

Nexus between the volatility of WTI crude oil price and Indian Exports

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Abstract

This study aims to analyse the volatility spill over between WTI crude oil price and Export of India using monthly data for time period April 2001 to March 2020. To examine the impact of oil price on export of India, Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model have been employed. The analysis reveals that an increase in oil price leads to the decline of exports. The study accredits that there is an inverse influence between the crude oil price volatility and export volatility. Finally, it strongly affects the volatility of Total exports of India.

Keywords: GARCH, Volatility, Crude Oil Price, Export.

Introduction

India is said to be one of the highest emerging economy in the world. Macroeconomic variables such as interest rates, inflation, IIP, gold prices, stock prices, exchange rate etc plays an important role in influencing the development as well as economic growth of any country around the world. The total value of export is determined by market forces of demand and supply. The market forces in turn are influenced by number of macroeconomic variables like inflation rate, stock prices, IIP, interest rates etc. With the increasing level of international trade and capital movements, total exports have become one of the important determinants of country's economic strength and has witnessed increased level of volatility during recent times. There are various factors which determine the export with international crude oil price being one of the most important factors. Crude oil being one of the most important resources of energy used in economic activities is also considered as a comparative advantage and one of the strategic resources for country. The present paper aims to examine the volatility spill over between India's total export and crude oil price over the period of 20 years from April 2001 to March 2020. The study would be instrumental in understanding the extent by which the India's total export is influenced by Global crude oil price change.

Literature Review

Giri A.K and Joshi Pooja (2018)¹ in their study they examined the long run and short run relationship between stock price and set of macroeconomic variables for Indian economy using annual data from 1979 to 2014. The long run relationship was examined by implementing the ARDL bounds testing approach. VECM method is used to test the short run and long run causality. The results confirm a long run relationship among the variables. Evidence suggests that economic growth, Inflation and exchange rate influence stock price positively were as crude oil influences negatively.

Ya-Wen Lai (2019)² in his study empirically investigates whether macro economic factors are priced in the cross section of index option returns. the empirical analysis employed a linear factor methodology with a factor structure including market return and macro economic factors. The result showed that the risk premia on inflation, term spread, induction production and housing factors are significant. This study confirms that the index options returns are exposed to systematic macroeconomic factor and these macro economic factors are priced in accordance with their exposures.

Stefen R. Henzel and Malte Rangel (2020)³ tried to identify the distinct dimensions of uncertainty in the macro economy, they constructed a large dataset covering all types of economic uncertainty. They identified two fundamental factors that account for common dynamics in the data set .the first factor captures business cycle uncertainty, while the second factor represents oil and commodity price uncertainty. While both types of uncertainty generate a decline in output, time- varying oil and commodity price uncertainty is more important for fluctuations in real activity.

Statement of the problem

The change in crude oil price is considered as one of the important determinant of global economic performance and world economy. Volatility of crude oil price has a significant impact on cost of production thereby influencing the price of commodity and thus impacting the demand and finally exports. Change in oil price also result into shift of income from oil importing nations to oil exporting nations which in turn is bound to have impact on exchange rates. This phenomenon necessitates the crude oil price dynamics and its influence on export. On this backdrop, it is necessary to evaluate the impact of crude oil price on the export of developing countries like India.

Objectives of the study

1. To know the volatility of WTI crude oil price and export of India.
2. To study the volatility spill over effect between crude oil price and export of India.

Hypothesis of the Study

- H01: There is no stationarity in crude oil price and total exports value.
H02: There is no ARCH effect of crude oil price on the export of India.

Data analysis and Interpretation

Table 1
DESCRIPTIVE STATISTICS

Descriptives	Oil price	Export
Mean	1.7651	10.162
Median	1.7734	10.296
Maximum	2.1267	10.464
Minimum	1.2876	9.512
Std. Dev.	0.1904	0.2919
Skewness	-0.44	-0.844
Kurtosis	2.4414	2.3157
Jarque-Bera	10.334	9.1771
Probability	0.077	0.0689

Source:Authors

The table 1 depicts the Descriptive statistics of Oil price and exports. From Probability value of both the variables it can be inferred that the variables are non normal in nature. From the standard deviation, volatility of the export is found to be greater than oil price. Hence, from the descriptive statistics the data set is found to be normally distributed and it can be used for further analysis.

Table 2
AUGMENTED DICKEY FULLER TEST

Variables	Level		First difference	
	t-Statistic	Prob	t-Statistic	Prob
Oil price	-2.094	0.2472	-9.521	0.001*
Export	-1.87	0.346	-19.39	0.000*

Source:Authors

The above table depicts the stationarity of variables through augmented dickey fuller test (ADF). The test result shows that both oil price and export are not stationary and they have unit root at level. They are stationary and free from unit root at first difference.

Table 3
HETROSKEDACITY TEST: ARCH EFFECT

F-statistic	46.398	Prob. F(1,225)	0.0211*
Obs*R-squared	224.799	Prob. Chi-Square(1)	0.0207*

Source:Authors

Heteroskedasticity test for knowing the ARCH effect is done in Table 3. The probability values are significant at 5 per cent level and hence the presence of ARCH effect is identified. So, the Researcher can proceed with the GARCH model. The mean equation for the GARCH effect is as follows:

$$R_t = C + \theta O_t + \varepsilon_t \quad \dots\dots\dots \text{eq(1)}$$

Where ε_t is the white noise error term.

The variance equation for GARCH (p,q) has the following form:

$$\sigma^2_t = \omega + \sum_{i=1}^p \alpha_i \varepsilon^2_{t-i} + \sum_{j=1}^q \delta_j \sigma^2_{t-1} \quad \dots\dots\dots \text{eq(2)}$$

For GARCH(1,1) model $\omega > 0$, $|\delta_1| < 1$ and $(1 - \alpha_1 - \delta_1) > 0$.

The mean of the volatility equation is denoted by ω and size effect by α which indicates how much volatility increases irrespective of the direction of the shock.

Table 4
GARCH EFFECT

Mean Equation				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	7.6269	0.0367	207.84	0.000*
LOG_PRICE	1.3965	0.0202	69.167	0.000*
Variance Equation				
C	0.0007	0.0003	2.5208	0.0117
RESID(-1)^2	0.7412	0.2199	3.37	0.0008
GARCH(-1)	0.2825	0.0846	3.3403	0.0008*

Table 4 shows the GAARCH output and from the mean equation of GARCH (1,1) model with optimal orders based on SBC criteria have been estimated using maximum likelihood estimation procedure, assuming the errors to be normally distributed. As observed in Table 4, the mean equation of GARCH (1, 1) model reveals that an increase in oil price has positive impact on Export of India. A 7 per cent increase in oil price leads to 1.40 per cent increase of Exports. The residual series were observed to be free from autocorrelation and ARCH effects. With respect to variance equation, the measure of asymmetry, ω is found to be statistically significant which implies that within sample period, shocks to Export have symmetric effect. The volatility persistence term, GARCH (-1) is positive and statistically significant at 5% level of significance. The coefficient being close to 1, which implies that shocks have permanent effect on Export volatility.

Conclusion

The present paper analysed the volatility transmission between global crude oil price and the export using monthly data from year 2001 to year 2020. To study the time varying volatility relationship between return of oil price and export of India GARCH model have been employed. The study reveals that an increase in the oil price leads to the fall of total export of India and the outcome is in accordance with theoretical consistency being, an oil importing country. Similar to the other studies the present analysis revealed that shocks to Exports have Positive effect. At last the study establishes the presence of permanent effect of oil shocks on Export volatility of India. The present study would help to give significant understanding to the policy makers in India to deal with export volatility caused by the fluctuations of international crude oil price.

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