The Algerian Exchange Rate Determinants

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Abstract :

The exchange rate is the key relative price in international finance .This paper indentifies the main determinants of real exchange rate in Algeria from 1974 to 2013. For that purpose we tried to apply El badawi's (1998) model which include (the real effective exchange rate, Termes of trade , openness and foreign exchange reserves) to the Algerian dinar using a Vector autoregressive model 'VAR' . Our results show that mouvement in terms of trade and oppenness are very important in explaining the real effectif exchange rate in Algeria.

Keywords : Real effective exchange rate, VAR, terms of trade

I.   Introduction :

Recent decades have seen rapid growth of the world economy. World trade of goods & services has grown rapidly and increase capital flows and financial services between countries around the world. And as there is no international currency, partipations in the international exchanges requires countries to convert their national currency against another, this conversion takes place in the foreign exchange market according to the exchange rate. Wish is « *the price of a nation's currency in terms of another currency* ».

Exchange rate determinantion has been the holy grail of international finance and macroeconomics ever since the beginning of the flexible exchange rate period and the breakdown of the Bretton Woods system 1974 and the ensuing period of high exchange rate volatility when nominal and real exchange rate become extremely volalile and much more than macroeconomic fundamentals. In the works of Ghura and Grennes (1993), Aron and al (1997), Cotti and al (1990) Elbadawi and Soto (1997)taken as a whole, real exchange rate determinants are mainly the terms of trade, the openness degree of the economy, imports and capital flows.

The dynamics of exchange rates has an important role as a transmission mechanism of monetary policy in countries in transition such as Algeria, and understanding what drives real exchange rate developments is important for monetary pilcy-makers and a condition for the conduct of monetary policy efficiency .

Therefore, the objective of this paper is to identify theoretically the determinants of real effective exchange rate(RER) and empirically investigate the link between RER and select determinants in case ofAlgeria over the period from 1974 to 2013. The structure of the remainder of the paper is as follows. The theoretical framework that introduce the theoretical basis of the exchange rate to define its determinants which include the main important theories that explain the exchange rate determinants such as the purchasing power parity PPP , interest rate parity and the balance of payments approach has been given in sectionII , while Section III dwells upon the studies that tried to identify the several factors that influencing the exchange rate. Section IV provides details on the model used, sources of data, research methodology. Empirical results have been discussed in section V. The concluding observations have been furnished in section VI.

II.   *Literature Review :*

This section attempts to shed light on theories that explain the exchange rate determinants. More precisely , we present the most importants theories that identify the differents fundamentals determinants .

The bilateral nominal exchange rate (NER) between two currencies is defined as the price of one unit foreign currency in domestic currency terms (Hinkle et al. 1999). RER is defined as the ratio of the domestic price of tradable to non-tradable goods within a single country (Hinkle et al., 1999).

$$ERE = \frac{p_t}{p_n} = NER * \frac{p_t^*}{p_n}$$

Where NER represents for nominal exchange rate between two currencies in index form; Pt and P*t represents domestic and international price of tradable respectively; Pn represents for price index in home country. NEER and REER are defined respectively as follows:

$$NEER_t = \prod_{t=1}^{k} NER_{it}^{wit}$$

$$REER_t = \prod_{t=1}^{k} RER_{it}^{wit}$$

Where RERi denotes real exchange rate of home currency against foreign currency i denotes various currency in the basket, wi denotes weights attached to currency i, t denotes time periods.

The theories of the exchange rate began to grow in the early 1960s. Few years later, several new approaches of exchange rate determinations were appeared.

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The traditional explanation of exchange rates based on the purchasing power parity theory PPA developed by Caustav Cassel (1923). According to the PPA , the exchange rates between the currencies of two countries is the ratio of price levels between the two countries. The PPP is simply an application of the law of one price. "the currency of the country with the higher rate of inflation will depreciate against the other country's currency by approximately the inflation deferential"(Lumby S. & Jones C. 1999).

The balance of payments approach is another method that explains what are the factors that determine the supply and demand curves of a country's currency. Until the early 1970s, explaining exchange rate movements based on the situation of current accounts of countries. The balance of payments gives some indication of the medium-term exchange rate. Indeed any transaction registred in the balance of payments resulting directly or indirectly by an supply or demand of the national currency.

Another theory « *interest rate parity* » which has been attributed to JMKeynes (1923). A theory in which the interest rate differential between two countries is equal to the differential between the forward exchange rate and the spot exchange rate. Interest rate parity plays an essential role in foreign exchange markets, connecting interest rates, spot exchange rates and foreign exchange rates.

The first attempts to analyze exchange rate behavior were made by Rudiger Dornbusch (1973), Richard Meese (1979) and Kenneth Rogoff (1983). The traditional macroeconomic approach, as it could be developed by Mundell (1963), Fleming (1962) and Dornbusch (1976) establishes that a restrictive monetary shock results in nominal and real currency appreciation.

Wealth effects and portfolio models explain the variations in exchange rates by asset accumulation dynamics through external imbalances (Kouri "1976" Calvo and

Rodriguez "1977" or Branson and Henderson "in 1985 "or Bleuze Sterdyniak and" 1988 ").

After the breakdown of the Bretton Woods system, the exchange rate of the Algerian dinar has undergone several significant changes due to the depreciation of the value of the dinar. The Algerian dinar was attached to the standard of a basket of 14 currencies in the 1980s several devaluations were chained. between 1986 and 1990 the Algerian dinar a sharp depreciation following a sharp fall in oil revenues of more than 150% against the USD (US dollar) .Then in 1991 one second devaluation of 22%.

As part of the structural adjustment program imposed by the IMF, the purpose of a gradual adjustment of the real value of the Algerian dinar, there was another devaluation of 40% in 1994.

Table : Exchange rate evolution of the Algerian dinar from 1987 to 1992

Year Currency	1987	1988	1989	1990	1991	1992
FRF(France)	1.3494	1.806	2.2126	3.2349	6.132	6.0027
USD (Etats-Unis)	18.0766	23.6461	2705752	40.3639	-	74.149
YEN (Japon)	269.7699	335.9168	414.2383	705.3056	1188.35	1271.84

Source : *world tables 1993, Bank of Algeria*

III.   *Empirical Evidence :*

Many studies have been conducted on the exchange rate determinants. The first attempts to analyze exchange rate behavior were made by Rudiger Dornbusch (1973), Richard Meese (1979) and Kenneth Rogoff (1983).

Philipe Lan (1999) analyzed in a study nominal and real exchange rates in the long term. The results show that some variables are both important to analyze the real exchange rate and nominal exchange rate. Such as openness, growth and terms of trade that are proven to be significan.

Achy Lahcen (2001) estimated an ERER for five MENA countries namely: Algeria, Morocco, Tunisia, Egypt and Turkey from the period of 1985 to 1997. By applying the Edwards's model (1989, 1994) and Elbadawi (1994), he uses a cointegration method to see whether there is a long run relationship between the REER and the fundamentals.

Joseph and Linda Joyce Kamas (2003) in their study on the factors that determine the real exchange rate in the long term in Argentina, Colombia and Mexico. A cointegration analysis is used to establish that the real exchange rate has a relationship with real variables (the terms of trade, capital flows, productivity and the government of GDP). They found that the terms of trade and productivity are signifiquant.

Kombe Mungule Oswald (2004) tried to explain the movements of the real effective exchange rate of Zambia using a vector model for error correction. He found that The Zambian real exchange rate depends on the terms of trade and the nominal exchange rate devaluation in the long term .

Dufrénot and Yehoue (2005) used the panel cointegration techniques to estimate the determinants of the TCR in 64 developing countries. The variables used are: productivity, terms of trade, openness and expenses. This study revealed that some

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variables seem to have an impact on the real exchange rate in countries with a low income, such as openness and terms of trade.

Korhonen et al. (2007) tried to analyse the relationship between oil price and exchange rate by using the panel cointegration methods to the OPEC countries over the period 1975 to 2005. The results found that oil price has a direct effect on the equilibrium exchange rate.

HASANOV F. (2009) estimated the ERER by using several methods: Purchasing Power Parity (PPP) Macroeconomic Balance, BEER and Permanent real exchange rate. The results show that relative productivity, trade openness, Net foreign asset, government expenditures, and oil prices are the main real exchange rate determinants.

Likka Korhonen, Tuuli Juurikkala (2009) assess the dereminants of equilibrium real exchange rates in a sample of oil-dependent countries. They found that the price of oil has a clear , statistically significant effect on real exchange rates in this countries (oil producing countries).Higer oil price lead to appreciation of the real exchang rate.

Maysam Musal, Hesam Mardan Tabar, All Habibia (2012) studied the long-term behavior of the real exchange rate in Iran over the period 1986 to 2007. A BEER approach using NLSTR method at the following variables: the terms of trade, government spending, openness and the real exchange rate. The results indicated that the most important factor to balance the real exchange rate is the opening. Foreign exchange reserves as an appropriate tool to control fluctuations in exchange rates, also contribute to change the trend of the real exchange rate in Iran.

Ahmed Saeed, Rehmat Ullah Awan, Dr Maqbool H.Sial, Falak Sher (2012) in their study on the exchange rate determinants of Pakistan using an econometric analysis based on the monetary approach (January 1982 to April 2010). The empirical results

confirm that the money supply, exchange reserves and debt are important determinants of the exchange rate of the Pakistani rupee. Further instability has a negative effect on the value of the national currency

A study by the IMF (IMF Country Report No. 12/20) An analysis using the methodology of the Consultative Group on Exchange Rates (CGER) indicates that the current level of the real effective exchange rate (REER) broadly in line with medium-term fundamentals. In this context, the algerian EREER is determined by the terms of trade (ToT), the productivity (prod) and government expenditure as percentage of GDP (G) (t-stats in parentheses)

The most popular methodologies to define the exchange rate determinants based on the Vector Autoregressive method. They have used cointegrationtechniques developed by Engle and Granger (1987) and Johansen ((1988), (1995)) which permit to test the existence of a long-run relationship.

Empirical framework :

In this section we present a model of real exchange rate determinantion to identify the fundamentals that influence the algerian real exchange rate.

The model attemps to capture in a simple way some of the most salien macroeconomic features of the Algerian economie.

Among equilibrium real exchange rate model, the model of Edward (1988) is considered to be the most typical and applied widely for many developing countries. Edward (1988) defines EREER as the relative price of tradable to non-tradable goods that, for given sustainable or equilibrium values of other relevant variables, results in the simultaneous attainment of internal and external equilibrium.

Following Elbadwi (1998), we simplify the analysis of exchange rate determinants .our model departs from a small open economy « Algeria ». Elbadawi's model is determined by real effective exchange rate (REER) ,terms of trade (TOT), trade openness (OPEN) and foreign exchange reserves (RES).

- ✓ Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.
- ✓ Trade openness measures the degree of trade liberalization and used as proxy for commercial policy,it is defined as the ratio of total trade (imports + exports) to GDP. Edwards (1994) and Elbadawi (1994) show that an increase in trade openness depreciates the REER because trade liberalization makes future consumption of tradable goods become cheaper; The openness degree of the economy is an equilibrium real exchange ratedeterminant since an increasing openness towards foreign countries , leads to an import price decrease and so of the price of tradable goods price,by reducing customs tariffs on imports for instance.
- ✓ Terms of trade are the ratio of the price of a country's exports to the world price of imports. The variable is used to represent for international economy environment of a country. The impact of terms of trade on REER is theoretically ambiguous, depending on the substitution and income effect (Melecky & Komarek, 2005). In our study TOT is the world crude oil price divided by the CP.
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Based on the model of El Badawi (1998) suggested an improved model for determining the equilibrium exchange rate; this determination is based on a simple econometric methodology and adapted to developing countries is to define the fundamentals that can have a significant effect on the real exchange rate to test their stationarity and make a co-integration test between these variables and the real exchange rate.

$$LnREER = \beta_0 + \beta_1 lnOPEN + \beta_2 lnTOT + \beta_3 lnRES + \varepsilon.$$

the variables of interest are :

REER **_:_** real effectif exchange rate is the weighted average of a country's currency relative to an index or basket of other major currencies adjusted for the effects of inflation. REER is the nominal effective exchange rate (is the exchange rate of the domestic currency vis-à-vis other currencies weighted by their share in either the country's international trade or payments) divided by a price deflator of index of costs,

Open : it measures the trade policy by the ratio (sum of exports and imports in current US divided by GDP (current US), in logarithme terms,

TOT : terms of trade is the world crude oil divided by the CPI(see Cashin & al. (2003) and Sorsa, P., (1999)).

RES : foreign exchange reserves are the foreign-currency deposits held by national central banks and monetary authorities.

Data :

The model will be estimated on annual Algerian data series covering the period 1970–2013. The choice of the sample period is based on the time of the collapse of the Bretton Woods system of fixed exchange rates. The data comes mainly from the World Bank , CNUCED, UNCTADstat, Central bank of Algeria . All original series were transformed into natural logarithm.

The analyses were performed with 8 Eviews.

The dataset consist of annual data from1974 to 2013. We estimate the determinants of the exchange rate of the Algerian dinar from a model inspired by the model of El Badawi (1994), which has improved a model of determination of the equilibrium exchange rate; This determination is based on a simple econometric methodology and adapted to developing countries of defining the fundamentals that can have a significant effect on the real exchange rate, to test their stationarity and the co-integration test between these variables and the real exchange rate.

The ADF and Phillips- Perron tests indicate that the non-stationarity hypothesis cannot be rejected in level for all variables. However, for the first difference, the hypothesis of nonstationarity is rejected at the level of 1 percent for all variables. So, it suggests that the variables (REER, TOT, OPEN, RES) are integrated of order one I(I)

The estimated Algerian exchange rate determinants equation takes the following form :

LTCR= 5.76 -0.85 OUV+1.56 TOT -0.99RES

The results are consistent with theoretical background. An increase of 1% on the trade openness is associated with a 0.85% appreciation of the real effective exchange rate.

An increase of 1% on the terms of trade (the increase of oil prices) will be associated with a depreciation of 1.56% of the real effective exchange rate (RER).

Also an increase of 1% on foreign exchange reserves is associated with a 0.99% depreciation of the real effective exchange rate.

Conclusion :

This thesis will focus on the basic theory of the exchange rate, which emphasizes the influence of various factors on its dynamics. Our study was therefore designed to analyze the determinants of the real effective exchange rate in Algeria. The explanatory factors of the real effective exchange rate of the Algerian dinar highlighted by our econometric work correspond to a set of assumptions to better understand the determinants of the exchange rate

Our model builds on the real effective exchange rate version of Elbadawi (1994) model . it concluds as determinants as openness , oil prices and foreign exchange rate reserves .

The results of our estimates, we concluded that:

• The variables are stationary in first differences. It notes that a shock to the economy has a temporary effect on the real effective exchange rate in Algeria.

• The results fall in Algeria, the evolution of the real effective exchange rate is explained by the economic variables such as oil prices (terms of trade) trade openness ... which requires management fundamentals to achieve a stable real exchange rate.

• In addition the long-term dynamics of the estimate indicates that trade openness has a significant negative impact on the real effective exchange rate of the dinar. An increase of 1% of trade opening rate causes an appreciation of 0.85% in the exchange rate of the dinar.

• The terms of trade, which represents the oil price has a significant positive effect on the real effective exchange rate. An increase of 1% on the terms of trade will be associated with a depreciation of 1.56% of the real effective exchange rate (RER).

• The impact of foreign exchange reserves on the TCR is significantly negative. This results in a deterioration of foreign exchange reserves from one point lead to a depreciation of 0.99% of the real effective exchange rate.

LOGOPEN

LOGREER

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LOGRES

TOT
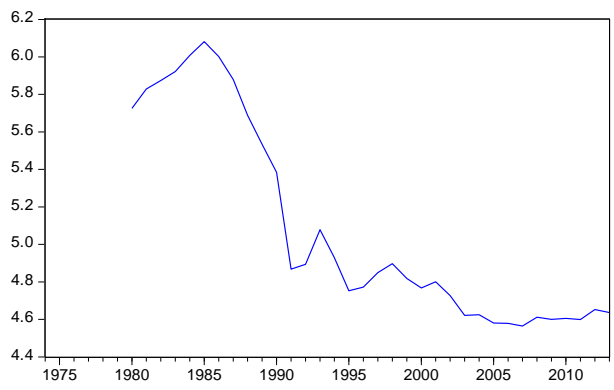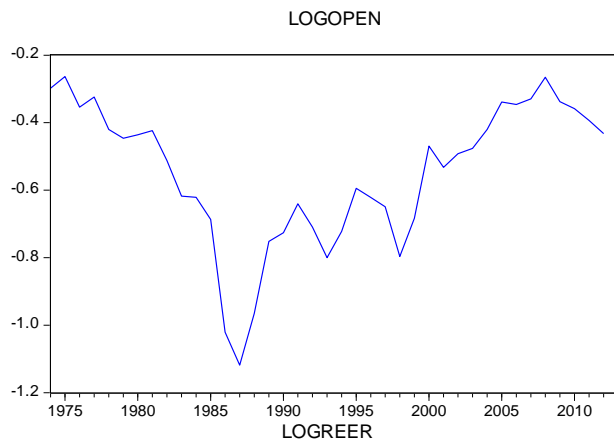
The ADF and Phillips- Perron tests :

Variables	ADF		PP	
	Niveau	1ere différence	Niveau	1ere différence
LTCER	-1.97	-5.20*	-2.05	-5.55*
LRES	-2.72	-4.28*	0.28	-6.71*
LOUV	-1.84	-4.84*	-2.14	-4.83*
LTOT	-3.21	-7.26*	-3.21	-8.77*

The critical values are: [-3.56] at 5% [-4.29] at 1%.

*: The test is significant at a level of 1%

**: The test is significant at a level of 5%

Source: Calculated by the authors using Eviews® 8

The co-integration test :

Hypothèses nulles	Valeurs propres	Trace statistiques	Valeurs critiques 1%
R=0	0.177872	77.16547	54.68150
R=1	0.529394	37.93823	35.45817
R=2	0.264705	14.57250	19.93711
R=3	0.150067	5.040514	6.634897

The Granger causality test :
VAR Granger Causality/Block Exogeneity Wald Tests
Date: 06/21/15   Time: 12:41
Sample: 1971 2013
Included observations: 41

Dependent variable: TCER

Excluded	Chi-sq	df	Prob.
RES	0.387401	2	0.8239
TOT	0.405758	2	0.8164
OUV	3.284423	2	0.1936
All	4.991180	6	0.5449

Dependent variable: RES

Excluded	Chi-sq	df	Prob.
TCER	1.209757	2	0.5461
TOT	0.539018	2	0.7638
OUV	1.221929	2	0.5428
All	8.064668	6	0.2334

Dependent variable: TOT

Excluded	Chi-sq	df	Prob.
TCER	10.86844	2	0.0044
RES	0.274601	2	0.8717
OUV	1.692631	2	0.4290
All	12.18881	6	0.0579

Dependent variable: OUV

Excluded	Chi-sq	df	Prob.
TCER	0.676073	2	0.7132
RES	1.877645	2	0.3911
TOT	1.627708	2	0.4431
All	3.584758	6	0.7327