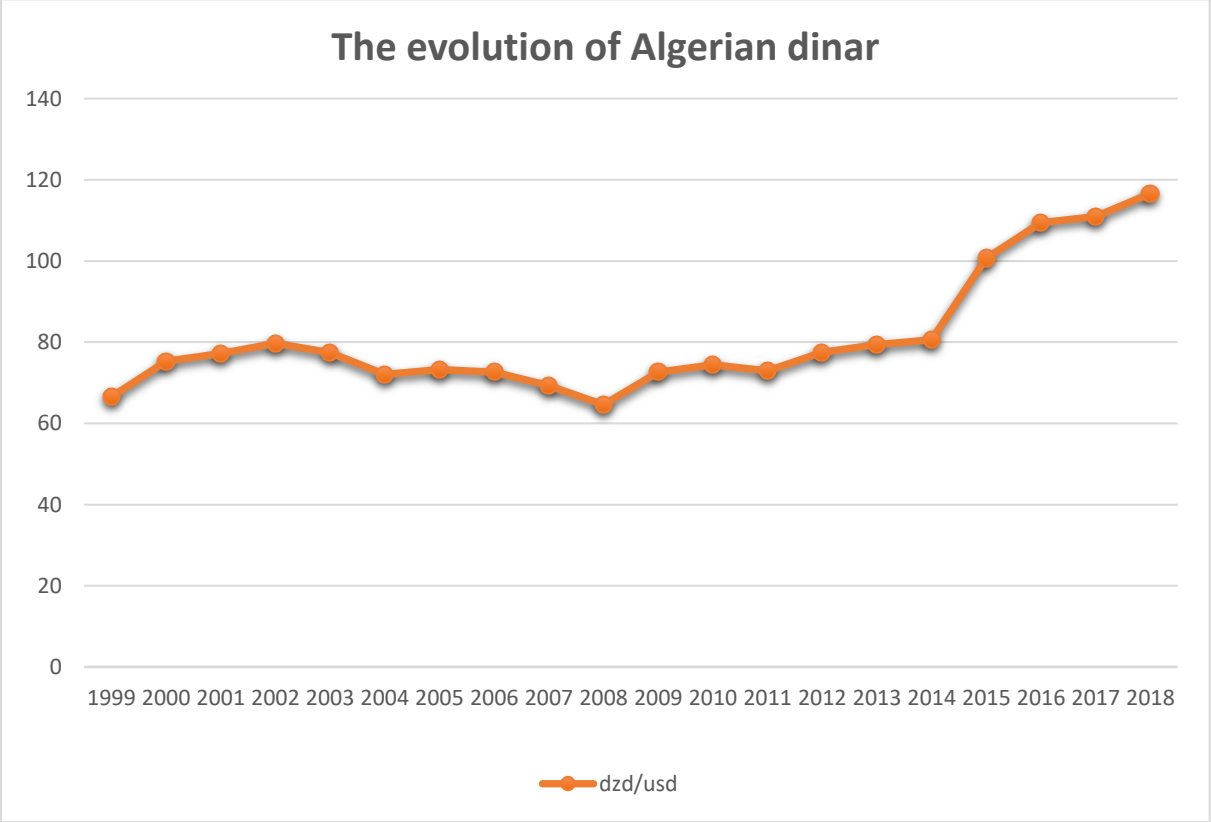
As a result of the oil price decline in the international market since June 2014. The authorities devalued the ER to benefit from dollar-driven oil income when it was converted to the Dinar. Therefore, the Dinar lost 25% of its value from 80.58DZD/1USD in 2014 to 100.69DZD/1USD in 2015. 1n late 2017 the Bank of Algeria applied the unconventional financing to ensure the continuation of economic development under pressure from the oil shocks which led to a devaluation of the Dinar about 14.5% where it became in June 117.67DZD/1USD.

Table (III.2): Algerian Exchange Rate against U.S.dollar

year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
DZD/ USD	66.57	75.26	77.22	79.68	77.40	72.06	73.36	72.64	69.89	71.18
year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
DZD/ USD	72.64	74.40	72.85	77.55	79.38	80.58	100.69	109.44	110,97	116,61

Source: the Bank of Algeria

Graph III.1: The Evolution of Algerian Dinar



Source: by the student

1.3) The goals of liberalization of the Algerian dinar exchange:

There was a set of goals in order to liberate the Algerian dinar exchange, which we will try to show them in the following points (M.A.Barbari):

- ✓ Approximate Algerian dinar value of its real value, and reduce the difference between the official rate and the parallel rate.

- ✓ Reduce the activity of the parallel market, so as to improve and intensify the operations carried out by private banks transfer at the lowest cost.

- ✓ Working out to reduce imports and increase exports in order to improve the situation of the balance of trade.

- ✓ Allowing Algerian dinars to affect and to be affected by all the changes that can affect the national economy.

- ✓ Contribute to stimulate SME to grow and encourage them to develop their competitiveness and production in order to encourage import substitution.

- ✓ It is necessary for economic institutions, banks and financial institutions to adopt the necessary measures to strengthen internal and external control to face various risks, such as the expecting exchange risk.

- ✓ Reduce capital flight, which helps to re-finance the various forms of investments, whether directly or indirectly.

- ✓ Seek and work out to improve the bank-increased competition through quality and upgrade banking services.

2) The Determinants of Algerian Exchange Rate:

In Algeria, the management of exchange rate is the responsibility of the Bank of Algeria, and this has taken different dimension over the years. However, in 1994, Algeria put in place an adjustment programs in order to correct the previous real appreciation of the Algerian dinar, which led to several devaluation of the dinar with a view to achieving a realistic exchange rate. In 1995, Algeria adopted the management float regime and this is the case so far. Through past years, Algeria has experienced serious problems in its balance of payments and its macroeconomic equilibrium for many reasons, the most important of which is the decline in economic growth rates, high interest rates in international markets, fluctuating exchange rates in addition to low productivity and quantitative easing.

Therefore, considering the massive importance given to the role of exchange rate in the economic. There is a need to study exchange rate determinants and behavior in Algeria.

2.1) Evolution of The Dinar's Determinants:

2.1.1) Balance of Payments (BoP):

b. Definition:

- A statement that summarizes an economy's transactions with the rest of the world for specified time period. The Balance of Payment, also known as balance of international payments, encompasses all transactions between a country's residents and its non-residents involving goods, services and income.

- The IMF definition: “the balance of payments is a statistical statement that systematically summarized, for a specific time period, the economic transactions of an economy with the rest of the world” (IMF 1993) (A.O.Akpunsung, 2013).

- The Balance of Payment (BoP) is the method countries use to monitor all international monetary transactions at a specific period of time. Usually, the BoP is calculated every quarter and every calendar year. All trades conducted by both the private and public sectors are accounted for in the BoP in order to determine how much money is going in and out of a country. If a country has received money, this is known as a credit, and if a country had paid or given money, the transaction is counted as a debit. Theoretically, the BoP should be zero, meaning that assets (credit) and liabilities (debts) should balance, but in practice, this is rarely the case. Thus, the BoP can tell the observer if a country has a deficit or a surplus and from which part of the economy the discrepancies are stemming (R.Heakel, 2013).

- The balance of payments of Algeria denominated in Algerian dinar and in U.S.dollars, has been compiled in accordance with the IMF’s Balance of payments Manual.5 edition (BPM5) since 1998, the reference year. The balance of payments records all the transaction flows in a given period resulting from the creation, transformation, disposal, or liquidation of economic value derived from a change in ownership between residents in Algerian economy and the rest of the world.

Balance of Payments statistics follow the principle of double entry bookkeeping. Since exports are recorded as credits the payment received for exports must be recorded as a debit and since imports are debits, it follows that the payment made on imports must be recorded as a credit. That is, what is giving up in every transaction is recorded as a credit and what is received is recorded as a debit.

A nation's balance of payments is made up of accounts as measures of international trade. The precise portioning of these groups' varies between countries and over time (O.Ugbed, 2013). The following table shows the elements of BoP:

Table (III.3): Representation of the Balance of Payments

Accounts and Sub-accounts	Cumulative Balance
Current Account	
Merchandise	Merchandise balance
Services	
- Tourism - Transportation - Professional and other services - Interest and other investment income	Resource transfer Balance on goods and services
Unilateral transfers	
- Government grants - Private remittances	Current account balance
(Private) Capital Account	
Direct investment Securities	
Banking flows	

- Short term - Long term Other portfolio capital **Official Reserve Transaction** Changes in foreign CB holding of domestic assets Changes in domestic CB holdings of foreign assets - Gold - IMF credit and SDR's - Foreign exchange reserves **Errors and Omissions** Total payments	Basic balance Overall balance of payments

c. Analysis of Algerian Balance of Payments Evolution:

After the oil crisis that Algeria have been faced in late of the 80's, it was necessary to undertake a set of economic reforms. Therefore, the period of 90's was marked by a series of reforms programs recommended by the international organizations as IMF to progress the transition from central planning to market economy. Moreover, this period has been known many economic fluctuations that affected on several sectors, which reflected on BoP position and its accounts. A BoP's accounts evolution is given as follow:

- **Balance of Payments (BoP):**

We have seen previously in this study that BoP is a statement that summarized an economy's transactions with the rest of the world. We have also seen the relationship between the ER and the BoP items, as one of the

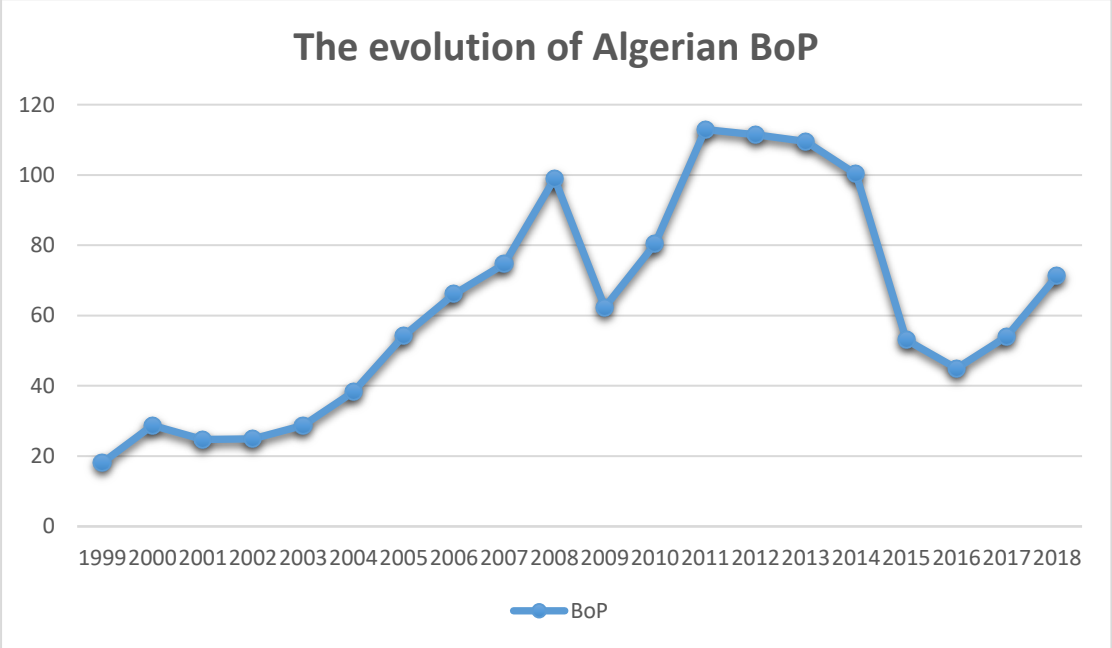
mechanisms that are critical in influencing the balance of payments. Therefore, it is necessary to know the Algerian BoP evolution. Our study is limited between(1999-2018), because this period the Algerian dinar had devaluated many times, so we will study the impact of this devaluation on the BoP and its items.

Table III.4: Algerian BoP Evolution

Year	1999	2000	2001	2002	2003	2004	2005
BoP	18.12	28.77	24.74	24.91	28.73	38.35	54.24
Year	2006	2007	2008	2009	2010	2011	2012
BoP	66.05	74.66	98.96	62.35	80.35	112.92	111.49
Year	2013	2014	2015	2016	2017	2018	
BoP	109.54	100.2	53.1	45	54.1	71.3	

Source: Bank of Algeria

Graph III.2: The Evolution of Algerian Balance of Payment



Source: by the student

Continues to increase in the balance of payments of the year 2003 where it reached 7.47 billion $, and 9.25 billion dollars in 2004. Then, 16.94 billion dollars in 2005, and then continued to rise to reach the year 2006 amounted to 17.73 billion dollars, and this is due to the high barrel prices significantly and continuously, as yields rose to 54.74 hydrocarbons in 2006.

Moreover, it continued to rise to $ 19.53 billion $ and 36.99 billion dollars in 2007 and 2008, respectively, as the trade balance achieved a balanced stability in 2007 compared to 2006, to an average of 34.15 billion $, then rose in 2008 to $ 40.52 billion dollars, thanks to the revenue of hydrocarbons.

As in 2009, there has been a breakdown in the balance of payments by about 12 times what it was in 2008, falling from 36.99 billion dollars in

2008 to reach 3.86 billion dollars, causing external shock of the Algerian economy. In addition, trade balance fell to 7.87 billion dollars after a record 40.52 billion dollars in 2008 and due to the sudden drop in oil prices. After the shock seemed to improve gradually in the price where the price of a barrel was $ 82.870 in the second semester of 2010, after it was 77.501 dollars for the first of the same year. We also note a rise in the balance of capital account the year 2008 after it there was a deficit from 2003 to 2007. And it continued to rise in 2010 to reach 3.42 billion dollars, then in 2011 it dropped to 2.38 billion dollars.

Hydrocarbon exports amounted to $ 71.66 billion $ in 2011 with an annual average price is estimated at 112.943 dollars per barrel to a high rate of 40.91 percent, compared to the average price in 2010. We notice that the level of the revenue of hydrocarbon export for the year 2011, it included the character of the quarter stability with 18.01 billion dollars in the first quarter, 81.03 billion $ per second quarter, 17.79 billion dollars in the third quarter, and 17.83 billion dollars for the fourth quarter. Which led to a surplus in the Trade Balance was estimated at 27.94 billion dollars in addition to an increase of surplus foreign exchange reserves and the balance of payments of 15.33 billion dollars in 2010 to 20.06 billion dollars in 2011 .

The balance of payments fell to 12.06 billion dollars after it was 20.14 billion dollars in 2011, then it fell sharply in 2013 to reach 0.13 billion dollars. there is also a similar decrease in the balance of trade where it fell from 20.17 billion dollars in 2012 to 0.41 billion dollars in 2013. Therefore, it is because of a decline in hydrocarbon export revenues, and to a decline in the value of the dinar. As the balance of the capital returned

to record a deficit of -0.24 billion $ and -0.72 billion dollars in 2012 and 2013 respectively. Then there was an improvement until 2014 where it came back to the deficit in 2015 with 27,54 billion $, as well as 2016, 2017 and 2018.

- **Trade Balance (TB):**

Trade balance (TB) determines the position of exports (X) and imports (M) of goods, where the difference between this two items is the balance of trade balance.

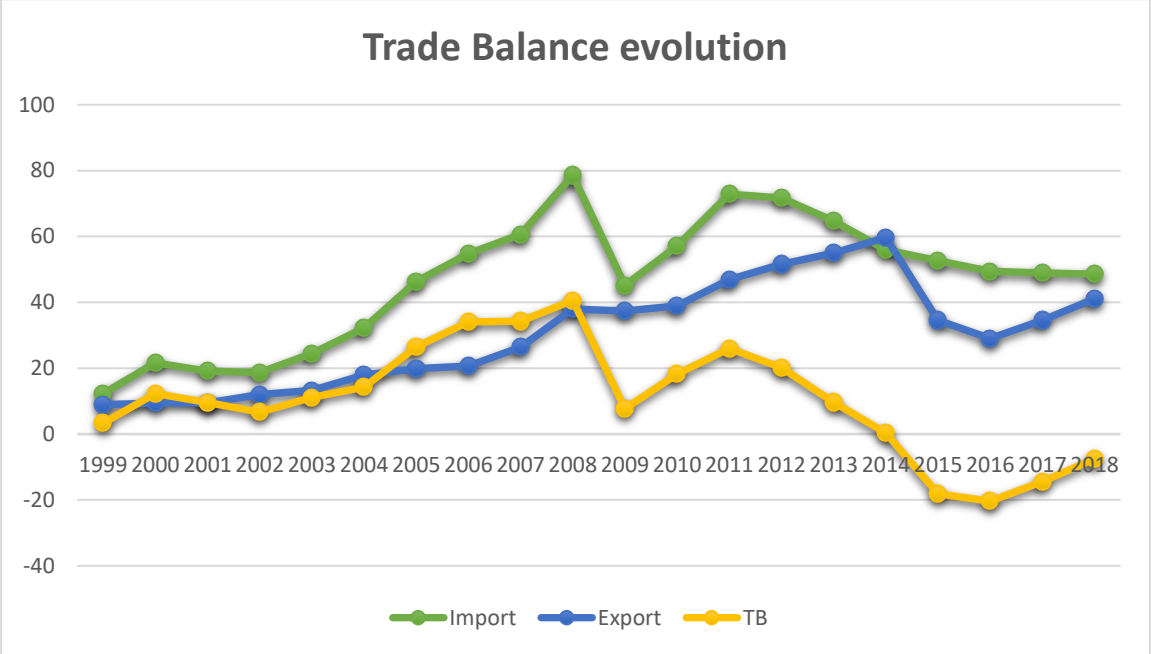
Table III.5: The Evolution of Algerian TB

year	Trade Balance	Exports (X)	Imports (M)
1999	3,36	8,96	12,32
2000	12,3	9,35	21,65
2001	9,61	9,48	19,09
2002	6,7	12,01	18,71
2003	11,14	13,32	24,47
2004	14,27	17,95	32,22
2005	26,47	19,86	46,33
2006	34,06	20,68	54,74
2007	34,24	26,35	60,59
2008	40,6	37,99	78,59
2009	7,78	37,4	45,18
2010	18,2	38,89	57,09
2011	25,96	46,92	72,88
2012	20,16	51,56	71,73
2013	9,72	54,98	64,71

2014	0,32	59,67	55,99
2015	-18,08	34,57	52,65
2016	-20,38	29,05	49,44
2017	-14,41	34,57	48,98
2018	-7,48	41,11	48,57

Source: the Bank of Algeria

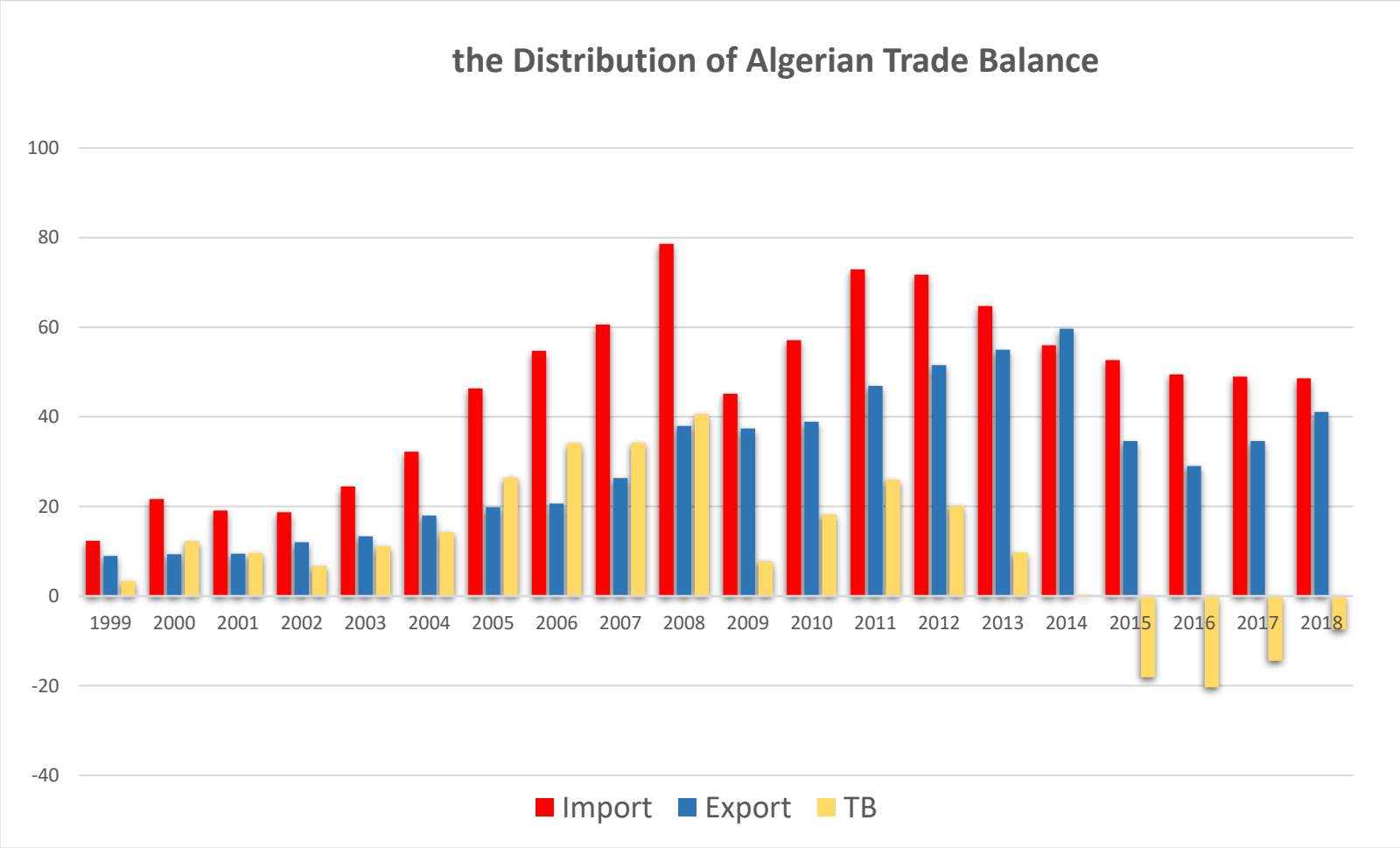
Graph III.3: The Evolution of Algerian Trade Balance



Source: by the student

1999-2002 the balance was non-stable between ups and downs but it was positive. From 2002 to 2008, there was a significant increase from 6,7 to 40,6 billion $ thanks to the revenue of hydrocarbons. As in 2009, it fell to 7,78 billion $ due to a sudden drop in oil prices caused by the financial crisis. After the shock, it seemed to improve but it fell again in 2015, 2016 and 2017 where the balance was deficit because of the decline in the oil prices, even there was a slight increase in 2018 but the balance still deficit.

Graph III.4 Distribution of Algerian Trade Balance



Exports:

Algerian exports characterized by its focus on one commodity, which is oil. Where, the Algerian economy depends primarily on hydrocarbon revenues, and the rate of exports of these last ranging between (97% and 98%) of the total exports. Therefore, the balance of trade and balance of payments linked to revenues of hydrocarbon. This makes the national economy shaky, because it depends on one sector, which is hydrocarbon. Without searching for alternatives which could lead to the depletion of oil wealth. The following table shows the evolution of Algerian exports during the period (1999-2018).

Imports:

We notice from the table and the graphic above that imports rose significantly and rapidly from 13.32 billion U.S.dollar in 2003 up to 38.07 billion U.S.dollar in 2008. Then we note that imports remained semi-stable during the three years 2008, 2009 and 2010 with values of 38.07, 37.40 and 38.89 billion U.S.dollar respectively. After 2010, the imports continued to increase abruptly and substantially to reach 55.02 billion U.S.dollar.

This upward trend has to do with the commodity composition of Algerian imports. This increase in imports has negatives effects on BoP in general and specially on TB.

- **Capital Account (CA):**

The capital account balance refers to all international asset transactions, excluding the ones made by the monetary authorities. When US resident purchase German bonds that represents an outflow in the capital accounts. A German resident's purchase of US assets would represent a capital inflow. If the CA balance is in surplus it means that there is an net inflow of resources.

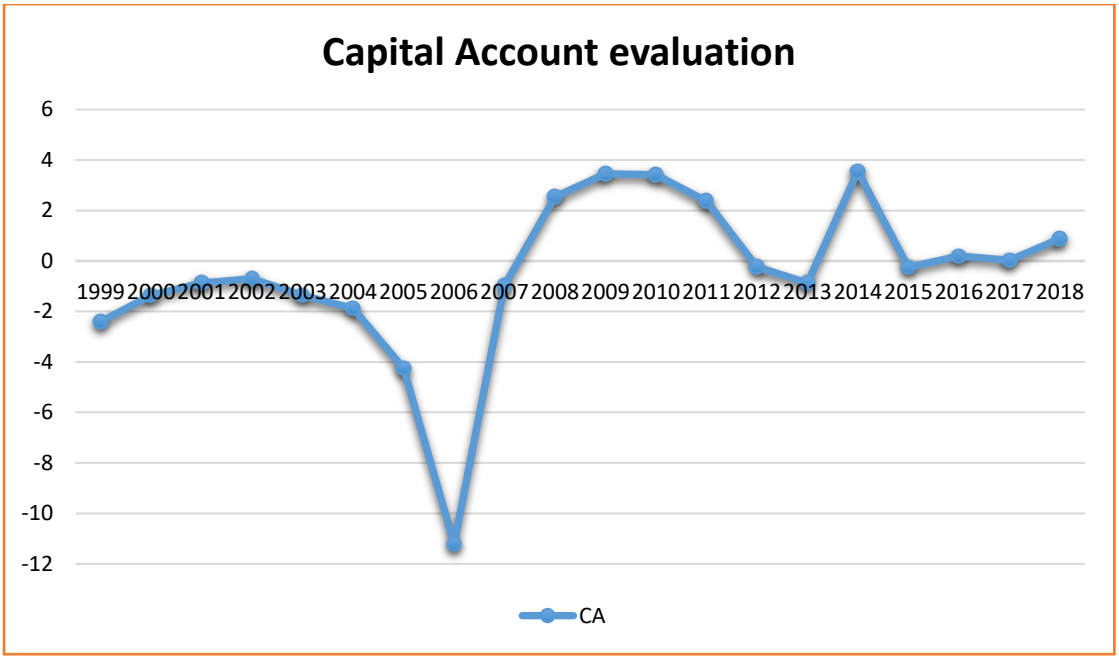
The CA contains three main types of flows. First, there is direct foreign investment; e.g., the factory built in Canada (example mention above). Second, there is long-term portfolio investment, which would include purchases of securities and long-term bank loans. Of course, purchases of securities is somewhat arbitrary; one can speculate on 10 years bonds just as easily as on 3-month T bills. Short-term capital flows are third item, and refer to purchases of securities with maturities less than one year.

Table III.6: The Capital Account Evolution

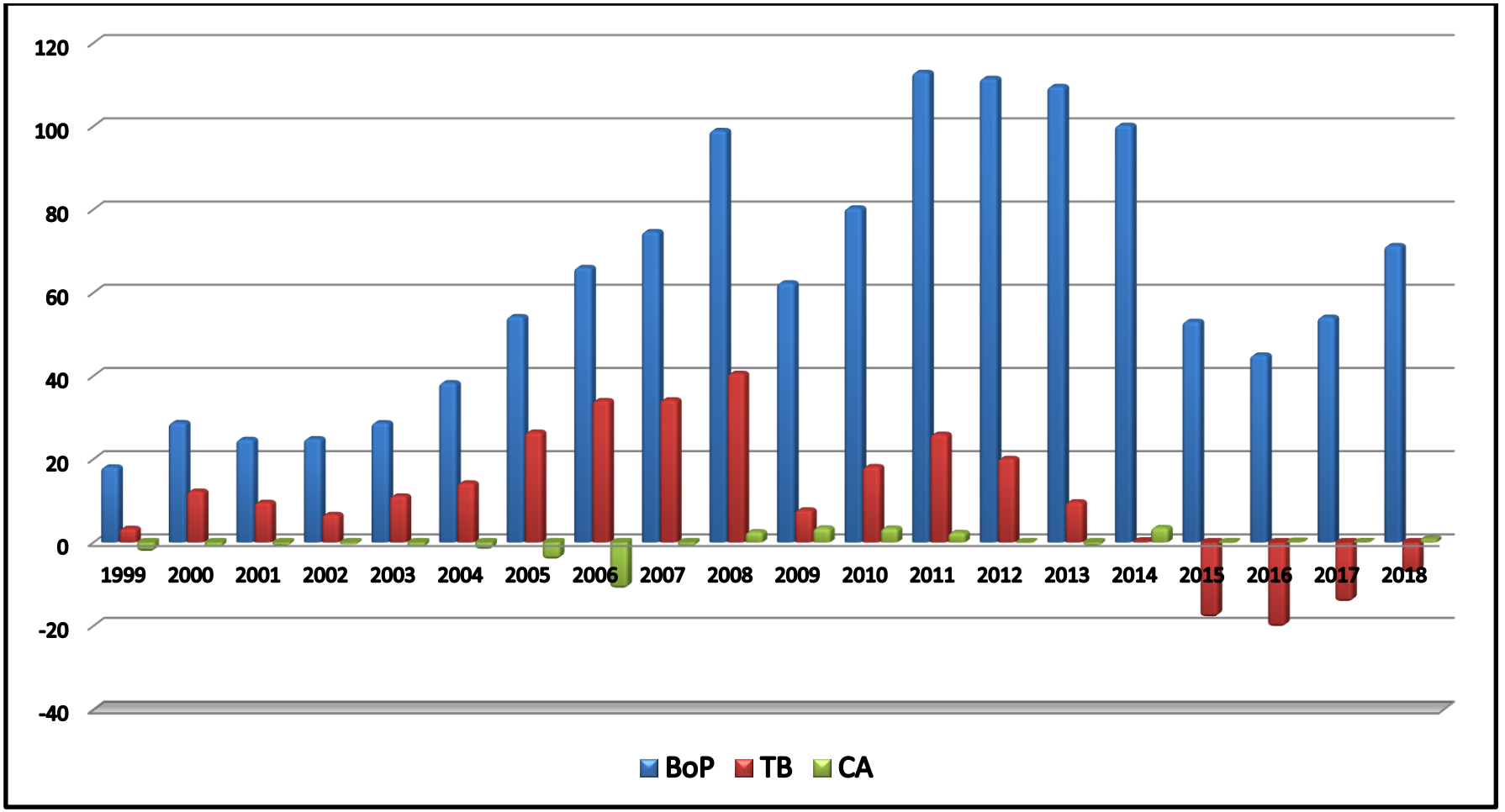
Year	1999	2000	2001	2002	2003	2004	2005
CA	-2.4	-1.36	-0.87	-0.71	-1.37	-1?87	-4.24
Year	2006	2007	2008	2009	2010	2011	2012
CA	-11.22	-0.99	2.54	3.45	3.42	2.38	-0.24
Year	2013	2014	2015	2016	2017	2018	
CA	-0.87	3.55	-0.25	0.19	0.03	0.88	

Source: the Bank of Algeria

Graph III.5: The Capital Account Evolution



This account was deficit from 1999 to 2006 where it reached the lowest point by a deficit of 11,22 billion $ in 2006 because of the advanced payment of external debt which have been 10,93 billion $ (D.Selma,2015). We note a rise in it from 2008 to 2011 where a surplus was recorded. It fell slightly in 2012 and 2013 then it reached the peak in 2014 with an estimated surplus at 3,55 billion $. After that, it was relatively stable in 2015,2016 and 2017.



Graph III.6: development of Algerian BoP, Trade Balance and Capital Account

2.1.2) Money supply (monetary mass) (MM):

The monetary mass and its issuance procedures differ from one country to another according to the adopted development model. As well as the type of economic management, and the monetary mass differs according to the different monetary policies applied in modern economies to monitor the development of the cash balance in its economy, and to know the factors leading to the issuance of money.

a. Definition:

- It is defined as "The amount of money in circulation in a society during a certain period of time, and what is meant by money in circulation here are all forms of money possessed by individuals or institutions, whose forms differ in the extent of economic and social development and the development of banking habits in societies."(Hadad, 2005)

- The monetary mass is also known as “that quantity of money available in a certain period of time, which is determined by the monetary authorities, or it is the monetary quantity represented by all kinds of payment methods”.(Belazouz, 2008)

It is evident from the two previous definitions that the monetary mass is the group of money circulating in the national economy, which is a very variable set of means of payment. This quantity cannot be understood until after studying its components and the characteristics of these components.

The monetary mass is divided into two subgroups: money (cash) and quasi money or near money:

- **Money**: They are liquid means of payment that have been placed at the disposal of individuals and institutions, as they are considered absolute liquidity and the final asset into which all assets can be converted, while it cannot be converted to another, more liquid asset, and this concept applies to both credit money and bank money. In other words, it is what we cold cash.
- **Quasi money**: The term quasi money refers to assets which can be easily converted to cash because they are in high demand and are issued by entities with excellent creditworthiness.

Book money, such as account balances at commercial banks, may also be considered quasi money because it is assumed that the bank will repay the debt in base money upon request. Other forms of quasi money include liquid cash equivalents like travelers checks, gift cards and vouchers which have fixed redemption values.

Examples of near money are as follows:

- *Savings accounts*: is a bank account at a retail bank whose features include the requirements that only a limited number of withdrawals can take place, it does not have cheque facilities and usually do not have a linked debit card facility, it has limited transfer facilities and cannot be overdrawn. Traditionally, transactions on savings accounts were widely recorded in a passbook, and were sometimes called passbook savings accounts, and bank statements were not provided; however,
-

currently such transactions are commonly recorded electronically and accessible online.

- *Money market funds*: (also called a money market mutual fund) is an open-ended mutual fund that invests in short-term debt securities such as US Treasury bills and commercial paper. Money market funds are managed with the goal of maintaining a highly stable asset value through liquid investments, while paying income to investors in the form of dividends. Although they are not insured against loss, actual losses have been quite rare in practice.

- *Bank time deposits (certificates of deposit)*: is a deposit in a financial institution with a specific maturity date or a period to maturity, commonly referred to as its "term". Time deposits differ from at call deposits, such as savings or checking accounts, which can be withdrawn at any time, without any notice or penalty. Deposits that require notice of withdrawal to be given are effectively time deposits, though they do not have a fixed maturity date.

  Time deposits enable the bank to invest the funds in higher-earning financial products. In some countries, including the United States, time deposits are not subject to the banks' reserve requirements, on the basis that the funds cannot be withdrawn at short notice. In some countries, time deposits are guaranteed by the government or protected by deposit insurance.

- *Government treasury securities (such as T-bills)*: United States Treasury securities are government debt instruments issued by the United States Department of the Treasury to finance government

- spending as an alternative to taxation. Treasury securities are often referred to simply as *Treasurys*.

- Bonds near their redemption date

- Foreign currencies, especially widely traded ones such as the US dollar, euro or yen.

Near money is not included in narrowly defined versions of the money supply, but broader versions include some types of near money.

b. Monetary aggregates:

Money aggregates are broad categories that measure the money supply in an economy.

❖ **Narrow money M1**: is a country's basic money supply that's used as a medium of exchange. M1 includes demand deposits and checking accounts, which are the most commonly used exchange mediums through the use of debit cards and ATMs. Of all the components of the money supply, M1 is defined the most narrowly.

M1 does not include financial assets, such as savings accounts and bonds. M1 money is the money supply metric most frequently utilized by economists to reference how much money is in circulation in a country.

❖ **Money stock M2:** is a calculation of the money supply that includes all elements of M1 as well as "near money." M1 includes cash and checking deposits, while near money refers to savings deposits, money

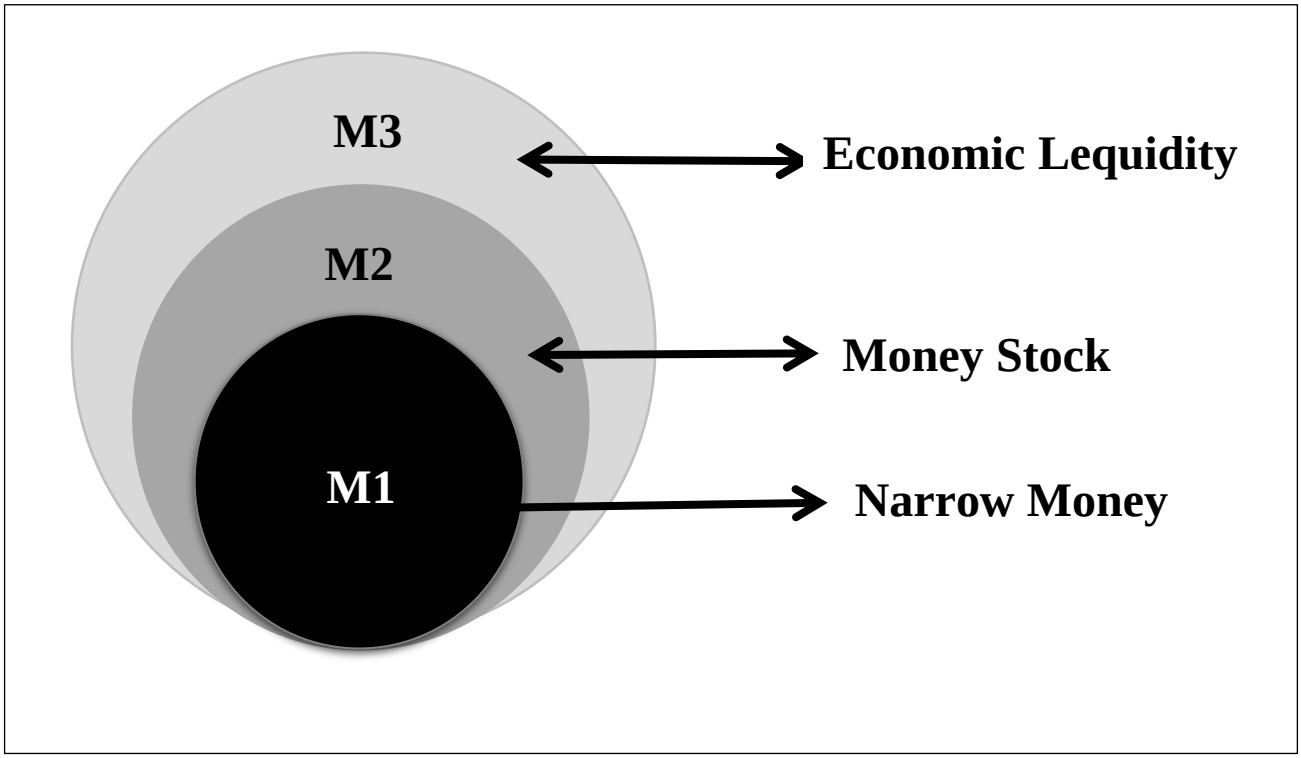
market securities, mutual funds, and other time deposits. These assets are less liquid than M1 and not as suitable as exchange mediums, but they can be quickly converted into cash or checking deposits.

- **Economic liquidity M3:** The M3 classification is the broadest measure of an economy's money supply. It emphasizes money as a store-of-value more so than as a medium of exchange, hence the inclusion of less-liquid assets in M3. Less-liquid assets would include those that are not easily convertible to cash and therefore not ready to use if needed right away.

M3 is a measure of the money supply that includes M2 as well as large time deposits, institutional money market funds, short-term repurchase agreements (repo), and larger liquid assets.

The M3 measurement includes assets that are less liquid than other components of the money supply and are referred to as "near money," which are more closely related to the finances of larger financial institutions and corporations than to those of small businesses and individuals.

Figure III.3: Monetary Aggregates



c. Factors affecting money supply:

There three main factors affect or determine money supply, which are as follow:

- *Foreign assets*: includes gold, SDR holdings, reserve position in IMF and foreign exchange holding of central bank (foreign exchange reserve). Foreign assets can be considered the external counterpart of the monetary mass, and these assets are obtained as a result of the commercial and financial operations that the country undertakes with the outside world.

- *Bank credit to the Government*: They are loans requested by the public treasury from the central bank, financial institutions and individuals. Their increase leads to an increase for money in circulation, and their decrease leads to a decrease for money. It includes advances on treasury, deposits to post offices and other advances.

- Bank credit to the economy: It is represented in the receivables granted to institutions and advances provided to families. These loans are considered one of the counterpart for money because granting them leads to an increase in the amount of money in circulation in addition to its high level, which leads to an increase in the available monetary means, and vice versa with respect to its decrease.

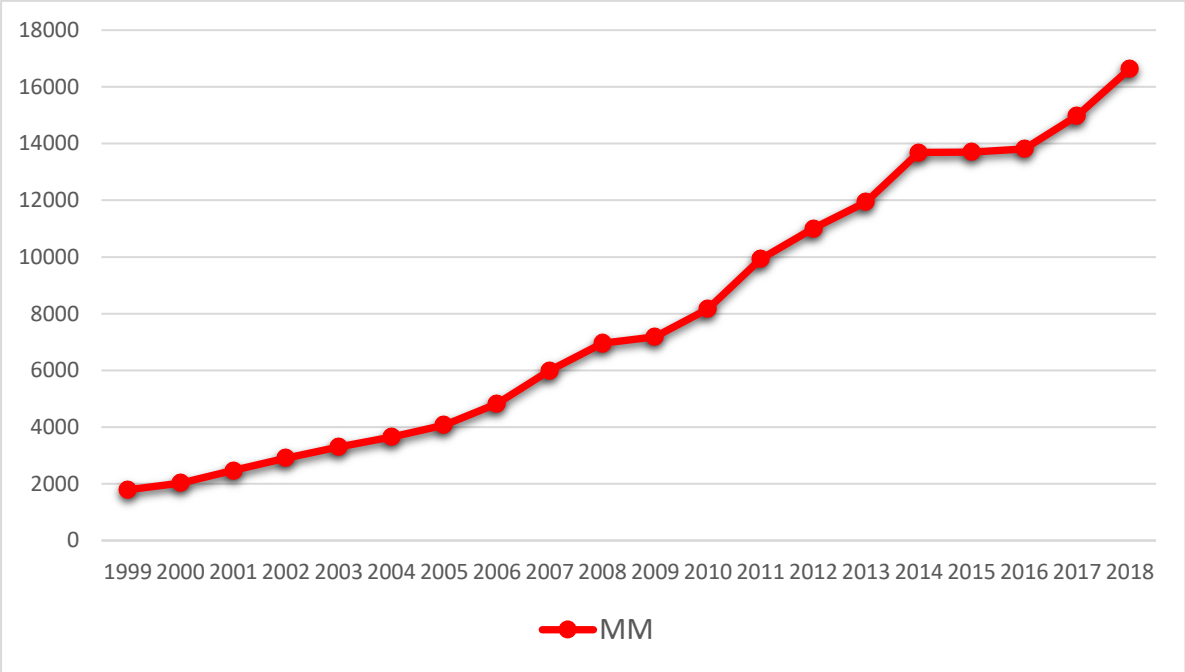
d. Analyze of money supply evolution:

Table III.7: The Money Supply Evolution

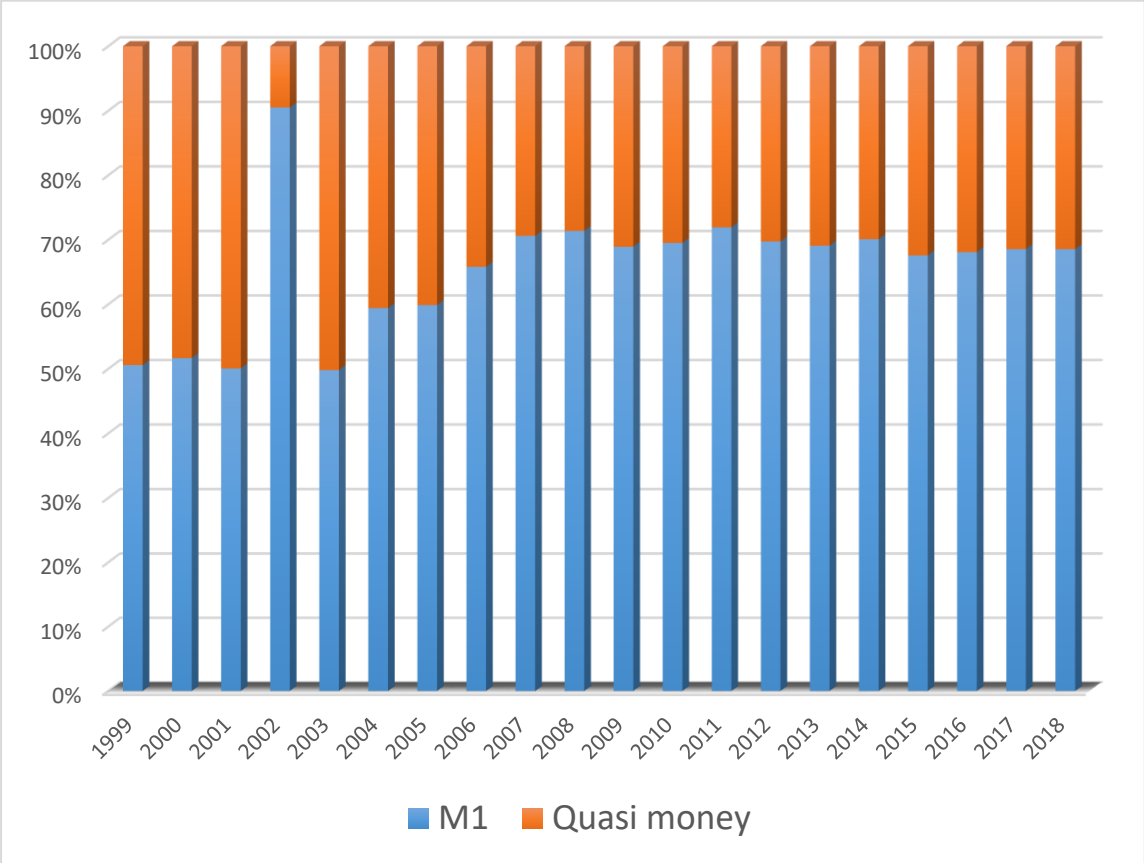
Year	MM (M2)	M1	Quasi money
1999	1789.6	905.2	884.2
2000	2022.5	1041.3	974.3
2001	2473.5	1238.5	1235.0
2002	2901.5	14163.5	1485.2
2003	3299.5	1643.5	1656.0
2004	3644.4	2165.6	1478.7
2005	4070.4	2437.5	1632.9
2006	4827.6	3177.8	1649.8
2007	5994.6	4233.6	1761.0
2008	6956	4964.9	1991.0
2009	7178.8	4944.2	2228.9
2010	8162.8	5756.4	2524.3
2011	9929.2	7141.7	2787.5
2012	11015.1	7681.5	3333.6
2013	11941.5	8249.8	3691.7
2014	13686.8	9580.2	4088.7
2015	13704.5	9 261,1	4 443,4
2016	13816.3	9 407,0	4 409,3
2017	14974.6	10 266,1	4 708,5
2018	16636.7	11 404,1	5 232,6

Source: Bank of Algeria

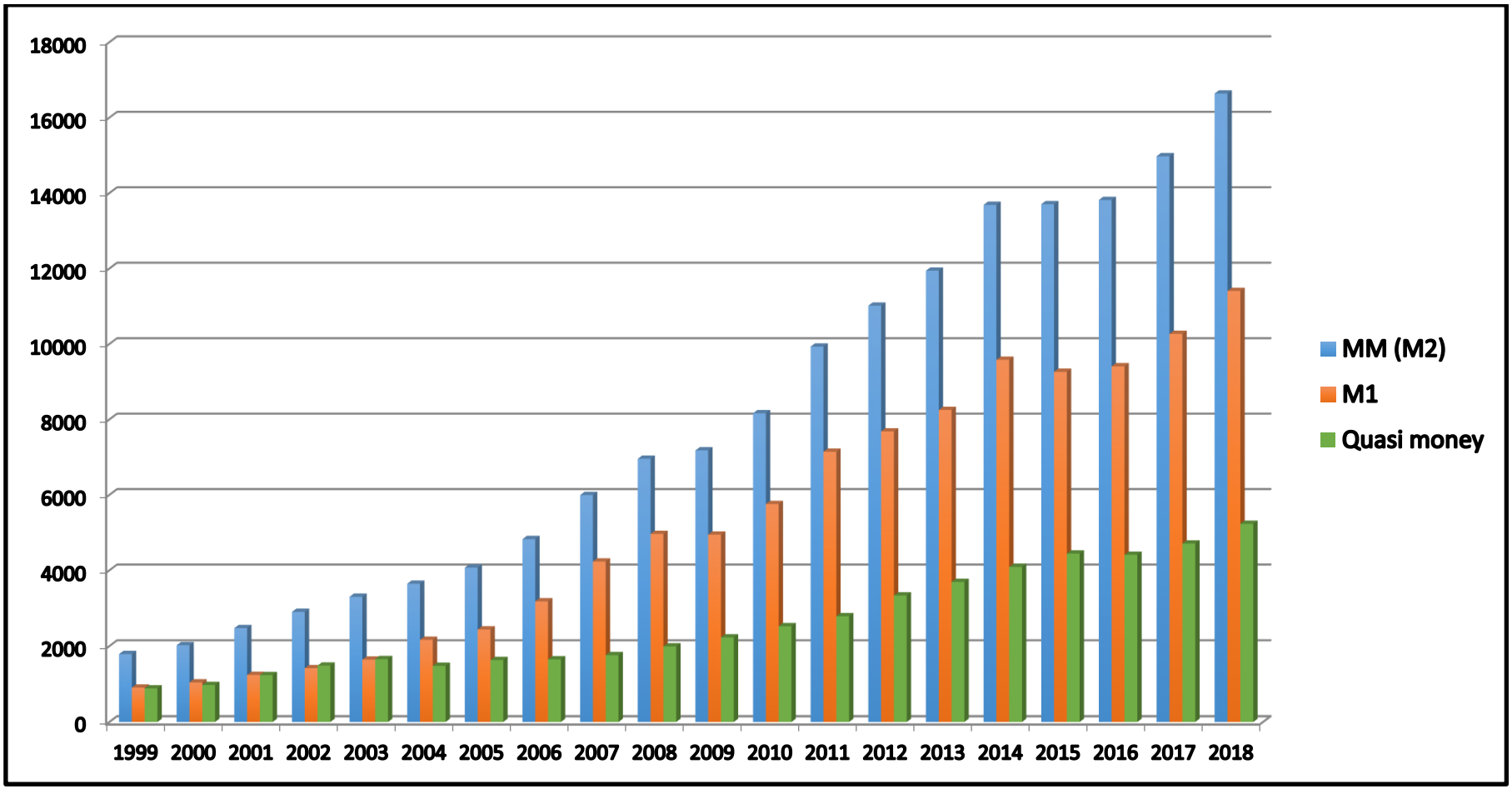
Graph III.7: The Money Supply Evolution



Graph III.8: the distribution of M2



Graph III.9: the Evolution of MM, M1 and Quasi money



Through the above table and the graphs show the increasing growth of the M1 cash money, as it moved from 1041.3 billion in 2000 to 9580.2 billion DZD in 2014 i.e, a growth rate 820.02% .This is due to the significant shortfall in the volume of demand deposits of petroleum enterprises, which doubled from 467.5 billion DZD in 2000 to 4460.9 billion DZD in 2014 with rate of growth 854.20%. However, the rise in other components also has an impact on the growth of the M1. After 2014 the M1 continue To rise to reach 11 404.1 billion DZD by the end of 2018.

The Monetary Mass M2 experienced an upward trend, as with the beginning of 2001, it witnessed a high growth rate estimated at 22.3%, and this coincided with the beginning of the implementation of the development plan to support the economic recovery (2001-2004).

Thus, it pursued an expansionary policy to achieve satisfactory growth rates and eliminate many problems, including unemployment, so that the monetary mass M2 subsequently achieved during the period 2003-2006 low growth rates despite the notable increase in demand deposits with banks by 14% and 54.8% for the years 2003 and 2004 consecutively. Unfortunately, it was not able to compensate for the shortfall in quasi money, which witnessed a decline, especially in 2004, by 10.7%.

The ultimate goal of the monetary policy was monetary stability by stabilizing prices and then supporting the course of monetary policy by strengthening the supervision of banks by the Bank of Algeria and the Banking Committee, and this is in accordance with international standards.

As for the period 2006-2009, there were fluctuating growth rates, the highest in 2007 with 24.2% and the lowest in 2009 by 3.2%. Knowing that the only reason for this was the official exchange reserves generated by the hydrocarbon sector.

As for the period 2010-2016, it witnessed similar growth rates, and the hydrocarbon sector contributed to these rates, in addition to the growth rate in cash circulation outside banks. Without this being accompanied by significant growth in the gross domestic product outside of hydrocarbons.

What concern the last two years of the study 2017 and 2018 the M2 rise sharply because of the quantitative easing, at that time Algeria issued over 5665 billion DZD.

2.1.3) Foreign Exchange Reserves (EXR):

a. Definition:

One of the most official definition of Foreign Reserves is by International Monetary Funds (2006) that sees international reserves as "consisting of official public sector foreign assets that are readily available to, and controlled by the monetary authorities, for direct financing of payment imbalances, and directly regulating the magnitude of such imbalances, through intervention in the exchange markets to affect the currency exchange rate and/or for other purposes."

Algeria's foreign exchange reserve consists of five components (Bouhenik, 2010):

- Reserve at the International Monetary Fund: which is the reserve owned by Algeria at the IMF.
- Gold: It consists of gold reserves, gold that does not comply with international standards and temporary gold investments.
- Payments Agreements assets
- Special Drawing Rights (SDR) holdings
- Foreign Assets (foreign currencies)

Algeria began in 2000 to strengthen its exchange reserves, which is due to the rise in oil prices during that period, especially since Algeria relies in its economy on exporting the hydrocarbons sector as a source of accumulating its reserves.

b. The use of exchange reserve in Algeria:

The foreign exchange reserves in Algeria exceeded the safe limits in the period of the high price of oil and before the last oil crisis in 2014. Many economic experts believe that Algeria could have benefited from the large size of the reserve by investing it in high-yielding foreign assets, while others argue that this large volume of reserves should be kept from the obligation to maintain the exchange rate of the Algerian dinar.

Since the Bank of Algeria has the right and the authority to manage and administer the exchange reserve in order to achieve the interest of the national economy, so the most important uses of this reserve are:

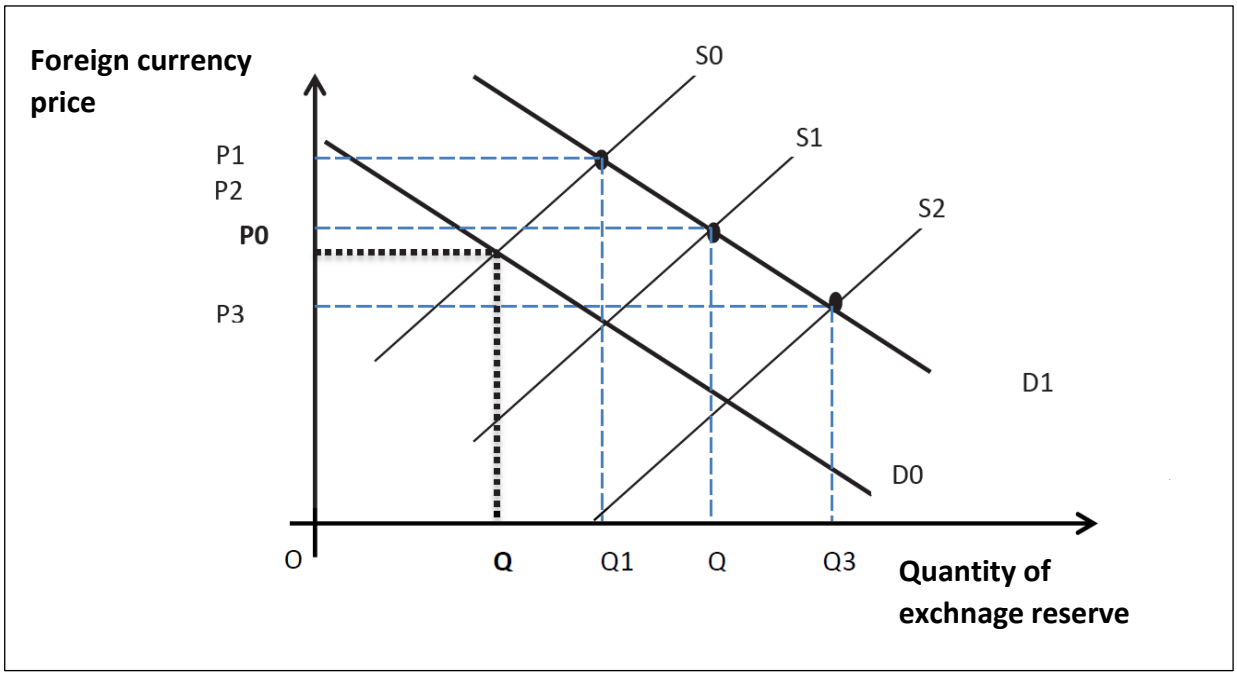
- Prepayment of external debts
- Establishment of income adjustment fund

❖ Approval of economic recovery programs.

c. The relationship between foreign exchange reserve and exchange rate:

Countries strive to create an appropriate amount of exchange reserves in order to defend the level of the local currency exchange rate and maintain its stability. The following figure is used to clarify the relationship more:

Figure III.2: The relationship between foreign exchange reserve and exchange rate



Source : ramzy zaki, p118

The horizontal axis in the above figure represents the amount of foreign exchange reserves that the country owns, and the vertical axis represents the

foreign exchange rate, i.e. the number of units of local currency to buy one unit of foreign currency, for example 1DZD=200 EUR.

As for the figure, it reflects the foreign exchange market, for example for country (A) and the outside world consisting of one country (B). Also, private capital in the short and long term and speculative activities on foreign exchange are excluded from this market.

- (D0) represents the demand line for foreign exchange, and it is the demand of residents in A for goods and services produced in country B, where the higher the exchange rate of country B for residents of country A indicates that the prices of goods and services in country B are higher for residents of country A.

- (S0) represents the foreign exchange supply curve in the state A which is derived from the demand of the state B for the goods produced in the state A. That is, the higher the price of the foreign currency for country A, indicating that its domestic currency is low, therefore the prices of produced goods are low for residents of country B. This is what leads to an increase in the demand for goods produced in country A by residents in country B, i.e. they increase the supply of foreign currency to obtain the local currency, so the S0 curve has a positive slope from the bottom up.

- The equilibrium occurs in the exchange market when the demand curve D0 converges with the supply curve S0, so the equilibrium price of exchange is determined at the level P0, and the equilibrium quantity at

this price is Q0, which is the price that the monetary authorities want to maintain.

- In the event of a sudden turbulence in the foreign exchange market as a result of the sudden increase in demand for foreign exchange, the demand for foreign exchange shifts from D0 to D1 while the supply curve S0 remains constant. The occurrence of the equilibrium in this case will lead to a change in the equilibrium exchange rate, which rises to P1, and the new equilibrium quantity becomes Q1. Since the state seeks to maintain the exchange rate at P0, in this case it interferes in the foreign exchange market and offers foreign currency in order to face the increase that occurred in demand. In this case, it must have a sufficient amount of reserves of this currency, and from the figure to reach P0, the country must offer in the market a quantity equivalent to Q3.

- The fact that the exchange rate remains at the level of P1 means that the value of the domestic currency of country A is cheaper compared to the foreign currency, that is, the prices of domestic goods are very low in country A compared to that in country B.

- Assuming that the external demand for domestic goods for country A is elastic, the foreign exchange supply curve shifts unfortunately to the right S1, thus the exchange market tends towards equilibrium, where the equilibrium price falls to P2 and the equilibrium quantity Q2 with the assumption that the foreign exchange demand curve is on D1. In spite of all this, this new equilibrium rate is not what the state seeks to achieve, but rather is at the P0 level. In order to reach this level, it must

display the foreign exchange in a manner that makes the prevailing price at the P0 level. From the previous figure, it is been found that this quantity must not be less than Q3 or Q2, and this quantity includes the necessary reserves that must be in the possession of the monetary authorities, and it can quickly sell it to keep the old price.

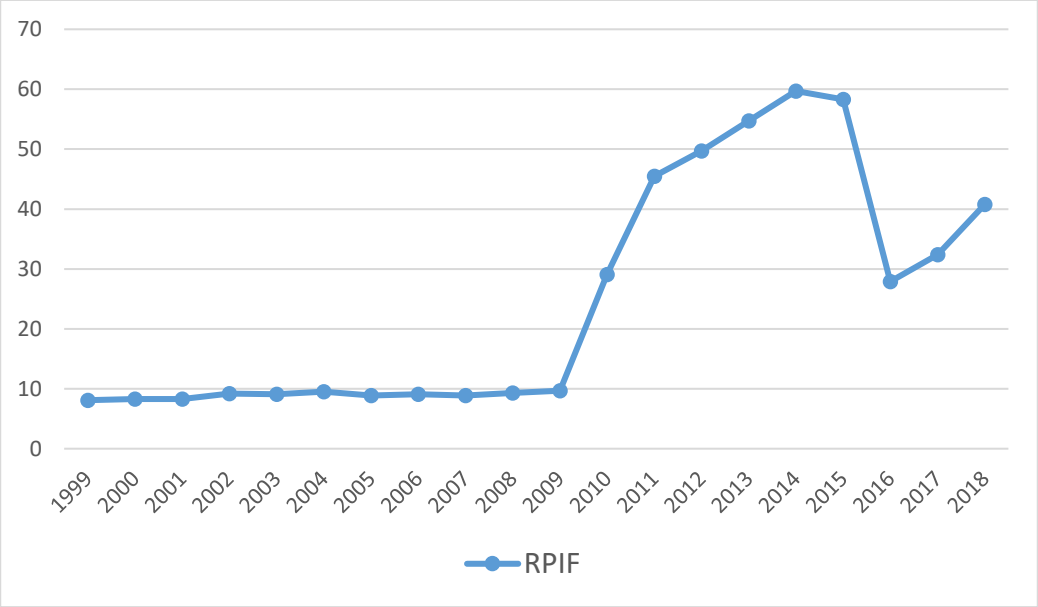
- In case that, the foreign exchange supply curve shifts to the S2 position and the demand curve remains at D1, the foreign exchange market regains its old equilibrium without state intervention. From the foregoing, we conclude that if the country wants to maintain the position of the foreign exchange rate, and the exchange market is not subject to its control, it must maintain adequate quantities of exchange reserves, selling these reserves during the period of increasing demand for foreign exchange and buying them in the periods that demand is less.

d. Analyze of foreign reserves:

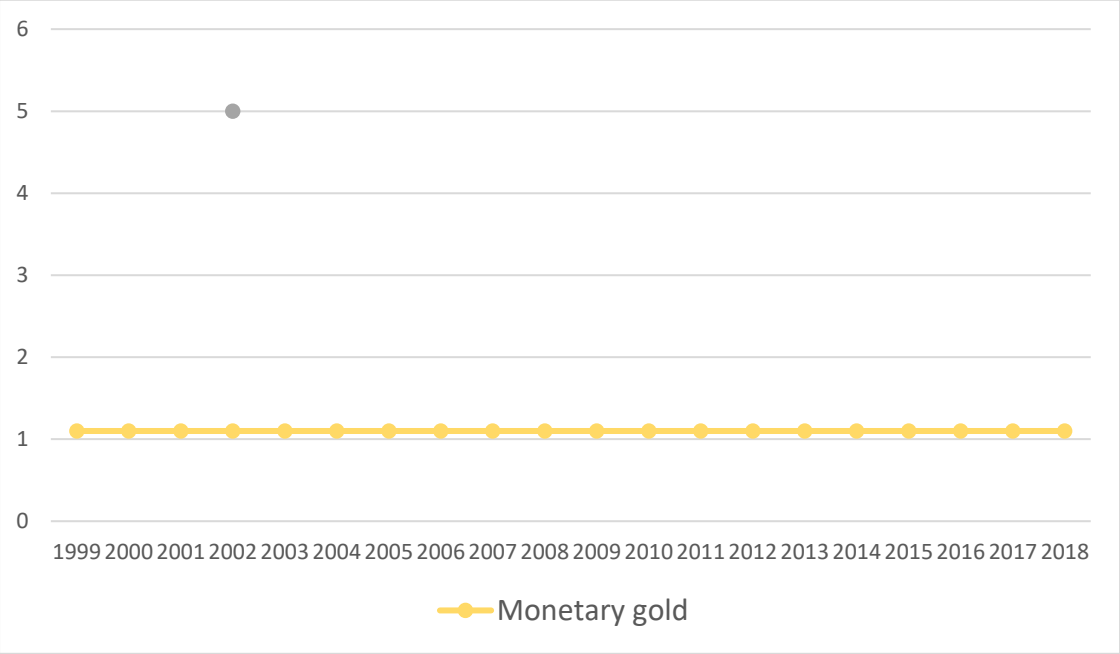
Table III.8: The Evolution of Foreign Assets

Year	Reserve position In the Fund	Monetary gold	Payments agreements assets	SDR Holdings	Foreign Assets
1999	8.1	1.1	1.3	0.1	319
2000	8.3	1.1	0.7	0.2	908.9
2001	8.3	1.1	0.7	0.9	1434.8
2002	9.2	1.1	0.7	1.1	1856.3
2003	9.1	1.1	0.8	4.1	2404.4
2004	9.5	1.1	1.3	0.09	3161
2005	8.9	1.1	1.7	0.2	4159.7
2006	9,1	1,1	0,3	0,3	5559,5
2007	8,9	1,1	0,3	0,2	7410,3
2008	9,3	1,1	0,2	0,7	10249
2009	9,7	1,1	0,2	122,6	10762,3
2010	29,1	1,1	0	122,2	11891,2
2011	45,5	1,1	0,3	125,4	13759,8
2012	49.7	1.1	0.3	129	14805.5
2013	54.7	1.1	0.3	129.4	15083.3
2014	59.7	1.1	0.3	136.9	15628.2
2015	58.3	1.1	0.4	159.6	15305.4
2016	27.9	1.1	0.4	133.5	12533.4
2017	32.4	1.1	0.4	147	11142
2018	40.8	1.1	0.5	147.5	9384.8

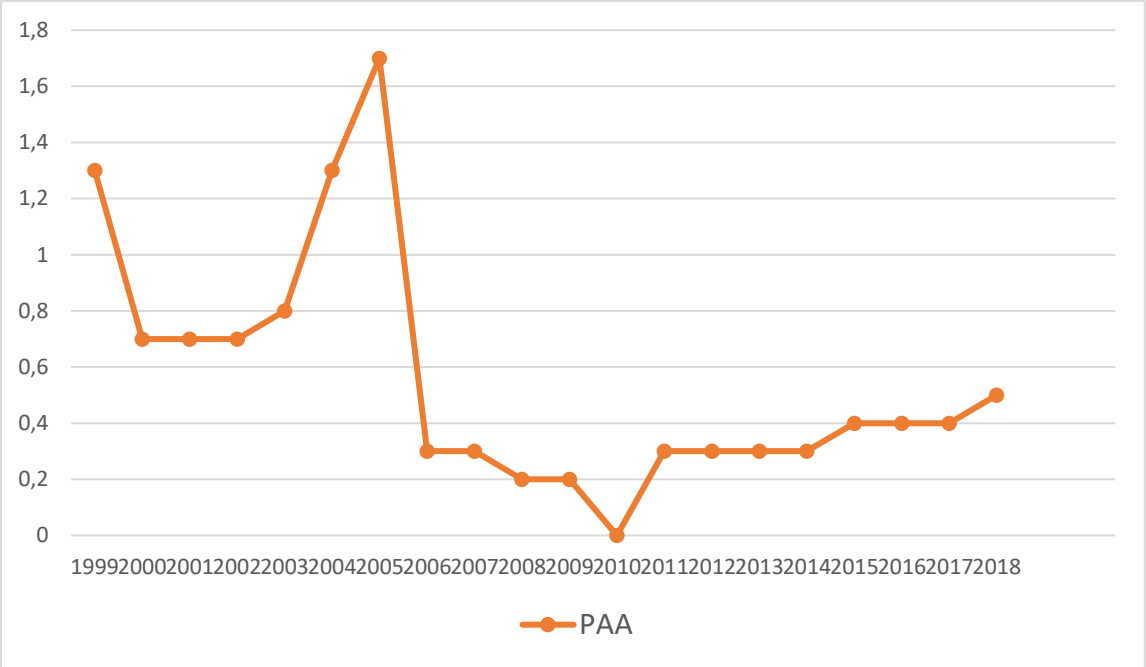
Graph III.10: The Evolution of Reserve Position in the Fund



Graph III.11: The Evolution of Monetary Gold



Graph III.12: The Evolution of Payments Agreements Assets



Graph III.13: the evolution of SDR

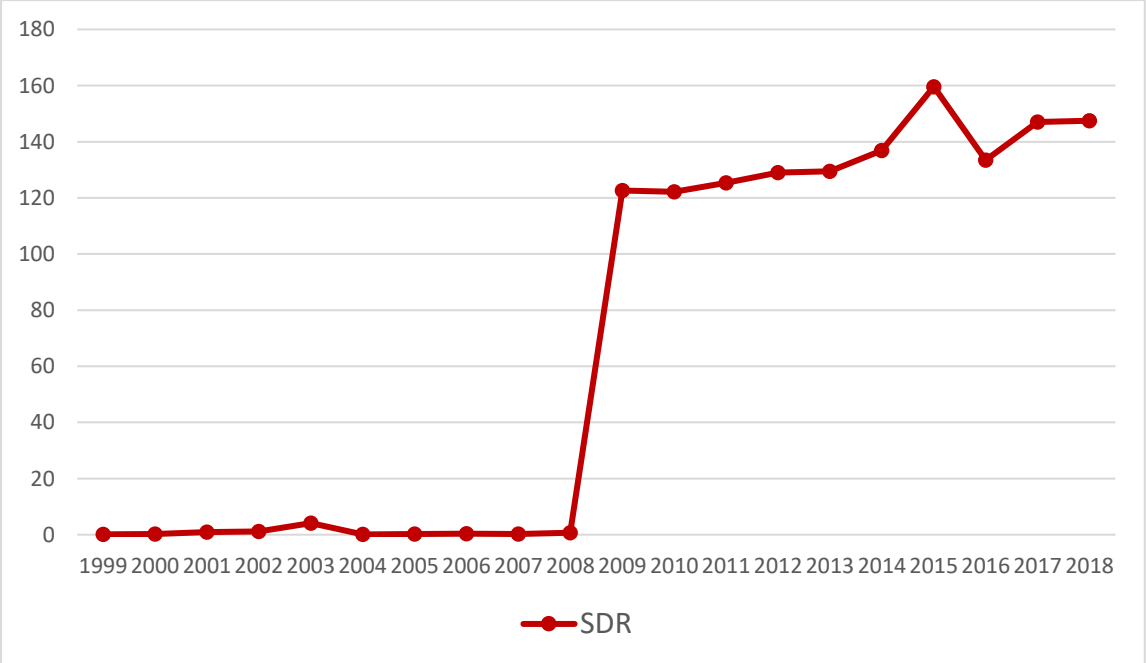
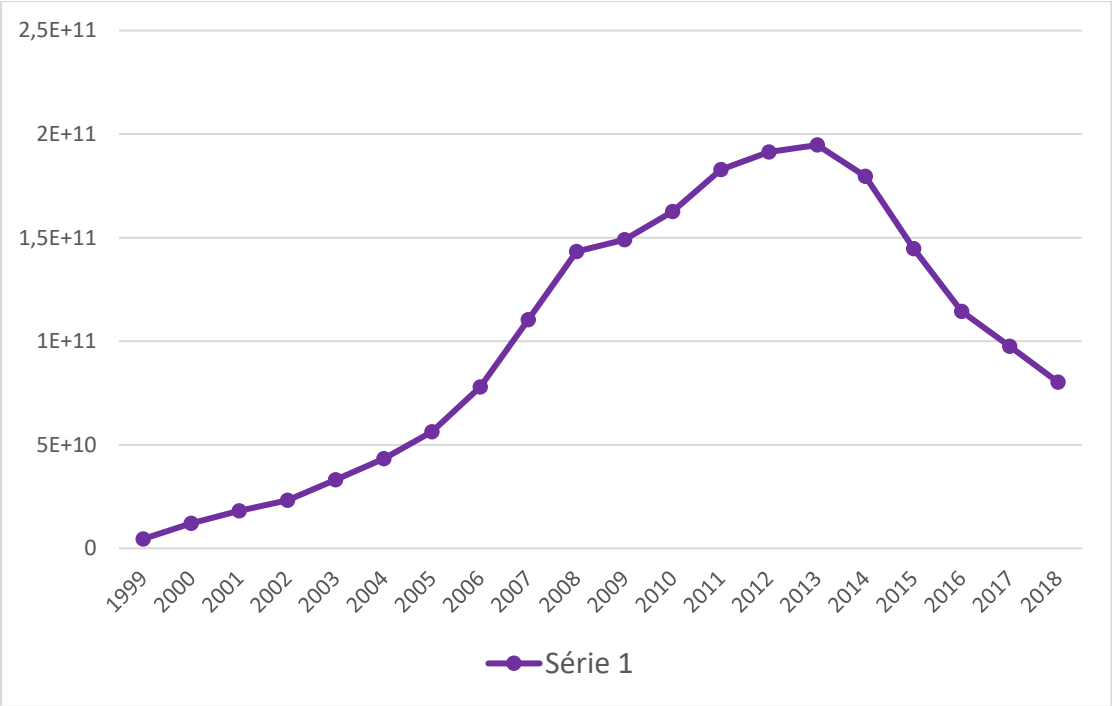


Table III.9: the Evolution of Foreign Exchange

Year	1999	2000	2001	2002	2003
EXR	4525667963	12023903987	18081413033	23237503813	33125171866
Year	2004	2005	2006	2007	2008
EXR	43246380714	56303086193	77913736745	1,10318E+11	1,43243E+11
Year	2009	2010	2011	2012	2013
EXR	1,49041E+11	1,62614E+11	1,82822E+11	1,91297E+11	1,94712E+11
Year	2014	2015	2016	2017	2018
EXR	1,79618E+11	1,44677E+11	1,14391E+11	97614427695	80227698868

Graph III.14: The Evolution of Foreign Exchange



From the tables above it is noticed that Algeria relies heavily in its exchange reserves on hard currencies (foreign assets) compared to other components. This dependence is in a continuous increase. And starting from the year1990, it began to increase continuously, as it did not exceed 9.4 billion dinars to 118.17billion dinars in the year1994, which is the date of implementing the structural adjustment program with the International Monetary Fund and rescheduling foreign debts. Thanks to the rise in oil prices, foreign exchange reserves exceeded to 1400billion dinars in 2000.

Since June 2014, foreign reserves have plunged by more than US$35 billion, the Oil Fund (Fond de Régulation des Recettes, or FRR) by more than 30 percent, while the Algerian dinar has fallen against the US dollar by more than 30 percent. The government itself expects the FRR to fall to a third of its 2014 level by the end of 2016 (Gonzalo, 2016).

Also, note that the foreign exchange rate constitutes 98.65% of the total components of the exchange reserve in Algeria, this percentage poses a threat to the Algerian economy, due to instability in exchange rates, and this is what happened during the last quarter of 2014. As global markets witnessed a state of instability in the exchange rates of international currencies as a result of the collapse of oil prices by about 51%, which led to the shrinking of foreign exchange reserve.

It observes that gold reserves are almost stable from the year1999, up to2016, despite the enormous reserves that Algeria possesses of gold, as it occupies the 25th position in the world and the third in the Arab world according to the estimation of the World Gold Council in February 2014. It possesses 173.6 tons of gold, which represents 3.7% of the world gold, but it evaluates gold reserves at a historical price.

As for international payment agreements, they were in constant fluctuation from the year1999, to reach 1.7 billion dinars as a maximum in the year2005, and since the year2006, they remained constant at the level of 0.3 billion dinars, to rise after that to 0.4 billion dinars in 2015, 2016 and 2017, then it want up to 0.5 billion dinar in 2018.

As for the special drawing rights (SDR) in the period 1999 -2001, it did not exceed 1 billion dinars, to reach in 2003 about 0.4 billion dinars, then it decreased again from the year 2004 to 2008, and it achieved a remarkable increase in the year 2009 with a value that exceeded 120 billion dinars. Despite this, it is still far from the desired level, especially as it is linked to the distributions made by the International Monetary Fund. After 2009, it continued to rise up to 159.6 billion dinar in 2015, then it fall to 133.5 and 147 billion dinar in 2016 and 2017 respectively to want up finally and reach 147.5 in 2018.

2.2) Data and Methodology:

The study employed annual time series data from 1999 to 2018. The data of dinar's exchange rate against the US dollar (USD/DZD), monetary mass (MM), balance of payments (BoP) and exchange reserve (EXR). All data were retrieved from Bank of Algeria except for exchange reserve from World Bank database. Furthermore, to investigate the causal relationship between dinar's exchange rate against US dollar and the other variables, this study applied *Toda-Yamamoto causality* approach. The unit root test was conducted by Augmented Dickey-Fuller (ADF), and the optimal lag length was selected according to *Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC).*

2.2.1) Stationarity test:

The first step in causality analysis is to check unit root problem in the data. The time series are one of the most important data used in empirical studies, especially those that rely on the construction of regression models to estimate the economic relationships. These studies assume that the time series used are stationary; this is because the nonstationary leads to econometric problems such as the spurious regression problem. In time series analysis a series is said to be stationary if both the mean and variance are constant and do not depend on time, that is, it meets the following conditions :

- The mean of xt must be constant $\mathrm{E}(x_t) = \mu, t \in Z$
- The variance of x_t must be constant over time $V(x_t) = \delta_x^2 = \gamma_0 < +\infty, t \in Z$
- The autocovariance must not depend on time $\mathrm{cov}(x_{ti}, x_{t\pm h}) = \gamma_h, t \in Z, h \in Z$

In other words, time series are considered stationary if it does not have a component trend , seasonal component or any affection by a change of time origin.

There are many methods used to examine the stationarity of time series and we have relied in this study on ***Augmented Dickey-Fuller*** , because the simple dickey-fuller test is valid only for autoregression model integrated in order one as well as neglecting error correlation possibility, therefore, Dicky &Fuller extended an developed this test to overcome these deficiencies. As this test is based on three models shown as follow:

$$\begin{cases} (4)\Delta y_t = \lambda y_{t-1} - \sum_{j=1}^{p} \phi_j \Delta y_t + \varepsilon_t \\ (5)\Delta y_t = \lambda y_{t-1} - \sum_{j=1}^{p} \phi_j \Delta y_t + c + \varepsilon_t \\ (6)\Delta y_t = \lambda y_{t-1} - \sum_{j=1}^{p} \phi_j \Delta y_t + c + bt + \varepsilon_t \end{cases}$$

After estimating these three models using ordinary least squares (OLS) method, the two hypotheses are tested:

$$\begin{cases} H_0 : \lambda = 0 \\ H_1 : \lambda \neq 0 \end{cases}$$

In order to accept or to reject the null hypothesis we compare the critical value in the statistical tables proposed by Dickie-Fuller with the statistical test results:

$$ADF_\tau = \frac{\hat{\lambda}}{SE(\hat{\lambda})}$$

If $ADF_\tau \geq ADF_{tab}$ in one of the three models, the null hypothesis is accepted $H_0 : \lambda = 0$ it means that the time series has a unit root and it is not stationary.

2.2.2) Optimal lag length:

Once, established the order of integration, the study process requires the estimation of the relationships among the variables included. However, before estimating this relationship need to identify the optimal lag length of the model. *Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC)* are adopted to determine the optimal lag length.

- **Akaike Criterion**: this is the most used criterion, which aims to minimize the variance. When there are several competing models, it is defined by the model and by the maximum likelihood estimates of

the parameters which give the minimum of AIC which is defined by (*Akaik, 1974*):

$$AIC = \hat{\sigma}^2 \exp\left[2\left(\frac{p+q}{N}\right)\right]$$

Where : *p,q* number of estimates parameters in the model

- **Schwarz criterion *:*** this criterion is suggested by (*Schwarz, 1978*) and it is assumed that the trade-off among models is made according to its lowest value and it is defined by the following formula:

$$SC = Ln\left(\hat{\sigma}^2\right)\left(\frac{p+q}{N}\right)Ln(N)$$

2.2.3) Causality test (Toda-Yamamoto causality) :

Traditionally (Granger, 1969) causality is employed to test for the causal relationship between variables. This test states that, if past values of a variable ***y*** significantly contribute to forecast the future value of another variable ***x*** then ***y*** is said to Granger cause ***x*** and that if:

$$E\left(Y_t / Y_{t-1}, X_{t-1}\right) \neq E\left(Y_t / Y_{t-1}\right)$$

Time series must be stationary and integrated in the same level that is the most important condition to apply *Granger causality*. To avoid this problem *Toda & Yamamoto (1995)* suggested a new developed method based on *Granger* equation but augmented with extra lags. Moreover, *Toda-Yamamoto causality* could be use regardless whether a series is I(0), I(1) or even I(2). The testing procedure is built on the following steps:

- Determine the maximal order of integration in the process d_{max}. ;
- Determine the optimal lag length *k* using *AIC, SC, HQ;*

- Estimate *VAR(k+d_{max})* model which is a developed approach for *Wald* test .

One of the preconditions to apply *Toda-Yamamoto Causality* is that the order of integration of the process d_{max} does not exceed the true lag length *k* of the model. In order to clarify the principle, let us consider the simple example of a bivariate model (h_t, m_t) , and, in order to study *Toda-Yamamoto Causality*, we have to estimate *VAR (k+ d_{max})* model as follow:

$$\begin{cases} h_t = \alpha_0 + \sum_{i=1}^{k} \alpha_{1i} h_{t-i} + \sum_{j=k+1}^{k+d_{\max}} \alpha_{2j} h_{t-j} + \sum_{i=1}^{k} \alpha_{1i} m_{t-i} + \sum_{j=k+1}^{k+d_{\max}} \alpha_{2j} m_{t-j} + u_{1t} \\ m_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i} m_{t-i} + \sum_{j=k+1}^{k+d_{\max}} \beta_{2j} m_{t-j} + \sum_{i=1}^{k} \beta_{1i} h_{t-i} + \sum_{j=k+1}^{k+d_{\max}} \beta_{2j} h_{t-j} + u_{2t} \end{cases}$$

The test is based on *Wald* statistic has an asymptotic chi-square x^2 distribution, which test the following hypotheses:

$$H_0 : \alpha_{1i} = 0 \left(\chi_c^2 < \chi_t^2 ; p-value\, \chi^2 > 5\%\right) : m_t \; does \quad not \quad cause \; h_t$$
$$H_0 : \beta_{1i} = 0 \left(\chi_c^2 < \chi_t^2 ; p-value\, \chi^2 > 5\%\right) : h_t \; does \quad not \quad cause \; m_t$$

2.3) Results and Discussion:

2.3.1) Stationary test :

In our study we will apply ADF test to examine the stationarity of study variables *dinar exchange rate against the dollar (USD/DZD), monetary mass (MM), exchange reserve (EXR), balance of payment balance (BoP)).* The following table summarizes the results of ADF test obtained from EVIEWS:

Table III.10: Stationarity test result

Time series	Decision	Augmented Dickey-Fuller		
		Level	1st difference	2nd difference
USD/DZD	I(1)	0.082967	**-3.679536**	/
Mm	I(1)	6.010109	**-3.093077**	/
Exr	I(2)	-1.257029	-1.096699	**-3.395121**
Bop	I(1)	-0.171051	**-3.727442**	/
Critical Values	*1%*	-2.692358	-2.699769	-2.708094
	5%	-1.960171	-1.961409	-1.962813
	10%	-1.607051	-1.606610	-1.606129

Source: based on Eviews 9 output

By comparing the ADF statistic in the table (III.10) with the critical value of ADF from (*Mackinon*) table for a significance level of 1%, 5% and 10%. This comparison shows that the null hypothesis of nonstationarity is accepted for all variables in level, in other words, all variables are non-stationary in level. Therefore, we run the test in 1st difference.

While the null hypothesis is rejected for ***USD/DZD*** (dinar exchange against dollar), ***Mm*** (monetary mass) and ***Bop*** (balance of payment) in 1st differences. Where, the statistic values are greater than critical values from *Mackinon* table for a significance level of 1%, 5% and 10%. Hence, the series are integrated of order 1 I(1).

However, ***Exr*** (exchange reserve) is getting rid of unit root at 2nd difference. Hence, it is integrated of order 2 I(2).

2.3.2) Optimal lag length:

The lag length selection results are provided in the Table:

Table III.11: optimal lag length results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-717.6700	NA	8.77e+31	84.90235	85.09840	84.92184
1	-629.8381	123.9979	2.01e+28	76.45154	77.43179	76.54898
2	-613.5730	15.30829	2.93e+28	76.42036	78.18481	76.59575
3	-534.1710	37.36567*	7.29e+25*	68.96129*	71.50995*	69.21463*

Source: based on Eviwes 9 output

The results shown in the table (III.11) indicates that the lowest value of AIC is (68.96129) which corresponds to the third lag (*k=3*). Therefore, this lag length will be relied upon to test causality using (*Toda-Yamamoto Causality*).

2.3.3) Causality test (Toda-Yamamoto Causality):

The choice of the optimal lag length was made by *SC,AIC* criteria and the results in the table (III.11) indicate that the lowest value of *AIC* is 68.96129 which corresponds to third lag *k=3.* After the determination of the number of lagged terms and level of cointegration d_{max}=2, we construct *VAR(2+3)* model then we apply *Toda-Yamamoto Causality* test in order to study the relationship among the variables. The results were as follow:

Table III.12: results of Toda-Yamamoto Causality test

Dependent variable: USD/DZD			
Excluded	Chi-sq	Df	Prob.
MM	0.527755	2	0.7681
EXR	139.9560	2	0.0000
BOP	8.051798	2	0.0178
All	316.1836	6	0.0000
Dependent variable: MM			
Excluded	Chi-sq	Df	Prob.
USD/DZD	1.207551	2	0.5467
EXR	5.830522	2	0.0542
BOP	0.260330	2	0.8780
All	12.85727	6	0.0454
Dependent variable: EXR			
Excluded	Chi-sq	Df	Prob.
USD/DZD	2.623261	2	0.2694
MM	5.818066	2	0.0545
BOP	3.998731	2	0.1354
All	49.64826	6	0.0000
Dependent variable: BOP			
Excluded	Chi-sq	Df	Prob.
USD/DZD	0.136617	2	0.9340
MM	1.829281	2	0.4007
EXR	13.79680	2	0.0010
All	19.48477	6	0.0034

Source: based on Eviews 9 output

The table (III.12) above shows the causal relationship between the variables of the study and the Dinar exchange against Dollar in significant level 5%. The results will be analyzed and discussed hereunder:

- **Causal relationship between *USD/DZD* and *MM:*** the table above gives no evidence of causality existence between these two variables at 5% significant because the p-value of *Wald* statistic is greater than 0.05. Therefore, changes in monetary mass *MM* does affect or cause changes in *USD/DZD* dinar exchange rate against dollar and vices-versa. This result disagrees with the economic theory and that due not only to economic factors but also to political and social factors. This disagreement is because of inefficiency of banking system also the preference of using parallel market rather than the formal because of variations in exchange rate between the two markets. Furthermore, a big mass monetary of foreign currency is in parallel market where the banks are not able to absorb them into current accounts or convert them into Algerian dinar that is why Algerian-banking system could not control this massive monetary mass in parallel market, which is continuing to expand;

- **Causality relationship between *USD/DZD* and *BOP*:** the findings show the existence of a unidirectional causality from balance of payments *BOP* to dinar exchange rate against dollar *USD/DZD* at 5% significant with a p-value lower than 0.05. Thus, changes in *BOP* cause changes in *USD/DZD*, in contrary changes in *USD/DZD* do not cause changes in *BOP*. According to the economic theory, the impact of balance of payments on exchange rate is indirect; the effect is through supply and demand of the domestic currency. Moreover, the exchange rate is a tool of *BOP* disequilibrium correction whether this disequilibrium is temporary or structural (in term of IMF) so, in order to fix this disequilibrium the state should devaluate its exchange rate .In other words, deficit in *BOP* causes an exchange rate devaluation. This causal

relationship is on way relation since Algeria has an undeveloped tourism sector and almost 96% of its imports are hydrocarbon. By mean, that Algeria does not have any advantages to motivate domestic currency supply;

- **Causality relationship between *USD/DZD* and *EXR*:** as observed in the table above there is a unidirectional causality from exchange reserve *EXR* to dinar exchange rate against dollar *USD/DZD* at 5% significant whereas p- value of *Wald* statistic is lower than 0.05. Hence, changes in *EXR* affect and cause changes in *USD/DZD* but in the opposite changes in *USD/DZD* don't have an impact on *EXR.* These assets are used to fulfill financial obligations such as debt and to meet the needs finance the balance of payments or interfering with the exchange markets to influence the exchange rate. Since Algeria adopt the managed float regime, which is based on the accumulation of foreign reserves, the authorities adjust their exchange rates frequently based on their foreign currency reserves and gold.

3) The impact of the Dollar and the Euro on the Dinar:

The most important characteristic of the international monetary system at the end of the twentieth century was the emergence of an international currency, which is the single European currency "Euro", embodying the European Economic and Monetary Union. The currency that has become a strong competitor to the international currency on which the Bretton Woods system has been based since its inception in what is known as the dollar rule. Where the US dollar has remained the focus of the international payments system as the billing currency for international trade as well as a reserve currency and employment at the international level.

The stability of the international monetary system based on the dollar base was removed by the collapse of the Bretton Woods system in 1971 and the emergence of the floating exchange rate system, which is characterized by sharp and sometimes violent fluctuations. As the exchange rate is determined in the market based on the strong interaction of supply and demand for international currencies in the international markets, which affected the effective play of those roles, and became a foretaste of a catastrophic failure of the international payment system based on one currency.

In the face of the emergence of the single European currency and its power stemming from the economic power of the European Union, and the place that it occupies in the global economy, beside the international exchange. The euro has become able to play those roles, especially if the European Union countries were able to reduce the cost of the transaction at the international level, so the exchange rate for the euro against the US dollar

was determined at best that it does not exceed $ 1.10 per euro, which can achieve economic balances for European countries.

Based on the exchange rate of the euro against the dollar, real and financial international transactions prices are predicted at the international level, especially the direction of the European Union countries as well as the United States of America. Since the adopted exchange system is characterized by free floating, the euro exchange rate against the dollar can fluctuate in Any moment for several reasons, which may be economic or political, internal or external, it may also be uncontrolled by the European Monetary Agency (BCE) as a deterioration or improvement in the value of the dollar against the euro. The volatility of the euro does not only affects the countries of the European Union and the United States of America, but extends the effect to include the economies of other countries related to the euro area as well as the United States of America, as is the case for OPEP countries, for example, including Algeria, which depends on the dollar as a reference currency in the evaluation and billing of its export earnings and as a reserve currency At the same time. It depends, by virtue of its dealings with the euro area, on the European currency in the settlement of payments for the imports from European countries as well as services European debt, etc. This makes these countries, including Algeria; suffer many difficulties, resulting from the crisis of the international payment system, due the fluctuations of the exchange rates of the main international currencies on which that system is based.

Therefore, our research tries to study and analyze the impact of the fluctuation of the value of the euro against the US dollar on the Algerian dinar, by studying the relationship between the changes in the exchange rate

of the euro against the dollar with some macroeconomic variables in Algeria, with the aim of discovering measures that can work to reduce the impact of those the changes, or at least reduce their intensity, in order to preserve as much as possible the gains from international exchange.

3.1) Theoretical background:

3.1.1) European single currency:

The US dollar has been the only international currency largely for a long time. As it is used in settling financial obligations and international commercial transactions, as it is a calendar and billing currency at the international level, and in order for any currency to enjoy this international character, it must meet certain conditions or perform certain functions. Which can be highlighted as follows:

For a currency to be an international currency, it must be an investment or employment currency, a reserve work and a billing currency at the international level.

a. Overview:

All European Union Member States are part of Economic and Monetary Union (EMU) and coordinate their economic policy-making to support the economic aims of the EU. However, a number of Member States have taken a step further by replacing their national currencies with the single currency – the euro.

When the euro was first introduced in 1999 – as 'book' money –, the euro area was made up of 11 of the then 15 EU Member States. Greece joined in 2001, just one year before the cash changeover, followed by Slovenia in 2007,

Cyprus and Malta in 2008, Slovakia in 2009, Estonia in 2011, Latvia in 2014 and Lithuania in 2015. Today, the euro area numbers 19 EU Member States.[4]

In the preparations for the introduction of the euro in 1999, Member States applied the 'Madrid scenario', so-called because it was agreed at the European Council meeting in Madrid in 1995.

The Madrid scenario set the legal framework and the timetable for the adoption of the euro, which involved a gradual changeover during a three-year transitional period:

- On 31 December 1998, the euro conversion rates for the national currencies of the Member States adopting the euro were irrevocably fixed.

- On 1 January 1999, the euro became the official currency of the participating countries. The national currency units became 'sub-units' of the euro, and national banknotes and coins remained in circulation. Consumers saw dual price displays in euro and the national currency units, e.g. in shops and on bank account statements, but euro cash was yet to be made available. Governments, financial institutions and companies began operating in euro, e.g. for wholesale transactions and for issuing debt. The euro was in widespread use as 'book money' and as a unit of account.

- Euro banknotes and coins were first introduced in the euro-area countries on 1 January 2002 (€-day), three years after the euro was

[4] / European commession

launched. During a short period of dual circulation when both euro and national cash were legal tender, the latter was progressively withdrawn from circulation, mainly collected by shops and banks. The dual circulation period came to an end on 28 February – or even before in some countries – so that from 1 March 2002 only euro banknotes and coins were accepted for payment in the euro area.

Convergence criteria were put in place to measure progress in countries' preparedness to adopt the euro, and are defined as a set of macroeconomic indicators, which focus on:

- Price stability
- Sound public finances, to ensure they are sustainable
- Exchange-rate stability, to demonstrate that a Member State can manage its economy without recourse to excessive currency fluctuations
- Long-term interest rates, to assess the durability of the convergence

b. The international role of EURO:

The euro’s success as a stable and credible currency means that it already plays an important role beyond the borders of the EU and the euro area.

- The European Union’s share of global gross domestic product amounts to an estimated around 17%. The share of the euro area is estimated to be around 12%.

- The euro is the second most widely used currency in terms of its share of global payments. The share of the euro in global payments amounted to around 36% in 2017. The US dollar, by comparison, accounts for about 40% of total payments.

- Sixty other countries and territories around the world, home to some 175 million people, have chosen to use the euro as their currency or to peg their own currency to it.

- The share of the euro in global holdings of foreign exchange reserves currently stands at around 20%. The US dollar's share, by comparison, is over 60%. No other currency exceeds 5%.

The EU maintains its position as a leader in international trade and development and humanitarian assistance.

- The EU is the world's largest trading bloc and the top trading partner of 80 countries across the world. The recently agreed EU-Japan Economic Partnership Agreement is the biggest trade agreement ever negotiated by the EU.

- The EU, together with its Member States, remains the biggest donor of development and humanitarian assistance globally. In 2017 the overall amount of Official Development Assistance was €75.7 billion. The EU contributed 57% of global Official Development.

3.1.2) The US Dollar:

a. Overview:

The first U.S. dollar, as it is known today, was printed in 1914 upon the creation of the Federal Reserve Bank. Less than six decades. Less than six decades later, the dollar officially became the world's reserve currency. (R.Best 2016).

In 1944, delegates from 44 Allied countries met in Bretton Wood, New Hampshire, to come up with a system to manage foreign exchange that would not put any country at a disadvantage. It was decided that the world's currencies couldn't be linked gold, but they could be linked to the U.S. dollar, which was linked to gold (Best 2016)

The Bretton Woods was the forum where a US-centric world system was instituted. The systems, institutions and arrangements that facilitate US hegemony were established at the Bretton Woods Conference. The most critical of these components for the functioning of US hegemony were the creation of the International Monetary Fund (IMF) and the World Bank, the adoption of the US dollar as the global reserve currency, and the "pegging" of the US dollar to the gold standard (Vasudevan 2008, 35).

The Bretton Woods Conference instituted a world system where the US dollar was at the center of the global economy; the value of a nation's currency was determined in relation to the US dollar, and "most international transactions were denominated in dollars" (Engdahl 2008)

A critical development for the US dollar as the global reserve currency occurred in 1971 when President Richard Nixon removed the US dollar from the gold standard. Until that period, the US dollar had been convertible into gold at the rate of 35 dollars an ounce (Hall et al. 2011)

By default, the United States remained the only option as the global reserve, despite the precarious state of US finances. Nixon's removal of the US dollar from the gold standard represented a key departure from the protocols established by the Bretton Woods Conference. The US dollar became a "fiat currency," and its value was no longer determined by, or redeemable for, physical commodities such as gold or silver (D'arista 2004; Kotlikoff 2006).

Removed from the gold standard, the US dollar was, beginning in the 1970s, increasingly linked to the value of oil. From the late 1960s ,Momani (2008) argues that a unique relationship between the trade in oil and the US dollar was established.

b. The international role of the US Dollar:

According to the International Monetary Fund, the U.S. dollar is the most popular. As of the first quarter of 2019, it makes up 61% of all known central bank *foreign exchange reserves*. That makes it the global currency, even though it doesn't hold an official title.

The relative strength of the U.S. economy supports the value of the dollar. It's the reason the dollar is the most powerful currency. Around $580 billion in U.S. bills are used outside the country.[5] That's 65% of all dollars. That

[5] /Federal Reserve Bank of New York. "Is the International Role of the Dollar Changing? https://www.newyorkfed.org/medialibrary/media/research/current_issues/ci16-1.pdf

includes 75% of $100 bills, 55% of $50 bills, and 60%of $20 bills. Most of these bills are in the former Soviet Union countries and in Latin America. They are often used as hard currency in day-to-day transactions.

Cash is just one indication of the role of the dollar as a world currency. More than one-third of the world's gross domestic product comes from countries that peg their currencies to the dollar. That includes seven countries that have adopted the U.S. dollar as their own. Another 89 countries keep their currency in a tight trading range relative to the dollar (Amadeo 2019).

In the foreign exchange market, the dollar rules. Around 90% of forex trading involves the U.S. dollar. The dollar is just one of the world's 185 currencies according to the International Standards Organization List, but most of these currencies are only used inside their own countries[6].Theoretically, any one of them could replace the dollar as the world's currency, but they won't because they aren't as widely traded. The chart below shows a breakdown of the 10 most traded currencies in 2018.

Almost 40% of the world's debt is issued in dollars[7]. As a result, foreign banks need a lot of dollars to conduct business. This became evident during the 2008 financial crisis. Non-American banks had $27 trillion in international liabilities denominated in foreign currencies. Of that, $18 trillion was in U.S. dollars (F.R.B of NY)

As a result, the U.S. Federal Reserve had to increase its dollar swap line. That was the only way to keep the world's banks from running out of dollars.

[6] /XE. “ISO 4217 Currency Codes ; https://www.xe.com/iso4217.php.
[7] /International Monetary Fund. "Global Financial Stability Report”, https://www.imf.org/en/Publications/GFSR/Issues/2019/10/01/global-financial-stability-report-october-2019.

The financial crisis made the dollar even more widely used. In 2017, the banks of Japan, Germany, France, and the United Kingdom held more liabilities denominated in dollars than in their own currencies[8]. Additionally, bank regulations enacted to prevent another crisis have made dollars scarce, and the Federal Reserve has increased the fed funds rate. That decreases the money supply by making dollars more expensive to borrow.

The dollar's strength is the reason governments are willing to hold the dollar in their foreign exchange reserves. Governments acquire currencies from their international transactions. They also receive them from domestic businesses and travelers who redeem them for local currencies.

3.2) The Algerian dinar and its relation with US Dollar and the Euro:

Since the exchange rate are often used in international transaction i.e; between the country and the outside word, especially in term of international trade (import and export). Therefore, this part of the study will discuss the relationship between euro and the dinar in one hand and in the other hand the relationship between the US dollar and the dinar in term of international transaction in order to analyze the impact of these two foreign currencies on the dinar.

[8] /WSJ City, https://city.wsj.com/articles/e4a6d373-d13b-4de2-9be4-436d360b3ea2.

3.2.1) The relationship between DZD and US dollar:

The relation with the United States in terms of the dollar is inevitable; more than 97% of Algerian exports in oil for decades (Structural trade retention for exports) are priced in US dollar (dollar-domination). According to NCIS of the customs (national center of information and statistics) that through the nine first months of 2010 the hydrocarbon refers to 96.88% from the total Algerian exports, however, the proportion of fuel from total exports is not less than 97% for decades and it is in rise. Thus, according to data from AMF (Arabic monetary fund), that percentage has been rise from 97.2% in 2008 to more than 97.6% in the end of the same year. Moreover, until the end of 2012 the total of Algerian exports reach 56.054 billion dollar, in the other hand, the exports out of hydrocarbon did not even cross 1.514 billion dollar.

3.2.2) The relationship between DZD and EURO:

Any slight turmoil in the European economy will have profound effects on the level of the entire developing or developed world economies. Especially Algeria, whose relationship with European countries is characterized by an organic intertwining that is historically justified. At the level of economic and geographical reality, the most prominent of which and everyone is aware of the Euro-Med partnership, which we signed with the countries of the European Community in the last decade, which brought our economic association with the European Union to the peak.

With regard to the high economic correlation coefficient of Algeria with the countries of the European Community, it must be known that European countries are the first trading partner with Algeria, because, more than 70%

(what it is called trade retention) of our imports comes from Europe, while the share of Arab countries has not exceeded The borders of 4% and Africa 1.2% despite the geographical convergence and economic similarity. However, France represents the main supplier of the Algerian market with grains and many agricultural products without forgetting that about 50% of Algerian foreign exchange reserve is denominated in European currency.

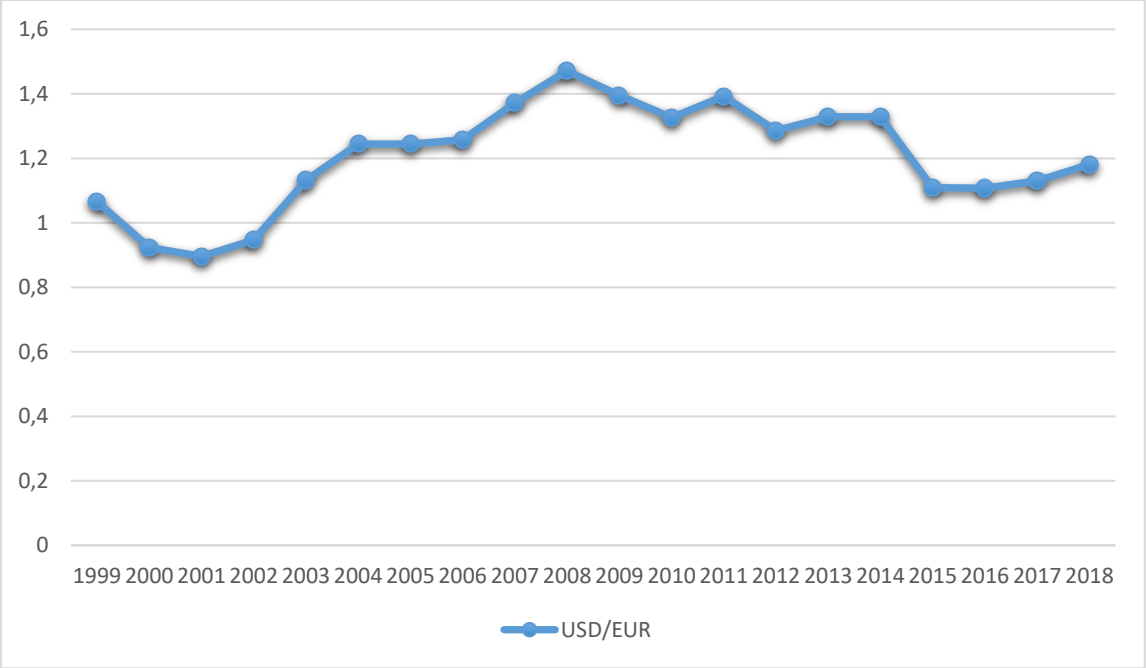
This makes foreign trade a very hindering factor for development processes, and even contributes to importing many monetary problems and economic crises. If the dollar's exchange rate falls in relation to other major currencies, this automatically leads to an increase in the prices of goods that Algeria imports from the countries of the European Union, which is the main source of Algeria's annual imports. The prices of Algerian imports from the countries whose currencies rose against the US dollar, will also be affected. Including Japan and other Asian countries, their currencies rose in relation to the US dollar. For example, from 2002 to 2006, when the value of the US dollar decreased by 33% compared to the euro, the total Algerian import costs increased by more than 14%.

3.2.3) Analyze the dollar and the euro evolution:

Table III.13: Evaluation of USD/EUR/DZD

year	USD/EUR	USD/DZD	EUR/DZD
1999	1.065	66.57	
2000	0.923	75.26	
2001	0.895	77.22	
2002	0.946	79.68	83.45
2003	1.132	77.39	
2004	1.243	72.06	89.64
2005	1.244	73.28	91.30
2006	1.256	72.65	91.24
2007	1.371	69.29	94.99
2008	1.471	64.58	94.86
2009	1.394	72.65	101.16
2010	1.326	74.39	114.97
2011	1.392	72.94	102.21
2012	1.285	77.54	102.16
2013	1.3285	79.37	105.43
2014	1.3282	80.58	106.90
2015	1.109	100.69	111.44
2016	1.106	109.46	121.17
2017	1.129	110.97	125.32
2018	1.180	116.61	137.68

Graph III.15: The Evolution of USD/EUR



3.3) Data and methodology:

Following the approach employed in some above-mentioned studies, in this study we use a SVAR model to examine the impact of the exchange rate of the euro against the dollar fluctuation on the exchange rate of the dinar and its determinants.

3.3.1) SVAR Definition:

The Structural Autoregression Vector model (SVAR) has been developed during the past decades to explain the fluctuations of economic cycles in addition the determination of the effects of different economic policies. This model represents an extension of the traditional theoretical approach (VAR), especially since this modern approach combines economic theory and time

series analysis to determine the dynamic response to economic changes resulting from various structural disturbances.

The SVAR models are similar to the dynamic simultaneous equation models, which it has been criticized by (Sims C. A., 1980), except that the economic models present unexpected shocks making the traditional models the object of criticism because, the SVAR models allow to impose restrictions on the dynamic models. In addition, the analysis of the model's reaction in the presence of structural crises. However, the SVAR models provide a treatment to predict the effects of shocks that occur at different levels, social or economic, in addition to the fact that random shocks have become well defined because their origin is known.

The SVARs have been used to document the effects of money on output (Sims & Zha, 2005), the relative importance of supply and demand shocks on business cycles (Blanchard & Quah, 1989), the effects of fiscal policy (Blanchard & Perotti, 2002), or the relation between technology shocks and worked hours (Galí, 1999) , among many other applications.

Structural Vector Autoregressions (SVARs) are a multivariate, linear representation of a vector of observables on its own lags and (possibly) other variables as a trend or a constant. SVARs make explicit identifying assumptions to isolate estimates of policy and/or private agents' behavior and its effects on the economy while keeping the model free of the many additional restrictive assumptions needed to give every parameter a behavioral interpretation (Jesús Fernández & Juan F. Rubio).

The main objective of the SVAR methodology is to determine the dynamic responses of different economic variables to disturbances (independent shocks) by combining time series analysis and economic theory (Eduardo, Armando, & Uberto, 2010). The SVAR approach represents a suitable alternative to the traditional a-theoretic VAR (Sims C. A., 1980).

3.3.2) SVAR specification:

$$Ay_t = A_1^s y_{t-1} + \ldots\ldots + A_p^s y_{t-p} + C^s x_t + Bu_t \qquad \textbf{(1)}$$

Where **A**, all of the $\boldsymbol{A^s_i}$, and $\boldsymbol{C^s}$ are the structural coefficients, and the ut are the orthonormal unobserved structural innovations with $E(u_t u_t') = I_k$

It is easy to see the relationship between the SVAR specification and the corresponding reduced-form VAR. Assuming that **A** is invertible, we have:

$$y_t = A^{-1}A_1^s y_{t-1} + \cdots + A^{-1}A_p^s y_{t-p} + A^{-1}C^s x_t + A^{-1}B$$

$$= A_t y_{t-1} + \cdots + A_p y_{t-p} + C x_t + \epsilon_t \qquad (2)$$

So the reduced-form lag matrices $A_i = A^{-1}A_i^s$ and $C = A^{-1}C^s$, and the reduced form error structure is given by:

$$\epsilon_t = A^{-1}Bu_t = Su_t$$

$$E(\epsilon_t \epsilon_t') = \Sigma_\epsilon = A^{-1}BB'^{A^{-1}\prime} = SS' \qquad \textbf{(3)}$$

Where $S = A^{-1}B$

SVAR estimation uses estimates $\widehat{\Sigma_\varepsilon}$ obtained from the reduced form VAR, the short-run covariance relationships and any restrictions in Equation **(3)**, and long-run restrictions on the accumulated impulse responses, to

identify and estimate the model. The challenge in SVAR estimation is that there are only k(k+1)/2 moments in Σε and more than k(k+1)/2 elements in **A** and **B**, or in **S** so that those matrices are not identified unless additional restrictions are provided.

3.3.3) Different classes of Structural VAR models:

In the literature, the alternative ways of modelling instantaneous correlations can be summarised in the following terms. Literature on the so-called Structural VAR approach used different ways of structurising the VAR model. (Amisano & Giannini, 1997) Discussed three such ways: a **KEY** model, which they called the K-model, the C-model and the AB-model.

K-Model:

K is a (***n*** x ***n***) invertible matrix such that

$\mathbf{K}\ \mathbf{A}(L)\ y_t = \mathbf{K}_{\varepsilon t}$

$\mathbf{K}_{\varepsilon t} = \mathbf{e}_t$

$\mathbf{E}(\mathbf{e}_t) = 0 \qquad \mathbf{E}(\mathbf{e}_t\ \mathbf{e}_t\ ') = \mathbf{I}_n$

The **K** matrix "premultiplies" the autoregressive representation and induces a transformation on the $\boldsymbol{\varepsilon}_t$ disturbances by generating a vector ($\mathbf{e}_t$) of orthonormalised disturbances (its covariance matrix is not only diagonal but also equal to the unit matrix $\mathbf{I}_n$). Contemporaneous correlations among the elements of y are therefore modelled through the specification of the invertible matrix **K**. The structural K-model can be thought of as a particular structural form with orthonormal disturbance vector. Note that assuming

(Amisano & Giannini, 1997) know the true variance covariance matrix of the $\boldsymbol{\varepsilon}_t$ terms from:

$\mathbf{K}\,\boldsymbol{\varepsilon}_t = \mathbf{e_t}$

$\mathbf{K}\,\boldsymbol{\varepsilon}_t\,\boldsymbol{\varepsilon}_t'\,\mathbf{K}' = \mathbf{e_t}\,\mathbf{e}_t'$

taking expectations one immediately obtains

$\mathbf{K\Sigma K}' = \mathbf{I_n}$.

The previous equation implicitly imposes $n(n+1)/2$ non-linear restrictions on the **K** matrix, leaving $n(n-1)/2$ free parameters in **K**.

- **C-Model:**

C is a (***n*** x***n***) invertible matrix such that

$\mathbf{A}(L)\,y_t = \boldsymbol{\varepsilon}_t$

$\boldsymbol{\varepsilon}_t = \mathbf{C}\,\mathbf{e_t}$

$E(\mathbf{e}_t) = 0 \qquad E(\mathbf{e_t}\,\mathbf{e}_t') = \mathbf{I_n}$

In this particular structural model, they have a structural form where no instantaneous relationships among the endogenous variables are explicitly modelled. Each variable in the system is affected by a set of orthonormal disturbances whose impact effect is explicitly modelled via the **C** matrix.

(Sims C. , 1988) Stresses the point that there is no theoretical reason to suppose that **C** should be a square matrix of the same order as **K**. If **C** were a square matrix, the number of independent (orthonormal) transformed disturbances would be equal to the number of equations. Many reasons lead them to think that the true number of originally independent shocks to the

system could be very large. In that case the **C** matrix would be a (***n***x ***m***) matrix, with ***m*** much greater than ***n***. In this sense, this research path is opposite to the one studied by the factor analysis, which attempts to find ***m*** (the number of independent factors) strictly smaller than ***n***. The case of a rectangular (***n*** x ***m***) matrix **C**, with ***m>n***, conceals a number of problems connected with the completeness of the model and the aggregation over agents – see a short and not very illuminating discussion of this topic in (Blanchard & Quah, 1989). In their book, they did not face this problem and they assumed **C** square and invertible. Nevertheless, they thought that many important issues could be better treated following the research path indicated before.

Turning back to our **C model**, the $\boldsymbol{\varepsilon}_t$ vector is regarded as being generated by a linear combination of independent (orthonormal) disturbances to which they referred hereafter as $\mathbf{e}_t$. This may have a different meaning than that of the **K-model**, where one is concerned with the explicit modelling of the instantaneous relationships among endogenous variables.

As for the C-model, notice that from:

$$\boldsymbol{\varepsilon}_t = \mathbf{C}\mathbf{e}_t$$

$$\boldsymbol{\varepsilon}_t \boldsymbol{\varepsilon}_t' = \mathbf{C}\mathbf{e}_t \mathbf{e}_t' \mathbf{C}'$$

taking expectations,

$$\boldsymbol{\Sigma} = \mathbf{C}\mathbf{C}'$$

If, again, they assumed to know **Σ,** the previous matrix equation implicitly imposes a set of *n(n+ 1)/2* non-linear restrictions on the **C** matrix, leaving *n(n-I)/2* free elements in **C**.

❖ **AB Model:**

Suppose the following bivariate VAR(1) model of the following form (Note: we suppress the intercept term for simplicity):

$$y_t = -a_{12}x_t + \alpha_{11}y_{t-1} + \alpha_{12}x_{t-1} + b_{11}u_{1t} \qquad (4)$$

$$x_t = a_{21}y_t + \alpha_{21}y_{t-1} + \alpha_{22}x_{t-1} + b_{22}u_{2t} \qquad (5)$$

In the framework, ***y*** and ***x*** are specified to be related contemporaneously as well as with lags and u_{1t} and u_{2t} are structural shocks of y_t and x_t respectively and

$$\begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\right]$$

OLS estimation method may not be used to estimate the above since the error terms are correlated with the right-hand-side contemporaneous variables.

SVAR and Reduced VAR:

Expressing (1) and (2) in matrix notation, we have:

$$\begin{bmatrix} 1 & a_{12} \\ a_{21} & 1 \end{bmatrix}\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix}\begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix}\begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix}$$

SVAR or primitive VAR

Moving Average (Rearranging terms):

$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} 1 & a_{12} \\ a_{21} & 1 \end{bmatrix}^{-1} \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{bmatrix} + \begin{bmatrix} 1 & a_{12} \\ a_{21} & 1 \end{bmatrix}^{-1} \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix} \begin{bmatrix} u_{2t} \\ u_{2t} \end{bmatrix}$$

$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \Leftarrow$$ Reduced form VAR

The basic issue in VAR modeling is structural shock identification

$$\begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} = \frac{1}{1 - a_{12}a_{21}} \begin{bmatrix} 1 & -a_{12} \\ -a_{21} & 1 \end{bmatrix} \begin{bmatrix} b_{12} & 0 \\ 0 & b_{22} \end{bmatrix} \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix}$$

The reduced form errors make up of structural errors. Accordingly, a shock to a reduced form "error" cannot be taken as a structural shock to a particular variable.

Structural shock identification:

$$\begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} = \begin{bmatrix} 1 & a_{12} \\ a_{21} & 1 \end{bmatrix}^{-1} \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix} \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix} \rightarrow \begin{bmatrix} 1 & a_{12} \\ a_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

$$= \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix} \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix} \rightarrow A\varepsilon_t = Bu_t$$

Let ***B*** be an identity matrix. To just identify the structural shocks, the number of restrictions on the off-diagonal elements of matrix ***A*** is ***n(n- 1)/2*** since the estimated variance-covariance matrix of reduced form residuals has ***n(n+1)/2*** unique elements.

In general, the number of restrictions for exact identification is $2n^2 - n(n+1)/2$ on ***A*** and ***B*** matrices.

Case 1: $a_{12} = a_{21} = 0$

In this case, the contemporaneous value of x will not appear in the ***y*** equation and, likewise, the contemporaneous value of y will not be in the ***x*** equation. Hence, the reduced form residuals are identical to structural residuals (or shocks).

$$\begin{bmatrix}\varepsilon_{1t}\\ \varepsilon_{2t}\end{bmatrix} = \frac{1}{1-a_{12}a_{21}}\begin{bmatrix}u_t & -a_{12}u_{2t}\\ -a_{21}u_{1t} & +u_{2t}\end{bmatrix} \rightarrow \begin{bmatrix}\varepsilon_{1t}\\ \varepsilon_{2t}\end{bmatrix} = \begin{bmatrix}u_{1t}\\ u_{2t}\end{bmatrix}$$

Case 2: $a_{12} = 0$

This is a recursive identification as suggested by (Sims C. A., 1980), the so-called *Cholesky factorization*.

$$\begin{bmatrix}1 & 0\\ a_{21} & 1\end{bmatrix}\begin{bmatrix}\varepsilon_{1t}\\ \varepsilon_{2t}\end{bmatrix} = \begin{bmatrix}u_{1t}\\ u_{2t}\end{bmatrix} \rightarrow \quad \begin{aligned}\varepsilon_{1t} &= u_{1t}\\ \varepsilon_{2t} &= a_{21}u_{1t} + u_{2t}\end{aligned}$$

In this case, ***x*** is affected contemporaneously by structural shock in y but not the reverse (***y*** is also affected by structural shock in ***x*** with lag).

Theoretical Restrictions:

- In general, the model contains more than two variables.
- The essence of SVAR is to use theoretical restrictions to identify the shocks.
- Since these restrictions are theoretical-dependent, illustration need to be given from the theoretical model adopted to assess the relationship among the variables.

3.4) Results and Discussion:

In this study, logarithm is applied on the series of the variables in order to make the data endogenous. Therefore, the variables of the study become as follows:

- ***DLDEXD/ LDEXD :*** the exchange rate of the dinar against the dollar USD/DZD
- ***DLEEXD/LEEXD:*** the exchange rate of the euro against the dollar EUR/USD
- ***DLMM/LMM:*** the monetary mass or the money supply M2
- ***DLBoP/LBoP:*** the balance of payments.
- ***DLEXR/LEXR:*** the foreign exchange reserve.

In order to apply the model of the study, which is SVAR model, first estimating the Vector Auto-Regressive (VAR) model is needed. Then, there will be a study for VAR model validation.

3.4.1) stationarity test:

In this study only the ADF test is applied to examine the stationarity of study variables: euro exchange rate against the dollar (*LEEXD*), dinar exchange rate against the dollar (*LDEXD*), monetary mass (*LMM*), exchange reserve (*LEXR*), balance of payment balance (*LBoP*). The following table summarizes the results of ADF test obtained from EVIEWS:

Table III.14: Stationarity Test Results

Time series	Decision	Augmented Dickey-Fuller		
		Level	1st difference	2nd difference
LEEXD	I(1)	-0.760238	**-3.588199**	/
LDEXD	I(1)	1.127504	**-3.438791**	/
LMm	I(2)	6.010109	-1.155998	**-4.645825**
LExr	I(1)	0.182051	**-3.942686**	/
LBop	I(1)	0.446319	**-3.734296**	/
Critical Values	*1%*	-2.699769	-2.699769	-2.708094
	5%	-1.961409	-1.961409	-1.962813
	10%	-1.606610	-1.606610	-1.606129

By comparing the ADF statistic in the table (III.10) with the critical value of ADF from (*Mackinon*) table for a significance level of 1%, 5% and 10%. This comparison shows that the null hypothesis of nonstationarity is accepted for all variables in level, in other words, all variables are non-stationary in level. Therefore, we run the test in 1st difference.

When examining the variables at the 1st difference, it was found that the null hypothesis (that saying there is a unit root) can be rejected at the 1st difference for the following variables the *LEEXD* (EUR / USD) exchange rate of the euro against the dollar series, the *LDEXD* (DZD / USD) exchange rate of the dinar against the dollar, the *LEXR* foreign exchange reserve and the *LBoP* balance of payments series. Where the calculated values were greater than the critical values extracted from (*Mackinon*) table at the level of

significance (1%), (5%) and (10%), which means that they are all stationary at the 1st difference I(1).

While for the monetary mass *LMM* series the null hypothesis is accepted , meaning that the series is not stationary at the 1st difference, thus, it is moved to the 2nd difference where the findings show that *LMM* is stationary at the 2nd difference I(2), as the calculated values were greater than the critical values extracted from (*Mackinon*) table at the level of significance (1%), (5%) And (10%) and this is what is shown by the results of the above table.

3.4.2) The Optimal Lag:

After studying the stationarity of the time series that will be include in this study, the results concluded that there are variables that are stationary at 1st difference I(1) and one variable is stationary at 2nd difference I(2). Hence, this is acceptable to apply the VAR model. Before estimating this model, The lag length selection was determined, depending on these two criteria (*AIC*) and (*SC*). The results shown in the table below (III.15) indicates that the optimal lag length is 2 (*k=2*):

Table III.15: optimal lag length results

VAR Lag Order Selection Criteria
Endogenous variables: DLDEXD DLEEXD DLEXR DDLMM DLBOP
Exogenous variables: C
Date: 11/24/20 Time: 21:49
Sample: 1999 2018
Included observations: 16

Lag	LogL	LR	FPE	AIC	SC	HQ
0	34.79940	NA*	1.66e-08	-3.724925	-3.483491	-3.712562
1	58.06269	29.07911	2.50e-08	-3.507836	-2.059232	-3.433655
2	111.7517	33.55563	2.71e-09*	-7.093961*	-4.438187*	-6.957964*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: output of Eviews 9

After selecting the optimal lag length, we estimated the Autoregressive Model (VAR) has been estimated which is the standard model before moving to the Structural Model (SVAR) if it is acceptable.

3.4.3) VAR Model Estimation:

The standard Autoregressive (VAR) model is estimated according to the following results:

Table III.16:VAR Estimates

Vector Autoregression Estimates

Vector Autoregression Estimates
Date: 11/24/20 Time: 22:01
Sample (adjusted): 2003 2018
Included observations: 16 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DLDEXD	DLEEXD	DLEXR	DDLMM	DLBOP
DLDEXD(-1)	-1.301411	0.749671	3.790489	0.603577	3.779808
	(1.62519)	(2.08358)	(98.5678)	(1.23173)	(6.65834)
	[-0.80077]	[0.35980]	[0.03846]	[0.49002]	[0.56768]
DLDEXD(-2)	-0.337243	0.029235	-0.232956	-0.131277	0.867827
	(1.24938)	(1.60177)	(75.7748)	(0.94690)	(5.11865)
	[-0.26993]	[0.01825]	[-0.00307]	[-0.13864]	[0.16954]
DLEEXD(-1)	-0.653689	0.457405	-2.901801	-0.049077	1.738095
	(0.72860)	(0.93410)	(44.1894)	(0.55220)	(2.98503)
	[-0.89719]	[0.48967]	[-0.06567]	[-0.08887]	[0.58227]
DLEEXD(-2)	-0.002863	-0.121783	7.708129	-0.199019	1.062597
	(0.76920)	(0.98616)	(46.6520)	(0.58298)	(3.15138)
	[-0.00372]	[-0.12349]	[0.16523]	[-0.34139]	[0.33718]
DLEXR(-1)	-0.007968	0.003472	-0.099819	-0.001403	0.013533
	(0.00671)	(0.00860)	(0.40681)	(0.00508)	(0.02748)
	[-1.18800]	[0.40376]	[-0.24537]	[-0.27605]	[0.49247]
DLEXR(-2)	0.008186	-0.011659	0.124439	-0.007431	-0.051686
	(0.01355)	(0.01737)	(0.82162)	(0.01027)	(0.05550)
	[0.60430]	[-0.67133]	[0.15146]	[-0.72379]	[-0.93126]
DDLMM(-1)	0.478891	-0.741215	30.96181	-0.401680	-1.261360
	(0.69476)	(0.89072)	(42.1370)	(0.52656)	(2.84639)
	[0.68929]	[-0.83216]	[0.73479]	[-0.76284]	[-0.44314]
DDLMM(-2)	0.149481	0.318005	3.702175	-0.734187	-0.676651
	(0.37666)	(0.48289)	(22.8441)	(0.28547)	(1.54314)
	[0.39686]	[0.65854]	[0.16206]	[-2.57188]	[-0.43849]
DLBOP(-1)	-0.337561	0.299280	-2.460119	0.192568	1.062652
	(0.21259)	(0.27255)	(12.8933)	(0.16112)	(0.87095)
	[-1.58789]	[1.09809]	[-0.19081]	[1.19520]	[1.22010]
DLBOP(-2)	-0.065544	-0.116531	10.42292	0.048594	-0.070357
	(0.21848)	(0.28011)	(13.2511)	(0.16559)	(0.89512)
	[-0.30000]	[-0.41602]	[0.78657]	[0.29346]	[-0.07860]
C	0.087523	-0.014126	-0.055807	-0.023540	-0.098824
	(0.09031)	(0.11579)	(5.47751)	(0.06845)	(0.37001)
	[0.96910]	[-0.12200]	[-0.01019]	[-0.34391]	[-0.26709]
R-squared	0.575543	0.424123	0.532919	0.733788	0.519572
Adj. R-squared	-0.273371	-0.727631	-0.401244	0.201364	-0.441284
Sum sq. resids	0.035226	0.057900	129.5762	0.020234	0.591271
S.E. equation	0.083936	0.107610	5.090701	0.063615	0.343881
F-statistic	0.677976	0.368241	0.570478	1.378201	0.540739
Log likelihood	26.24546	22.27004	-39.43646	30.68073	3.681538
Akaike AIC	-1.905682	-1.408755	6.304557	-2.460091	0.914808
Schwarz SC	-1.374527	-0.877601	6.835712	-1.928936	1.445962
Mean dependent	0.023801	0.013840	0.077444	-0.003396	0.065727
S.D. dependent	0.074382	0.081871	4.300518	0.071184	0.286440

Determinant resid covariance (dof adj.)	1.98E-10
Determinant resid covariance	5.90E-13
Log likelihood	111.7517
Akaike information criterion	-7.093961
Schwarz criterion	-4.438187

3.4.4) VAR Model Validation:

Study of the Vector Autoregressive (VAR) model validation:

The viability of the VAR model will be tested through the residuals according to the following tests:

- Normal distribution test: through *Skewness* and *Kurtosis* testes and *Jarque-Bera* test. It appears that its probabilities are greater than 5% as shown in the results below, and therefore it can be said that the residuals follow the normal distribution.

Table III.17 :VAR Residual Normality Tests

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/24/20 Time: 22:05
Sample: 1999 2018
Included observations: 16

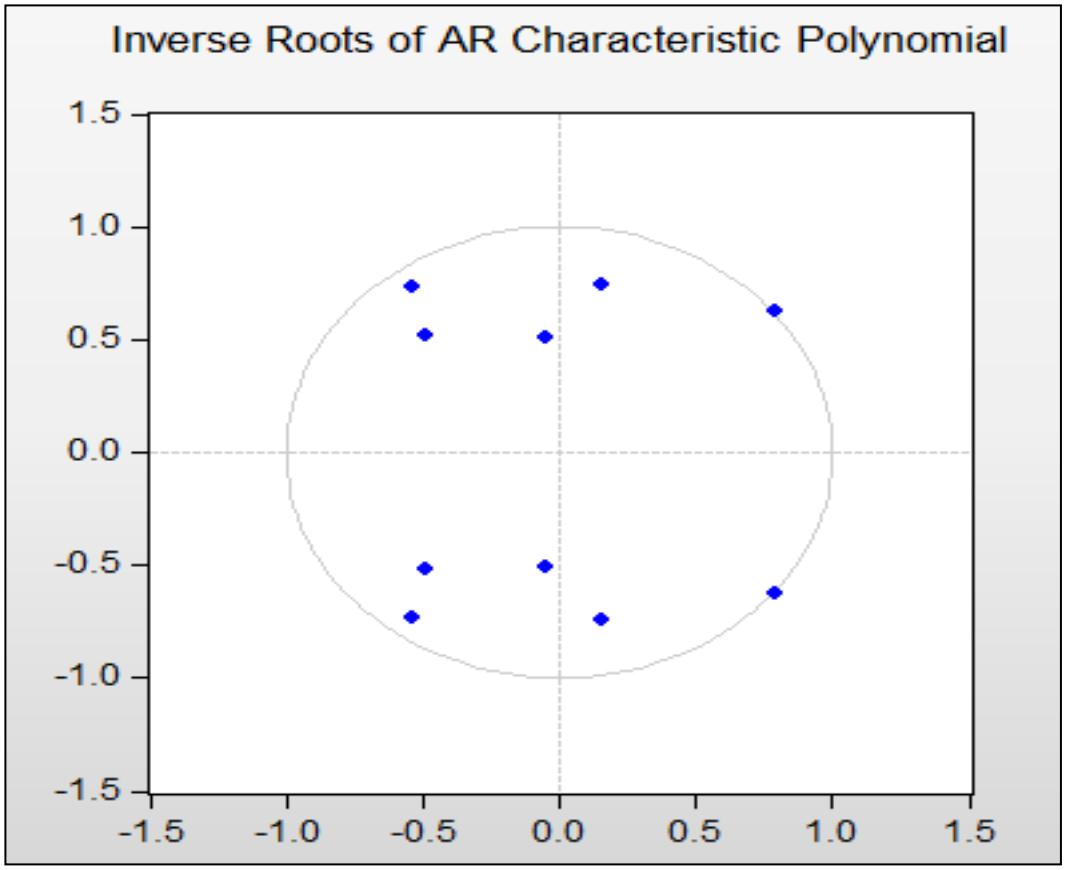
Component	Skewness	Chi-sq	df	Prob.
1	0.497590	0.660255	1	0.4165
2	-0.143091	0.054600	1	0.8152
3	-0.250973	0.167966	1	0.6819
4	-0.410560	0.449491	1	0.5026
5	-0.557250	0.828075	1	0.3628
Joint		2.160387	5	0.8265

Component	Kurtosis	Chi-sq	df	Prob.
1	2.806405	0.024986	1	0.8744
2	2.560434	0.128812	1	0.7197
3	1.538488	1.424011	1	0.2327
4	2.593821	0.109987	1	0.7402
5	2.499630	0.166913	1	0.6829
Joint		1.854710	5	0.8689

Component	Jarque-Bera	df	Prob.
1	0.685241	2	0.7099
2	0.183412	2	0.9124
3	1.591977	2	0.4511
4	0.559478	2	0.7560
5	0.994988	2	0.6081
Joint	4.015097	10	0.9467

- Residuals Aoto-correlation test: From the figure, it appears that all the points inside the circle and thus the null hypothesis, which says that there is no auto-correlation to the residuals is accepted.

Figure III.3 :Inverse Roots of AR



3.4.5) SVAR Model:

Moving from standard VAR into structural VAR (SVAR):

The moving average is through defining the matrix P, which is the moving average through these equations e_t=P.u_t and A.e_t=B.u_t And through which the matrix P is extracted.

Where: ***P= A*** $^{-}$ ***B***. and that throughout the following steps:

1- The number of restrictions (N) must be determined And that is through the following rule:

$$N = \frac{N(N-1)}{2} = \frac{5(5-1)}{2} = 10$$

And the number is found through a number of C(i) in the matrix A and they are from C(1) to C(10).

2- We use economic theory by defining the non-diagonal elements of the two matrices A and B Where this is as follows:

❖ Unexpected changes in the dinar exchange rate against the dollar (DZD/USD) (DLDEXD) Caused by changes in the euro exchange rate against the dollar (DLEEXD), changes in the foreign exchange reserves (DLEXR), changes in the mass monetary (DLMM). It is also, affected by changes in the balance of payments (DLBOP) And also by a simultaneous structural shock to the exchange rate of the dinar against the dollar. All of this is represented by the following mathematical formula:

$$e_t^{DLDEXD} = \propto_{DLEEXD}^{DLDEXD} . e_t^{DLEEXD} + \propto_{DLEXR}^{DLDEXD} . e_t^{DLEXR} + ❖ \propto_{DLMM}^{DLDEXD} . e_t^{DLMM} + \propto_{DLBOP}^{DLDEXD} . e_t^{DLBOP} + u_t^{DLDEXD}$$

❖ The unexpected changes of the euro's exchange rate against the dollar (DLEEXD) are only affected by an immediate structural shock to the euro's exchange rate against the dollar, And that is mathematically represented as follow:

$$e_t^{DLEEXD} = u_t^{DLEEXD}$$

❖ The unexpected changes of the foreign exchange reserve (DLEXR) Caused by changes of the dinar exchange rate against the dollar (DLDEXD) and changes in the euro exchange rate against the dollar

(DLEEXD), also with a simultaneous structural shock to the exchange reserve, all that is represented as follow:

$$e_t^{DLEXR} = \propto_{DLDEXD}^{DLEXR} . e_t^{DLDEXD} + \propto_{DLEEXD}^{DLEXR} . e_t^{DLEEXD} + u_t^{DLEXR}$$

- Unexpected changes of monetary mass (DLMM) Caused by changes in the exchange reserves (DLEXR) and changes in the balance of payments (DLBOP), besides, a structural simultaneous shock in the monetary mass, all of which is represented by the following mathematical formula:

$$e_t^{DLMM} = \propto_{DLEXR}^{DLMM} . e_t^{DLEXR} + \propto_{DLBOP}^{DLMM} . e_t^{DLBOP} + u_t^{DLMM}$$

- Unexpected changes in the balance of payments (DLBOP) caused by changes in the exchange rate of the dinar against the dollar (DLDEXD) And changes in the euro exchange rate against the dollar (DLEEXD) And also by a structural shock to the balance of payments, this is represented as follow:

$$e_t^{DLBOP} = \propto_{DLDEXD}^{DLBOP} . e_t^{DLDEXD} + \propto_{DLEEXD}^{DLBOP} . e_t^{DLEEXD} + u_t^{DLBOP}$$

Therefore, through these data, the two matrices A and B and their coefficients are explained in the following outputs:

Table III.18: SVAR Estimates

Structural VAR Estimates

Structural VAR Estimates
Date: 11/24/20 Time: 22:30
Sample (adjusted): 2003 2018
Included observations: 16 after adjustments
Estimation method: method of scoring (analytic derivatives)
Maximum iterations reached at 500 iterations
Structural VAR is over-identified (5 degrees of freedom)

Model: Ae = Bu where E[uu']=I
Restriction Type: short-run pattern matrix

A =

1	C(3)	C(6)	C(8)	C(9)
0	1	0	0	0
C(1)	C(4)	1	0	0
0	0	C(7)	1	C(10)
C(2)	C(5)	0	0	1

B =

1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
0	0	0	0	1

WARNING: B matrix is fixed (structural innovation variances not estimated)!!!

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-37.12509	6.875025	-5.399994	0.0000
C(2)	-29.31125	4.993361	-5.870045	0.0000
C(3)	8.283873	4.922837	1.682744	0.0924
C(4)	-60.32912	5.450874	-11.06779	0.0000
C(5)	-23.37635	3.962721	-5.899065	0.0000
C(6)	0.044543	0.155393	0.286648	0.7744
C(7)	-0.021846	0.008564	-2.550782	0.0107
C(8)	-43.79243	7.744654	-5.654537	0.0000
C(9)	5.644995	1.236922	4.563742	0.0000
C(10)	2.803231	0.517322	5.418737	0.0000

Log likelihood	-62.48677		
LR test for over-identification:			
Chi-square(5)	255.4249	Probability	0.0000

Estimated A matrix:

1.000000	8.283873	0.044543	-43.79243	5.644995
0.000000	1.000000	0.000000	0.000000	0.000000
-37.12509	-60.32912	1.000000	0.000000	0.000000
0.000000	0.000000	-0.021846	1.000000	2.803231
-29.31125	-23.37635	0.000000	0.000000	1.000000

Estimated B matrix:

1.000000	0.000000	0.000000	0.000000	0.000000
0.000000	1.000000	0.000000	0.000000	0.000000
0.000000	0.000000	1.000000	0.000000	0.000000
0.000000	0.000000	0.000000	1.000000	0.000000
0.000000	0.000000	0.000000	0.000000	1.000000

Through the coefficients and their probabilities, it can be said that all the effects are significant, except for the exchange rate of the euro against the dollar on the exchange rate of the dinar against the dollar, as well as the effect of the exchange reserves on the exchange rate of the dinar against the dollar is not significant.

3.4.6) Analysis of Impulse response functions:

The response functions for the reaction measure the impact of the shocks faced by the internal variable within the VAR model on the current and future values of the other internal variables. There are two ways to measure the impact of shocks, first, measure the impact of the shock by one standard deviation. Second, measure the impact of the shocks by one unit (A.Atia).

In other words, the impulse response functions are an explanation of the response of each variable to the deviations and sudden changes in the other variables, where the blue line represents the response to the shock and how it changes over the following periods, which are often 10 periods, while the two red lines represent the confidence interval of the blue line, i.e. the effect function of 90%. Where both the upper and lower lines are estimated by simulating the shock 100 thousand times and studying all possible impacts.

The topic is about the effect of the exchange rate determinants on the value of the Algerian dinar, and through that, the attention will be focused on the impulse response function of the variable of the dinar exchange rate against the dollar through 5 shocks shown in the following figure:

Figure III.4:Structural response functions.

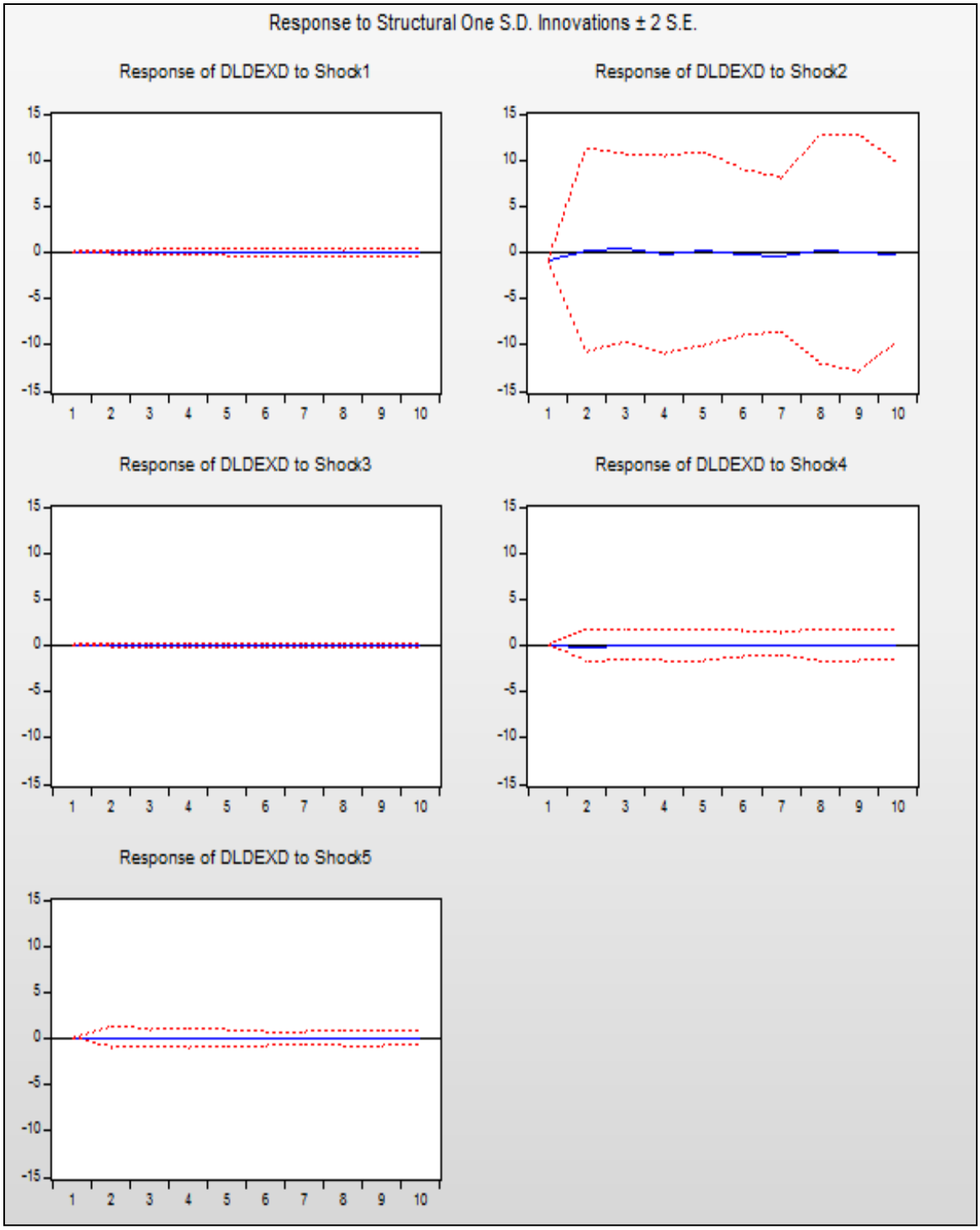


Figure III.5: Structural response functions (2)

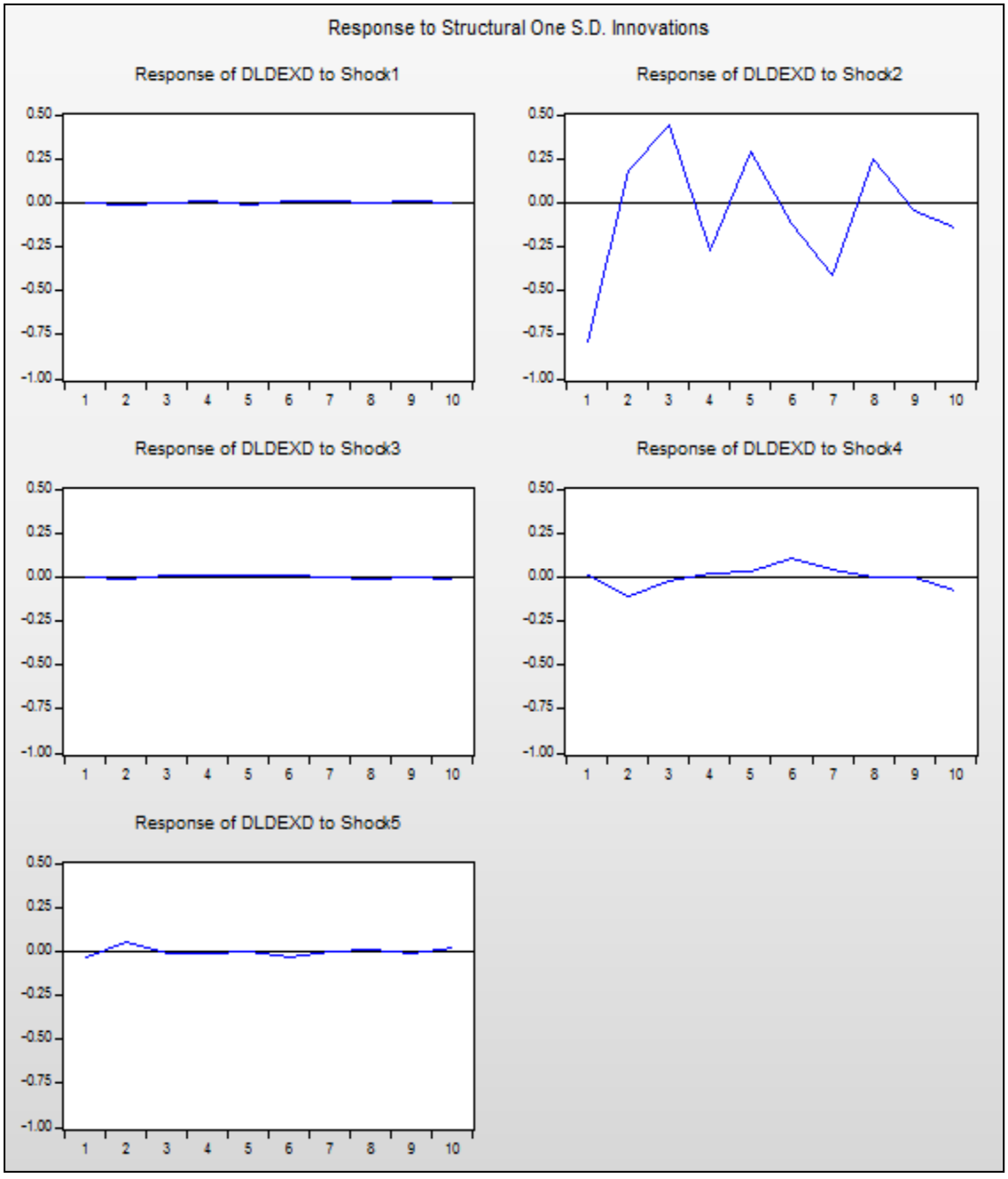
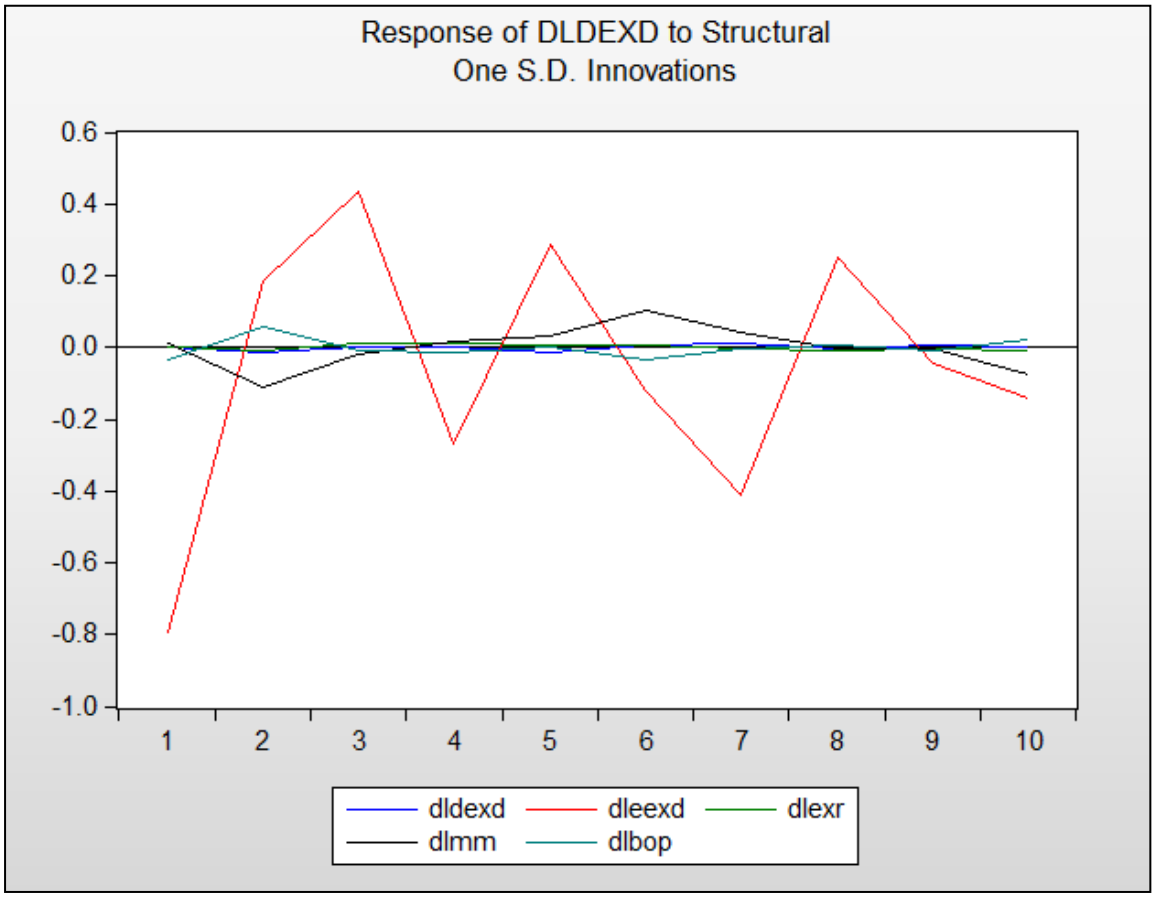


Figure III.6: Structural response functions (3)



To explain the impact of these shocks, it is necessary to use numerical values for them, where:

- The effect of a structural shock on the exchange rate of the dinar against the dollar leads to slight effects on the exchange rate of the dinar against the dollar. Despite its decrease and increase, the rate of this increase or decrease did not exceed, at the most, 1.51% during the fifth year

- The shock to the exchange rate of the euro against the dollar leads to a decrease in the value of the dinar against the dollar by 79.2%

during the first year. Despite its increase during the second and third years, it became instable and it keeps rise and fall throughout the remaining years by 43.56% as a higher level of its increase and this during the third year and 40.94% as the highest decline rate, during the seventh year. This shock remains the most impactful and significant shock on the exchange rate of the dinar against the dollars. Since the dollar is the currency of factorizing of Algeria, most of its imports are from Europe, and these two currencies form the foreign exchange rate, which is evaluated with the dollar, all that makes the dinar exchange rate sensitive to their fluctuation. If the dollar depreciate against the euro then there will be negative consequences on the Algerian economy in general and the dinar in particular. In other words, the input of Algeria from the exports is in the dollar especially hydrocarbon which is evaluated with the dollar in the world wild. In the other hand, most of its imports are from Europe with the Euro, so most of the time a switch between these two currencies is needed that why any change in their exchange rate affects the dinar exchange rate.

- Making a shock on the foreign exchange reserves does not lead to significant effects on the exchange rate of the dinar against the dollar. Although it was lowered or raised, the rate of this increase or decrease did not exceed a maximum of 1.14% during the third year. As mentioned in the causality relationship, exchange reserve affects USD/DZD, but this results shows that the effect is not significant because there is not a direct relationship between foreign exchange reserves and the dinar. The exchange reserve is used usually as a

cover of the transactions of Algeria with the rest of the world. Therefore, if there is fluctuation in the dollar and the euro exchange rate, the exchange reserves cover the shortfall. In addition, it can be used as a tool to correct balance of payments disequilibrium caused by the fluctuation of factorizing currencies.

- The shock on the monetary mass leads to an increase in the value of the dinar against dollar by 1.17% during the first year. Then, it decreases by 11.33% during the second year, then returns to rise until it reaches 10.35% during the sixth year, then returns to decline during the remaining years to reach 7.50% during the tenth year. According the economic theory there is an inverse relationship correlation between money supply and exchange rate, the increase in monetary mass leads to a fall in exchange rate, thus the same thing happened in Algeria the bank of Algeria kept issuing the dinar and provide the economy with currency which led to a continuous increase in money supply and a continuous decrease in dinar exchange rate. Furthermore, the monetary authority in Algeria resorted to the quantitative easing in the recent years and because of that, the exchange rate of the dinar lost its value. The PPP theory can prove that if a comparison between the dinar and any other currency is done.

  Causing a shock in the balance of payments leads to a decrease in the value of the dinar against the dollar by 3.44% during the first year. Despite, its increase during the second year by 5.64%, this percentage is the highest in the decline or rise over the remaining years. Countries used to devaluate their currency to encourage their

exports, which make it cheaper compared to others. This rule is good of industrial countries unlike of Algeria which its exports depends on 90% or more on hydrocarbon even more, Algeria is not a touristic country so this rule can not be applicable on Algeria. The only advantage Algeria has is there many emigrant whom live in Europe and bring the euro to switch it to dinar but unfortunately this process is done in the informal market and not in the formal market. If the economic theory is followed it can be said that balance of payment has a significant impact on exchange rate, but it is not the case of Algeria.

Since Algeria, depends in its exports largely on hydrocarbon. It is necessary to mention international trade especially that the study contain the exchange the euro against the dollar as an important variable.

The revenues from oil exports abroad are still obtained in dollars, which represent a large proportion of the gross domestic product in many Arab oil-producing countries, and given the fluctuation of the dollar's exchange rates, we have to clarify the effect of this on the foreign trade of these countries and Algeria in particular. The European Union is considered the most important economic partner for Algeria, as it still accounts for more than 50% of Algerian imports, and most of Algeria's income, i.e. its exports, comes from hydrocarbons, which accounted for more than 97% of total exports in recent years, as this percentage is almost constant. If the valuation and pricing of fuel is done in dollars, then this means that more than 97% of the state's income is made in dollars, and in return, more than 50% of the exchanges take place in euros, and therefore

the fluctuations of the dollar exchange rate against the euro have direct effects on Algerian foreign trade.

The value of the dollar decreased dramatically compared to the euro in 2008 and 2009, bringing the dollar exchange rate to 1.4726 and 1.3935 dollars per one euro, due to the global financial crisis in the United States of America and its spread in many developed countries due to the globalization of markets. This contributed to the decline in growth and the continuation of the situation. Uncertainty led to a decline in the demand for oil, and then a drop in prices, as Algerian oil prices reached nearly one dollar and 79 dollars per barrel for the years 2009 and 2010 respectively, as it was expected to increase demand for oil due to the decrease in the value of the dollar, but the opposite happened to the decline in growth. Uncertainty prevailed in global markets during and after the crisis.

After the beginning of the American economic recovery, the value of the US dollar rose compared to the years 2008 and 2009, when the exchange rate reached 1.3261 dollars per euro in 2010, so that the US currency remained in constant fluctuation after that, on the other hand, oil prices rose to return to the recent collapse, because the value of Algerian exports is linked mainly to the price of a barrel of oil. However, we should not neglect the role of exchange rates in evaluating the purchasing power of Algerian exports.

Since most of Algerian imports come from the European Union, which is the undisputed first trading partner of Algeria, this means that Algeria is settling most of its imports in euros, so if the dollar's exchange

rate falls in relation to the euro, this means that Algeria will pay more dollars to obtain a European commodity, and as previously mentioned 97% of Algeria's income is denominated in dollars. Therefore, these incomes will decrease their purchasing power due to the decrease in the dollar exchange rate.

As an example if 1 euro = 2 dollars and the price of a barrel of Algerian oil is 100 dollars, or 50 euros per barrel, then if we assume that we need to buy a laptop from France and its price is 500 euros, then we need to export 10 barrels of oil, or 1000 dollars, to buy the device ($ 100 per barrel, 10x barrels), so if the dollar's exchange rate falls in relation to the euro and becomes, for example, 1 euro = 3 dollars, assuming the price of oil remains stable, i.e. $ 100 per barrel, then we need 1,500 dollars (500 euros * 3) at the new exchange rate to buy the device (i.e. to obtain (500 euros to buy the machine, we need 1500 dollars), and this amount needs to export 15 barrels of oil. So in this case, we notice a decrease in the purchasing power of oil exports as a result of the decline in the value of the dollar. In the first case, buying the device to export 10 barrels of oil, while when the exchange rate drops, we need to export 15 barrels of oil to buy the same commodity that has not changed.

Oil countries and Algeria in particular, cannot control the price of oil to compensate for the losses resulting from the decrease in the purchasing power of the dollar. Oil prices are linked to many factors, Algeria is forced not to stop its imports from the European Union in order to preserve the quality of imported goods, and thus it will suffer from imported inflation, because of the high cost of imported goods that the

Algerian citizen will bear. This also affects the balance of the trade balance due to the high value of imports compared to exports.

When the value of the dollar decreases in relation to other foreign currencies, the price of oil becomes less expensive in other currencies, meaning that countries whose currency has a higher exchange rate than the dollar will need a smaller amount of dollars to pay the value of their oil imports, as well as the trend towards investment in this area, which will contribute to increasing demand for Oil by importing countries due to its low prices, and as we know that increased demand leads to raising prices again, this in the short term.

In the long term, the depreciation of the dollar will lead to a decrease in the strength of the deployment, the structure, the exports of the oil-producing countries, as we saw in the previous example for Algeria. The decrease in these revenues will automatically lead to a decrease in production capacity and a decline in growth for the oil-exporting countries of course, and thus production will decline. Thus, the decrease in supply compared to demand, including the return of oil prices to rise (according to the law of supply and demand), the same thing happens with companies operating in the field of energy (international oil companies), as they receive their revenues in rent while they pay their workers' wages, maintain their equipment and expand their investments in foreign currencies, and when the value decreases The dollar, in relation to these currencies, increases their costs, so they are forced to reduce their activity in order to avoid additional costs, and this in turn is a reason for a decrease in supply compared to demand, and thus higher oil prices.

The decrease in the dollar's exchange rate will be positive in the near term for non-oil countries and compensate for the rise in oil prices and thus the continued demand for it. In the United States, lowering the value of the dollar increases the price competitiveness of the country's exports in return, which raises the price of oil again, which leads to a decline in the state's GDP and an increase The value of its imports and the weakening of its currency abroad, which forces it to try to improve its economy by raising the dollar exchange rate so that the price of oil rises and then the demand decreases, thus reducing the price of oil and thus the strong inverse correlation between fluctuations in the dollar exchange rate and oil prices, but we exclude here the occurrence of financial crises and the degree of stability Political affairs in oil-producing countries and the revolutions that occurred in recent years.

4) Summary of The Findings:

In this section, the most important points of the results obtained in the study are demonstrated as follow:

4.1) Results of Toda-Yamamoto Causality:

The results of (ADF) test presented in the table (III.10) show that not all variables are stationary at level. Consequently, to reach stationary, we differenced the data as a result all variables are significant at 1%, 5% and 10% level in the first difference except ***EXR***, which is getting rid of unit root at 2nd difference. Therefore, ***USD/DZD*** (dinar exchange against dollar), ***Mm*** (monetary mass) and ***Bop*** (balance of payment) are integrated of order 1 I(1), unlike ***EXR*** (exchange reserve) is integrated of order 2 I(2).

After that, the optimal lag length is selected and according to the table (III.11) k=3, so the optimal lag length for this study is the third lag. level of cointegration also is determined d_{max}=2. Next, *VAR(2+3)* model is constructed then *Toda-Yamamoto Causality* test was applied in order to study the relationship among the variables.

The *Toda-Yamamoto Causality* Test shows that there is a causal relation between ***USD/DZD*** and ***BoP***, ***USD/DZD*** and ***EXR***, for the direct relationship between these variables, which is a one-way relationship (***BoP*** → ***USD/DZD***) (***EXR*** → ***USD/DZD***). This means that changes in both ***EXR*** and ***BoP*** affect ***USD/DZD***. Whereas, the absence of a causal relationship in both directions between (***USD/DZD*** and ***MM***) this result disagrees with the economic theory and that due not only to economic factors but also to political and social factors.

4.2) Results of SVAR model:

The results of (ADF) test presented in the table (III.14) show that not all variables are stationary at level. Consequently, to reach stationary, we differenced the data as a result all variables are significant at 1%, 5% and 10% level in the first difference except ***LMM***, which is getting rid of unit root at 2nd difference. Therefore, ***LDEXD***(dinar exchange against dollar), ***LEEXD*** (euro exchange rate against dollar), ***LEXR*** (foreign exchange reserve) and ***LBoP*** (balance of payment) are integrated of order 1 I(1), unlike ***LMM*** (monetary mass) is integrated of order 2 I(2).

The results shown in the table (III.15) indicates that the optimal lag length is 2 (k=2). The viability of the VAR model is proven by Normal distribution test, which shows in the table (III.17) that the residuals follow the normal distribution. And Residuals Aoto-correlation test which indicates in the figure (III.3) that there is no auto-correlation to the residuals is accepted.

Through the coefficients and their probabilities table (III.18), it can be said that all the effects are significant, except for the exchange rate of the euro against the dollar (***DLEEXD***) on the exchange rate of the dinar against the dollar (***DLDEXD***), as well as the effect of the exchange reserves (***DLEXR***) on the exchange rate of the dinar against the dollar (***DLDEXD***) is not significant.

The shock to the euro exchange rate against dollar ***DLEEXD*** leads to a decrease in the value dinar exchange rate against dollar ***DLDEXD*** by 79.2% during the first year. Despite its increase during the second and third years, it became instable and it keeps rise and fall throughout the remaining years by 43.56% as a higher level of its increase and this during the third year and 40.94% as the highest decline rate, during the seventh year. This shock remains the most impactful and significant shock on the exchange rate of the dinar against the dollars (***DLDEXD***).

Conclusion:

Since Algeria is dealing with U.S.dollar in exports and with the Euro in imports, it makes the study difficult in this topic specially the case of Algeria. Hence, the rise of the Euro against the U.S.dollar leads to higher import bill than it is and this is what affects the balance of trade (TB). In addition, the effect of this increase on the Algerian exchange reserves, so Algeria has to find out to take the necessary measures to limit or at least reduce the severity of the impact of these fluctuations on the economy.

The devolution process did not achieve the desired goals, which did not positively affect the BoP. The economic reality of the Algerian who depend exclusively on oil revenues, also the weakness of flexible production system and lack of competitive local products to foreign products.

Conclusion :

The aim of the study is an attempt to answer the main questions about what is the nature of the causal relationship between the exchange rate of Algerian dinar against U.S dollar and its determinants and how far can the Dollar and the Euro influence the Algerian Dinar. We have noted that countries change the exchange rate of their currency in order to make economic reforms and encourage their exports. Where they may adopt what is known as the devaluation of exchange rate policy, which leads to increase exports and reduce imports. However, this policy requires the availability of a set of conditions in order to help it, especially for developing countries, which appeared through the study that the devaluation of exchange rate policy is not effective in its economic environment and what makes the situation worse is issuing money without any real cover. A developed country as Algeria suffers from economic problems such as lack of exports flexibility and the inability of the incorporation of its financial markets with international markets and that what limits the possibility of the success of the devaluation policy. It also shows us the fragility of the economic structure of developing countries against global economic changes. We denoted that it could confirm that there is not an appropriate exchange system definitively for all developing countries and we cannot favouring a particular exchange system, because it depends on the political, financial and economic situation of each State.

It is noteworthy that the changes or fluctuations in exchange rates, which occur spontaneously, because of the interaction of the forces of supply and demand for currency in the exchange market, which have an

impact on the balance of payments. Moreover, the adoption of the Euro as the single European currency, which has become a point of strength of the European Union and its benefits for to the countries of the region and the states that deal with, its impact, also extends to the global economy. The Euro considered as a strong contender for the U.S.dollar, it could be a stable international currency that people can trust. Thus, the possibility of introducing of the euro as a currency billing is expected to happen given the strength of the economic relationship. This led the Algerian economy to support negative consequences resulting from losses due to the decline of the dollar against the euro, especially with the possibility of the euro to billing hydrocarbons, which has been monopolized by of the U.S.dollar. Therefore, Algeria must take optimal economic policy to avoid the results of the rising and continuous of the exchanges volatilities.

The results of testing hypotheses:

Through our study, we conclude to the following outcomes concerning the proposed hypotheses:

The first hypothesis assumed that there is a causal relationship between dinar's exchange rate and its determinants. The obtained results from *Toda-Yamamoto Test* do confirm that there is a causal relationship between dinar exchange against dollar ***USD/DZD*** and both determinants balance of payments ***BoP*** and foreign exchange reserve ***EXR***. However, it is not the case for money supply ***MM***. Moreover, there is a unidirectional causality from exchange reserve ***EXR*** to dinar exchange rate against dollar ***USD/DZD*** also from balance of payments ***BoP*** to dinar exchange rate ***USD/DZD***. Hence, changes in ***EXR*** and ***BoP*** affect and cause changes in ***USD/DZD*** but in the opposite changes in ***USD/DZD*** do not have an impact

on ***EXR*** and ***BoP***. Whereas, changes in monetary mass ***MM*** does affect or cause changes in ***USD/DZD*** dinar exchange rate against dollar and vices-versa which it disagrees with the economic theory and that due not only to economic factors but also to political and social factors. This disagreement is because of inefficiency of banking system also the preference of using parallel market rather than the formal because of variations in exchange rate between the two markets.

The second hypothesis, which assumed that the Dollar and the Euro have an impact on dinar's exchange rate. The results obtained from SVAR model confirm it by analysing Impulse response functions. Since the dollar is the currency of factorizing of Algeria, most of its imports are from Europe, and these two currencies form the foreign exchange rate, which is evaluated with the dollar, all that makes the dinar exchange rate sensitive to their fluctuation. If the dollar depreciate against the euro then there will be negative consequences on the Algerian economy in general and the dinar in particular. In other words, the input of Algeria from the exports is in the dollar especially hydrocarbon which is evaluated with the dollar in the world wild. In the other hand, most of its imports are from Europe with the Euro, so most of the time a switch between these two currencies is needed that why any change in their exchange rate affects the dinar exchange rate.

The Research Results:

By studying this topic, we conclude the following points:

- That exchange rate behaviour significantly depends upon the macro or monetary fundamentals of the respective countries. There is no relationship between monetary mass and dinar's exchange rate and that contradicts the economic theory, which assumes the inverse

relationship between them. Additionally, the unidirectional causal relationship between balance of payments and dinar's exchange rate contradicts the economic theory, which assumes that exchange rate affects balance of payments; because if a country intends to motivate and increase its imports it depreciates its currency value and that reflects on trade balance and so balance of payments. Nevertheless, in Algeria the low productivity and the dependence just on hydrocarbon as imports lead to this unidirectional causality relationship. Accordingly, to this analysis we say that factors affecting exchange rate can be economic, political, and psychological whether short run or long run.

- The exchange rate is a factor able to link the local economy to the international economy, also it considered as a way to re-balance the balance of payments, through a policy of the domestic currency depreciation or through the exchange control policy.

- The economic situation of the developing countries, especially they are as countries dependent on a single product or two at the most. This situation makes rebalancing the balance of payments through the domestic currency devaluation policy not possible or relatively at best. Where it characterized by the non-elasticity of the production system in addition, to the debt problem that is suffered by most of the developing countries, and the inability of its financial markets to integrate into international markets. As well as its inability to dispense in trade from the outside world and that is because most of the imports are essential goods like commodities food, medicine and intermediate goods used in the production process.

- The Algerian balance of payments surplus in most years of the study has nothing to do with the status of the Algerian dinar. The balance of trade surplus along the period refers to an improvement in oil prices. As for capital account deficit, which is identified most of the study period, and that it is due to lack of capital flows to Algeria, in addition to the payment of debts at the beginning of the second millennium, which had an impact on the capital account.

- The devaluation policy adopted by Algeria did not achieve the desired goals; because of the Algerian exports have no elasticity toward the devaluation of the dinar, as Algerian exports based on oil an uncompetitive product, which greatly affects the value of exports. Moreover, imports are also not affected by the change in the exchange rate of the dinar and that because of most Algeria's imports are consumer goods and essential, which cannot be dispensing.

- The deviation of the U.S.dollar exchange rate against the euro has an effect on the Algerian economy, leading to losses and affecting primarily the deterioration of the purchasing power of oil revenues. Therefore, it influences the purchasing power of Algeria's revenue, thus the deterioration of the balance of payments, also it leads to a rise in the value of imports due to the high currency exchange rate of payment and especially that most of them are in euro.

Recommendations:

After the results obtained we can come up with some recommendations represented in the following points:

- Taking the necessary measures to reduce losses resulting from fluctuations in the exchange rate of the U.S.dollar against the euro, such as activated the futures exchange market and managed foreign exchange reserves.

- Working to diversify the structure of imports from outside the region of the European Union to avoid losses causing by converting U.S.dollar into euro.

- Motivating Algerian immigrants especially in European countries to convert their savings to Algeria, but it requires the necessary facilities, which has to be provided by the Algerian authorities.

- Diversifying the structure of foreign exchange reserves i.e. its constituent currencies, taking into account the fluctuations occurring in these currencies. In addition, the trade relationship with other countries also it should well employ these reserves to maintain the stability of the purchasing power.

- Algeria must work constantly trying to equalize the exchange rate between the parallel market and the official market, therefore to ensure the monetary mass in the parallel market and in order to retrieval it in the official market. In addition encouraging migrants to transfer money through the official market, this contributes to raising national savings. Accordingly, it increases the ability of investment and raises the level of foreign currency reserves.

- Reducing the role of the Bank of Algeria in market-making by limiting its dealings with banks and its interference to allow other market makers, and the central bank should not deal with clients other than financial entities.

- Increase the information available in the market on the sources of foreign exchange and its uses and on the trends of the balance of payments aimed at enabling market participants to form effective and credible opinions on the exchange rate, monetary policy and foreign exchange pricing. The authorities should ensure that the information systems and trading halls are able to announce buy and sell prices at Real-time interbank trading market.

- The gradual elimination of regulatory rules that restrict market activity, and among the important measures in this regard is the abolition of conditions for the delivery of foreign exchange proceeds to the Central Bank, additional taxes and fees on transactions in split foreign exchange, and the easing of restrictions imposed on current accounts and some capital accounts in order to increase sources of foreign exchange And its market uses. But capital controls should be loosened gradually, and not before certain macroeconomic and institutional preconditions are fulfilled; Unifying and simplifying foreign exchange laws and avoiding frequent and specialized changes in the law to increase the transparency of transactions.

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APPENDIX

Appendix :

Null Hypothesis: MM has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		6.010109	1.0000
Test critical values:	1% level	-2.692358	
	5% level	-1.960171	
	10% level	-1.607051	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and
may not be accurate for a sample size of 19

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MM)
Method: Least Squares
Sample (adjusted): 2000 2018
Included observations: 19 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MM(-1)	0.088984	0.014806	6.010109	0.0000

R-squared	-0.034683	Mean dependent var	781.4263
Adjusted R-squared	-0.034683	S.D. dependent var	552.5627
S.E. of regression	562.0633	Akaike info criterion	15.55230
Sum squared resid	5686473.	Schwarz criterion	15.60201
Log likelihood	-146.7469	Hannan-Quinn criter.	15.56071
Durbin-Watson stat	1.436259		

Null Hypothesis: D(MM) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.093077	0.0463
Test critical values:	1% level	-3.886751	
	5% level	-3.052169	
	10% level	-2.666593	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 17

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(MM,2)
Method: Least Squares

Sample (adjusted): 2002 2018
Included observations: 17 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(MM(-1))	-1.059478	0.342532	-3.093077	0.0079
D(MM(-1),2)	0.344605	0.266086	1.295088	0.2162
C	859.6866	285.6308	3.009782	0.0094

R-squared	0.424739	Mean dependent var	71.24118
Adjusted R-squared	0.342559	S.D. dependent var	683.8815
S.E. of regression	554.5097	Akaike info criterion	15.63283
Sum squared resid	4304734.	Schwarz criterion	15.77987
Log likelihood	-129.8791	Hannan-Quinn criter.	15.64745
F-statistic	5.168398	Durbin-Watson stat	1.722092
Prob(F-statistic)	0.020847		

Null Hypothesis: EXR has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.257029	0.1841
Test critical values:	1% level	-2.699769	
	5% level	-1.961409	
	10% level	-1.606610	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and
may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXR)
Method: Least Squares

Sample (adjusted): 2001 2018
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR(-1)	-0.026041	0.020716	-1.257029	0.2268
D(EXR(-1))	0.883154	0.136096	6.489203	0.0000

R-squared	0.713609	Mean dependent var	3.79E+09
Adjusted R-squared	0.695710	S.D. dependent var	1.95E+10
S.E. of regression	1.07E+10	Akaike info criterion	49.13553
Sum squared resid	1.84E+21	Schwarz criterion	49.23446
Log likelihood	-440.2197	Hannan-Quinn criter.	49.14917
Durbin-Watson stat	1.700019		

Null Hypothesis: D(EXR) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.096699	0.2366
Test critical values:	1% level	-2.699769	
	5% level	-1.961409	
	10% level	-1.606610	

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXR,2)

Method: Least Squares

Sample (adjusted): 2001 2018

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXR(-1))	-0.149065	0.135922	-1.096699	0.2881

R-squared	0.051020	Mean dependent var	-1.38E+09
Adjusted R-squared	0.051020	S.D. dependent var	1.12E+10
S.E. of regression	1.09E+10	Akaike info criterion	49.11860
Sum squared resid	2.03E+21	Schwarz criterion	49.16806
Log likelihood	-441.0674	Hannan-Quinn criter.	49.12542
Durbin-Watson stat	1.548123		

Null Hypothesis: D(EXR,2) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.395121	0.0021
Test critical values:	1% level	-2.708094	
	5% level	-1.962813	
	10% level	-1.606129	

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 17

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXR,3)

Method: Least Squares

Sample (adjusted): 2002 2018

Included observations: 17 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXR(-1),2)	-0.837106	0.246561	-3.395121	0.0037

R-squared	0.418743	Mean dependent var	48842046
Adjusted R-squared	0.418743	S.D. dependent var	1.51E+10
S.E. of regression	1.15E+10	Akaike info criterion	49.22278
Sum squared resid	2.11E+21	Schwarz criterion	49.27179
Log likelihood	-417.3936	Hannan-Quinn criter.	49.22765
Durbin-Watson stat	1.897022		

Null Hypothesis: D(LMM) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.155998	0.2161
Test critical values:	1% level	-2.699769	
	5% level	-1.961409	
	10% level	-1.606610	

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LMM,2)

Method: Least Squares

Sample (adjusted): 2001 2018

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LMM(-1))	-0.139321	0.120520	-1.155998	0.2637

R-squared	0.072700	Mean dependent var	-0.000949
Adjusted R-squared	0.072700	S.D. dependent var	0.070356
S.E. of regression	0.067751	Akaike info criterion	-2.492017
Sum squared resid	0.078032	Schwarz criterion	-2.442552
Log likelihood	23.42815	Hannan-Quinn criter.	-2.485196
Durbin-Watson stat	2.001793		

Null Hypothesis: D(LMM,2) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.645825	0.0001
Test critical values:	1% level	-2.708094	
	5% level	-1.962813	
	10% level	-1.606129	

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 17

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LMM,3)

Method: Least Squares

Sample (adjusted): 2002 2018

Included observations: 17 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LMM(-1),2)	-1.113877	0.239759	-4.645825	0.0003

R-squared	0.573875	Mean dependent var	-0.003189
Adjusted R-squared	0.573875	S.D. dependent var	0.106167
S.E. of regression	0.069304	Akaike info criterion	-2.443611
Sum squared resid	0.076848	Schwarz criterion	-2.394598
Log likelihood	21.77069	Hannan-Quinn criter.	-2.438739
Durbin-Watson stat	2.052151		

Null Hypothesis: D(LSER01) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.438791	0.0018
Test critical values:	1% level	-2.699769	
	5% level	-1.961409	
	10% level	-1.606610	

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LSER01,2)

Method: Least Squares

Sample (adjusted): 2001 2018

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LSER01(-1))	-0.756191	0.219900	-3.438791	0.0031

R-squared	0.409055	Mean dependent var	-0.004062
Adjusted R-squared	0.409055	S.D. dependent var	0.093263
S.E. of regression	0.071694	Akaike info criterion	-2.378866
Sum squared resid	0.087381	Schwarz criterion	-2.329401
Log likelihood	22.40979	Hannan-Quinn criter.	-2.372045
Durbin-Watson stat	1.967396		

Null Hypothesis: D(LSER02) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=0)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.588199	0.0012
Test critical values:	1% level	-2.699769	
	5% level	-1.961409	
	10% level	-1.606610	

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

Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LSER02,2)

Method: Least Squares

Sample (adjusted): 2001 2018

Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LSER02(-1))	-0.780516	0.217523	-3.588199	0.0023

R-squared	0.424671	Mean dependent var	0.010409
Adjusted R-squared	0.424671	S.D. dependent var	0.101838
S.E. of regression	0.077245	Akaike info criterion	-2.229722
Sum squared resid	0.101435	Schwarz criterion	-2.180257
Log likelihood	21.06750	Hannan-Quinn criter.	-2.222901
Durbin-Watson stat	1.863289		

Response of DLDEXD to Structural One S.D. Innovations					
Period	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.000268	-0.792017	0.000244	0.011738	-0.034417
	(8.1E-05)	(0.00909)	(0.00011)	(0.00289)	(0.00591)
2	-0.013523	0.183113	-0.009841	-0.113308	0.056403
	(0.14360)	(5.52149)	(0.07706)	(0.89322)	(0.59710)
3	-0.000408	0.435679	0.011415	-0.020380	-0.009331
	(0.12435)	(5.03089)	(0.08902)	(0.75182)	(0.45602)
4	0.003732	-0.267454	0.009071	0.018922	-0.011932
	(0.16098)	(5.36728)	(0.09946)	(0.88207)	(0.53592)
5	-0.015121	0.288243	0.003873	0.030380	0.002473
	(0.16955)	(5.26552)	(0.08918)	(0.83497)	(0.41362)
6	0.008747	-0.120774	0.007058	0.103581	-0.032234
	(0.18719)	(4.50874)	(0.08636)	(0.67119)	(0.37592)
7	0.013964	-0.409420	-0.005500	0.044472	-0.003049
	(0.17152)	(4.14410)	(0.10218)	(0.59253)	(0.32252)
8	-0.001636	0.250829	-0.008740	-0.003044	0.005820
	(0.16265)	(6.21488)	(0.09508)	(0.87588)	(0.44388)
9	0.007582	-0.045992	-0.004481	-0.004414	-0.007213
	(0.17270)	(6.40199)	(0.09541)	(0.86897)	(0.39727)
10	-0.001150	-0.140097	-0.008949	-0.075088	0.022923
	(0.18886)	(4.80763)	(0.10099)	(0.76471)	(0.38758)

Factorization: Structural
Standard Errors: Analytic

بنك الجزائر

Régime de change, conduite de la politique de change et évolution du taux de change du dinar 2000-2018

1. Régime de change et politique de change.

Le régime de change adopté par la Banque d'Algérie, au début des années quatre-vingt-dix, est un régime de flottement dirigé. Ce régime se situe entre les deux régimes extrêmes ; à savoir, le régime de parité fixe et le régime de taux de change flottant. Il s'écarte, ainsi, de la fixation purement administrative du taux de change sans, pour autant, abandonner totalement la détermination du taux de change aux seules forces des marchés internationaux. Cette relative flexibilité permet à la Banque d'Algérie d'ajuster le taux de change en fonction des déterminants structurels et macroéconomiques, internes et externes, tout en tenant compte des évolutions des taux de change des principales monnaies sur les marchés internationaux.

Dans ce cadre, la politique de change de la Banque d'Algérie se fixe, pour variable cible, le maintien du taux de change effectif réel (TCER) à un niveau proche de son niveau d'équilibre. Le TCER est défini comme étant le taux de change effectif nominal, rapporté aux prix relatifs de l'économie nationale et des principaux pays partenaires, qui permet de favoriser, simultanément, une croissance non inflationniste (équilibre interne) et un compte courant de la balance des paiements soutenable à long terme (équilibre externe).

La détermination du TCER s'appuie sur les fondamentaux de l'économie nationale, identifiés comme étant : le différentiel de productivité et le différentiel d'inflation entre l'économie nationale et les pays partenaires, le degré d'ouverture de l'économie, le prix de pétrole et les dépenses publiques.

En pratique, la Banque d'Algérie détermine chaque année le niveau cible du taux de change effectif réel d'équilibre en fonction de l'évolution de ces fondamentaux. Au cours de l'année, la Banque d'Algérie intervient sur le marché interbancaire des changes pour veiller à ce que l'évolution du taux de change effectif nominal (et donc des taux nominaux bilatéraux), sous l'effet des fluctuations des monnaies des pays partenaires sur les marchés internationaux de change, n'induise pas d'écarts significatifs entre le niveau mesuré du TCER et son niveau d'équilibre de moyen terme.

2. Evolution du taux de change du dinar entre 2000 et mi-2018.

Durant les années 2000, la bonne tenue des fondamentaux de l'économie nationale, notamment le niveau des prix du pétrole, celui des dépenses publiques et le différentiel du niveau d'inflation avec ceux des principaux pays partenaires, a permis de stabiliser le taux de change effectif réel à son niveau d'équilibre fondamental de l'année 2003.

Cela s'est traduit, dès cette année, par une appréciation progressive du dinar contre le dollar ; le cours passant 79,7 dinars pour un dollar en moyenne en 2002 à 64,6 dinars pour un dollar en moyenne en 2008, soit une appréciation de 23,4 % sur la période. En revanche, le dinar s'est déprécié de 26,8 % vis-à-vis de l'euro sur la même période, en raison de la forte appréciation de l'euro contre le dollar américain ; le taux de change de l'euro par rapport à la monnaie américaine étant passé de 0,9236 en moyenne en 2000 à 1,4708 en 2008.

Au cours de l'année 2009, les fondamentaux de l'économie nationale ont connu une forte détérioration, dans le sillage de la crise économique et financière internationale. Les prix du pétrole ont, ainsi, chuté de 37,7 %, passant de près de 100 dollars le baril en 2008 à 62,3 dollars le baril en 2009, entraînant une forte baisse des recettes d'exportation d'hydrocarbures. En revanche, le ratio dépenses budgétaires / PIB a augmenté, passant de 37,9 % en 2008 à 42,6 % en 2009, année du premier déficit budgétaire (5,7 % du PIB) depuis 1999. En parallèle, le différentiel d'inflation s'est élargi, la hausse moyenne des prix à la consommation sur la période atteignant 5,3 % en Algérie, contre 1,6 % aux Etats-Unis et 1,7 % dans la zone euro.

Ces évolutions ont induit une dépréciation du dinar par rapport au dollar, de 11,1 %, en moyenne, en 2009 et de 2,1 % par an sur la période 2010-2013. Cette dépréciation en nominal a permis de limiter la déviation du TCER mesuré, par rapport à son niveau d'équilibre, à 2,17 % sur la période.

L'effondrement du prix du pétrole à partir du deuxième semestre de 2014 s'est traduit, en 2015, par un déficit du compte courant extérieur de 16,4 % du PIB et un déficit budgétaire de 15,3 % du PIB. Cette forte détérioration de l'un des principaux fondamentaux de l'économie nationale, en contexte de différentiels d'inflation et de productivité défavorables et de nécessaire maintien de la dépense publique à un niveau élevé, pour soutenir la croissance et l'emploi, a entraîné une dépréciation du dinar, en moyenne annuelle, de 19,8 % vis-à-vis du dollar et de 4,07 % contre l'euro entre 2014 et 2015, tenant compte de l'évolution des cours de change entre ces deux devises sur les marchés internationaux. ***Ainsi, face au choc externe de grande ampleur et durable, le taux de change du dinar a joué, dans une large mesure, son rôle d'amortisseur, en l'absence de consolidation budgétaire***. Cela a permis de contenir la forte déviation du TCER par rapport à son niveau d'équilibre, induite par la dégradation substantielle des fondamentaux et de contribuer à limiter l'impact du choc externe sur la stabilité macroéconomique, à moyen terme.

A partir de juin 2016, dans un contexte de quasi stabilité, en cours de fin de période, des cours de change euro/dollar sur les marchés internationaux de change entre juin 2016 et juin 2017, ***le second semestre de 2016 et le premier semestre de 2017 ont connu une relative stabilisation du cours de change du dinar vis-à-vis des deux principales monnaies de règlement de l'Algérie.***

Cependant, sur l'ensemble de l'année 2017, l'euro a enregistré une appréciation sensible de 12,4 % par rapport au dollar (entre décembre 2016 et décembre 2017). En conséquence, le dinar s'est déprécié de 3,3 % vis-à-vis de la monnaie européenne et de 1,3 % vis-à-vis de la monnaie américaine. En cours de fin de période, le dinar s'est déprécié de 15,4 % par rapport à l'euro et de 3,8 % vis-à-vis du dollar, entre fin décembre 2016 et fin décembre 2017. Ces dépréciations sont intervenues essentiellement au second semestre de l'année 2017, soit des dépréciations de 10,5 % et 6,2 % vis-à-vis de l'euro et du dollar, respectivement.

Le glissement du dinar, en cours de fin de période, notamment par rapport à l'euro, reflète donc et dans une très large mesure l'évolution des cours de change des deux principales monnaies de règlement de l'Algérie - de l'euro par rapport à la quasi-totalité des monnaies et du dollar par rapport à certaines monnaies de pays partenaires - dans un contexte de persistance des déséquilibres des comptes extérieurs et publics et d'évolution défavorable de certains fondamentaux de l'économie nationale, notamment le différentiel d'inflation avec nos principaux partenaires commerciaux.

Il est à souligner que l'appréciation de l'euro par rapport au dollar, en 2017, a induit une valorisation positive d'environ 5 milliards de dollars sur le niveau des réserves de change, exprimés en dollars.

Sur les sept (07) premiers mois de 2018, l'évolution des cours de change du dinar, en moyenne mensuelle, vis-à-vis de l'euro et du dollar reflète globalement l'évolution des cours de change de l'euro face au dollar sur les marchés internationaux.

Entre décembre 2017 et mars 2018, le cours de change de l'euro face au dollar est passé de 1,18 à 1,23 dollar, soit une appréciation de 4,24 %. En revanche, l'euro s'est déprécié face au dollar de près de 5,69 %, entre mars et juillet 2018.

En phase avec ces évolutions, le dinar s'est légèrement apprécié face au dollar de 0,86 % entre décembre 2017 et mars 2018 et s'est déprécié face à l'euro de 3,04 % sur la même période. Inversement, ***entre mars et juillet 2018, le dinar s'est déprécié face au dollar de 3,09 % et s'est apprécié de 1,02 % face à l'euro***.

Ces évolutions traduisent, ainsi, ***des ajustements limités du cours de change du dinar par rapport à ces deux monnaies, en relation avec les évolutions de leurs cours sur les marchés internationaux, en contexte de relative amélioration des fondamentaux*** (meilleure tenue des prix du pétrole et, dans une moindre mesure, réduction du différentiel d'inflation). Cela contribue à éviter de trop fortes déviations du TCER par rapport à son niveau d'équilibre, dommageables pour la stabilité macroéconomique, à moyen terme. Par ailleurs, ces ajustements du cours de change du dinar étant limités, cela permet d'éviter d'alimenter de potentielles pressions inflationnistes, notamment en

contexte de relative abondance de liquidités, induites par le recours au financement monétaire pour la couverture, notamment, des besoins de financement du Trésor et de la dette publique.

A cet égard, il est utile de rappeler que face à l'expansion de la liquidité bancaire de près de 57 % en moyenne, enregistrée au 1er semestre 2018, corrélativement à la mise en œuvre du financement non conventionnel, à compter du 4ème trimestre 2017, la Banque d'Algérie a mis en œuvre ses instruments de conduite de politique monétaire, ayant consisté en des opérations de « stérilisation » et de « cantonnement » des excédents de liquidités monétaires. La politique ainsi, instrumentée, visait à contenir les éventuelles poussées inflationnistes : le taux d'inflation s'étant établi à 4,6 %, à juin 2018 (source ONS).

En définitive, il convient de souligner que ***la Banque d'Algérie, dans son approche prudente et pragmatique de gestion du taux de change, a maintenu sa trajectoire en matière de politique de change inaugurée, à compter de juin 2016*** : L'ajustement du cours du dinar n'ayant obéit, essentiellement, qu'à des fluctuations sur les marchés financiers internationaux des changes, des monnaies de référence.