

MEASURING EXCHANGE RATE VOLATILITY, OIL PRICE SHOCKS & ECONOMIC GROWTH

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ABSTRACT : Exchange rate volatility and oil price shocks has received attention from last many era and its importance is certain in all sectors of the economy. This paper seeks to identify factor affecting exchange rate volatility and the impact of oil prices on economic growth of Canada from year 1971 to 2012. Firstly, cointegration technique applied and result indicates that relationship of oil prices shocks and exchange rate volatility on economic growth is significant in the long run and its error correction adjustment mechanism in short run is significant and correctly signed. Secondly, data was analyzed to check the factor affecting exchange rate volatility and it is estimated that imports, exports, inflation, interest rate, government consumption expenditure and foreign direct investment has a significant impact on real effective exchange rate in the long run and short run.

KEY WORDS: Exchange rate volatility, Oil prices shocks, Economic growth

I. INTRODUCTION

Generally it is recognized that depreciation in exchange rate be a positive signal for the economy it increases cost of imports that discourages imports and encourages exports and have a positive impact of the balance of trade. As far as appreciation of the currency is concerned it decreases exports and increases imports. This in turn proves that depreciation in exchange rate transfers income from importing countries to the exporting countries and effects terms of trade. Because of uncertainty of exports revenue people reduces trade and this affects the economic growth of both importing and exporting nations. It is to be noted that for the purpose of adjustment of regime people hold foreign as well as domestic stocks. If exports are more than imports (Trade surplus) then people stated to hold foreign currency. In case of holding demand for the currency decreases and foreign currency will depreciate. If expectations of trade deficit in the future then as imports are more than exports then foreign money holding will be less. In case of that the foreign currency will started to appreciate. 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. 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. Due to an increase in demand imports increases 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. FDI will be a source of revenue for countries but some countries don't enjoy it like those having political instability and prices volatility. 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.

On the other hand, Oil prices have a large significant impact on Economic Growth. The impact of oil prices is different for both oil imparting and oil exporting countries. A rise/fall in oil prices will be regarded as a good/bad sign for oil exporting countries and a bad/good sign for oil importing countries. The main instruments affecting economic growth are demand and supply of oil. If we consider the supply side, Crude oil which is a vital input of production, a rise in the crude oil prices increases the cost of production. If cost of production becomes high then lower production in the available resources and also less output (Cost push inflation). Lower output has an adverse impact on the economy as a whole. Economics is the study of scarcity of resources, there is a scarcity of oil resources in all over the world. As far as demand side is concerned an increase in oil prices has a large significant impact on output ($GDP = C+I+G+NX$) which affects consumption and investment decisions. Due to rise in demand of oil there is increase in prices of oil (Demand pull inflation). Consumption is positively correlated with disposable income, due to higher oil prices a fall in disposable income will decreases consumption and production and adverse impact on GDP. If investment decisions are concerned increase in oil prices will increase cost of production and lowers profit margin and investment. 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. So, this paper seeks to identify factor affecting exchange rate volatility and the impact of oil prices on economic growth. This study extend the literature in two directions; first it will establish a relationship between oil prices and exchange rate with economic growth, and measures a long run relationship and short run adjustment mechanism in between macroeconomic variables and exchange rate like Exports, Imports, interest rate, inflation, and government consumption in Canada.

II. LITRATURE REVIEW

It has proposed that appreciation of a currency is a bad signal and depreciation is a good signal for developing countries [1]. Depreciation of a currency is positively correlated with economic growth in developing countries like china, India, South Korea, Taiwan, Uganda and Tanzania but is negatively correlated in Mexico which is a developed country. Capital inflow will lead to appreciation of a currency and increases growth in Mexico. It has demonstrated that monetary policy has a significant impact on exchange rate that lowers interest rate and causes an increase in money supply and causes currency depreciation. Several studies are done to see the behavior of exchange rate under fixed, floating and pegged exchange rate regime [2,3]. Under fixed exchange rate regime state bank intervene by increasing or decreasing interest rate to stabilize exchange rate [4]. Devaluation of a currency leads contraction in aggregate demand and output. Devaluation increases general price level and decrease in real money value increase demand for nominal money and interest rate and have a negative impact on investment and consumption decisions. Government has to pay more money for external debt which is either generated from taxes or by reducing expenditure. If it is by increase in taxes then it will lessened the private sector spending and negatively affects economy [5]. Literature empirically proves that depreciation in exchange rate will make imports expensive that will encourage exports and stronger balance of trade position and leads to higher economic growth. Despite that, appreciation in exchange rate will make imports cheap and has studied affect the economic growth as well [6,7]. It has noted that Venezuela GDP has been increased due to volatility in exchange rate. Government must focus on price stability to control volatility [8]. It has analyzed that Capital inflows are associated with recession in a country and higher interest rate will lead to appreciation of the country and have an adverse impact on exports [9]. Expansionary monetary policy will decrease interest rate and therefore expectation of depreciation of currency, less attractive for investment leads to capital flight and cause depreciation of currency [10]. It has further investigated that higher interest rate leads appreciation of the currency and the relationship between exchange rate and interest rate must be treated differently because it is more favorable for traded goods [11]. If government increases its spending that will increases consumption decreases balance of trade and depreciation in exchange rate and have a positive impact on Gross domestic product. Foreign direct investment is regarded as an important source of capital financing [12]. Government implement different strategies to foster economic growth and regime stability lead to increase in foreign direct investment inward [13]. If foreign direct investment is used in non-tradable sector then it will leads to appreciation of the currency. Different countries have proposed different causes of inflation [14]. Either it is due to the supply of money or due to increase in import prices that causes depreciation of the currency.

Empirical analysis of exchange rate volatility and oil prices fluctuations on economic growth in three countries Russia(oil exporting country) Japan(oil importing countries)

and china(not both).From the results of Granger causality oil prices cause economic growth and exchange rates cause GDP in Japan and Russia [15]. A rise in oil prices in Russia has a positive impact on economic growth and appreciation in ruble will lead increase in GDP in long run and no impact in short run. Japan is unable to produce oil for its domestic consumption rely for oil on other countries has a negative relationship between oil and GDP, appreciation in Japanese yen is associated to fall in GDP in long run as well as in short run. No long run relationship is found in china because it may be oil importing and exporting country and pegging of Yuan with US dollar virtually. Russia, the second largest oil producer in the world has increased its economic growth from last ten years. GDP of Russia is increasing due to high oil production and relatively high oil prices, producing 10 million barrel oil per day and exports 7.3 million barrel oil per day. Russian currency ruble is linked with dollar and euro. Appreciation of Russian ruble is positively correlated with economic growth in long run and has no significant impact in short run. Demand for oil is increasing day by day and depends upon demand and supply of oil, its consumption and alternatives availability of resources. Current demand for oil is 85 million barrel a day and is estimated that it will increase in 2030 by 116 million barrel a day. Due to high demand for oil prices of oil are increasing. This is not a matter of concern for oil importing countries but also oil exporting countries. It is analyzed that increase in oil prices is negatively correlated with economic growth for oil importing country like Pakistan [16,17]. Economists are trying to investigate the relationship between oil prices volatility and economic growth and noted that increase in oil prices is regarded as a positive signal for the oil exporting countries like Iraq and Nigeria and appreciation in exchange rate will have a significant positive impact on economic growth. So for those countries oil prices and appreciation in exchange rate are positively correlated with Gross domestic product [18,19,20].

III. METHODOLOGY

Growth of any country is affected by different macroeconomic variables like government investment and consumption decisions, foreign direct investment, political conditions, 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. Gross domestic product is taken in national currency in billions. 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 \$.Then conversion of all the data in US dollar.

$$GDP = \beta_0 + \beta_1 OILPRICES + \beta_2 REER + \mu \dots \dots (1)$$

Based on the model of (Jin 2008) and (Aliyu 2009) cointegration technique is applied for the analysis. REER is real effective exchange rate which is also checked as an endogenous variable with certain macroeconomic variables. Exchange rate of a country is affected by inflation. Annual data of imports, exports and government consumption expenditure is taken in local currency in billions from 1971

to 2010. 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, This is a econometric model

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

Before applying any statistical technique Stationarity of the time series data is to be checked. ADF augmented ducky fuller is a most trustworthy source for checking the Stationary of the data.

IV. RESULTS

Firstly, In order to check either there exist cointegration among Oil prices, real effective exchange rate with gross domestic product. The Augmented dickey-fuller test is applied. So it is estimated that there exists a long run relationship among the variables at the first difference as shown in table 1.

Table 1: ADF test

Variables	Test Specification	ADF Test	Critical Value	Prb	DW
GDP	IT-Δ-1%	-5.807	-3.615	0.0	1.94
OILP	I-Δ-1%	-6.57	-4.21	0.0	1.98
REER	I-Δ-5%	-4.355	-3.53	0.0	1.86

Either to check short run adjustment mechanism error correction mechanism is to be used in table 3. ECM is a general to specific approach to econometric modeling. All the series are found to be integrated at the same order.

Table 2: Lag selection

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-240	NA	52.3	12.4	12.5	12.5
1	-132	194*	0.3*	7.3*	7.9*	7.5*

All the variables are significant at first difference, in such case I (1) exist and equilibrium relationship exists among the variables. The two-step Eager 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.

Table 3: Cointegration and Error Correction Mechanism

Variables	Coeff.	S.E	t-stat	Prob.
C	0.0377	0.0123	3.0625	0.0042
D(REER)	-0.0768	0.1917	-0.4009	0.6909
D(OILP)	0.1288	0.0445	2.8924	0.0065
UT(-1)	-0.0800	0.0417	-1.9187	0.0632

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. 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 an automatic adjustment mechanism and that the economy

responds to deviations from equilibrium in balancing manner for Canada at 10% level of significance. 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. If we consider the results of Canada then

$$GDP = 0.0377 - 0.0800U_t (-1) - 0.0800REER + 0.1288OILP \dots \dots \dots (3)$$

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 negative and positive showing that 1 unit increase in exchange rate will cause -0.08 units change in economic growth and 1 unit increase in oil prices will cause 0.128 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.

Table 4: ADF test

Variable	Test Specification	ADF Test	Critical Value	Prb	DW
REER	I-Δ-1%	-5.74	-3.615	0.0	1.94
CPI	IT-L-1%	-4.93	-4.219	0.0	1.95
EXPR	IT-Δ-1%	-6.56	-4.219	0.0	2.00
GCE	I-ΔΔ-1%	-6.38	-4.226	0.0	2.01
IMP	IT-Δ-1%	-6.38	-4.219	0.0	1.97
IR	IT-Δ-1%	-6.77	-4.226	0.0	1.96
FDI	IT-Δ-5%	-3.26	-2.938	0.02	1.83

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 2 Shows the results of the optimal lag Selection. According to the results lag 1 is to be selected for in the VAR model.

Table 5: Lag selection

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-734	NA	1.23e	37.9	38	38.0
1	-532	330*	258*	29.4*	31*	30*

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 4 cointegration equations in Canada. Equation (4) indicates that in Canada 1 unit increase in exports will cause decrease in Real effective

exchange rate by 49 unit and 1 unit increase in imports will cause 25 unit increase in Real effective exchange rate and interest rate, foreign direct investment and government consumption expenditure are positively correlated 1 unit increase in interest rate, foreign direct investment and government consumption expenditure will cause 13.79, 0.97

Table 6: Unrestricted cointegration Rank Test

No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.758	166.3	125.61	0.0000
At most 1 *	0.574	112.4	95.753	0.0022
At most 2 *	0.553	80.0	69.818	0.0061
At most 3 *	0.414	49.42	47.856	0.0354
At most 4	0.348	29.05	29.797	0.0608
At most 5	0.186	12.4	15.494	0.1246
At most 6	0.121	4.911	3.8414	0.0267

REER=29.24-

$49.02exp+25.06imp+0.06int+13.79IR+0.97FDI+19.22GC.....(4)$
(3.89) (-1.55) (-0.29) (-7.59) (-0.84) (-2.44)

and cause 13.79, 0.97 and 19.22 units increase in real effective exchange rate. The t-value in parenthesis indicates that all the variables are statistically significant except of inflation. As far as signs of the variables are concerned the sign of interest are not expected because of consumption in non development projects and service industries.

V. CONCLUSION

The signs of coefficient of oil prices and exchange rate are positive and negative respectively. So positive sign showing that rise in oil prices will be affecting positively to gross domestic product of the Canada and in exchange rate will cause decrease in gross domestic product of Canada. Short run error adjustment mechanism shows that all the errors will be removed in short run and will slowly recover in Canada. Secondly, effect of imports, exports, interest rate, inflation, government consumption expenditure and foreign direct investment are having effect on exchange rate. Interest rate, foreign direct investment, government consumption and import of the country has significant positively related to the exchange rate while the exports has negatively related to the real effective exchange rate.

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