



IMPACT OF CRUDE OIL PRICES ON THE PROFITABILITY PERFORMANCE OF OIL AND GAS PSUS OF INDIA

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Abstract: Crude oil also known as 'black gold' is a non-renewable source of energy and is a commodity that holds such relevance in today's world that requires no reference for its introduction and usage. This paper has focused on the profitability condition of Indian oil and gas PSUs that gets hampered with the changes in the crude oil prices. Using the regression analysis the findings of the study have revealed that an increase in crude oil prices has put a negative impact on the profitability performance of Indian oil and gas PSUs. The following profitability ratios namely Net Profit Margin, ROA and ROE have been significantly found to be negatively related with the crude oil prices from the period between 2006-07 to 2018-19.

Keywords: crude oil, profitability, PSUs, crude oil prices

4.1 Introduction: Oil and Gas Industry in India

Oil and gas industry in India constitute a major part of core industries. The existence of oil and gas industry in India goes back to 1889 when the oil deposits were first discovered near Digboi in Assam. India has 23 crude oil refineries in which 18 refineries are public sector undertakings, 3 refineries are privately owned and 2 are joint ventures. In terms of refining capacity India has been ranked as the 2nd largest refiner after China in Asia and 4th largest refiner in the world. Its refining capacity has increased to 249 metric million tonnes per annum (MMTPA) in 2019-20 from 247.566 MMTPA in March 2018 in which 57% share is held by public refineries, 35.3% share by private and 7.7% by joint ventures. The top three refiners in India are Indian Oil Corporation, Bharat Petroleum Corporation and Reliance Industries.

This study focuses on how the oil and gas PSUs of India have performed over the years and how their performance is affected by the changes in the prices of crude oil. For this profitability ratios have been selected and their growth rate have been calculated. Further the impact of oil prices on profitability ratios have been analysed.

Financial performance of a company

Financial performance of a company can be analysed by looking into the financial statements of a company like balance sheet, profit & loss statements, cash flow statements etc and calculating certain ratios and growth rates.

Ratio analysis includes calculating five different types of ratios. They are

1. Profitability ratios
2. Liquidity ratios
3. Activity ratios
4. Leverage ratios and
5. Market value ratios

Literature review

Prasad V. Daddikar and M. Rajgopal (2016) they had taken top 5 Indian petroleum refining firms based on total income and net profits that are traded on NSE/BSE for the period from 2006-15 and have used daily closing prices of crude oil which was traded on MCX. They have used spot crude oil prices with 2960 observations. Stratified random sampling was used for the study. The study found out that there is volatility in crude oil prices. Univariate regression analysis showed partial impact of crude oil prices on firm's financial performance. Among all the sample firms RIL has the highest mean and maximum firm value and the impact of crude oil prices on HPCL and IOCL's value was significant. RIL and BPCL were affected by oil price volatility as reflected by efficiency ratio.

Worapho, Wattanatorn, Termkiat, Kanchanapoom (2012) the impact of crude oil prices on the profitability of 11 different sectors/companies that were listed in the stock exchange of Thailand from 2001-10. Panel data regression method by using generalised least square estimator is employed here. Return on asset has been taken as a dependent variable and crude oil price, interest rate, exchange rate as the independent variables. Findings of the study were- that coefficient of energy sector was .0702 at 5% level of significance which means that crude oil prices have a positive effect on the profitability of energy sector. In food and beverage sector the coefficient is .0352 this sector too has a positive relation with crude oil prices. On the petrochemical sector there was marginal significant impact. Whereas the auto and real estate sector has negative relation with crude oil prices.

Olivier Taile Manikom, Charles Guillermet (2014) analyses the relationship between crude oil prices and the financial performance of 11 international oil companies (IOCs) from 10 countries of the Eurozone. The study used multiple regression model with panel data and financial ratios (ROA, ROE, PROFIT MARGIN) as dependent variables and crude oil price as independent variable. In their findings it was seen that crude oil prices were negatively correlated with ROA and the impact is moderate i.e., with an increase of euro oil price the ROA will decrease of .184. ROE was also negatively related and with the increase in euro oil prices ROE decreases by .354. with profit margin no relationship is being found as the coefficient is zero.

Jonathan P. Garcia (2016) the study has examined the relationship between crude oil prices and stock return of oil companies. Sample selection is done on the basis of stratified sampling and for assessing the relationship between oil price volatility and stock return of oil companies, univariate summary statistics, bivariate correlation and multivariate regression methods are used for a period of 10 years from 2006-15. The methodology is consisting of 3 parts in part 1- crude oil price volatility is measured using West Texas Intermediate (WTI) as oil price benchmark. Part 2- historical stock price daily data of oil companies related to WTI price volatility has been examined. Part 3- included how the total returns of the oil companies (upstream, downstream and integrated) reacts to changes in oil prices. It was observed that each different type of company moves in a different direction with the changes in the crude oil prices. On the one hand, upstream companies showed higher positive correlation which means they are more prone to stock return changes with the change in oil prices. Whereas, downstream companies have negative correlation i.e., stock return moves in opposite way as the oil price change

Raymond Swaray and Afees A. Salisu (2017) addressed the question of stock price movement of non-integrated upstream and downstream oil firms with the changes in oil prices. In all there were 216 non- integrated oil firms were in which 102 upstream firms and 114 downstream firms were selected. For the oil price spot prices were used of three benchmarks WTI, Brent and Dubai and for the main analyses Brent crude oil prices were taken. Data on stock prices of firms was collected from Thomas Reuters while for the oil prices was taken from US Energy Information Administration. Findings of the study showed that in the long- run stock prices of upstream sector increased in response to increase in oil prices while the stock prices of downstream sector moved in an opposite direction with oil prices. In the short run stock prices of both the sector increased with the increase in oil prices and upstream sector showed greater degree of changes with the changing market conditions than downstream sector.

Objectives

- To assess the profitability performance of selected oil and gas PSUs of India during 2006-07 to 2018-19.
- To analyse the effects of crude oil prices on the profitability performance of oil and gas PSUs.

Hypotheses

H₀₁ : There is no effect of crude oil prices on the profitability performance of selected oil and gas PSUs of India.

Data and Methodology

In this study firstly we will assess how oil and gas PSUs have performed in the past thirteen years in terms of their profitability by calculating CAGR of profitability ratios. Then we will analyse how the fluctuations in the prices of crude oil will affect the profitability performance of oil and gas companies in India. The study will cover the period of 13 years from 2006-07 to 2018-19. For analysing the profitability of oil and gas companies 10 public sector undertakings of oil and gas industry have been selected. The following financial ratios Net Profit Margin, Return on Equity (ROE) and Return on Assets (ROA) are used for analysing the profitability of the companies.

Data analysis

Panel data analysis is done using secondary data sources. The data collected has been analysed by applying a descriptive statistics, correlation and a multiple regression technique.

For evaluating the performance compound annual growth rate has been calculated-

$$\text{CAGR} = \left(\frac{\text{ending value}}{\text{beginning value}} \right)^{1/n} - 1$$

For understanding the relationship between crude oil prices and profitability performance following regression model is used-

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + U_i \dots \dots \dots (1)$$

Left side of the equation shows the dependent variable which is Y and the right side of the equation shows an independent variable which is X, β_0 is an intercept or the value of X when Y is zero and β represents the correlation coefficients whereas U_i represents the regression residuals.

Profitability= f (ROE, ROA, Net profit margin). Below is the regression equation for the study concerned

$$\text{Profitability} = \beta_0 + \beta_1 \text{ crude oil price} + U_i \dots \dots \dots (2)$$

Result and Analysis

Performance evaluation of oil and gas PSUs of India

Table-1: CAGR of Net Profit Margin of PSUs

Year	NP HPCL	NP BPCL	NP ONGC	NP IND OIL	NP OIL IND	NP GAIL	NP BALMER	NP CHENNAI	NP ENG	NP NUMALI
2006	1.75	1.86	27.48	3.46	30.26	14.88	5.4	2.28	26.58	7.17
2007	1.08	1.43	27.8	2.81	29.33	14.44	6.02	3.98	28.12	4.25
2008	0.46	0.54	25.19	0.96	29.64	11.78	6.21	-1.23	22.5	2.66
2009	1.21	1.27	27.82	3.79	27.51	12.56	7.27	2.4	21.95	2.94
2010	1.15	1.01	27.69	2.26	34.7	10.94	6.02	1.54	18.5	3.11
2011	0.51	0.61	32.83	0.99	34.94	9.04	6.04	0.15	17.2	1.3
2012	0.43	1.1	25.21	1.11	36.08	8.46	6.3	-4.12	25.08	1.64
2013	0.77	1.56	26.33	1.48	31.01	7.6	5.96	-0.61	26.3	3.75
2014	1.32	2.13	21.39	1.2	25.75	5.35	5.38	-0.09	17.97	6.63
2015	2.15	3.92	20.81	3.23	23.57	4.42	10.38	2.87	17.26	10.15
2016	3.31	3.97	23.03	5.3	16.28	7.27	9.98	3.71	22.43	15.03
2017	2.89	3.37	23.47	5.03	25.03	8.6	10.7	2.8	21.13	12.82
2018	2.19	2.39	24.37	3.2	18.85	8.02	10.61	-0.51	15.13	10.64
CAGR	1.74	1.94	-0.92	-0.59	-3.57	-4.64	5.21	1.73	-4.24	3.08

Table-2: CAGR of ROE of oil and gas PSUs

Year	HPCL ROE	BPCL ROE	ONGC ROE	IND OIL ROE	OIL IND ROE	GAIL ROE	BALMER ROE	CHENNAI ROE	ENG IND ROE	NUMALI ROE
2006	16.36	17.57	25.26	21.52	23.94	20.94	25.97	21.43	13.86	27.81
2007	10.74	13.53	23.65	16.94	22.54	20	26.75	32.41	16.89	16.61
2008	5.35	6.06	20.48	6.7	23.16	18.98	26.16	-12.95	25.05	10.02
2009	11.2	11.7	19.2	20.2	18	18.69	25.39	17.42	39.07	9.47
2010	12.2	10.9	19.4	13.5	18.5	18.49	22.68	13.58	36.23	10.73
2011	6.9	8.7	22.2	6.8	19.4	16.89	22.3	1.62	34.5	6.8
2012	6.5	15.8	16.8	8.1	18.7	16.6	22.51	-87.19	28.09	5.23
2013	11.5	20.8	16.1	10.6	14.4	16.16	19.11	-17.64	19.48	12.4
2014	17	22.6	12.2	7.7	11.6	10.43	16.32	-2.35	11.99	21.41
2015	21.04	27.36	9.73	12.7	9.2	7.51	15.43	31.41	9.69	28.29
2016	31.51	27.09	9.64	19.1	5.3	9.18	14.61	31.07	11.7	40.47
2017	26.54	23.3	10.3	19.3	9.5	11.45	14.71	23.67	16.66	40.47
2018	21.39	19.4	13.1	15.5	9.3	13.66	14.49	-6.44	16.26	35.48
CAGR	2.08	0.76	-4.92	-2.49	-7.01	-3.23	-4.38	.83	1.23	1.89

Table-3: CAGR of ROA of oil and gas PSUs

Year	HPCL ROA	BPCL ROA	ONGC ROA	IND OIL ROA	OIL IND ROA	GAIL ROA	BALMER ROA	CHENNAI ROA	ENG IND ROA	NUMALI ROA
2006	4.94	5.3	11.44	7.36	17.22	12.78	11.65	6.66	7.33	21.84
2007	2.72	3.67	13.1	5.94	16.6	11.95	11.99	10.64	8.06	14.27
2008	1.22	1.53	10.58	2.26	16.01	10.94	11.98	-4.76	11.51	8.9
2009	2.51	2.83	9.97	6.99	14.33	10.38	12.54	5.7	15.33	8.01
2010	2.53	2.76	12.78	4.28	13.6	11.12	11.38	4.17	15.06	9.11
2011	1.28	1.99	14.62	1.88	15.19	9.34	11.88	0.41	16.99	5.47
2012	1.18	3.94	11.74	2.23	14.25	9	12.78	-12.52	16.34	4.07
2013	2.23	5.6	11.08	2.79	8.54	8.78	10.89	-2.17	12.79	9.01
2014	4.04	7.29	8.52	2.39	6.92	5.74	10.17	-0.35	7.86	16.14
2015	5.48	9.78	7.27	5.09	5.87	4.33	10.31	7.18	6.33	22.54
2016	7.91	8.73	7.23	7.37	3.41	6.33	9.5	8.95	7.52	35.59
2017	7.32	7.96	6.84	7.6	6.05	7.95	9.98	6.44	8.52	36.07
2018	5.81	6.16	8.83	5.35	5.45	9.35	10.01	-1.3	7.89	33.38
CAGR	1.25	1.16	-1.97	-2.42	-8.46	-2.37	-1.16	-0.28	0.56	3.31

Results of performance evaluation of oil and gas PSUs during 2006-07 to 2018-19 based on CAGR.

Table4 results

Performance	Net profit margin	ROE	ROA
Best	Balmer Lawrie (CAGR: 5.21%)	HPCL (CAGR: 2.08%)	Numaligarh refinery (CAGR:3.31%)
Poor	GAIL (CAGR: -4.64%)	OIL India (CAGR: -7.01%)	Oil India (CAGR: -8.46%)

Table-5: Descriptive statistics

Variable(s)	observations	mean	Std. deviation	maximum	minimum
Crude oil prices	130	77.67	21.07	111.89	46.17
Net profit margin	130	10.54	10.47	36.08	-4.12
ROE	130	15.99	12.97	40.47	-87.19
ROA	130	8.56	6.46	36.07	-12.52

From the above table it is shown that the mean values of net profit margin, ROE and ROA are 10.54 percent, 15.99 percent and 8.56 percent respectively. ROE value of between 15-20 percent is considered as good while the desired ROA percentage is above 5 percent. From the findings of the table we can see that the average ROE percentage of all the firms is 15.9 percent which is approximately 16 percent and ROA percentage is 8.56 percent which is also well above the required 5 percent. This means that firms are getting good returns on their equity and assets as well. The maximum value for net profit margin is 36.08 percent and the minimum value is -4.12 percent. For ROE and ROA the highest values are 40.47 percent and 36.07 percent respectively while the lowest values are -87.19 percent and -12.52. From the point of view of profitability of the companies the higher these ratios are the better the profitability is. The average crude oil price for the period of study is \$77.67/barrel. The oil prices reach an all time high of \$111.89/barrel during the 13 years and the lowest price is \$46.17/barrel. Standard deviation measures the variability in data from its mean value. Greater value of S.D. means that data values are far away from mean. S.D. of net profit margin 10.47 and S.D. of ROA 6.46 while S.D. value of ROE 12.97 and crude prices 21.07.

Table-6: Correlation analysis

	Crude oil prices	Net profit margin	ROE	ROA
Crude oil prices	1.0000			
Net profit margin	-0.0243	1.0000		
ROE	-0.2377	0.2566	1.0000	
ROA	-0.1586	0.4677	0.7220	1.0000

Above is the table of correlation analysis between net profit margin, ROE, ROA and crude oil prices. Correlation table tells us the extent to which two or more than two variables move together. It portrays the direction of fluctuation between the variables. If the correlation coefficients are positive, it means that variables are moving in the same direction i.e., if one variable increases the other variables also increases and if one variable decreases the other variable also decreases. If the correlation coefficient is negative, it means that variables are moving in opposite direction i.e., if one variable increases the other variables decreases. A similar correlation analysis has also been performed between the variables of our study. The results from the correlation analysis shows that crude oil prices are negatively related to all the three dependent variables i.e., net profit margin, ROE and ROA with a coefficient of -0.0243, -0.2377 and -0.1586 respectively. While the profitability variables are positively correlated among themselves. This negative relationship implies that net profit margin, ROE and ROA of an oil and gas companies decreases when the crude oil price increases.

Table-4.7: Regression analysis

Variables	Net Margin	Profit	ROE	ROA	R-sq
Crude oil prices	-.0125069 (.035)**		-.0062547 (.009)**	-.0080427 (.017)**	.041

Significance level- P<0.01 *** P<0.05 ** P<0.10 *

The relationship between net profit margin, ROE and ROA with crude oil prices is negative and is significant at 0.05% level of significance. The p-values have been shown in parenthesis.

- The regression coefficient is -.0125069 which indicates that if there is a unit increase in crude oil prices, net profit margin of the companies will decrease by 1.25 percent, keeping other variables constant. For this relationship p-value is (.035< 0.05).
- Relationship between ROE and crude oil prices is negative. Regression coefficient is -.0062547 which means that if there is a unit increase in crude oil prices, ROE of the companies will decrease by 0.62 percent, keeping other variables constant. For this relationship p-value is (.009< 0.05).
- Relationship between ROA and crude oil prices is also negative. Regression coefficient is -.0080427 which means that if there is a unit increase in crude oil prices, ROA of the companies will decrease by 0.80 percent, keeping other variables constant. For this relationship p-value is (.017< 0.05).
- R-sq is .041 i.e., 4.1% variations in the dependent variables have been explained by the independent variable
- So, the hypothesis that there is no effect of crude oil prices on the profitability performance of selected oil and gas PSUs of India is **rejected**.

Conclusion

Oil prices play a major role in influencing the profitability of the firms in oil and gas industry. Financial stability of any firm is an important factor for its growth. Financially sound companies are able to attract more investments and the share of such companies are also high in stock market. The objective of the study was to analyse the effects of crude oil prices on the profitability performance of oil and gas PSUs.

For analysing the relationship between the profitability of oil and gas companies and crude oil prices, a study period of 13 years from 2006-07 to 2018-19 have been taken and three dependent variables: net profit margin, ROE and ROA have been selected. The results of the study have shown a negative relationship between crude oil prices and profitability of 10 oil and gas PSUs of India. The correlation coefficients of these three dependent variables i.e., for net profit margin (-0.0243), ROE (-0.2377) and ROA (-0.1586) with respect to crude oil prices (independent variable) are negative. This means that as and when oil prices go up, profits of the firms come down. Similarly, the regression results from relationship between crude oil prices and profitability has also shown negative outcomes. The regression coefficients are also negative which means that if oil prices go up by one-unit, net profit margin, ROE and ROA will reduce by 1.25 percent, .62 percent and .80 percent respectively. The results are clearly depicting the adverse effects of rising oil prices on the profitability performance of oil and gas companies. Hence, the hypothesis which states that there is no effect of crude oil prices on the profitability performance of selected oil and gas PSUs of India is rejected.

Recommendation

- As we have seen that profitability of oil and gas companies is hampered by the changes in crude oil prices these companies should work out on minimising their cost by reducing errors in design or manufacturing errors etc.
- Better utilisation of assets and inventories should be done.
- Exploring new technologies both at national and international level by indulging in advanced research is immediately needed.

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