

Fiscal Policy Shocks and Real Exchange Rate Dynamics: -An Empirical Investigation in the case of Algeria-

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Abstract:

The aim of this paper is to measure the impact of government revenue and government expenditure on real exchange rate dynamics in Algeria, using a Vector Auto regression (VAR) approach, based on annual data covering 1970-2011 period, depending on seven key macroeconomic variables: government revenue, government expenditure, real gross domestic product, consumer price index, real exchange rate, the nominal interest rate and oil prices, in particular to shed light on the possible effects of fiscal imbalances on the real exchange rate.

the results of the study are as follows: a positive structure shock in both revenues and government expenditures estimated at 1% would cause a positive responses on both real GDP and interest rate, jointly with real appreciation, was confirmed by testing the variance decomposition where it became clear that fiscal shocks are the main driving force of real exchange rate fluctuations. Finally, depending on the results the paper recommends that the fiscal policy should be encouraging productive government investment in addition to subject projects to the standards of economic yield, which will give a positive impulse to improve the value of the national currency, in addition to direct the investments towards non-oil sectors.

Key Words: Fiscal Policy Shocks, Government Revenue, Government expenditure, Real Exchange Rate dynamics, Vector Auto regression (VAR).

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1. Introduction:

the accelerating and successive developments that world has seen Caused a number of changes imposed by globalization on economic environment, from the upgrading of scientific and technological innovation factors, to the transcend of borders between communities, pushing many nations to reconsider the way using its economic policies, notably fiscal policy, which known fundamental shifts as a result of political and social development in the concept of the financial system carrier him from neutral role (Invisible Hand) to the intervener role in the economic life.

Fiscal policy occupies important placement among other policies, because of their effective contribution in maintaining the economic stability, through conditioning quantitative Government expenditures and government revenues in order to influence the level of aggregate demand and then on macroeconomic variables, as the exchange rate, which has become for many developing countries as a measure of real government's success in macroeconomic management, expressing the work of contemporary state to control economic policies in addition to maintaining internal and external equilibrium, so most developing countries went to manage the exchange rate even reduce the movements sharp and to avoid the negative effects that may arise from fluctuations.

Like other developing countries, Algeria is working hard to search look for financial resources in order to achieve internal stability, by exploiting its privileges in the Mediterranean. However, this privilege relative cannot be translated to tangible reality if the drainage system is not clear and is not stable, for this purpose Algeria make economic financial reforms including mainly the drainage system approach Followed where was transformed from a fixed exchange rate system to managed float regime that accompanied the application of the structural reform program during the nineties of the last century.

Because the importance of fiscal policy and the exchange rate, this study came to looking at the effects of the shocks (changes) of fiscal policy instruments during the period (1970-2011) on real exchange rate dynamics in the Algerian economy.

2. Literature Review:

In this section of the study we analysis the research work which was carried out by the different researchers; A number of studies have examined the impact of fiscal policy shocks on real exchange rate dynamics where most researchers focused on developed countries (Pereira& Manuel)⁽¹⁾, (Jean & Alain)⁽²⁾ which looked at the effective role that fiscal policy plays in the economic life.

(Zeno, Gernot, Almuth, 2011)⁽³⁾: This paper provides new evidence on the dynamic effects of government spending and technology shocks on the real exchange rate and the terms of trade, Using vector auto regressions(VAR) on industrialized countries U.S, over the period (1975-2005), Depending on nine key macroeconomic variables: gross domestic product, government spending, inflation, investment, budget balance, interest rate, net exports, and real exchange rate. The results show that both the real exchange rate and the terms of trade-whose responses are left unrestricted-depreciate in response to expansionary government spending shocks and appreciate in response to positive technology shocks.

(Antonio, Ricardo, 2011)⁽⁴⁾: This paper mainly aimed to analyze the macroeconomic effects of fiscal policy in Portugal, Using a Bayesian Structural Auto regression model (VAR) and a Fully Simultaneous System approach, With a new quarterly dataset over the period (1987-2007). The Results show that positive government spending shocks, in general, have a negative effect on real GDP; lead to “crowding-out” effects of private consumption and investment; have a persistent and positive effect on the price level and a mixed impact on the average financing cost of government debt. Explicitly considering the government debt dynamics in the model is also important. A VAR counterfactual exercise confirms that unexpected positive spending shocks create relevant “crowding-out” effects.

(Roel, Massimo, 2011)⁽⁵⁾: The purpose of this study was to review the theoretical consequences of government purchases shocks for the EU countries, based on annual data extended between (1970-2004). Using a Bayesian Structural Auto regression model (VAR), Depending on six key macroeconomic variables: gross domestic product, government spending, government revenues, budget balance, interest rate, investment, consumption, trade balance, and real effective exchange rate. The Results show that an increase in government purchases raises output, consumption and investment and reduces the trade balance. However, the stimulating effect is weaker and the trade balance reduction is larger for the more open EU economies, consistent with larger leakage effects. Further, we show that government purchases shocks in large EU economies have non-negligible consequences for economic activity in the main trading partners.

(Guglielmo, Davide, Alessandro, 2011)⁽⁶⁾: This paper focused on the effects of fiscal shocks on international competitiveness (the bilateral real exchange rate vis-à-vis the US dollar) using a two-country macroeconomic model for output, labor input, government spending and relative prices which provides the orthogonally restrictions for obtaining the structural shocks. Dynamic simulation techniques are then applied, in particular to shed light on the possible effects of fiscal imbalances on the real exchange rate in the case of six Latin American countries, using quarterly data over the period (1980-2006). The Results show that fiscal shocks are a key determinant of fluctuations in international competitiveness for most of the countries was considered, by shedding new light on the driving forces of real exchange rate dynamics in developing economies.

(Fransisco and Laura, 2011)⁽⁷⁾: this study analyzed the impact of fiscal shocks on the Spanish effective exchange rate over the period (1981-2008) using a standard structural VAR framework. The results show that government spending brings about positive output responses, jointly with real appreciation. Such real appreciation is explained by persistent nominal appreciation and higher relative prices. Results indicate that the adoption of the common currency has not implied any significant change in the way fiscal shocks affect external competitiveness through their effect on relative prices. In turn, the current account deteriorates when government spending rises mainly due to the fall of exports caused by the real appreciation. Furthermore, the study show that shocks to purchases of goods and services and public investment lead to real appreciation, whereas the opposite happens with higher personnel expenditure.

(Corsetti, Meier, Müller, 2010)⁽⁸⁾: This study focus on the economy's response to government spending shocks, i.e., Changes in government spending that are not systematically related to the state of the economy, based on panel of 17 OECD countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom, and the United States, over the period (1975-2008). Using a Structural Auto regression model (VAR). The results show that an unconditional response to a spending shock are in line with earlier results, featuring a positive, if relatively small output multiplier, no significant movement in consumption, and a fall in investment and the trade balance. Yet, these average results mask important differences across environments. In particular, the responses of the real exchange rate and net exports vary systematically across exchange rate regimes, with real appreciation and external deficits emerging mainly under a currency peg. Output and consumption multipliers, in turn, become quite sizeable during times of financial crisis.

(Mona Kamal, 2010)⁽⁹⁾: This article examines fiscal policy shocks in the UK through using a Bayesian Vector Auto regression (BVAR) model. It investigates the impact of three fiscal policy experiments on macroeconomic variable. Specifically, the Deficit-Financed Spending Increase (DFSI), the Deficit-Financed Tax Cut (DFTC), and the Balanced-Budget Spending Increase (BBSI), over the period (1971:Q1 to 2009:Q2). The Results show that, that for the period from 1971:Q1 to 2009:Q2, the (DFSI) has positive impact on output in the short-term, but the costs in the medium-term are higher compared to the positive impact of the (DFTC). Regarding the (BBSI), the negative effects of the tax increase outweighs the

expansionary effects of the increased expenditure. Furthermore, while a (DFTC) could be a desirable option for the fiscal authority to adopt from 1971:Q1 to 2009:Q2. It is indifferent between the (BBSI) and the (DFSI) for the period from 1980:Q1 to 2009:Q2.

(Al-mulali and authors, 2010)⁽¹⁰⁾: This study investigated the impact of oil shocks on the real exchange rate of the UAE dirham, using annual time series data from 1977 to 2007. Where the VECM model has five variables with the real exchange rate as the dependent variable and oil price, gross domestic product per capita, trade balance, and foreign direct investment inflows as the independent variables. The results show that, when the oil price increased, with a tightly fixed exchange rate regime, the resulting financial surpluses were found to have a significant impact on the patterns of spending and investment, and also resulted in large and sudden increases in liquidity, high asset prices, lack of control on consumer prices and thus resulting in high levels of inflation and instability to its economy.

(Antonio, Ricardo, 2009)⁽¹¹⁾: Assessed empirically the macroeconomic effects of fiscal policy in a sample of developed countries (U.S., the U.K., Germany, and Italy), respectively, for the periods 1970:3-2007:4, 1964:2-2007:4, 1980:3-2006:4, and 1986:2- 2004:4, using a Bayesian Structural Vector Auto regression approach. The results show that government spending shocks, in general, have a small effect on GDP; lead to important “crowding-out” effects; have a varied impact on housing prices and generate a quick fall in stock prices; and lead to a depreciation of the real effective exchange rate. Government revenue shocks generate a small and positive effect on both housing prices and stock prices that later mean reverts; and lead to an appreciation of the real effective exchange rate. The empirical evidence also shows that it is important to explicitly consider the government debt dynamics in the model.

(Philip, Agustin, 2009)⁽¹²⁾: estimate the impact of shocks to government spending on the real exchange rate for a panel of eleven EMU member countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain). The results show that the impact differs across different types of government spending, with shocks to public investment generating a larger and more persistent impact on the real exchange rate than shocks to government consumption. Within the latter category, also show that the impact of shocks to the wage component of government consumption is larger than for shocks to the non-wage component. on the real effective exchange rate.

(Bjorn land Hilde, 2009)⁽¹³⁾: This paper analyses the effects of oil price shocks on stock returns in Norway, an oil exporting country, highlighting the transmission channels of oil prices for macroeconomic behavior over the period (1993-2005). To capture the interaction between the different variables, stock returns are incorporated into a structural (VAR) model, as stock prices are an important transmission channel of wealth in an oil abundant country. The results show that following a 10 percent increase in oil prices, stock returns increase by 2.5 percent, after which the effect eventually dies out. The effect on the real exchange rate is that of appreciation, as expected, but the effect is small.

(Katsuya Ito ,2010)⁽¹⁴⁾: examined the impact of oil prices on the levels of inflation; real effective exchange rate and real GDP for Russia from 1995: Q1 to 2009: Q3; using the VAR model. The result show that the oil prices fluctuations contributes to the growth (decline) in real GDP in the long run. Likewise; the study found that in the short run (4 quarters) rising oil prices not only stimulate inflation and economic growth negatively and positively; respectively; but also induce real effective exchange rate appreciation.

The Pro-cyclical fiscal Policy:

Over the last 10 years, cyclical behavior of fiscal policy has been subject to numerous theories and studies. They argued that there is a fundamental deference between how fiscal policy is conducted in developing countries compared to industrial countries. While fiscal policy in industrial countries is either

acyclical or countercyclical, fiscal policy in developing countries, however, is procyclical (Gavin and Perotti, 1997)⁽¹⁵⁾. It seemed that fiscal policy is the rule in all developing world, in fact, a large number of authors have reached similar conclusions to the point that the procyclicality of fiscal policy in developing countries has become part of the conventional wisdom (Braun, 2001)⁽¹⁶⁾, (Kaminsky, Reinhart and Végh, 2004)⁽¹⁷⁾, (Alesina and Tabellini, 2005)⁽¹⁸⁾, (Manasse, 2006)⁽¹⁹⁾, (Ilzetski, 2008)⁽²⁰⁾.

Many empirical studies have found that discretionary fiscal policy tends to be procyclical, across different countries, notably developing countries, this finding has “puzzled” macroeconomists, since it does not square with the common wisdom that governments should borrow in “bad times” when revenues shrink and “social” spending rises, and repay debt in good times.

More specifically, procyclical fiscal policy is at odds with both the neoclassical notion who considered that the optimal fiscal policy is to be acyclical where the tax policy should be used to smooth tax distortions and expenditures over the business cycle by calling nearly constant tax rates, and the Keynesian notion who believed that the best policy is countercyclical where taxes and expenditures should try to dampen, rather than exacerbate, business cycle fluctuations, while the Procyclical fiscal policy could be rationalized by (a): resorting to political distortions (Tornell and Lane, 1998)⁽²¹⁾, (Talvi and Végh, 2005)⁽²²⁾, (b): borrowing constraints (Riascos and Végh (2003)⁽²³⁾, (Mendoza and Oviedo, 2006)⁽²⁴⁾, or (c): incomplete markets (Riascos and Vegh, 2003)⁽²⁵⁾.

We can defined procyclical fiscal policy as a negative correlation between the central bank's policy rate and the output gap (Duncan, 2012)⁽²⁶⁾, where it involves higher (lower) government spending and lower (higher) tax rates in good (bad) times, and we call it a procyclical policy because it tends to reinforce the business cycle (i.e., fiscal policy is expansionary in good times and contractionary in bad times), in general, it is regarded as potentially damaging for welfare: they raise macroeconomic volatility, depress investment in real and human capital, hamper growth, and harm the poor. If expansionary fiscal policies in good times are not fully offset in bad times, they may also produce a large deficit bias and lead to debt unsustainability and eventual default.

Algeria as one of the developing countries, it can explain the concept of procyclical fiscal policy through its economic activity considering its heavily dependent on oil revenues as well as the interrelationship between both spending policy and the volatility of oil prices, and the following table hold the main idea:

Table 1. Development of the real oil price and public spending:

<i>Year</i> <i>s</i>	<i>G</i> (DA)	<i>OP</i> (US\$/Barrel)	<i>Year</i> <i>s</i>	<i>G</i> (DA)	<i>OP</i> (US\$/Barr el)	<i>Years</i>	<i>G</i> (DA)	<i>OP</i> (US\$/Barrel)
1970	7605000	1.67	1991	240800000	18.62	2003	1811109534	28.20
1974	14173000	10.73	1993	503950251	16.33	2005	2302983000	50.64
1979	36881000	17.25	1995	734845529	16.83	2007	3946748625	69.08
1981	61788250	32.51	1997	946217135	18.68	2008	4882190696	94.08
1986	12800000 0	13.53	1999	109857671 5	17.48	2009	5474574660	61.06
1987	10800000 0	14.24	2001	145236000 0	23.12	2011	8472561921	88.56

Source: World Bank.

The Dutch disease:

Generally, customary (it is known) that finding treasure is a guarantee of future happiness. However, several studies like (sachs and warner, 2001)⁽²⁷⁾, (Richard Auty, 2001)⁽²⁸⁾, showed puzzlingly, that countries with great natural resources tend to grow slower than countries that have fewer resources. The riches may be a curse rather than a blessing. Moreover, resource riches may displace and diminish the manufacturing sector, a symptom of the “Dutch disease”, “the resource curse” or “the curse of oil”, this term has been mentioned for the first time in 1977 by The Economist to describe the decline of the manufacturing sector in the Netherlands after the discovery of a large natural gas field in 1959, defined as the damaging effect on an economy as a result of the exploitation and export of natural resources⁽²⁹⁾. The classic cause is de-industrialization as manufacturing industries are made less competitive by exports of oil and natural gas.

The disease may become an acute problem since the manufacturing sector often is associated with productivity growth and technical advance. Since many resource booms are only temporary, the displacement may portend a later on-set of stagnant growth. This may appear to be beneficial, but there are a number of reasons it may be harmful, especially in the long term:

- The exports (or remittances) may not be sustainable.
- Especially in the case of commodities, prices may be volatile, making reliance on exports of a single commodity dangerous.
- The industry may have less growth potential than the industries it displaces.
- The distribution of wealth may be uneven.
- Those within one industry can become dramatically better off, while many others become worse off.
- Entrepreneurial activity is deflected from wealth creation.
- There are political and consequences such as increased corruption.

The dependence on natural resources (oil) revenues makes the national economy vulnerable to marked prices. The oil dependence and the volatility of oil prices in international markets lead to significant problems in fiscal planning, reduce the quality of public spending, and lead to financial disaster when oil prices collapse. When oil prices fall, however, fiscal budgets go into deficit, countries start taking loans leveraged against their reserves, and March unimpeded into debt.⁽³⁰⁾

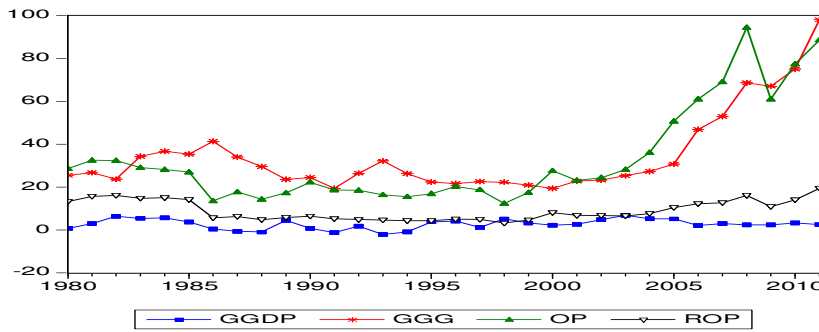
Indeed, Algeria considered one of the oil-producing countries; participating in global production of oil about 1.1898 barrels per day in 2010, it export also 709 thousand barrels per day, and estimated oil reserves of 12.2 billion barrels that ranked it the 15th globally.

Algeria is highly dependent on hydrocarbons, which has become a cornerstone of his economy and being a strategic commodity of huge financial revenues, as seen as a source of foreign currency, and the most important factor to raise income, where the percentage of oil exports approximately 98% of the country's total exports, approximately 70% of the government revenues and 40% of GDP from this sector.

This increasing dependency has made the country highly vulnerable to price shocks, where high oil prices affected domestic prices and revenues, resulting in the movement of financial resources and the workforce from tradable goods to the non- tradable goods.

This can be illustrated by table below, which shows the high correlation of oil revenues to oil price fluctuations, which reflected on the gross domestic product (GDP) during the period (1970 -2011).

Table 2. Development of G/GDP and T/GDP compared with OP in Algeria:



Source: prepared by the authors – according to World Bank data.

Methodology and Model Specification:

To estimate the impact of fiscal policy shocks on real exchange rate dynamics on Algerian economy we must base on some of empirical studies(Rajmund)⁽³¹⁾,(Al-mulali, etl)⁽³²⁾,(Fransisco and Laura)⁽³³⁾, (Olivier & Romain)⁽³⁴⁾, (Afonso & Sousa)⁽³⁵⁾ (Monacelli & Perotti)⁽³⁶⁾,we use a Bayesian Structural Auto regression model (VAR) including seven key macroeconomic variables (7equations), Four of them work directly on the evaluation of the impact of fiscal policy represented in the logarithm of government spending (G_t) is defined as the sum of government consumption and investment, the logarithm of tax revenue (T_t) is defined as total government current receipts, less current transfers excluding interest payments, the logarithm of real (GDP_t) defined as GDP at constant price, and oil prices (OP_t) as an important and essential in Algerian economic life and essential funded to the budget balance, representing 70% of total revenue considering the Algerian state is a rentier state dependent on oil dramatically defined as crude oil prices in real terms, As for the remaining variables first inflation (INF_t) as measured by the percentage changes of consumer price index(CPI), which will allow us to observe the evolution of the price level, in addition to the interest rate of lending (NIR_t), and the real exchange rate (RER_t) Defined in the long run as the nominal exchange rate (e) that is adjusted by the ratio of the domestic price level (P) to the foreign price level (P^*) Mathematically, it can be shown as $q = e \frac{p}{p^*}$, to measure the impact of monetary policy.

The study period was chosen to surround all developments defined by the exchange rate from a fixed exchange rate system until managed float regime approach of the State until now, and fiscal policy that passed substantial shifts moving from socialism or planned system to a free market system applied by the state until today, We make use of Annual data over the period (1970 to 2011). The variables and the period of analysis obtained from the World Bank WB, the National Bureau of Statistics NOS, the International Monetary Fund (IMF), and the Organization of the Petroleum Exporting Countries OPEC.

Model Specification:

Theoretical models working on the link between internal and external variables, but the economic variables affected the macroeconomic situation as a result of the interrelationship between variables, which means that all variables can be become internal variables (Endogenous). This can be expressed through the optimal formula in Vector Auto regression (VAR) approach, which takes the form of the initial unrestricted dimensions PXP, and can be written as:

$$X_t = D(L)X_{t-1} + U_t \dots\dots (1)$$

Where: $X_t = (G_t, T_t, RGDP_t, CPI_t, RER_t, NIR_t, RER_t, OP_t)$ is the vector of endogenous variables and $D(L)$ is an autoregressive lag-polynomial. The benchmark specification includes a constant and a deterministic time trend.

The vector $U_t = (u^G, u^T, u^{RGDP}, u^{CPI}, u^{RER}, u^{NIR}, u^{OP})$ is a vector of white noise process contains the reduced-form residuals, which in general will present non-zero cross-correlations.

We apply the identification strategy proposed by Blanchard and Perotti (2002) which exploits decision lags in policy making and information about the elasticity of fiscal variables to economic activity. Their strategy relies on the assumption that the reduced-form residuals of the G_t and T_t equations, u^G and u^T , can be thought of as linear combinations of three types of shocks: a) the automatic responses of spending and net taxes to the rest of macroeconomic variables in the system, b) systematic discretionary responses of fiscal policy to the same set of macro variables and c) random discretionary fiscal policy shocks, which are the truly uncorrelated structural fiscal policy shocks whose effects are the purpose of our analysis. The innovations model can be written as: $\Gamma U_t = B V_t$, where $U_t = (u^G, u^T, u^{RGDP}, u^{CPI}, u^{RER}, u^{NIR}, u^{OP})$ is the vector containing the orthogonal structural shocks.

The model (VAR) examines each equation individually using (OLS), because of the insert variables using Previous values and slowing time, that will not be statistically significant, so it will be hard to explain the results. Therefore, the coefficients from the estimated (VAR) are not our priority. So; we focus on Granger causality test the impulse response function (IRFs) and variance decomposition (VDC) generated from the (VAR), to capture both the short-run and long-run relationships between variables.

The baseline (VAR) includes tow lags of each endogenous variable according to the information provided by LR tests, the Akaike information criterion and Schwarz information criterion.

Results and Discussion:

1. Unit Root Tests:

Many econometric studies (Stock & Watson)⁽³⁷⁾, (Plosser & Nelson)⁽³⁸⁾, (Yule)⁽³⁹⁾, (Mackinnon James)⁽⁴⁰⁾ prove that time series of macroeconomic variables unstable resulting problem of Spurious Regression, this is shown by the misleading results obtained where R^2 values are high even in the absence of a real relationship between the variables, and be sure of the stability of variables The study based on the Unit Root Test by using test (ADF) Augmented Dickey Fuller to test the stability of the time series so the null hypothesis is to contain the variable of time series the unit root (it is not stable) and we judge this hypothesis by observing the value of probability less than (0.05), it means that the calculated value of the statistic (ADF) bigger than the tabular value, which means refused the null hypothesis existence of unit root and stability of time series variables.

Table 3. Unit Root Tests for variables:

Variables	Lag	None				Intercept		Decision
		ADF		PP		KPSS		
		Level	Idifference	level	Idifference	level	Idifference	
G	9	1.0000	0.0147**	1.0000	0.0206**	0.81225 7	0.044896	I(1)
T	9	1.0000	0.0000***	1.0000	0.0000***	0.81060 2	0.441605	I(1)
RGDP	9	0.9985	0.0009***	0.9992	0.0006***	0.76868 9	0.169388	I(1)
CPI	9	0.1787	0.0000***	0.1698	0.0000***	0.14960	0.075317	I(1)

						1		
RER	9	0.7350	0.0000***	0.6918	0.0000***	0.62526 2	0.287568	I(1)
NIR	9	0.4156	0.0008***	0.5372	0.0012***	0.43456 0	0.136290	I(1)
OP	9	0.9384	0.0000***	0.9384	0.0000***	0.53345 6	0.294788	I(1)

***, **, * Significant at levels 1%, 5%, 10%, successively.

Source: prepared by the authors - output software Eviews.

From the results obtained in the Table 3.shows that all economic variables are not stationary at level, when we testing (ADF) and (PP), where the absolute values was less than the critical value for all variables which requires accepting the null hypothesis on the existence of a unit root, but after taking first difference all the variables has become stable (stationary) at the abstract level 5%, as for(KPSS) test the variables were unstable at the level where the values of the statistical estimates exceed those critical (0.463000) at 5%, but after taking the first difference the variables became stable, Where are estimated values less than critical values.

Therefore the result does not deny the possibility that each time series variables integrated first degree I(1) at the 5% level of significance.

To be sure if the variables are first degree integrated I (1) or not we will test the degree of integration of residuals presented in the following table:

Table 4. Unit Root Tests for residuals:

Variable s	Lag	None	
		ADF	PP
		Level	Level
Z=residual	9	0.0000***	0.0000***

Source: prepared by the authors - output software Eviews.

Through the results obtained in the table 4. the two tests(ADF) and (PP) show that the residuals are stationary at level, therefore the residuals integrated I(0) at 1% level of significance.

From the results obtained that residuals integrated I(0) and the variables are integrated I(1), we cannot reject the null hypothesis (the variables are not integrated) and we will use Vector Auto regression approach (VAR).

2. Co-Integration Test :

To test co integration the variables must be integrated of the same rank, which is what has been achieved through the unit roots testing.

Juselius Johansen and is The most important tests of cointegration, which use Full Information Maximum Likelihood (FIML) Dealing with all the variables in the model as internal variables, and we can illustrated by the following equation:

$$\Delta y_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \Pi y_{t-p} + u_t$$

Table 5. Co-Integration Test:

<i>Hypothesized No. of CE(s)</i>	<i>Eigenvalue</i>	<i>Trace Statistic</i>	<i>Critical Value 0.05</i>	<i>Max-Eigen Statistic</i>	<i>Critical Value 0.05</i>
<i>None *</i>	0.750216	189.1125	125.6154	54.09919	46.23142
<i>At most 1 *</i>	0.737475	135.0133	95.75366	52.15893	40.07757
<i>At most 2 *</i>	0.582057	82.85435	69.81889	34.02399	33.87687
<i>At most 3 *</i>	0.483696	48.83036	47.85613	25.78129	27.58434
<i>At most 4</i>	0.282873	23.04907	29.79707	12.96761	21.13162
<i>At most 5</i>	0.201311	10.08146	15.49471	8.766572	14.26460
<i>At most 6</i>	0.033153	1.314888	3.841466	1.314888	3.841466

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Source: prepared by the authors - output software Eviews.

The finding of Johansen co integration shows in Table 5.the result of the maximal Eigen values and trace test statistics for the model shows that the variables are co integrated at $r=4$. There are four long run co integrated equations in vector six. the results indicate rejection of the hypothesis that there is no integration of Johansen, so we have three vectors integrated at least suggests a long-term relationship between variables. So the finding shows that there is a long run association among the variables.

3. VAR Lag Order Selection Criteria:

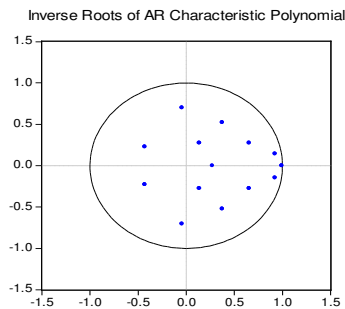
Table 6. VAR Lag Order Selection Criteria:

<i>Lag</i>	<i>LR</i>	<i>FPE</i>	<i>AIC</i>	<i>SC</i>	<i>HQ</i>
<i>0</i>	NA	14.62294	22.54766	22.84321	22.65452
<i>1</i>	482.2499	5.02e-05*	9.927348	12.29178*	10.78225*
<i>2</i>	66.33978*	5.16e-05	9.723757*	14.15707	11.32670

* 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: prepared by the authors - output software Eviews.

The Table.6 shows that the optimal lag of VAR (Vector Autoregressive) structure model is 2 lags by using Akika Criterion and Shewariz criterion.

Figure.1: Stationary of the residuals:

Source: prepared by the authors - output software Eviews.

The figure.1 shows that the model contain the condition of stability (VAR satisfies the stability condition) where the roots are all inside the unit circle ei, all parameters smaller than one, then is stationary. Which means that the model does not suffer from the problem of autocorrelation or heteroscedasticity. (De Castro & Hernández)⁽⁴¹⁾.

4. Granger-Causality Tests:

The Granger-causality tests show the direction of co-integrated relation; results are presented in Table.7; and it can be seen that for G; T; RGDP; OP; CPI; NIR and RER.

Table 7. Granger causality test:

<i>Null Hypothesis:</i>	<i>F-Statistic</i>	<i>.Prob</i>	<i>Result</i>
<i>GDP does not Granger Cause G</i>	2.76101	0.0770	<i>Cause</i>
<i>INF does not Granger Cause G</i>	0.05513	0.9464	<i>Cause</i>
<i>G does not Granger Cause RER</i>	3.10127	0.0575	<i>Cause</i>
<i>INF does not Granger Cause T</i>	0.42185	0.6591	<i>Cause</i>
<i>T does not Granger Cause INF</i>	0.69619	0.5053	<i>Cause</i>
<i>T does not Granger Cause RER</i>	3.47244	0.0421	<i>Cause</i>
<i>OP does not Granger Cause T</i>	3.99933	0.0273	<i>Cause</i>
<i>GDP does not Granger Cause INF</i>	3.05068	0.0601	<i>Cause</i>
<i>GDP does not Granger Cause RER</i>	6.34832	0.0044	<i>Cause</i>
<i>NIR does not Granger Cause GDP</i>	5.00967	0.0122	<i>Cause</i>
<i>RER does not Granger Cause INF</i>	3.12918	0.0562	<i>Cause</i>

Source: prepared by the authors - output software Eviews.

Pair wise Granger Causality tests conducted us to the results in table 5. at 10% significance level, we find that G granger caused RER, T granger caused RER and RGDP granger caused RER.

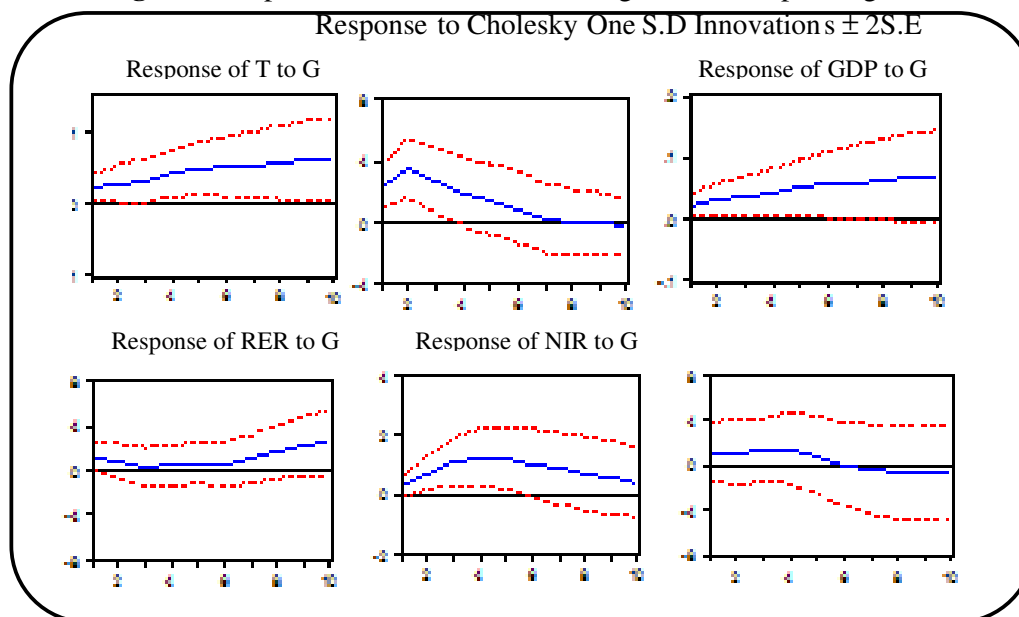
5. Impulse-Response Functions:

An impulse response function (IRF) usually used with vector auto regression (VAR) to keep track on the time path of shocks experienced by different variables in the model, where become so hard to interpretive each variable, therefore (IRF) shows us the reactions of dependent variable as a result of a sudden change in the Error Term by one Standard Deviation Causing variable change adopted at the present and the future, and how each variable response for any shock of any variable in the model. Each figure traces the effect of a one-time shock to the measures of oil shocks on the current and future values of each of the macroeconomic variables.

A. Effects of shock in government spending:

Figure.2 show us response of government revenue (T), real GDP (RGDP), inflation (CPI), the real exchange rate (RER), nominal interest rates (NIR) and oil prices (OP) to a standard deviation in government expenditures (G) for a period of 10 intervals.

Figure.2: response variables to a shock in government spending:



Source: prepared by the authors - output software Eviews.

According to estimation function extended to 10 years, a positive shock in government spending estimated with a one standard deviation or a dinar Algerian will have a positive significant effect of government revenues on lasts for the rest of year's maximum up to %0.060826 in the ninth year after the shock.

As for the impact of the shock on real GDP and real exchange rate and nominal interest rate will have a positive impact along the period of response amount to %0.067991 in the tenth year, %2.406781 in the tenth year and %1.243496 in the fourth year of a shock successively.

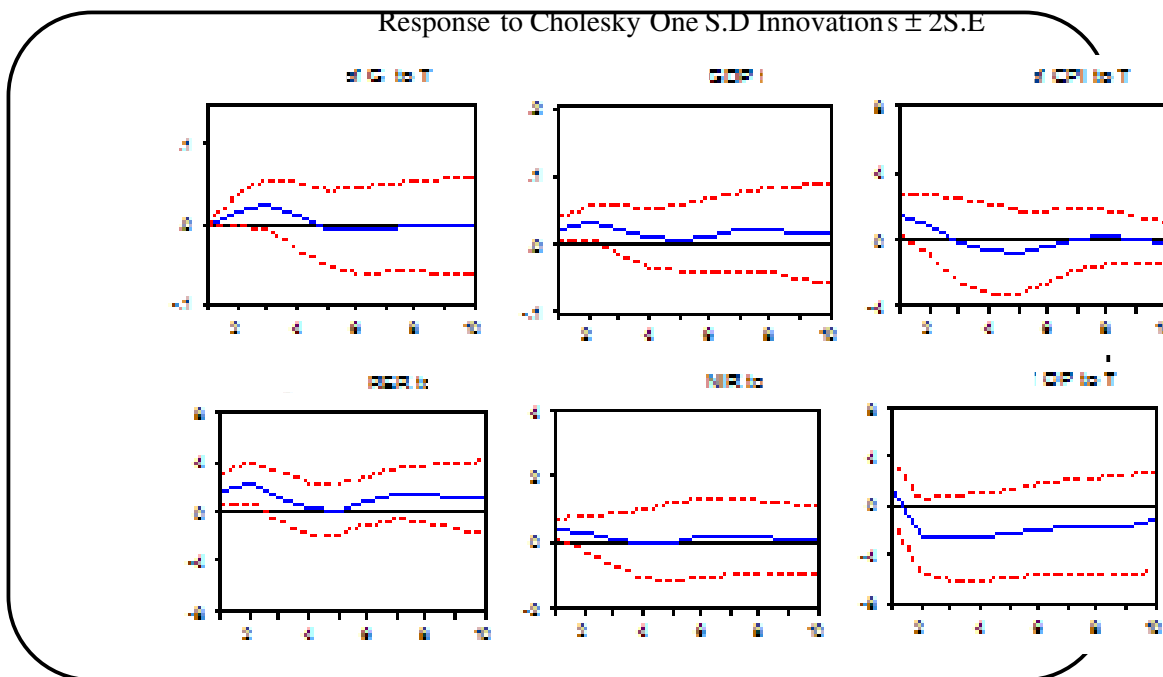
On the other hand, the incidence of positive shock in government spending of %1 would result an inflationary effects on the short and medium term estimated at %3.528449 in the second year following the shock, than it decrease gradually over the medium term to become negative impact estimated %-0.50263 in the eighth year lasts until the tenth.

Finally a positive shock in government spending will have a positive effect on oil prices during the short and medium term is estimated at %1.430205 in the fourth year of a shock, is fast turning into a negative impact from the seventh year.

B. Effects of shock in government revenue:

Figure.3. show us response of government expenditures (G), real GDP (RGDP), inflation (CPI), the real exchange rate (RER), nominal interest rates (NIR) and oil prices (OP) to one standard deviation in government revenue (T) for a period of 10 intervals.

Figure.3: response variables to a shock in government revenue



Source: prepared by the authors - output software Eviews.

According to estimation function extended to 10 years, a positive shock in government revenues estimated with a one standard deviation or a dinar Algerian will have a positive significant effect of government spending on the short and medium term estimated at %0.023775 in the third year following the shock, than it decrease gradually over the medium term to become negative impact estimated %-0.008133 in the tenth year.

As for the impact of the shock on real GDP and real exchange rate will have a positive impact along the period of response amount to %0.031291 in the second year, %2.269551 in the third year of a shock successively.

On the other hand a shock in government revenue will be generated by the rise in inflation during the first period of shock %1.370310, then it turn to a negative impact begin from the third year by %-0.154880 until the fifth period of shock.

As for the impact on the interest rates will be positive in the short and long term amounted to %0.335364 in the first period after the shock, while the medium term will be known negative levels will reach the limits of %-0.092329 in the third year.

For oil prices, the shock will result a negative response almost along the response, reaching a maximum of %-2.670229 in the fourth year following the shock.

6. Variance Decomposition Results:

To identify the amount of variation for each variable, which is due to an error variance in the variable itself and how much is due to an error variance in other explanatory variables form (VAR), is usually analyze components variance for each variable of variables model, also highlights the importance of

analyzing the components of variation in that it gives the relative importance of the impact of any shock in each variable on all variables model, and to avoid having problem of influence simultaneous errors in different variables in the model, therefore we Will resort the (Cholaski) test, which greatly affected by the order of the variables in the model to be tested, and it will be sure to results by changing the order of the variables used in the study model.

We tested the Variance Decomposition of all variables included in the model government revenue (T), government expenditures (G), real Gross Domestic Product (RGDP), inflation (CPI), the real exchange rate (RER), nominal interest rates (NIR) and oil prices (OP), the results are presented in Table 8:

Table 8. Variance decomposition

Percentage of the forecast error of:	Explained by shocks in:							
	Years	G	T	RGDP	INF	RER	NIR	OP
G	2	77.56767	4.682741	9.394448	3.415911	2.889916	0.005067	2.044245
	6	61.06345	3.279216	20.40712	1.120786	11.44498	1.531228	1.153221
	10	59.98384	2.004455	23.68556	0.652608	11.62151	1.379080	0.672948
T	2	19.81151	71.63496	1.193414	0.809711	1.719838	0.360645	4.469921
	6	43.41726	27.63733	14.90584	1.893185	9.524738	0.321230	2.300408
	10	52.19179	13.75997	20.39438	2.237996	9.180316	0.279450	1.956103
RGDP	2	21.19333	19.72202	49.72983	1.369840	1.170998	4.914623	1.899360
	6	31.44631	6.497028	36.06531	5.962606	4.079141	2.805536	13.14406
	10	38.46011	4.745578	29.17057	8.903381	3.679613	1.714433	13.32631
INF	2	40.10152	5.847151	18.96325	34.74712	0.015416	2.39E-06	0.325535
	6	40.84036	4.961255	17.13960	27.07978	2.449582	2.167993	5.361433
	10	40.15361	4.952800	17.29641	26.63172	2.424437	2.613714	5.927319
RER	2	7.085575	31.40812	43.97858	1.113880	9.071647	5.563967	1.778232
	6	5.208775	18.88683	37.58853	3.876410	7.802520	6.573038	20.06390
	10	14.47761	14.42406	26.75678	11.38170	4.011990	6.377889	22.56998

NIR	2	16.48673	5.085537	24.01430	15.24194	1.283482	30.76268	7.125332
	6	35.50215	1.176791	19.76492	18.20563	1.406838	7.182784	16.76090
	10	38.01079	1.246667	18.21363	18.64674	1.520341	6.193942	16.16789
OP	2	2.657603	9.576911	7.949420	20.28715	4.403716	0.835930	54.28927
	6	3.603476	16.53017	3.700067	20.73399	5.223862	7.875191	42.33325
	10	3.123518	15.71627	2.687285	26.35734	4.616616	7.230582	40.26838

Source: prepared by the authors - output software Eviews.

Through the results in table.5 it is clear that situational fluctuations of variables in the short term related to shocks in variables itself, while exchange rate it has been linked to fluctuations in government revenues and GDP, as well as nominal interest rate linked with fluctuations in GDP and the variable itself.

As for the medium and long term, we find that about %24 of government spending fluctuations resulting from the shock in the GDP, as interpreted shocks in the exchange rate about %12 of the fluctuations in government spending, while 61% of the fluctuations in government spending caused by a shock in the variable itself.

As for the fluctuations in the government revenue, estimated at %52 resulting from a shock in government expenditures, in contrast, shock in government revenues explain about %28 of the fluctuations in the variable itself, while the shock in GDP explains about %20 of the fluctuations in government revenue.

For the fluctuations in GDP, a shock in government expenditure and oil prices contributes to explain approximately %38 and %13 respectively, whereas the rest of the fluctuations relates to the variable itself estimated at %36.

On the other hand, the fluctuations of inflation rates at about %41, %17and %27, resulting from shocks in both government expenditure, GDP and the same variable, respectively.

And about %19 of the real exchange rate fluctuations result of shock in government revenues, in contrast, shock in GDP explain about %38 of the fluctuations in the real exchange rate, in addition a shock in oil prices resulting fluctuations estimated at %23 in real exchange rates.

As for the nominal interest rate fluctuations, a shock in government spending interpretive of %35.5, while the rest is distributed to shocks in GDP, inflation and oil prices between %20, %19 and %17 respectively.

Finally, the fluctuations in oil prices resulting from the shock in the variable itself estimated at %42, while the rest is resulting of shock in both government revenue and inflation rates ranging between %16.5 and %21 respectively.

Because of the Cholski vulnerability to the variables order and to ensure that the results obtained is not biased, we have been re-test after reverse previous arrangement, where the results showed that both government revenue and government spending greatly affects to the real exchange rates.

7. Conclusions and Recommendations:

We have reached four main conclusions:

- A positive shock in government spending by 1% will have a positive effects on the real exchange rate, that explain by expansionary policy Through increasing government spending to increase demand for the

Algerian dinar calling for decline in the money market, which increase the value of the real exchange rate, this result is agree with (Roel&Massimo)⁽⁴²⁾.

- A positive Shock in government revenues by %1 will cause a positive impact in the real exchange rate, that explain by increasing in petroleum taxes resulting from appreciation of oil prices associated with U.S. dollar, which would push to increase its value in the global markets causing Foreign rising prices compared to the prices of the Interior, which will impact on the value of the Algerian dinar against the U.S. dollar calling for an appreciation in real exchange rate, as these results are consistent with (Hilde)⁽⁴³⁾.

- The Granger Causality Test Show causal relationship between each of the exchange rates and fiscal policy instruments (government revenues and expenditure), that reflected by the effects of exchange rates on oil prices, which is the principal resource of Algerian government revenues about %70 from total revenues, underlying projects and government spending, which shows a positive relationship between economic variables represented in oil prices, real exchange rate, government revenue and government spending, this result is agree with (Shehu)⁽⁴⁴⁾ and (Tan)⁽⁴⁵⁾.

- The impulse response function (IRFs) and variance decomposition (VDC) show that the real exchange rate is affected significantly by government expenditure and revenues, Where these variables contribute to a large part to the explanation of variance decomposition of real exchange rates dynamics.

Finally, through the results obtained by analysis of econometric model we can give some recommendation, which can be summarized in the following points:

- ◆ Fiscal policy should be directed to activate and stimulate the aggregate supply by raising the capacity of national production in various sectors, and encourage the productive public investment, which will give a positive push to improve the value of the national currency.

- ◆ Work on the optimum utilization of the revenues of the oil wealth and improve the role of the Fund adjust resources in Algeria, and preserving the rights of future generations through converted into sustainable financial income assets.

- ◆ Finally we can say that the more rational government spending and government subtraction more meaningful and more profitable foreign trade, and fiscal policy more effective, would collectively to achieve economic equilibrium at higher rates of national Algerian income growth.

Reference:

- 1- Pereira, Manuel C , « A New Measure of Fiscal Shocks Based on Budget Forecasts and its Implications», *MPRA Paper*, No. 17475, posted 23, Banco de Portugal, September 2009.
- 2- Jean-Pierre Allegret and Alain Sand-Zantman, «Modeling the Impact of Real and Financial Shocks: The Role of the Exchange Rate Regime», *Springer Science and Business Media*, Open Econ Rev 2009.
- 3- Zeno Enders, Gernot J. Müller , Almuth Scholl, « How do Fiscal and Technology Shocks Affect Real Exchange Rates? New evidence for the United States», *Journal of International Economics*, 53–69, 2011.
- 4- Antonio Afonso, Ricardo M.Sousa , «The Macroeconomic Effects of Eiscal Policy in Portugal: a Bayesian SVAR Analysis », *The Economic Journal*, 121 (February), F4–F32,2011.
- 5- Roel Beetsma and Massimo Giuliodori, «The Effects of Government Purchases Shocks Review and Estimates For The EU », *The Economic Journal*, 2011.
- 6- Guglielmo Maria Caporale, Davide Ciferri and Alessandro Girardi, «Fiscal Shocks and Real Exchange Rate Dynamics: Some Evidence for Latin America », *Journal of International Money & Finance*, Vol. 30 Issue 5, p709-723, 15p, Sep2011.
- 7- Francisco de Castro and Laura Fernandez-Caballero, « The Effects of Fiscal Shocks on The Exchange Rate in Spain», *BANCO DE ESPAÑA*, Documentos de Trabajo N.º 1121, 2011.

- 8-Giancarlo Corsetti, André Meier, Gernot J. Müller, «What Determines Government Spending Multipliers?», *Euro Area Business Cycle Network*, 2010.
- 9- Mona Kamal, « Empirical Investigation of Fiscal Policy Shocks in the UK », *MPRA Paper* No. 26473, posted 06. November 2010.
- 10-Al-mulali, Usama and Che Sab, Normee, «The Impact of Oil Prices on the Real Exchange Rate of the Dirham: a Case Study of the United Arab Emirates », *MPRA Paper*, No. 23493, posted 25. June 2010.
- 11-Antonio Afonso, Ricardo M.Sousa , «The Macroeconomic Effects Of Fiscal Policy» ,*The Economic Journal*, F4–F32,2009.
- 12-Agustin S. Bénétrix, Philip R. Lane, «Fiscal Shocks and The Real Exchange Rate», *Institute for International Integration Studies*, No.286 / March, 2009.
- 13-Hilde C. Bjorn land, «Oil Price Shocks and Stock Market Booms in An Oil Exporting Country», *Scottish Journal of Political Economy*, Vol. 56, No. 2, May 2009.
- 14-Katsuya Ito, «The impact of oil price volatility on the macro economy in Russia». *Springer-Verlag, Economic Analysis Working Papers*, 9(5), 1-8, 2010.
- 15-Gavin, M., Perotti, R., «Fiscal Policy in Latin America», *NBER Macroeconomics Annual*, eds. Bernanke, B., Rotemberg, J., MIT Press, Cambridge, 2007.
- 16-Braun, M., «Why is Fiscal Policy Procyclical in Developing Countries?», manuscript, *Harvard University*, 2001.
- 17-Kaminski, G., Reinhart, C., Vegh, C., «When it Rains it Pours: Procyclical Capital Flows and Macroeconomic Policies», *NBER Working Paper*, no. 10780, 2004.
- 18-Alisina A, Tabellini G, «Why is Fiscal Policy often Procyclical?». *NBER Working Papers*, 2005.
- 19-Manasse, P., «Procyclical Fiscal Policy: Shocks, Rules, and Institutions-A View From MARS», *IMF Working Paper*, 2006.
- 20-Ethan Ilzetzki and Carlos A. Végh, «Procyclical Fiscal Policy in Developing Countries: Truth or Fiction?», *NBER Working Paper No.14191*, May, 2008.
- 21-Tornell, A., Lane, P.R.. «Are windfalls a curse? A non-representative agent model of the current account», *Journal of International Economics*, no. 44, pp. 83-112, 1998.
- 22-Talvi E., Vegh, C. «Tax Base Variability and Procyclicality of Fiscal Policy», *Journal of Development Economics*, forthcoming, 2005.
- 23- Riascos, A. and C. A. V_egh., «Procyclical Government Spending in Developing Countries: the Role of Capital Market Imperfections», manuscript, UCLA, October, 2003.
- 24- Mendoza, Enrique G, and Marcelo Oviedo «Fiscal Policy and Macroeconomic Uncertainty in Developing Countries: The Tale of the Tormented Insurer..Mimeo», 2006.
- 25- Riascos, Alvaro and Carlos A. Végh, «Procyclical Government Spending in Developing Countries: The Role of Capital Market Imperfections», 2003.
- 26- Duncan, R., «Institutional Quality, the Cyclicalilty of Monetary Policy and Macroeconomic Volatility», *manuscript, Ohio University*, (2012).
- 27- Sachs J D, A M Warner., «The Curse of Natural Resources», *European Economic Review*, (2001).
- 28- Richard Auty., « the political economy of resource driven growth », *European Economic Review*, (2001).
- 29- http://en.wikipedia.org/wiki/Dutch_disease.
- 30- Michael I. Ross, « the Political Economy of the Resource Curse», *World Politics*, 297-322, 1999.
- 31- Rajmund Mirdala, «Effects of Fiscal Policy Shocks in the European Transition Economies», *MPRA Paper*, No. 19481, posted 20. December 2009.
- 32- Al-mulali, Usama and Che Sab, Che Normee, «The Impact of Oil Shocks on Qatar's GDP», Op.cit.

- 33- Francisco de Castro and Laura Fernandez-Caballero, « The Effects of Fiscal Shocks on The Exchange Rate in Spain», *BANCO DE ESPAÑA*, Documentos de Trabajo N.º 1121, 2011.
- 34- Olivier Cardi, Romain Restout, «Fiscal Shocks in a Two Sector Open Economy», *Centre National de La Recherche Scientifique*, hal-00567855, version 1 - 22 Feb 2011.
- 35- Afonso A., and Sousa R. M., «The Macroeconomic Effects of Fiscal Policy in Portugal: a Bayesian SVAR Analysis», *School of Economics and Management*, Technical University of Lisbon, Working Paper N.º.09,2009.
- 36- Tommaso Monacelli, Roberto Perotti, «Fiscal Policy, the Trade Balance, and the Real Exchange Rate: Implications for International Risk Sharing», *International Monetary Fund*, Washington, DC—November 15-16, 2007.
- 37- Stock, J. H. and Watson, M. W., «Testing for Common Trends», *Journal of American Statistical Association*, Vol. 83, 1988.
- 38- Nelson C., and C. Plosser, «Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications», *Journal of Money Economics*, Vol. 10, 1982.
- 39- Mackinnon James J, « Critical Values for Co integration Test in Long-Run Relationships: Reading in Co integration », *Oxford University Press*, PP 267-276, 1991.
- 40- Yule, G.U., «Why Do We Some Times Get Nonsense-Correlations Between Time-Series? A Study in Sampling and the Nature of Time-Series», *Journal of the Royal Statistical Society*, Vol. 89, 1926.
- 41- Katarina Juselius, «*The Co integrated VAR Model: Methodology and Applications*», OXFORD University Press, P51, 2006.
- 42- Roel Beetsma and Massimo Giuliadori, «The Effects of Government Purchases Shocks Review and Estimates For The EU», Op.cit.
- 43- Hilde C. Bjørnland, «Oil Price Shocks and Stock Market Booms in An Oil Exporting Country», *Op.cit.*
- 44- Shehu Usman Rano Aliyu, « Impact of Oil Price Shock and Exchange Rate Volatility on Economic Growth in Nigeria: An Empirical Investigation», *Research Journal of International Studies*, Issue 11, July 2009.
- 45- Tan Juat Hong, «Impact of Oil Price Shocks on Government Revenue and Expenditure: Evidence for Malaysia », *IBBM*, 2010.