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DOES OIL PRICE MATTERS FOR INDIAN STOCK MARKETS? AN EMPIRICAL ANALYSIS

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Abstract

This paper investigates the long run relationship between oil prices and stock prices for India over the period April 2000- June 2011. We employ Auto Regressive Distributed Lag (ARDL) Model that takes into consideration the long run relationship. The results obtained suggest that volatility of stock prices in India have a significant impact on the volatility of oil prices. But a change in the oil prices does not have impact on stock prices.

JEL classification: G12; O57

Keywords: Oil Prices; Stock prices; ARDL cointegration

I Introduction

Changes in the price of crude oil are often considered an important factor for understanding fluctuations in stock prices. In the long-term, the influence of oil price on stock prices prevail, as oil price effect transmits to macroeconomic indicators that influence liquidity of these markets. This suggests that the effect of oil price changes transmit to fundamental macroeconomic indicators, which in turn affect the long-term equilibrium linkage between these markets. Conditions that reflect change in observable factors that affect an economy. Second, there are speculative factors that operate entirely within a market over short periods. These two sets of conditions sometimes work together, and sometimes opposite. Thus, a given market can be speculatively strong, but fundamentally weak, or the reverse Ravichandran (2010).

On theoretical grounds, oil-price shocks affect stock market returns or prices through their effect on expected earnings (Jones et al., 2004).One rational of using oil price change as a measure for change in key macroeconomic indicators is that value of stock prices in theory equals discounted expectation of future cash flows (dividends), which in turn are affected by macroeconomic events that possibly can be influenced by oil shocks. Since oil price increase, it raises the production cost in industrial oil consuming countries. Due to increase Oil price it is expected to raise the cost of imported capital goods, therefore it may adversely affecting the prospects of higher profits for firms traded in Indian stock markets. On the demand side, oil price increases drive up the general level of prices, which translates into lower real disposable income, and consequently reduces demand. Besides the direct impact on general price levels, oil prices also have secondary effects on wage levels, which in combination with high general prices result in increased inflation. Inflationary pressures are usually controlled by central banks through increase in interest rates. Given the higher interest rates, bond investments will become more attractive than stock investments, which will result in lower stock prices. Finally, increasing import prices trigger a deterioration of the terms of trade and therefore impose welfare losses. Oil-exporting countries, on the other hand, benefit from higher export revenues, which could be diminished by a decline in a

global oil demand (Bhar and Nikolova 2009). Liberalization and integration of international markets economies (Chittedi 2010, 2011), characterised with increased level of capital flows and international investments in emerging have made global investors more vulnerable to oil price impact on emerging stock markets. Therefore, understanding the level of susceptibility of stock prices in emerging economies to movement in global oil prices is very important.

The remainder of the paper is organised as follows: Section 2 provides review of previous studies on the study topic; Section 3 presents nature of data and the methodology; Section 4 covers the discussion of the results; and Section 5 provides the conclusions of the study.

II Review of Literature

There have been a large number of studies stating relationship between oil prices and stock return. Most of these studies have reported significant effects of oil price changes on stock return. For example, Adorsky (1999), Papapetrou (2001), Ciner (2001), Yang and Bessler (2004), Anoru and Mustafa (2007), Kilian (2008) and Miller and Ratti (2009) have investigated the effects of oil prices on stock prices in developed countries. In addition, studies by Maghyereh (2004), Onour (2007), Aliyu (2009), and Narayan and Narayan (2010) assessed the relationship between oil prices and Vietnam's stock prices with daily series from 2000 to 2008. Using the Johansen test, the findings provided evidence of oil prices, stock prices, and exchange rates for Vietnam sharing a long-run relationship. In addition, the study found both oil prices and exchange rates have a positive and statistically significant effect on Vietnam's stock prices in the long-run and not in the short-run.

Bashar (2006) uses VAR analysis to study the effect of oil price changes on GCC stock markets and shows that only the Saudi and Omani markets have predictive power of oil price increase. Jones and Kaul (1996) examined the reaction of stock returns in four developed markets (Canada, Japan, the UK, and the US) to oil price fluctuations on the basis of the standard cash flow dividend valuation model. The study found that for the US and Canada stock market reaction can be accounted entirely because of impact of oil shocks on cash flows. However, some studies have shown that the link between oil and economic activity is not entirely linear and that negative oil price shocks (price

increases) tend to have larger impact on growth than positive shocks do [Hamilton (2003), Zhang (2008), and Cologni and Manera (2009)]. Thus, we should expect that oil prices equally affect stock markets in a nonlinear fashion.

Notwithstanding such widely held views in the financial press, there is no consensus about the relation between the price of oil and stock prices among economists. Chen, Roll and Ross (1986), for example, concluded that oil price changes have no effect on asset pricing. Huang et al. (1996) provide evidence in favor of causality effects from oil futures prices to stock prices. O'Neill et al. (2008) find that oil price increases lead to reduced stock returns in the United States, the United Kingdom and France,. Huang, Masulis, and Stoll (1996), however, found no negative relationship between stock returns and changes in the price of oil futures.

Many of these studies determined the relations between oil prices and stock prices, and they have featured only developed countries, and the situations in developing countries have not been discussed.

III Nature of data and Methodology

The study investigates long run relationships between oil prices and stock prices in India for the period April 2000 to June 2011using monthly data. The oil price data collected from Petroleum Planning & Analysis Cell, Ministry of petroleum, Government of India, where as BSE (www.bse.com) and NSE (www.nse.com) stock prices collected from respective websites. Autoregressive distributed lag (ARDL) approach test have been applied to explore the long-run and short relationships.

a) Methodology

There are several methods available to test for the existence of the long-run equilibrium relationship among time-series variables. The most widely used methods include Engle and Granger (1987) test, fully modified OLS procedure of Phillips and Hansen's (1990), maximum likelihood based Johansen (1988,1991) and Johansen-Juselius (1990) tests. These methods require that the variables in the system are integrated of order one I(1). In addition, these methods suffer from low power and do not have good small sample properties. Due to these problems, a

newly developed autoregressive distributed lag (ARDL) approach to cointegration has become popular in recent years. This study employs autoregressive distributed lag approach. This methodology is chosen as it has certain advantages on other cointegration procedures. For example, it can be applied regardless of the stationary properties of the variables in the sample. Secondly, it allows for inferences on long-run estimates which are not possible under alternative cointegration procedures. Finally, ARDL Model can accommodate greater number of variables in comparison to other Vector Autoregressive (VAR) models. First of all data has been tested for unit root. This testing is necessary to avoid the possibility of spurious regression as Ouattara (2004) reports that bounds test is based on the assumption that the variables are I(0) or I(1) so in the presence of I(2) variables the computed F-statistics provided by Pesaran et al. (2001) becomes invalid. Similarly other diagonistic tests are applied to detect serial correlation, heterosidisticity , conflict to normality. (ARDL) to cointegration following the methodology proposed by Pesaran and Shin (1999).

IV Empirical Results

Before proceeding towards the ARDL cointegration exercise, a test is conducted to ensure that a all variables are I(0) or I(1). To perform this, an Augmented Dickey Fuller (ADF), Phillips perron (PP) and The Kwiatkowski, Phillips, Schmidt, and Shin (KPSS)[1] test are applied at the levels and at the first difference. These particular tests are conducted by making use of three different models namely; first with intercept, secondly a model with intercept and trend and finally a model without intercept and trend. As already mentioned, we consider the the period 2000 April to June 2011 for the following variables: Oil price, Sensex (Bombay Stock Exchange (BSE)), and Nifty (National Stock Exchange of India (NSE)). The results of Unit test which are given in the tables 1 and table 1.1.

[1] KPSS(1992) proposed an alternative test where stationarity is the null hypothesis and the existence of a unit is the alternative. The basic idea is that a time series is decomposed into the sum of a deterministic time trend, a random walk and a stationary error term (typically not white noise). The null hypothesis (of trend stationarity) specifies that the variance of the random walk component is zero. The test is actually a Lagrange Multiplier test and computation of the test statistic is fairly simple.

Table 1 Results of Unit Roots Tests at levels

Variables	Augmented Dickey-Fuller Test			Phillips-Perron Test			KPSS Test	
	With Intercept	With Intercept and Trend	Without Intercept and Trend	With Intercept	With Intercept and Trend	Without Intercept and Trend	With Intercept	With Intercept and Trend
Oil prices	-1.50	-4.49	-0.01	-1.25	-3.04	0.27	1.23	0.07
Sensex	-0.91	-3.33	0.39	-0.60	-2.75	0.70	1.29	0.11
Nifty	-0.83	-3.33	0.49	-0.58	-2.79	0.76	1.30	0.11

Note: ADF and PPTest critical values: 1% level -3.48, 5% level-2.88, 10% level -2.57; KPSS Asymptotic critical values: 1% level 0.73, 5% level 0.46, 10% level 0.34.

Table 1.1 Results of Unit Roots Tests First difference

Variables	Augmented Dickey-Fuller Test			Phillips-Perron Test			KPSS Test	
	With Intercept	With Intercept and Trend	Without Intercept and Trend	With Intercept	With Intercept and Trend	Without Intercept and Trend	With Intercept	With Intercept and Trend
Oil prices	-6.98	-6.98	-6.95	-6.90	-6.90	-6.95	0.04	0.02
Sensex	-4.67	-4.67	-4.56	-8.26	-8.23	-8.20	0.08	0.05
Nifty	-4.88	-4.88	-4.76	-8.16	-8.13	-8.09	0.08	0.05

Note: ADF and PP Test critical values: 1% level -3.48, 5% level -2.88, 10% level -2.57, KPSS Asymptotic critical values: 1% level 0.73, 5% level 0.46, 10% level 0.34

The results of unit root test in table 1 and table 1.1 at both levels and first difference gives an impression that all the indicators taken into consideration are integrated of order one, I(1), that is, series with unit root. The series are further tested for the presence of unit root roots and it was found that ADF, PP and KPSS tests, however fails to find any more unit roots and it is maintained that all the series are integrated of order1 i.e I (1) as ADF, PP and KPSS statistics was higher than that of the critical value. There is always a setback in the usage of differenced variables against level due to serious loss of long run information. Here comes the technique of cointegration that not only maintains the long run information but also avoid the so-called spurious in the regression specification. After establishing that the all variables are I(0) or I(1), the next task to look at the association between the oil prices and Sensex, Nifty.

Table 3 reports ARDL bounds test for cointegration of selected variables. In the present study, the maximum lag length fixed to twelve (being monthly data) and the optimal lag length to be employed in the estimation of ARDL model was decided by Akaike Information Criterion (AIC). Results of table 3 shows that when oil price (oil price/Sensex and oil price/nifty) is the dependent variable, the calculated F-statistics is found to be higher at 99% of level of significance than the upper critical bound values of peasarn et al (1996). This supports the assertion that there exists a long- run cointegration relation between oil prices with sensex and nifty when the oil price is the dependent variables.

As evidence from table 3, reverse cointegration relationship is not found when the sensex and nifty are the dependent variables as the F- statistics are lower at 95% upper critical bounds values.

Table 3 F- Statistics of Co-integration

Model No.	Macroeconomic Variables	Computed F -Statistics	Inference
1	**Oil price/Sensex**	**4.8344**	**Cointegration**
2	Sensex/Oil price	.68143	No Cointegration
3	**Oil price/Nifty**	**5.0906**	**Cointegration**
4	Nifty/Oil price	.59124	No Cointegration

Note: Pesaran et al. 2001, the critical values are estimated with the assumption of unrestricted intercept term with no trend. * Indicates the level of significance at 10%, (2.72 -2.72) ** indicates the level of significance at 5 % (3.23-4.35) and *** indicates the level of significance at 1 %. (4.29 - 5.61) (Pesaran tabulated lower and upper band values are given parentheses).

Based on the existence of cointegration relationship for model one and model three, the following long run coefficients are estimated (Table 4). The resulting underlying ARDL equation was also verified with all its statistical diagnostic properties in order to get unbiased and consistent /efficient estimates (See Appendix 1).

Table 4 Estimated Long Run Coefficients using the ARDL (3)*: Sensex and Nifty

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
Sensex Model			
C	12.83	4.75	2.69 [.008]
Sensex	.004	.4149E-3	10.49 [.000]
Nifty Model			
C	11.27	4.84	2.32 [.022]
Nifty	.014	.001	10.58 [.000]

*ARDL (3) selected based on Akaike Information Criterion

From Table 4, which brings out the precise nature of the long run relationship when oil price is the dependent variable, the following inferences can be drawn: the long run coefficient of sensex and nifty is found to be positive and significant supporting the long run effect on oil prices. It means changes in the stock prices have impact on oil prices.

Table 5 Error Correction Representation for the Selected ARDL (3)*: Sensex Model

Regressor	**Coefficient**	**Standard Error**	**T-Ratio [Prob]**
dOILPRICE1	.370	.081	4.55 [.000]
dOILPRICE2	.211	.084	2.50 [.014]
dC	2.24	.935	2.40 [.018]
dSENSEX	.7618E-3	.1423E-3	5.35 [.000]
ecm(-1)	-0.17	.030	-5.75 [.010]

*ARDL (3) selected based on Akaike Information Criterion

Table 5. Error Correction Representation for the Selected ARDL (3)*: Sensex Model

Regressor	**Coefficient**	**Standard Error**	**T-Ratio [Prob]**
dOILPRICE1	.367	.081	4.52 [.000]
dOILPRICE2	.211	.084	2.50 [.014]
dC	1.98	.934	2.12 [.036]
dNIFTY	.7618E-3	.1423E-3	5.35 [.000]
ecm(-1)	-.176	.030	-5.79 [.000]

Table 5 and 6 provides the Error Correction Representation for the Sensex and Nifty model. The error correction term ecm(-1), which measures the speed of adjustment to restore equilibrium in the dynamic model, appear with negative sign and is statistically significant at 1 percent level ensuring that long run equilibrium can be attained. The coefficient of ecm(-1) for both models, is equal to -0.176 for short run model implying that the deviation from the long-term inequality is corrected by 17.6 % percent over each year.

Conclusion

The findings of this study conclude that despite the India's aggressive economic growth in the past fifteen years, the volatility of stock prices in India have a significant impact on the volatility of oil prices. While dynamics in the oil prices not impacted the price creation process of equities in Indian stock markets. India is quite unique in a sense that they are less affected by the recent Global financial crisis. Also, there are macroeconomic factors that have had a strong impact over equity returns and volatility in these equity markets. These factors appear to have had a much greater role in shaping the equity price dynamics in India than global oil price movements.

Appendix 1

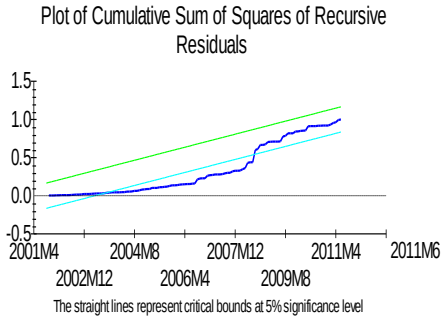
Table A1 Diagnostic Tests Nifty model

Item	Test Applied	CHSQ(χ^2)	Prob
Serial correlation	Lagrange multiplier test	20.52	.058
Normality	test of skewness and kurtosis	1.04	.307
Functional Form	Ramsey's RESET test	3.10	.051
Heteroscedasticity	White test	21 .59	.049

Table A2 Diagnostic Tests sensex model

Item	Test Applied	CHSQ(χ^2)	Prob
Serial correlation	Lagrange multiplier test	19.40	.079
Normality	test of skewness and kurtosis	1.03	.253
Functional Form	Ramsey's RESET test	4.85	.062
Heteroscedasticity	White test	22 .36	.040

Figure 1 Sensex model



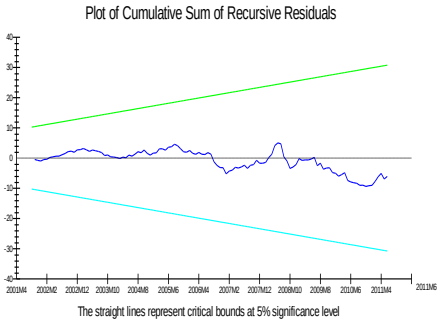
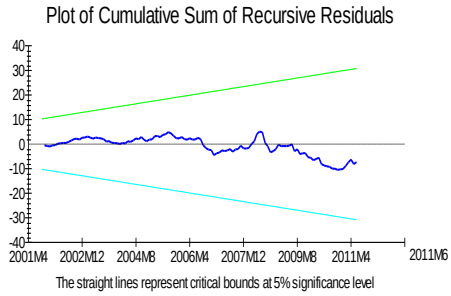
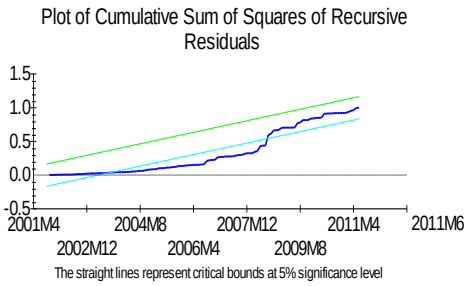


Figure 2 Nifty Model





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