

CHAPTER 7
IMPACT OF CRUDE OIL PRICES ON
DEFENCE FUEL OIL AND LUBRICANTS BUDGET

7.0 Introduction

Indian Defence forces have a large number of equipment, which needs fuel for its operation. These equipment includes Logistic vehicles, Heavy vehicles, Tanks, Infantry Combat Vehicle, Aircrafts, Helicopters and various types of Ships and Submarines. A substantial portion of defence budget goes into procurement of Fuel, oil and lubricants the cost of which varies as per the cost of crude oil. The Fuel Oil and lubricants are subsidised by the government of India and is given to three services at a contracted rate by the public sector oil companies.

The three services have large number of transport which are required for its operational commitment. In case of Indian Army, it has approximately about 80000 transport vehicles and about 7500 tanks and combat vehicles⁴⁸. These transport vehicles are required by Indian Army to mobilize troops and equipment, logistics for exercise and operations. The three services go into a rate contract with the public sector oil units on a yearly basis. The contracted rate for basic fuels in the last 10 years as taken from Integrated HQ of Ministry of Defence is as under

⁴⁸ http://www.globalfirepower.com/country-military-strength-detail.asp?country_id=India

Table 7.1: Contracted Rates for Main Grade Fuels

<u>Year</u>	<u>Petrol</u>	<u>Diesel</u>	<u>Kerosene</u>	<u>ATF</u>	<u>LPG</u>
2002	28.56	17.45	12.33	17.10	191.50
2003	29.34	18.39	8.36	17.10	229.00
2004	31.70	19.73	8.91	17.10	260.00
2005	43.50	30.50	9.02	45.82	240.00
2006	49.48	36.00	37.5	44.61	295.00
2007	44.88	33.37	34.43	44.54	295.00
2008	47.85	34.17	36.54	46.18	295.00
2009	49.88	35.37	34.43	44.54	295.00
2010	48.78	38.74	36.29	36.89	295.00
2011	48.80	38.76	38.25	42.75	296.00
2012	68.83	42.56	49.37	55.37	390.00

7.1 Fuel Expenditure

Based on the above contracted cost the fuel expenditure of Army, Navy and Air force were taken from the Controller of Defence Accounts. The details of the same are in Appendix III. The total cost of fuel, oil and lubricants for the three services were added from FY ending 2002 to FY ending 2012 and the details are as under

Table 7.2: Cost of Fuel consumed by Defence and Crude Price in US \$

<u>Year</u>	<u>Cost of Fuel In Crores</u>	<u>Crude Rate</u>
2002	2433.9106	24.95
2003	2303.1188	28.89
2004	2506.8062	37.76
2005	3257.1454	53.35
2006	3882.202	64.27
2007	4722.0283	71.12
2008	4972.4509	97.03
2009	5575.6482	61.77
2010	4550.5497	79.03
2011	5188.3079	104
2012	6130.7277	106

Based on data given in Table 7.2, it is evident that as the crude oil price was increasing the cost of defence fuel was also increasing. Thus it can be said that a relationship exist between crude oil price and cost of defence fuel. The same can be statistically tested through hypotheses.

7.2 Hypotheses

Since one of the research objectives is to study the impact of International crude prices on cost of Defence fuel, there is a need to first make hypotheses. Based on the data of crude oil prices and cost of defence fuel over the years, a

statistical analysis will give us the relationship between crude oil price and cost of defence fuel. Hence the hypotheses constructed are

H_0 = Increase in oil prices has no impact on cost of defence fuel

H_1 = Increase in oil prices has an impact on cost of defence fuel

With the data in Table 7.2, a graph can be drawn between Cost of Fuel consumed by defence and Crude Oil price which is given at figure 7.1

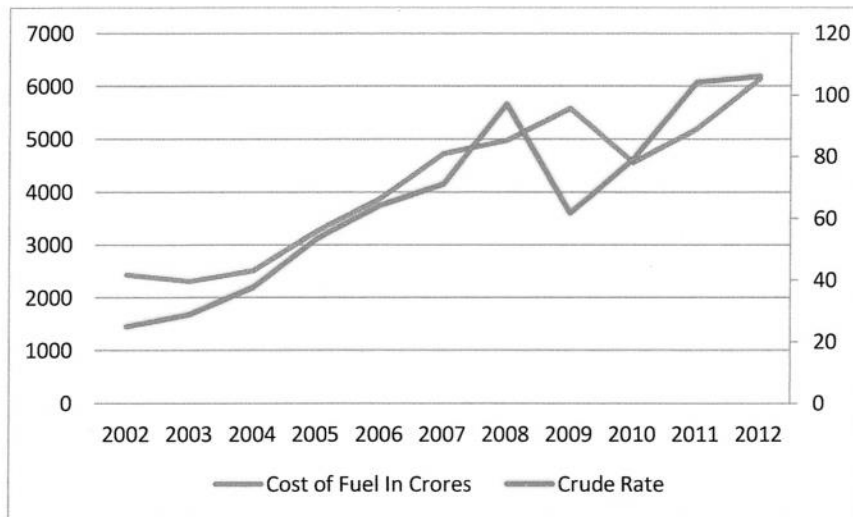


Figure 7.1: Cost of Defence Fuel in Crores and Crude Oil Price

Figure 7.1 depicts the trend in the increase in cost of fuel for defence and Crude Oil price from 2002 to 2012. From the trend it can be seen that barring for two years i.e. in 2008 to 2010, the rise in crude oil price and rise in the Cost of Defence Fuel are similar. Thus it is evident that a relationship exists between crude oil price and Cost of Defence fuel. To analyse the relationship statistically a correlation hypotheses testing is conducted.

7.3 Correlation

$H_0: \rho = 0$ (No correlation exists between Cost of defence fuel and Crude oil price)

$H_1: \rho \neq 0$ (Correlation exists between Cost of defence fuel and Crude oil price)

Before the correlation is checked it is necessary to see the scatter plot to see if any relationship exists.

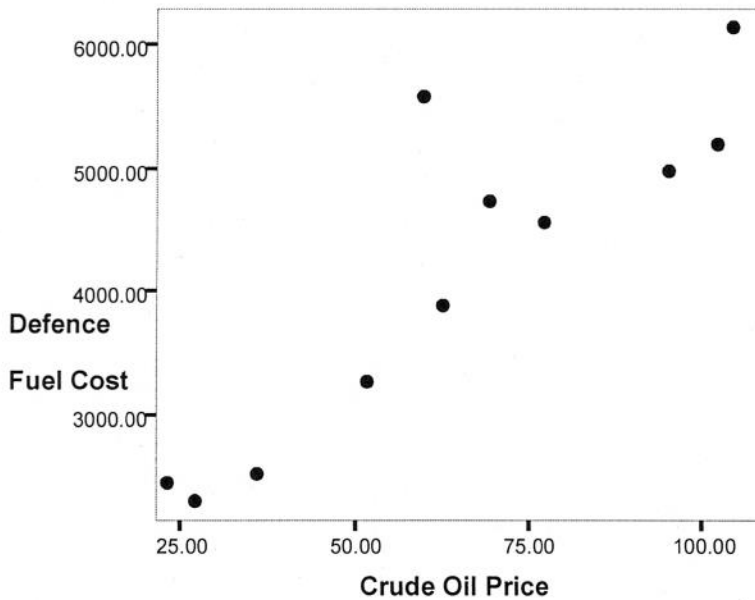


Figure 7.2: Scatter plot between Crude Oil price and Defence Fuel Costs

The scatter plot reveals that there is a positive linear relationship between Crude Oil price and Defence Fuel Cost. Thus the correlation can be checked between crude oil price and Defence Fuel cost.

Table 7.3:Correlations between Crude Oil price and Defence Fuel Costs

		Defence Fuel costs	Crude Oil price
Defence Fuel costs	Pearson Correlation	1	.889(**)
	Sig. (2-tailed)		.000
	N	11	11
Crude Oil price	Pearson Correlation	.889(**)	1
	Sig. (2-tailed)	.000	
	N	11	11

** Correlation is significant at the 0.01 level (2-tailed).

From Table 7.3 it is evident that a strong positive correlation exists between Crude Oil price and Defence Fuel Costs as the Pearson correlation is 0.889. The sig (P) is $< \alpha$ ($0.000 < 0.01$) and thus the correlation is statistically significant. Hence the Null Hypotheses is rejected as $P \neq \alpha$.

Therefore correlation exist between Crude Oil price and Defence Fuel Costs

Now as the coefficient of correlation is high we can make a model of relationship between Crude Oil price and Defence Fuel Costs as the relationship is linear

$$\hat{Y} = \beta_0 + \beta_1 X \quad \dots (7.1)$$

Where \hat{Y} is the estimated value of Defence Fuel Costs, β_0 is the constant and β_1 is the slope for the independent variable Crude Oil price X. Based on the above data the output for regression is produced as under

7.4 Statistical Output

Table 7.4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.889	.790	.767	650.45997

Predictors: (Constant), Crude Oil Price

Table 7.5 ANOVA Output

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	14313491.941	1	14313491.941	33.830	.000
Residual	3807883.570	9	423098.174		
Total	18121375.512	10			

Predictors: (Constant), Crude Oil Price

Dependent Variable: Defence Fuel cost

Table 7.6: Coefficients

Model	Unstandardized		Standardized	t	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta	B	Std. Error
1 (Constant)	1379.977	513.211		2.689	.025
Crude Oil Price	41.670	7.164	.889	5.816	.000

Dependent Variable: Defence Fuel Cost

7.5 Analysis

It is seen from Table 7.4 Model summary that regression R is 0.889 and R^2 is 0.790 implying that 79% of variation in Defence Fuel Cost can be explained by Crude Oil price. Table 7.5 ANOVA output can be used to check overall validity of the model. To validate the model hypotheses testing is conducted.

Hypotheses Testing for ANOVA

$$H_0: \text{All } \beta_i = 0 ; i \neq 0$$

$$H_1 : \text{At least one of the } \beta \neq 0$$

From the Table 7.5 ANOVA Output it is seen that the value of $p = 0.000$ which is $< \alpha(0.01)$ and hence the null hypotheses is rejected. Thus it can be concluded that the overall model is valid and at least one of the $\beta_i \neq 0$ and thus regression modelling can be carried out

The Regression Model thus is

$$\check{Y} = 1379.977 + 41.670 X \quad \dots \quad (7.1)$$

i.e. Defence Fuel Cost = 1379.977 + 41.670* Crude oil price

7.6 Implication

Indian defence forces fuel budget is approximately Rs 5000 crores and this budget will increase if the present state of counter insurgency operations remains. An increase of one \$ in crude oil price increases the fuel budget and this increases can be calculated by using the modelled equation and thus the defence forces need to go for fuel efficient vehicles and equipment so that the consumption reduces and impact of increase in crude oil price reduces.

7.7 Conclusion

The Crude oil price has a correlation with Defence fuel costs. Rise in crude oil price will lead to rise in defence fuel costs. Thus a tool is available with the budget planners to gauge the impact of rise in oil prices to defence fuel costs and plan move of units accordingly to reduce fuel costs.