

EMPIRICAL ANALYSIS OF THE IMPACT OF OIL IMPORTS AND NOMINAL EXCHANGE RATE ON THE GROSS DOMESTIC PRODUCT GROWTH RATE.

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ABSTRACT :

This paper attempts to identify the relationship between the growth of real GDP, nominal exchange rate and oil imports in India from 1995 to 2010. The study uses Correlation and Regression Analysis in SPSS. The main findings of this paper are that the oil imports give a positive impact on economic growth. The increase or appreciation of the nominal exchange rate leads to a decrease in the economic growth.

INTRODUCTION :

The exchange rate volatility in relation with excessive oil imports has been a matter of great study in academic parlance. Excessive oil imports cause a cascading effect on the price of essential goods and services, thereby triggering inflation. Similarly the exchange rate depreciation leads to an environment that drives exports and decreases imports. Imports are equally crucial for the strengthening of the manufacturing sector as input for the products worth exporting. At the same time excessive imports hit the balance of payment position thereby leading to a current account deficit. For the Emerging Market Economies euphemistically called 'gas guzzlers' it is the oil imports that acts as a catalyst and engine of economic growth. The life itself would come to a grinding halt if there is any discrepancy in the supply of the oil. But the question that is imperative worth investigating is what is the tolerable limit of balance of payment deficit for a country. Another question is 'Does excessive deficit cause any impact on the economic growth?' The quantum of Indian petroleum product imports is staggering. The total petroleum product formed bulk of imports in the year 2011-2012, registering 46.9 % growth to \$155.6 billion. The imports of the petroleum products is a chief contributor to the CAD (Current Account Deficit). The excessive amount of deficit would result in addition of unprecedented level of debt component. A great volatility in exchange rate is an indication of inherent weakness in the macroeconomic fundamentals.

In the present paper we try to understand the correlation between the oil imports, exchange rate and growth of GDP from the Indian perspective. We investigate whether there exist a strong correlation between these variables? We would like to see if there is any significant variable that contributes to the GDP growth?

LITERATURE REVIEW :

Most of the documented work has been with reference to the impact of the oil prices and the exchange rate volatility on the economic growth. The present paper tries to study the correlation of the quantum of oil imports as indicated by oil import bill in dollars and the nominal exchange rate (Rupee versus US dollar) for a given period with the gross domestic product growth rate with reference to India.

Greenspan (2004) noted that the impact of oil prices alone in the modern market economies is difficult to infer in a way in which policy is automatically obvious.

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McKillop (2004) argued that higher oil prices reduce economic growth, generate stock exchange panics and produce inflation, which eventually lead to monetary and financial instability. It will also lead to higher interest rate and even a plunge into a recession.

Jin (2008) argues that a sharp increase in the international oil prices and violent fluctuations of the exchange rate are generally regarded as factors discouraging economic growth. According to him the economic activity includes both supply and demand channels. The supply channels relates to the fact that the crude oil is the basic input to production and increase in the oil price leads to a rise in production costs that induces firms lower output. The demand side effect is derived from the fact that oil prices changes affect both consumption and investment decisions.

According to IMF (1984) and European Commission (1990) empirical evidence in favour of a systematic positive or negative effect of exchange rate stability on trade and thereby growth in small open economies has remained mixed. Bacchetta and van Wincoop (2000) found based on general equilibrium framework that exchange rate stability is not necessarily associated with more trade. Edwards and Levy Yeyati (2003) found evidence that countries with more flexible exchange rates grow faster. Eichengreen and Leblang (2003) found strong negative relationship between exchange rate stability and growth for 12 countries. Schnabl (2007) found robust evidence that exchange rate stability is associated with more growth in EMU periphery. The existence of negative relationship between the oil prices and macroeconomic activity was discovered by Hamilton (1983) in the United States. Hooker (1994) confirmed Hamilton's results and demonstrated that between (1948 and 1972), oil prices variability exert influence on the GDP growth. His result shows that an increase of 10% in the oil prices led to a lower GDP growth of roughly .6% in the third and fourth quarters after the shocks.

In general the literature review reveals a mixed result of the impact of oil import and exchange rate on the GDP.

OBJECTIVES OF THIS STUDY :

- To find out the correlation between the oil import, exchange rate and GDP growth rate and identify the variable which exhibits higher statistically significant correlation with the GDP growth rate.
- To find out which variable (oil imports or the exchange rate) has an overwhelming impact on the GDP growth rate.
- To check whether the regression model is useful in predicting GDP growth.

DATA AND METHODOLOGY :

A Secondary Time Series data ranging from 1995 to 2005 from a reputed sources namely the RBI website and Indxmundi.com is collected. The log oil imports (loimp) in billion dollars and the average log nominal exchange rate (lexr) between the Rupee and US dollar are the independent variables and the logarithm of gross domestic product (lgdp) growth is the dependent variable. A Co linearity diagnostics is carried out to eliminate the possibility of multicollinearity. This is followed by Correlation analysis to find out the extent of statistically significant correlation among the variables. Regression analysis to identify the major contributor as an independent variable and estimate the regression equation. The Coefficient of variation for the regression model computes the unexplained variability and gives an idea about the usability of the model. lexr denotes the variable logarithm of nominal exchange rate between the Rupee and USD. loimp denotes the variable logarithm of oil imports (bill) in billion dollars. lgdp denotes the variable logarithm of gross domestic product growth.

The following hypotheses are formulated based on our literature survey and statistical observation.

HYPOTHESIS :

1. Exchange rate does not have any significant correlation with the GDP growth.
Exchange rate does have a significant relation with the GDP growth.
2. Oil imports does not have any significant relation with the GDP growth
Oil imports do have significant relation with GDP growth
3. This regression model is not useful for prediction purposes
The model is useful for prediction purposes.

DATA ANALYSIS : (All the statistical results are collected in the Appendix)

The Co linearity statistics reveals that the independent variables lexr and loimp do not exhibit multi co linearity, this is justified by the low VIF values of 1.342 for lexr and 1.342 for loimp and the dependent variable is lgdp.

The correlation matrix indicates that loimp exhibit a moderate statistically significant (at 5% CI) positive correlation (.505 with a sig of .046) with lgdp. Whereas lexr exhibits a negative correlation -.117 which is not significant at 5 % CI.

The Coefficient table of Regression analysis indicates the linear Regression Equation for the model that is looking to predict the impact on the gdp by the variables like oil imports and the exchange rate.

$$\text{Lgdp} = 2.806 - 1.419(\text{lexr}) + .245(\text{loimp}) \quad [Y = b_1(x_1) + b_2(x_2) + C]$$

ANOVA test indicates the F value of 6.908 with a p value of 0.009, which is significant at 10 % CI ($p < ?$) we reject the null hypothesis.

T statistic test indicates lexr -2.373 with p value of 0.034 and loimp 3.668 with p value of 0.003. are significant at 10 % CI and are significantly related to the lgdp.

Adjusted R square is .441 indicating that only 44.1% of variability of the lgdp is explained by the variability of all of the variability of independent variables lexr and loimp. The variability that is unexplained is given by coefficient of variation for the regression is 11.1% (since it is > 10% but closer to it) this model could be useful for prediction purposes.

FINDINGS :

The independent variables chosen oil imports and the exchange rate do not exhibit any multi co linearity, the lower VIF values for loimp and lexr indicates the absence of multi co linearity among the variables.

The Correlation matrix indicates that the quantum of oil imports have a moderate correlation with the GDP growth rate which is statistically significant, indicating that excessive oil import bill will have a moderate positive impact on the GDP growth rate. As the correlation is seen to be positive there is every possibility that this factor does not impede GDP growth. The exchange rate volatility also statistically significant correlation with gdp growth but loimp is the major contributor to gdp among the chosen Independent Variables..

As the adjusted R square value is 44.1% it can be assumed that the oil import bill and the exchange rate may not markedly explain the variability in the gdp growth as there could be a number of factors which may explain the variability in the gdp growth.

As the ANOVA test indicates that at least one coefficient is not equal to zero means that at least one of the coefficient values has a correlation with the dependent variable. This corroborates the fact that there is a correlation between the loimp and lexr with lgdp. Since we reject the Null, it indicates that this model is useful for prediction purposes.

The t test for each independent variable indicates that loimp and lexr are significantly related to lgdp. The beta values indicates that for every unit increase in the oil import there is .245 unit of increase in the lgdp growth and every unit increase or appreciation in exchange rate causes a decrease in lgdp by 1.419. As this finding seems to be a departure from a pre conceived notion that excessive oil imports hinders growth prospects , instead it can be said that oil imports fuels economic growth (although exhibits a very small effect on the growth activity) through increased productivity, manufacturing and export competitiveness thereby trigerring the economic activity.

The coefficient of variation for regression model which explains the unexplained variability is 11.1 % (a ratio of standard error of the estimate divided by average mean of lgdp). As the value is close to 10 % a guideline value then there is a possibility of a moderate prediction accuracy , thereby this model could be useful for prediction purposes. We thus conclude that our model has a potential to make future predictions with regard to GDP growth vis-à-vis exchange rate between the Rupee and USD. We have also come to a conclusion that as such Exchange rate volatility does not exhibit significant correlation with GDP growth in the Indian scenario, while the data concerning Oil import bills does indicate a significant positive correlation with GDP growth.

LIMITATIONS OF THE STUDY :

We would study the impact of Oil price shocks in a broader framework in the near future depending upon the availability of reliable data. The present study however is subject to certain limitations. The Time series data chosen is a yearly data and may not take into consideration the local day to day fluctuations in the macroeconomic indicators, owing to which the predictability may be largely hindered. The analysis is restricted to India only and therefore does not predict this as a universal trend or the trend that is prevalent in Emerging Market Economies.

The raw data may exhibit a unit root and may be a non stationary which may result in a spurious output.

The data may represent diverse phases of economic liberalization with alterations in policy decisions especially pertaining to EXIM policies and containing foreign exchange volatility. It could also involve global economic slowdowns etc.

SCOPE OF FURTHER RESEARCH :

The present study can be conducted using advanced statistical tools like Granger causal tests and Vector Error Correction Models. (VECM) to elucidate the cause and effect relationship between the variables and validate the same. The correlation between loimp and lexr can be explored in greater detail. More number of macroeconomic indicators can be added as Independent variables to analyse their impact on the gross domestic product growth there by exploring their impact on gdp growth.

APPENDIX :

Correlations :

		lexr	lgdp	loimp
lexr	Pearson Correlation	1	-.117	.505(*)
	Sig. (2-tailed)		.667	.046
	N	16	16	16
lgdp	Pearson Correlation	-.117	1	.552(*)
	Sig. (2-tailed)	.667		.026
	N	16	16	16
loimp	Pearson Correlation	.505(*)	.552(*)	1
	Sig. (2-tailed)	.046	.026	
	N	16	16	16

*Correlation is significant at the 0.05 level (2-tailed) Fig. 1

Variables Entered / Removed (b)

Model	Variables Entered	Variables Removed	Method
1.	loimp, lexr(a)		Enter

- a. All requested variables entered.
- b. Dependent Variable : lgdp

Fig. 2

Coefficients (a)

Model	Collinearity Statistics	
	Tolerance	VIF
1. lexr	.745	1.342
loimp	.745	1.342

- a. Dependent Variable : lgdp

Fig. 3

Model Summary :

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1.	.718(a)	.515	.441	.99554

- a. Predictors : (Constant), loimp, lexr

Fig. 4

Descriptive Statistics

	Mean	Std. Deviation	N
lgdp	.8305	.12775	16
lexr	1.6341	.4780	16
loimp	1.4038	.42810	16

Fig. 5

ANOVA (b)

Model	Sum of Squares	df	Mean Square	F	Sig.
1. Regression	.126	2	.063	6.908	.009 (a)
Residual	.119	13			
Total	.245	15			

- a. Predictors : (Constant), loimp, lexr
- b. Dependent Variable : lgdp

Fig. 6

Coefficients (a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	B	Std. Error
1. (Constant)	2.806	.934		3.005	.010
lexr	-1.419	.598	-.531	-2.373	.034
loimp	.245	.067	.821	3.668	.003

a. Dependent Variable : lgdp

Fig. 7

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