

Exchange Rate Volatility and Oil Prices Shocks

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Abstract

Consumption is positively correlated with disposable income, due to higher oil prices a fall in disposable income will decrease consumption and production and have an adverse impact on growth. If investment decisions are concerned, an increase in oil prices will increase the cost of production and lower the profit margin and investment. This paper seeks to identify the impact of exchange rate volatility and oil price fluctuations on economic growth in France based on annual data for forty years. The impact of oil prices and exchange rate volatility on economic growth has been significant. The cointegration technique is applied to check if exchange rate volatility has been significant. The Engle and Granger cointegration technique is applied and the impact of oil prices and exchange rate volatility on economic growth is checked. Engle-Granger results indicate that the relationship is significant in the long run and its error correction adjustment mechanism (ECM) in short runs is significant and correctly signed for France.

Keywords; Exchange rate, Imports, Exports, Economic Growth

JEL: F30, F31, P33

1. INTRODUCTION AND THEORETICAL BACKGROUND

Oil prices have a large significant impact on economic growth. The impact of oil prices is different for both oil importing and oil exporting countries. Due to a rise in demand for oil, there is an increase in oil prices (Demand pull inflation). Consumption is positively correlated with disposable income, due to higher oil prices a fall in disposable income will decrease consumption and production and have an adverse impact on gross domestic product (GDP). If investment decisions are concerned, an increase in oil prices will increase the cost of production and lower the profit margin and investment. (Brahim Fezzani, 2011). Oil price fluctuations have significant consequences on economic growth. These consequences are expected to be different in oil importing and in oil exporting countries (Al-Ezzee, 2011). An increase in oil price is considered good news for oil exporting countries and bad news for oil importing countries, the reverse should be expected when the oil price decreases (Amano & Van Norden, 1998). Accordingly, an increase in crude oil price will affect positively the real GDP. Moreover, many

study investigates the effect of oil price fluctuations on the macroeconomic (Jiménez-Rodríguez* & Sanchez, 2005). Given that crude oil is a basic input to production, the theory normally predicts that supply-side consequences of oil price while addition, aggregate demand is expected to fall in oil importing countries, and go up in oil exporting countries (Bjørnland, 2009). A rise in oil prices has affected the global economy positively. The rise in oil prices is due to increase in demand not by supply side effects (Kilian, 2007). The rise in oil prices increases inflation in domestic country and transfers income from oil importing to exporting countries. In oil exporting countries the rise in oil prices as considered as a good sign increases earnings from exports. There is a continuous rise in demand for oil in East Asian countries (Hamilton, 2009). The countries that are moving towards industrialization like China and India are increasing their demand for oil. Oil hauling and oil wells spillover are also a great reason to increase in oil prices (Al-Ezzee, 2011).

If courtiers inject money in the economy then money supply is larger so more consumption and investment in the economy is undertaken (Calvo, 1993). More production will increase demand for goods and prices of goods increases. More money supply means lower interest rate and raise in exchange rate (Dornbusch, 1984). If prices rises as a result of money supply then domestic interest rate increases (Contraction in monetary policy) then demand for the currency will rise and more capital inflow will have a significant impact on the economy and currency will start to appreciate (Kim 2007). Different countries are having fixed as well as floating exchange rates. The goodness of flexible exchange rate is that countries are not dependent on one another in terms of formulating policies like monetary and fiscal policy. But in a fixed exchange rate regime if one country has implemented expansionary monetary policy then other country also has to follow the same policy. If a government increases its consumption in development projects then output of the economy will be more. Increase in consumption in domestic country will affect balance of trade positively and that will ultimately increase output and depreciation of exchange rate. Fluctuations in exchange rate are regarded as a significant impact on foreign debt. The currency depreciation is regarded as a positive signal for the economy because it improves investment decisions and makes exports intensive and less reliance on foreign flows (Globerman & Shapiro, 1999). Currency appreciation will intend investors toward dis saving mechanism because of expectations of tomorrow consumption will be more expensive for them, so people will spend and demand more (Ali, 1999). Due to an increase in demand imports increase and current account deficit enlarges. Foreign direct investment also has a significant positive impact on the economy. Government revenue increases due to foreign direct investment (FDI), which also leads to government investment in development projects that has a positive impact on the economy (Hafeez-ur-Rehman, 2010). FDI will be a source of revenue for countries but some countries don't enjoy it like those having political instability and price volatility (Hsing, 2011). It is to be noted that inflation has a significant impact on exchange rate volatility. Due to rise of import prices there is a rise in import prices which leads to increase inflation and currency depreciates (Ravn 2012). So, this problem is faced by both developing countries and developed countries. The various factors affecting exchange rate are inflation, interest rate, exports, imports, foreign debt, industrial growth and foreign direct investment. Exchange rate and oil prices have a significant impact on the growth of the economy. So, the research problem is to find out "the macroeconomic variables like imports, exports, inflation, interest rate, government consumption expenditure

and foreign direct investment have a significant impact on exchange rate and is exchange rate volatility and oil prices shocks has a significant long run relationship with economic growth and what is its short run adjustment mechanism in short run in France.

2. METHODOLOGY

Economic growth of a developed country like France is affected by different variables like government investment and consumption decisions, foreign direct investment, industrial and manufacturing growth rate, oil prices and exchange rate. Oil prices and exchange rate affect positively as well as negatively to the different countries. Annual data of variable is taken from International Financial Statistics (IFS) from year 1971 to 2012 for France. Gross domestic product is taken in US \$. Data of exchange rate variability is taken as CPI based real effective exchange rate (REER) from the same source. Data of world oil prices is taken in current US \$. In order to estimate the relationship between economic growth, exchange rate gap and, oil price shock, the following models are adopted.

$$GDP = \alpha + \beta_1 \Delta ROIL + \beta_2 REXR + \mu \dots \dots \dots (1)$$

Based on the model of (Jin, 2008) and (Aliyu, 2009) cointegration technique is applied for the analysis. REXR is real effective exchange rate which is also checked as an endogenous variable with certain macroeconomic variables. Annual data of imports, exports and government consumption expenditure is taken in local currency in billions from 1971 to 2012. Data of foreign direct investment and Consumer price index (2005) is taken from International financial statistics (IFS) in rate. First of all impact of inflation, interest rate, government consumption expenditure, imports and exports of a country on exchange rate is to be seen by using cointegration technique. So, econometric model is given below;

$$REXR = \beta_0 + \beta_1 EXP + \beta_2 IMP + \beta_3 IR + \beta_4 FDI + \beta_5 GC + \mu \dots \dots \dots (2)$$

Time series modeling and forecasting became quite popular following the publication of the text time series analysis forecasting and control by George box and Gwilym Jenkins in 1976. They suggested some properties of time series that would suggest departures from stationary, that is, these would suggest non stationary. The two main properties were visual cues. First, if a series does not seem to have a constant mean (part of the definition of stationary) when graphed, that is a visible symptom of non stationary. The stationary or otherwise of a series can strongly influence its behavior and properties -e.g. persistence of shocks will be infinite for non-stationary series. If the variables in the regression model are not stationary, then it can be proved that the standard assumptions for asymptotic analysis will not valid. In other words, the usual "t ratios" will not follow a t-distribution, so we cannot validly undertake hypothesis tests about the regression parameters. If a non-stationary series, y_t must be differenced d times before it becomes stationary, then it is said to be integrated of order d . We write $y_t \sim I(d)$. So if $y_t \sim I(d)$ then $\Delta y_t \sim I(0)$.

An $I(1)$ series contains one unit root,

e.g. $y_t = y_{t-1} + u_t$

A series is said to be trend stationary when it is stationary around a trend:

$y_t = \beta_0 + \beta_1 t + u_t$

$t = \text{trend}$

Differenced variables are usually thought of as representing the short-run. But if the built model does not belong to above circumstances, so the problem could be referred non stationary. Therefore, before running the model it will undergo stationary check.

3. RESULTS AND DISCUSSION

Firstly, Augmented dickey-fuller (ADF) test is applied. Graphical representation of all the variables is shown in the figure 1 below. So it is estimated that there exists a long run relationship among the variables at the first difference as shown in table 1.

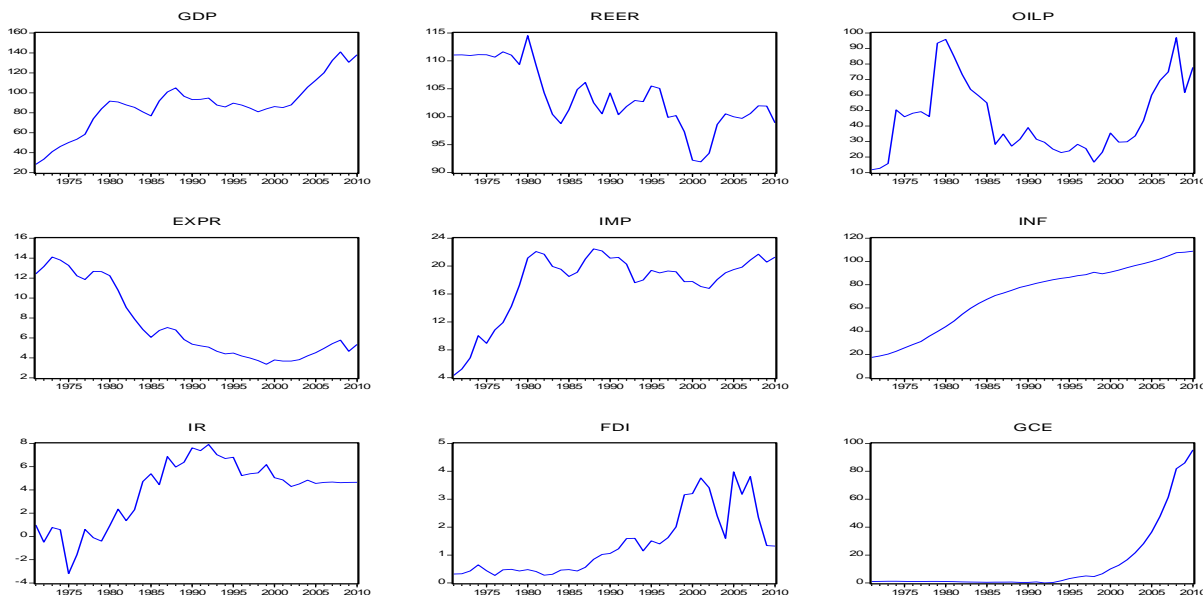


Fig 1: Graphical representation

Variables	Test Specification	ADF Test	Critical Value	Prb.	DW
GDP	IT-Δ-1%	-5.40	-3.615	0.0001	1.95
OILP	I-Δ-1%	-6.669	-3.616	0.000	1.98
REER	I-Δ-10%	-3.97	-3.19	0.0183	1.83

Table 1: ADF test

Either to check short run adjustment mechanism error correction mechanism is to be used in table 3. But before to test ECM, log selection is an important parameters which is shown in table 2 below. Lag one is selected and it fulfill all the criteria for lag. ECM is a general to specific approach to econometric modeling. All the series are found to be integrated at the same order. All the variables are significant at first relationship exists among the variables.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-285.0057	NA	521.0924	14.76952	14.89749	14.81544
1	-186.3871	177.0078*	5.271090*	10.17370*	10.68556*	10.35735*

Table 2: Lag selection

Engle and Granger model suggests that if any set of co integrated time series has an error-correction representation, which reflects the short-run adjustment mechanism. The lag value of the residual term must be negative showing that shocks in the long run having short run adjustment mechanism. A fundamental parameter in the estimation of the short-run dynamic model is the coefficient of error-correction term which measures the speed of adjustment of real GDP to its equilibrium level.

Variables	Coeff.	S.E	t-stat	Prob.
C	2.6663	0.9155	2.9124	0.0062
D(REER)	0.5720	0.3505	1.6321	0.1116
D(OILP)	0.1797	0.0659	2.7269	0.0099
UT(-1)	-0.0557	0.0582	-0.9562	0.3455

Table 3: Cointegration and Error Correction Mechanism

The results show that the factor of the error-correction terms in the model is statistically significant and correctly signed. This confirms that GDP has automatic adjustment mechanism and that the economy responds to deviations from equilibrium in balancing manner for France. As far as t-statistics are concerned if t-statistics are statistically significant then the shocks will adjust in that year and the remaining will be carry forward to the next year and if t-statistics are insignificant then the shock will recover in the same year.

$$GDP = 2.6663 - 0.0557U_t(-1) + 0.5720REER + 0.1797OILP \dots\dots\dots (3)$$

From the above results the coefficient of lag of error term is negative mean that there is short run error correction adjustment mechanism. And the signs of real effective exchange rate and oil prices both are positive showing that 1 unit increase in exchange rate will cause 0.572units change in economic growth and 1 unit increase in oil prices will cause 0.1797 units change in gross domestic product.

Secondly, check either cointegration exist in consumer price index (CPI), export(EXP), government expenditure (GCE), imports (IMP), interest rate (IR), foreign direct investment (FDI) with endogeneity of real effective exchange rate (REER), which shows stochastic trend that can only be removed by taking first difference. Unit root test is applied to check the Stationary of the data at level and first difference. A technique for Stationary of data is Augmented dickey fuller a most trustworthy source.

Variable	Test Specific-ion	ADF Test	Critic-al Value	Prb	DW
ER	IT-Δ-1%	-5.235	-4.219	0.0007	1.94
CPI	IT-ΔΔ-1%	-8.7434	-4.227	0.0000	2.00
EXPR	IT-Δ-5%	-4.0633	-3.533	0.0147	1.86
GCE	IT-Δ-10%	-3.3290	-3.198	0.0796	2.26
IMP	IT-Δ-1%	-4.2300	-4.210	0.0097	1.95
IR	IT-Δ-5%	-3.7275	-4.231	0.0335	2.15
FDI	I-Δ-1%	-4.3481	-3.627	0.0015	2.15

Table 4: ADF test

All the variables are integrated at first difference so order of integration is 1. After the estimation of order of cointegration lag order must be selected. As far as to achieve this purpose VAR lag order selection criteria must be used. For this purpose we use: Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn Information Criterion (HQ). Table 5 Shows the results of the optimal lag Selection. According to the results lag 1 is to be selected for in the Vector autoregressive model.

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-639.8121	NA	23275674	33.99011	34.24868	34.08210
1	-468.4521	279.5873*	19228.75*	26.86590*	28.67586*	27.50987*

Table 5: Lag selection

The value of Trace statistics and maximum Eigen value will tell the number of cointegration equations in this. It is noted that Trace statistics is greater than critical value at 5% level of significance then there exist cointegration (long run relationship) among the variables. From the results in the table 6 As per trace statistics there exists 3 cointegration equations in France.

No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.821539	197.3525	125.6154	0.0000
At most 1 *	0.761212	131.8638	95.75366	0.0000
At most 2 *	0.595863	77.44102	69.81889	0.0109
At most 3	0.466125	43.01301	47.85613	0.1323
At most 4	0.231782	19.16447	29.79707	0.4812
At most 5	0.208108	9.144587	15.49471	0.3522
At most 6	0.007290	0.278030	3.841466	0.5980

Table 6: Unrestricted cointegration Rank Test

$$REER = -201.04 - 3.44 \text{exp} + 54.10 \text{imp} - 0.921 \text{inf} - 102.677 \text{IR} + 77.26 \text{FDI} - 4.80 \text{GCE} \dots \dots \dots (4)$$

0.11 -5.44 0.11 9.57 3.36 2.62

Equation indicates that in France 1 unit increase in exports will cause decrease in real effective exchange rate by 3.44 unit and 1 unit increase in imports will cause 54.1 unit increase in Real effective exchange rate and interest rate, inflation rate and government consumption expenditure are negatively correlated while foreign direct investment is positively correlated. 1 unit decrease in interest rate, inflation rate and government consumption expenditure will cause 102.67, 0.92 and 4.80 units increase in real effective exchange rate. The t-value in parenthesis indicates that all the variables are statistically significant except of inflation and foreign direct investment.

4. CONCLUSION

Coefficient sign of oil prices and exchange rate are negative and positive respectively. So positive sign showing that rise in oil prices will be affecting positively to gross domestic product

of the France and in exchange rate will cause decrease in gross domestic product and vice versa. Short run error adjustment mechanism shows that all the errors will be not removed in short run and will not recover in the same year. Secondly, effect of imports, exports, interest rate, inflation, government consumption expenditure and foreign direct investment are having effect on exchange rate. Foreign direct investment and import of the country has significant positively related to the exchange rate while the exports and other factors has negatively related to the real effective exchange rate. So, it is concluded that the oil prices shocks has effect in the short run and exchange rate has also has the same phenomena.

REFERENCES

- Al-Ezzee, D. I. (2011). Real Influences of Real Exchange Rate and Oil Price Changes on The Growth of Real GDP: Case of Bahrain. *International Conference on Management and Service Science*, 8, 155-164.
- Ali, E. A. a. S. A. (1999). Relationship between exchange rate and inflation. *Pakistan Economic and Social Review*, 37(2), 139-154.
- Aliyu, S. U. R. (2009). Impact of Oil Price Shock and Exchange Rate Volatility on Economic Growth in Nigeria: An Empirical Investigation. *Research Journal of International Studies*(11), 4-15.
- Amano, R. A., & Van Norden, S. (1998). Oil prices and the rise and fall of the US real exchange rate. *Journal of international Money and finance*, 17(2), 299-316.
- Bjørnland, H. C. (2009). Oil price shocks and stock market booms in an oil exporting country. *Scottish Journal of Political Economy*, 56(2), 232-254.
- Brahim Fezzani, D. N. (2011). Oil Prices Fluctuation Impact on Iraq's Economy. *European Journal of Social Sciences*, 26(4), 626-633.
- Calvo, G. A. L., Leonardo Reinhart, Carmen M. (1993). Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors. *Staff Papers - International Monetary Fund*, 40(1), 108-151.
- Dornbusch, R. (1984). External debt, budget deficit and disequilibrium exchange rate. *National bureau of Economic Research, Working Paper No. 1336*.
- Globerman, S., & Shapiro, D. M. (1999). The Impact of Government Policies on Foreign Direct Investment: The Canadian Experience. *Journal of International Business Studies*, 30(3), 513-532.
- Hafeez-ur-Rehman, A. A. J., Imtiaz Ahmed. (2010). Impact of Foreign Direct Investment (FDI) Inflows on Equilibrium Real Exchange Rate of Pakistan. *A Research Journal of South Asian Studies*, 25(1), pp.125-141.
- Hamilton, J. D. (2009). Causes and Consequences of the Oil Shock of 2007-08: National Bureau of Economic Research.
- Hsing, Y. (2011). Impacts of Higher Crude Oil Prices and Changing Macroeconomic Conditions on Output Growth in Germany. *Journal of European Union Economics and Finance*(2), 60-66.
- Jiménez-Rodríguez*, R., & Sanchez, M. (2005). Oil price shocks and real GDP growth: empirical evidence for some OECD countries. *Applied economics*, 37(2), 201-228.

- Jin, G. (2008). The Impact of Oil Price Shock and Exchange Rate Volatility on Economic Growth: A Comparative Analysis for Russia Japan and China. *Research Journal of International Studies*(8), 98-111.
- Kilian, L. (2007). Not all oil prices are alike:Disentangling demand and supply shocks in the oil market forthcoming in *American Economic review*.