Impact Of Crude Oil Trends On Stocks

P Abhishikta Sai
Computer Science
PES University
Bangalore, India
abhishikta.sai21@gmail.com

Patnala Prudhvi Raj
Computer Science
PES University
Bangalore, India
pruthvipatnala@gmail.com

Nishant Ravi Shankar
Computer Science
PES University
Bangalore, India
nishantravishankar@gmail.com

***Abstract*— Crude oil commodity is one of the riskiest commodities to trade. With a lot of inexplicable fluctuations and the buzz about fuel prices in India, an investor would prefer trading another commodity just to avoid risk. While there are a few companies which depend on crude oil, someone trying to invest in such a company is unaware of the impact of crude oil on the company's stock. A mere glimpse into the historic stock fluctuations could be misleading as it never sheds light on factors influencing crude oil and hence it's impact on the company's performance through stock price. This paper aims at understanding various factors influencing commodity and stock prices along with forecasting the prices using different approaches and thereby comparing them as well to ultimately help investors investing in crude oil and crude oil dependent companies.**

Keywords—Crude Oil, Commodity exchange, Stock Market, Time Series Forecasting

I. Introduction

Crude Oil is one of the commodity that can be a clear indicator of country's economy and still remain a highly fluctuating and risky investment. Crude Oil is vital for many goods and services, as it is needed for transportation purposes. The number of companies participating in production, refinery and transportation of Crude Oil has increased heavily over the past two decades. Investing in these companies is tempting, but since their stock prices are highly dependent on the fluctuations of crude oil prices on an international level, it is worth exploring the various possible variables that affect crude oil prices.

The major factors influencing the Crude Oil commodity prices are (1) Supply and Demand of Crude Oil Worldwide (2) Quantity of import/export of Crude oil in India (3) US Dollar-Indian Rupee exchange rates (4) Price per barrel in US Dollars (5) Competition between OPEC and US exports of crude oil to India.

The observations made by Dr. K. Soundarapandiyan and Dr. M. Ganesh [1] state that fall in oil prices is good for the rupee, but does not affect Indian current account deficit due to the strengthening of US dollar at the same time. Energy being the prime mover in any economy, demand and supply levels have to be met through imports. Especially in a country like India which is not self-reliant on crude oil production, the increase in international crude oil prices will make import costly and raise the Indian crude basket price. Therefore, both rise of international crude oil prices and the import dependency on crude oil are problematic areas, which may damage the Indian economy. Oil refining companies on the other hand get negatively affected due to the fall in oil prices, mainly because their stock prices rely on the exports of the refined crude oil.

II. Related Work

A. Previous Work

Shuang Gao, Yalin Lei [2] have classified crude oil forecasting into three approaches (1) heuristic approaches (2) econometric models (3) machine learning techniques.

Ayodele Ariyo Adebiyi, Aderami Oluyinka Adewumi and Charles Korede Ayo [3] through their analysis on models for Stock market forecasting, found that ANNs (Artificial Neural Networks) outperform Autoregressive Integrated Moving Average (ARIMA) (econometric) models, due to ANNs capability of working with non linear data.

Most of the previous work done in crude oil price determination was mostly based on forecasting it within the supply and demand framework. Wen Xie, Lean Yu,Shanying Xu, and Shouyang Wang [4] proposed a new method based on Support Vector Machines (SVMs) crude oil time series prediction. SVMs are not susceptible to overfitting and can model nonlinear relations in an efficient and stable way. Their model achieved better accuracy than ARIMA and Back-Propagation Neural Network (BPNN) models. The drawback of their prediction is the usage of only crude oil price of previous years. This attributes the changing trends in crude oil prices to chaos when in reality it may be due to the various factors that were not accounted.

Mohammad Reza Mahdiani, Ehsan Khamehchi [5] implemented an ANN with a Genetic Algorithm (GA) for a dataset consisting of daily and monthly crude oil prices, and found out that forecasting greatly improves over traditional ANN models. ANN-GA also works better than ANNs in the case of reduction in the number of training data points.

As mentioned in [2], machine learning techniques mainly work on homogenous, stationary data and perform a "one-shot" analysis of the data. This is not particularly useful when it comes to price forecasting, since new data is being generated everyday and in order to predict the future prices, the entire dataset will have to be used again to forecast. So, [2] proposed a stream learning method, which updates the model based on new data in a computationally efficient manner.

Kaijian He , Rui Zha, Jun Wu and Kin Keung Lai[6] proposed a Empirical Mode Decomposition (EMD) to solve

the problem of heterogeneous characteristics of crude oil prices. The proposed model performed better than Autoregressive-moving-average-model(ARMA).

Taiyong Li, Zhenda Hu, Yanchi Jia, Jiang Wu and Yingrui Zhou [7] implemented Empirical EMD and Sparse Bayesian Learning, improved on the previous EMD model, through better representation of decomposed characteristics.

B. Data Collection

Due to the lack of an existing dataset to solve this problem, data had to be collected from various sources.

Crude oil prices from December 11th 2011 to the present day were taken. The dataset is being continuously updated too. Stock prices of ONGC and IOC, which are oil refining companies, TOC and Tiger Logistics which are oil dependent companies were taken. In order to understand the competition between OPEC and US oil markets, the supply and demand of the two were also taken. Petrol and Diesel prices of four major metropolitan cities were taken since these prices directly impact the performance of logistics companies and not only the crude oil prices. The daily price relation of United States dollar and Indian rupee was collected to see the correlation between trends of crude oil price and strength of the Indian rupee against dollar. The dataset has a lot of missing values, for which interpolation/extrapolation has been considered.

III. Plan Forward

Apply existing methods and be able to forecast and correlate crude oil price to stock price. Secondly, come to an understanding of differences, merits and demerits of the existing models by comparing them. Finally to try build a model combining econometric and neural networking models to ultimately forecast the crude oil commodity prices and stock prices and draw useful conclusions on how trends in crude oil are affecting stock prices of the companies under consideration. That would help investors take a call by using trends in crude oil to invest in stocks.

Differentiating our work :

We understand the direct impact of crude oil on a crude-oil dependent company's performance , which is why we want to be able to forecast crude oil price (helping commodity traders) and use it to forecast and draw useful insights on patterns and trends with respect to stock prices as well (helping stock traders) unlike economic papers that conclude an existence of relationship between crude oil and a country's economic indicators and forecasting papers which focus only on long term or short term forecasting. The insights we develop by analyzing patterns and trends along with forecasting would help make better investment decisions .

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