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# Market Efficiency between Indian & US Crude Oil Future Market

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## Abstract

This study explores how high frequency data can be turned to be an opportunity to generate possible trading strategies by examining the information flow direction between Indian and US Crude oil Future Markets. The profit opportunities in a market is special indicator of the market efficiency. Thus this paper simulates the trading strategies to check the efficiency of the Indian & US Crude Oil future Market. First, the informational relationship is examined on short term as well as long term basis. The results indicate that there is bidirectional information flow in long term, but in short term only US market is information provider. Next, VECM suggests that this long term and short term relationship between these two markets can be useful for formulating some trading strategies. And trading simulation confirm that very little profit opportunities exists on regular basis for hedgers. Both U.S. and Indian Future market are found to be efficient on daily basis, because there exist very little profit opportunity. But US Future market is found to be more efficient than the Indian Future market.

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*Keyword:* Trading Strategies; Simulation; High Frequency data; Market Efficiency

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## 1. Introduction

The time period from 2006 to 2008 sees an exceptional price hike and volatility in world commodities market. The reason behind this phenomenon is largely attributed to rapidly growing demand for the commodities (like energy, metallurgic, agricultural, and other commodities) in emerging economies such as China and India as well as to speculation and arbitrage trading activities in derivative markets. Few studies suggests that these fluctuation is result of co-integration of the different market. Thus, the transformation of the information across the market becomes cause of concern. Recent studies such as Fung, Leung and Xu [2] has examined the information transmissions and price linkages across markets with similar futures contracts. A number of studies have

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documented a recognized information flow pattern from larger, more liquid, and efficient markets such as that of the United States to others that are less liquid and less efficient. The studies like Ghosh, Saidi, and Johnson [5] has demonstrated the central role that U.S. financial markets play in global financial markets and the dominance of U.S. financial markets in information flows across countries. Therefore, to examine whether U.S. financial markets also plays role in disseminating information to Indian market, this study is conducted. This study investigates the pattern of information flows across the two countries i.e. Indian and U.S. “Crude Oil” Futures market. For the study, “Crude Oil” Futures contract traded on NYMEX for U.S and on MCX for India is considered because “Crude Oil” Futures contracts are highly traded contract on both MCX and NYMEX.

This present study is of interest for several reasons. First, India is an important and growing market that is well worth understanding, but there is limited research on the interactions of its financial markets with the US. India ranks among top 10 oil consuming countries in the world. The total oil consumption is about 2.5 MBPD. India import about 70% of its total oil consumption and has no oil export. It faces large supply deficit, as domestic oil production is unlikely to keep pace with demand. Being the member of World Trade Organization (WTO), Indian market is further open through reduced tariffs and import restrictions. Financial markets too will have fewer barriers, allowing better information flows across Indian and U.S markets.

Secondly, the prices of crude oil are highly volatile. Higher oil price leads to inflations which in turn increases input costs, reducing non-oil demand and reduces investments in net oil importing countries. Even after officially dismantling Administered Price Mechanism (APM), the product price continue to be policy driven rather than market driven. So this much dependency on “crude oil” is needed to be addressed. Thus, this study also look into the market efficiency of the both market in terms of opportunity of generating profit. Many prior studies have used simulated trading to examine market efficiency. For example, Johnson, Zulauf, Irwin, and Gerlow [13] use a profit margin trading rule to investigate the market efficiency of soybean, soybean oil, and soybean meal futures (i.e. the crush spread).

Trading strategies based on the co-integrating relationships between the futures price series are used to examine possible changes in the level of market efficiency. The study concludes the bi-directional relationship in both long run. The results from implying the trading strategy shows both markets are quite efficient since no significant profit can be found. But U.S. market is more efficient in comparison to Indian market.

## **2. Literature Review**

Garbade and William L. Silber [4] examines the characteristics of price movements in cash (or spot) markets and futures markets for storable commodities. And the theoretical results suggest that the degree of market integration over short horizons is a function of the elasticity of supply of arbitrage service. To shed light on the importance of U.S. futures trading in a global market, Fung, Leung & Xu [2] examine patterns of information transmission across U.S. and Asian markets for different dual-listed, U.S.-traded financial futures. Yang, Bessler & Leatham [17] in their paper examine the price discovery performance of futures markets for storable and non-storable commodities in the long run, allowing for the compounding factor of stochastic interest rates. Perry Sadorsky [14], in his paper, used several different univariate and multivariate statistical models to estimate forecasts of daily volatility in petroleum futures price returns. Agnolucci [1] compares the predictive ability of two approaches which can be used to forecast volatility: GARCH-type models where forecasts are obtained after estimating time series models, and an implied volatility model where forecasts are obtained by inverting one of the models used to price options. Zhang & Yi-Ming [19] sheds light upon the reasons for the consistent changes of the prices of crude oil and gold, as well as the interactive mechanism of them. In the paper By Kaoru Kawamoto & Shigeyuki Hamori [9], market efficiency and unbiasedness among such futures are defined and the concept of “consistently efficient (or consistently efficient and unbiased) market within n-month maturity” is introduced. The results show that WTI futures are consistently efficient within 8-month maturity and consistently efficient

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