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mpact of Crude Oil Price on Foreign Direct Investment (FDI)

By

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ABSTRACT

In this paper, an analysis is used to compare the effect of crude oil price on Foreign Direct Investment (FDI). Crude oil prices play a very crucial role on the economic growth of any country. India imports more than 82.5 % of its crude oil and natural gas requirement.

The objective of this paper is to find out the effect of crude oil price on Foreign Direct Investment (FDI) using time series data from 2012 to 2018. Karl Pearson's Correlation Coefficient and Simple Linear Regression are used to analyze the data.

Keyword: Crude Oil Price, Foreign Direct Investment (FDI), Correlation Coefficient, Simple Linear Regression.

About Crude Oil

Crude oil is naturally occurring thick, dark brown flammable liquid which is derived from fossil fuels. Crude oil is also referred as "Black Gold" as it of immense economic importance. It is a non-renewable resource, thus its demand is greater than supply leading to high price rise. It is recovered mostly through oil drilling and is then refined into many consumer products, like petrol, kerosene, plastics and pharmaceuticals etc. It is a typical type of fossil fuel consisting of complex mixture of hydrocarbons.

Objective of study

- ✓ To find out impact of crude oil price on the Foreign Direct Investment (FDI).
- ✓ To study and formulate the impact of Crude Oil Prices on Foreign Direct Investment (FDI).

Literature Review

Mr. Kali CharanModak, Ms. Pallabi Mukherjee (2015) used regression analysis and concluded that oil price unpredictability has also amplified. They said that future oil prices are difficult to predict, generally expected to rise. Increasing dependence on imports of crude oil affect the Indian economy. By the increase in the price of crude oil ,the inflation increases, Government had to spend too much on subsidy, our exports become weaker, investment decreases and GDP is also affected.

Foreign Direct Investment

Foreign direct investment is an investment made by a foreign individual or company in productive capacity of another country. It is the movement of capital across national frontiers in a way that grants the investor control over the acquired asset. Foreign Direct Investments (FDI) is investment of foreign assets into domestic structures, equipment, and organizations. FDI inflows are into the primary market and do not include foreign investments into the stock markets. It is a long-term investment and is used by the developing countries as a source of their economic development, productivity growth, to improve the balance of payments and employment generation. Its aim is to increase the productivity by utilizing the resources to their maximum efficiency. According to International Monetary Fund, FDI is defined as Investment that is made to acquire a lasting interest in an enterprise operating in an economy other than that of the investor. The investor's purpose being to have effective voice in the management of the enterprise.FDI is normally defined as a form of investment made in order to gain unwavering and long-lasting interest in the enterprises that are operated outside of the economy of the shareholder. There is a parent enterprise and a foreign associate to form a Multinational Corporation (MNC). Parent enterprise has power and control over its foreign affiliate on the investment.

Importance of FDI in India

1. The Indian economy stood at the 11thposition in the world with regards to the nominal gross domestic product (GDP) for the fiscal year 2011-12 witnessed a year low growth of the Indian economy (grew at a rate of 6.5%) and reasons traced could be the weak monetary policy, inflation issues, and cut in investments.
2. India is one of the most attractive destinations for foreign investment.
3. Since liberalization, when foreign direct investments (FDI) were allowed to enter India, our economy has grown by manifolds.
4. Foreign investments play a very significant role in the Indian economy.
5. The importance could be attributed to the following reasons:
   i. Increased Investment in the country Improvement in Technology and Infrastructure Increased productivity.
   ii. Enhanced Flow of Equity Capital Improved Corporate Governance Increased Employment Opportunities.

Statistical tools used in the Study

1. **Karl Pearson's Correlation Coefficient (r):-**

- The Karl Pearson correlation coefficient (r) is used to measure the correlation between two variables.
- The Karl Pearson coefficient is designated by the letter "r" and is sometimes called "Pearson's r."
- Pearson's correlation reflects the degree of linear relationship between two variables.
- It ranges from -1 to +1.
- If correlation coefficient is + 1 means that there is a perfect positive linear relationship between variables.
- If correlation coefficient is - 1 means that there is a perfect negative linear relationship between variables.
- If correlation coefficient is 0 means there is no linear relationship between the two variables.

The quantity r, called the linear correlation coefficient, measures the strength and the direction of a linear relationship between two variables. The linear correlation coefficient is sometimes referred to as the Pearson product moment correlation coefficient in honor of its developer Karl Pearson.

2. Simple Linear Regression Analysis

Regression Analysis is the modeling between the one dependent variable and one or more independent variables. When there is only one independent variable in the linear regression model, the model is generally termed as simple linear regression model. When there are more than one independent variables in the model, then the linear model is termed as the multiple linear regression model.

The linear regression model

Consider a simple linear regression model

$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$

where, Y_i is termed as the dependent or study variable and

X_i is termed as independent or explanatory variable

The terms β_0 and β_1 are the parameters of the model.

The parameter β_0 is termed as intercept term and parameter β_1 is termed as slope parameter.

These parameters are usually called as regression coefficients.

$$\widehat{\beta_1} = \frac{\sum_{i=1}^{n}(X_i-\bar{X})(Y_i-\bar{Y})}{\sum_{i=1}^{n}(X_i-\bar{X})^2}$$

$$\widehat{\beta_0} = \bar{Y} - \widehat{\beta_1}\bar{X}$$

Where, $\bar{X}$= Mean of independent variable.

$\bar{Y}$ = Mean of dependent variable.

The unobservable error component ε accounts for the failure of data to lie on the straight line and represents the difference between the true and observed realization of Y_i. There can be several reasons for such difference, e.g., the effect of all deleted variables in the model, variables may be qualitative, inherit randomness in the observations etc.We assume that ε is observed as independent and identically distributed random variable with mean zero and constant variance σ^2.i.e. $\varepsilon \sim N(0,\sigma^2)$

F-Statistics is used to find out the result.

Steps:-

1. State the null and alternative hypothesis using correlation coefficient.
2. Calculate F-value.

F-value is calculate using formula

$$F = \frac{\text{Mean sum of square of Regression}}{\text{Mean sum of square of Residuals}} = \frac{\text{Explained Variation in Y}}{\text{Unexplai ned Variation in Y}}$$

$$F = \frac{\sum_{i=1}^{n}(\hat{Y}_i-\bar{Y})^2}{\sum_{i=1}^{n}(Y_i-\hat{Y}_i)^2}$$

3. Now, Find tabulated F-value.
4. Compare Cal F and Tab F.
5. If Cal F < Tab F, then accept null hypothesis. Otherwise reject.

Coefficient of determination (R^2)

The coefficient of determination (R^2) is defined as the proportion of the total variation in the dependent variable Y (about its mean), explained by the variations in the independent variable or explanatory variable X. Given the definition, the coefficient of determination (R^2) is measured as follows:

$$R^2 = \frac{\text{Explained Variation in Y}}{\text{Total Variation in Y}}$$

Explained variation in Y $= \sum_{i=1}^{n}(\hat{Y}_i - \bar{Y})^2$

Where, $\hat{Y}_i$ = Predicted value of dependent variable.

$\bar{Y}$ = Mean of dependent variable

Total variation in Y $= \sum_{i=1}^{n}(Y_i - \bar{Y})^2$

Where, Y_i = Original value of dependent variable.

$\bar{Y}$ = Mean of dependent variable

Thus, the coefficient of determination (R^2) can be redefined in terms of the ratio of explained variation in Y and total variation in Y as

$$R^2 = \frac{\sum_{i=1}^{n}(\hat{Y}_i - \bar{Y})^2}{\sum_{i=1}^{n}(Y_i - \bar{Y})^2}$$

Range of coefficient of determination is 0 to 1.

Adjusted Coefficient of determination ($\bar{R}^2$)

Adjusted coefficient of determination is obtained from coefficient of determination (R^2). Formula for adjusted Coefficient of determination is

$$\bar{R}^2 = 1 - \frac{n-1}{n-(k+1)}(1 - R^2)$$

Where, n= Total numbers of observation.

k = Number of regressors

Method of data collection

Secondary data sources have been used to collect the data about the Indian crude prices and Foreign Direct Investment.

The data was quantitative and collected from various source which is as follows:-

- Crude Oil Price - Petroleum Planning and Analysis Cell (PPAC).
- Foreign Direct Investment – Department for Promotion of Industry and Internal Trade.

Statistical Analysis

Our aim is to find the impact of crude oil price on Foreign Direct Investment using correlation analysis and simple linear regression.

Correlation Analysis:-

Using correlation analysis we get idea about the relationship between independent and dependent variable.

S.N.	Dependent Variables	Correlation Coefficient
1	Foreign Direct Investment (FDI)	-0.33482

Observation:-We observed that Foreign Direct Investment (FDI) is negatively correlated with crude oil price.

Using Correlation Coefficient we set up the following hypothesis:-

Hypothesis

H_0 : Crude oil price plays an insignificant role in declining Foreign Direct Investment (FDI).

H_1 : Crude oil price plays a significant role in declining Foreign Direct Investment (FDI).

Simple Linear Regression Model

In an attempt to determine, the influence of crude oil price on Indian Consumer Price Index (CPI) the following regression equation was fitted.

S.N.	Models	Simple Linear Regression Model
1	Model 1	$Y_{\text{Foreign Direct Investment}} = \beta_0 + \beta_1 X_{\text{Crude oil Price}}$

Using above simple linear models we make conclusion.

Discussion I :-

Result of Regression Analysis

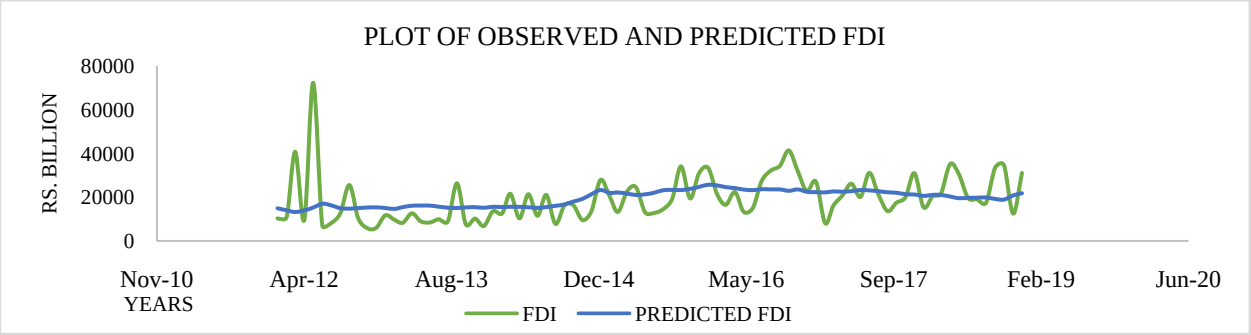
r	R Square	Adjusted R Square	Standard Error	Observations
- 0.334819	0.112104	0.101276	10174.56	84

Based on the Karl Pearson's correlation co-efficient and the regression analysis it is evident that there is significant negative correlation between crude oil price and Foreign Direct Investment (FDI). Crude oil price explained only 10.12 % variance on Foreign Direct Investment (FDI).

Discussion II :-

The fitted model is $Y_{FDI} = 29296.35 - 130.131 X_{COP}$

Scatter plot of observed and predicted Foreign Direct Investment (FDI).



Plot of observed and predicted Foreign Direct Investment (FDI)

We see that the Foreign Direct Investment (FDI) is relatively explained but not so well based on crude oil price. We see that observed and predicted Foreign Direct Investment (FDI) follows the same trend for some time only.

Discussion III :-

ANOVA Table

	df	SS	MS	F
Regression	1	1.07E+09	1.07E+09	10.35316
Residual	82	8.49E+09	1.04E+08	
Total	83	9.56E+09		

Calculations:-

F-Table value (95% confidence) at (df_k= 1, anddf_{n-k-1} = 82) i.e.$F_{0.95(1,82)}$ = 3.957388
i.e. Tabulated F value at 5% significance level.
Calculated F value = 10.35316
Tab $F_{0.95(1,80)}$ = 3.957388
$F_{Calculated} > F_{Tabulated}$
So, We rejectH_0 and accept H_1 at 5 % level of significance.

Conclusion:-Crude oil price plays a significant role in declining Foreign Direct Investment (FDI).

As Crude oil price increases Foreign Direct Investment (FDI) will decrease.

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