

## ECONOMIC SUSTAINABILITY & SHOCK

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**BSTRACT :** *Economy of USA (United state of America) experienced up and down over the decades. Exchange rate and oil price shocks are one of those factors which play significant role in the sustainability of the economy. This paper focuses on to identify factor affecting exchange rate volatility and the impact of oil prices on economic growth of USA from year 1971 to 2012. Firstly, co integration technique applied and result indicates that relationship of oil prices shocks and exchange rate volatility on economic growth and its error correction adjustment mechanism in short run is insignificant. 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:** *Economic shocks, Economic sustainability, Oil prices, Currency exchange*

### I. INTRODUCTION

Depreciation in exchange rate is a positive signal for the economy it increases cost of imports that discourages imports and encourages exports and have a positive impact on 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. 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 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 USA.

### II. BACKGROUND

Appreciation of a currency is a bad signal and depreciation is a good signal for developing countries. 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 [1]. 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 [2, 3]. 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 [4]. 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 [5]. 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 [6]. 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 [7]. Government implement different strategies to foster economic growth and regime stability lead to increase in foreign direct investment inward [8]. 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 [9]. 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 [10]. 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 rates are positively correlated with gross domestic product [11, 12, 13].

**III. METHOD AND MATERIAL**

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 [14]. REXR 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 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, the econometric model is;

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

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, yt must be differenced d times before it becomes stationary, then it is said to be integrated of order d. We write yt~I(d). So if yt~I(d) then  $\Delta dyt \sim I(0)$ .

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= 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 [15, 16].

**IV. RESULTS**

To check cointegration Oil prices, real effective exchange rate with gross domestic product, augmented dickey-fuller test is applied. Result shows that there exists a long run relationship among the variables at the first difference as shown in table 1.

Table 1: ADF test

Variab les	Test Specifi cat-ion	ADF Test	Critical Value	Prb	D W
GDP	I-Δ-1%	-2.82	-2.60	0.0	2.1
OILP	I-Δ-1%	-6.178	-3.616	0.0	1.9
REER	I-Δ-1%	-4.610	-3.616	0.0	1.9

Either to check short run adjustment mechanism error correction mechanism is to be used in table 3. Optimal lag selection is tested and it fulfills all the criteria at lag 1 as shown in the table 2. All the series are found to be integrated at the same order. All the variables are significant at first difference, in such case I (1) exist and equilibrium relationship exists among the variables. The two-step 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. ECM is general to specific approach to econometric modeling.

Table 2: Lag selection

La g	Log L	LR	FPE	AIC	SC	HQ
0	-747	NA	2.4	38	38.	38
1	-533	35 *	23*	29*	31*	30*

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 insignificant and correctly not signed. This confirms that

GDP has not automatic adjustment mechanism and that the economy responds to deviations from equilibrium in

**Table 3 Cointegration and Error Correction Mechanism**

Variables	Coeff.	S.E	t-stat	Prob.
C	19287.8	6446.9	2.9918	0.004
D(REER)	-136.98	61.810	-2.2161	0.032
D(OILP)	19287.8	6446.9	2.9918	0.004

Balancing manner for USA. As far as t-statistics are Table 3: Cointegration and Error Correction Mechanism 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 USA;

$$GDP = -31467 - 286REER + 108OILP \dots \dots \dots (3)$$

Table 3 Cointegration and Error Correction Mechanism

From the above results, 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 -286 units change in economic growth and 1 unit increase in oil prices will cause 108 units change in gross domestic product.

To 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	Critic -al Value	Prb	DW
ER	I-Δ-1%	-4.521	-3.61	0.0	1.9
CPI	I-Δ-10%	-3.820	-3.53	0.0	1.8
EXPR	IT-Δ-1%	-6.580	-3.62	0.0	1.8
GCE	IT-Δ-5%	-3.726	-3.53	0.0	2.1
IMP	IT-Δ-1%	-7.816	-4.21	0.0	1.9
IR	I-Δ-1%	-5.906	-3.62	0.0	2.0
FDI	I-Δ-10%	-2.620	-2.61	0.0	1.8

**Table 5: Lag selection**

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-747	NA	2.43	38.63	38	38
1	-533	351*	34*	29.4*	31*	30*

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 VAR model.

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 5 As per trace statistics there exists 5 cointegration equations in USA.

**Table 6: Unrestricted cointegration Rank Test**

No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.753	173.51	125.6	0.0000
At most 1 *	0.590	120.31	95.75	0.0004
At most 2 *	0.553	86.412	69.81	0.0014
At most 3 *	0.483	55.801	47.85	0.0075
At most 4 *	0.364	30.670	29.79	0.0396
At most 5	0.273	13.44	15.49	0.0993
At most 6	0.033	1.2972	3.841	0.2547

$$REER = 105.12 -$$

$$0.69exp + 0.80imp + 8.78inf + 2.40IR + 8.233FDI + 0.592GC \dots (4)$$

(7.45) (-7.169) (-4.78) (1.15) (0.75) (4.05)  
Equation (4) indicates that in USA 1 unit increase in exports will cause decrease in Real effective exchange rate by 0.69 unit and 1 unit increase in imports will cause 0.80 unit increase in Real effective exchange rate and interest rate, foreign direct investment and government consumption expenditure are positively correlated. So, 1 unit increase in interest rate, foreign direct investment and government consumption expenditure will cause 2.40, 8.23 and 0.592 units increase in real effective exchange rate. The t-value in parenthesis indicates that all the variables are statistically significant except of foreign direct investment.

**V. CONCLUSION**

Oil prices and exchange rate has positive and negative respectively with economic growth of the USA. So positive sign showing that rise in oil prices will be affecting positively to economic sustainability of USA and exchange rate will make negative impact on the sustainability of USA. Short run error adjustment mechanism shows that all the errors has been removed in short run and will fastly recover in USA. Secondly, effect of imports, exports, interest rate, inflation, government consumption expenditure and foreign direct investment are having effect on exchange rate. Interest rate, government consumption and import of the country have significant positively related to the exchange rate while the exports has negatively related to the real effective exchange rate.

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