

A Study on Long Term Relationship of Spot and Future Prices in Energy Commodities

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ABSTRACT

This study examines the active relationship of spot and future prices in energy commodities. The major objective of this study is to check their stationarity and the long term relationship between the daily commodity future and spot prices. To confer the relationship, the ADF and PP test are applied to test their stationarity and Johansen cointegration test implied to study their relationship of spot and future prices of the commodities. Energy commodities such as crude oil and natural gas are considered for this study.

Keywords : ADF Test, PP Test, Johansen Cointegration Test.

I. INTRODUCTION

The abundant forms of energy, crude oil and natural gas has pooled comfortably constitute more than half of the total primary energy consumed in 2016. Due to its high energy solidity, easy transport and relative abundance, crude oil has become the world's most important source of energy since the mid-1950s. Since then both these commodities played a vital role as well as due to the high consumption the prices have gone up and their depending cost like production, transportation cost also have increased.

There are certain factors which lead the spot prices; one of the main factor is future. Future prices are the prices specified in a given agreement to supply specified date, although the spot prices are fixed on the spot of purchase and sale of the commodities. Deliberately the relationship of spot and future price of the crude oil and natural gas are the main objective of this study. From this we expect an existence of long term relationship between the prices of future and spot.

Future markets are generally deliberated to achieve two major roles in commodity market – Risk transfer role and Price discovery role. The risk transfer role results from the fact of reallocating between the producers and speculators, hedgers are keen to compensate the speculators in sharing the risk intrinsic in their manufacture process. Future price also conveys

information to every economic agent. Even the physical traders use future prices as a reference to price their commodities due to the clearness and liquidity of commodity futures over physical commodities

II. LITERATURE REVIEW

(Dr.K.Nirmala) Have examined the relationship between spot and future price of crude oil. Recent market prices of crude oil are considered in discussing the relationship. ADF test has been used to check the stationarity of the data; Ganger Causality is used for testing the direction of information flows between spot and future prices and at last the cointegration test is used to figure out their existing relationship. The result of the study indicated that the spot prices are revealed in future markets and also the change in future prices have lead the change in spot prices frequently than the contrary.

(Sharma) Have studied the long and short run relationship between the spot and future prices of selected agricultural commodities, like channa, soya bean, potato, pepper, guar gum, soya refined. From this study, there is certain proved evidence of existing relationship and bi-directional relationship between these commodities as well as vector error correction model is used for examining the causal nexus between the future and spot market of the selected agricultural commodities.

(Derick D.Quintino) Investigated and analysed the relationship between ethanol spot and future prices in Brazil. In this study the Engle and Granger cointegration test is used to test the relationship. From the result, the future market is efficient in price detection and information transmission, and the cash market lead the long run price detection process.

(P.Natarajan) Examined the relationship between the spot and future prices of cardamom traded in MCX India. The relationship has been tested from February 2006 to March 2012. Tools like ADF test and PP test are used to check their stationarity whereas the Johansen cointegration test is used to test the long run relationship between the future and spot prices of the commodity. As well as the Granger causality test has supported that there is a bi-directional relationship between the prices. (Eryigit) has studied the variables influencing the price of investment instruments and also the relationship between the variables. The major aim is to study the variables related to the gold prices and those variables are alienated into precious metals and energy. To reveal the short term interaction between gold prices and precious metals stationarity test, vector autoregression model (VAR) and cointegration tests and vector error correction model (VECM) is used to test the relationship between gold and energy prices. The result of this study showcased the existence of certain relationship as well as no relationship between certain commodities.

(Dr.S.P.Dhandayuthapani) Have studied and analysed the price fixing method for the agricultural commodities. The major causes for the price variations are the market forces which alter the prices by the current or expected balance between the supply and demand. The Engle and Granger methodology is used for error correction as well as the causality interpretation, these econometric

tests help to figure out the long run relationship between spot and future prices.

(R.H.Raghavendra) Have assessed and examined the relationship between spot and future prices of agricultural commodities from the period January 2010 to March 2015. Techniques like ADF test or PP test are used for ensuring the stationarity and tools like Johansen cointegration and regression model were used to study the lead-lag relationship between spot and future markets. The result also showcases the existence of bidirectional relationship between these agricultural commodities.

III. DATA ANALYSIS AND DISCUSSIONS

Augmented Dicky Fuller and Philip Perron Test

Results of Augmented Dickey Fuller test and Philip Perron tests are conducted to verify the stationarity of the data sequence. The complete values of ADF and PP test statistic are more than the critical value 5%. Therefore the 1st difference records of data sequence are considered to be stationarity, and also the essential condition for testing Johansen cointegration is satisfied.

Johansen Cointegration Test

This test elucidates the long term relationship between spot and future prices of energy commodities, by means of Trace Statistic and Maximum Eigen Value Statistic it has been identified that there is a cointegration equation between the spot and future prices. The cointegrating vector cannot be rejected at 5% level, as the null hypothesis of zero integrating vectors is rejected. Thus the existence of cointegration is proved between future and spot of energy commodities.

Table 1. Results of Augmented Dickey Fuller Test and Phillip Perron Test

| Variables | ADF Test | | PP Test | |
|------------------|-----------|----------------------------|-----------|----------------|
| | At Level | 1 st Difference | At Level | 1st Difference |
| Future Crude Oil | -0.940085 | -39.61579 | -0.946803 | -39.59086 |
| (p value) | 0.7757 | 0.0000 | 0.7735 | 0.0000 |
| Spot Crude Oil | -0.950321 | -42.39676 | -1.016784 | -42.26719 |
| (p value) | 0.7723 | 0.0000 | 0.7492 | 0.0000 |

| | | | | |
|--------------------|-----------|-----------|-----------|-----------|
| Future Natural Gas | -2.134441 | -34.72379 | -1.744315 | -34.75371 |
| (p value) | 0.2312 | 0.0000 | 0.4086 | 0.0000 |
| Spot Natural Gas | -2.054797 | -38.47959 | -1.851708 | -38.86224 |
| (p value) | 0.2635 | 0.0000 | 0.3556 | 0.0000 |

Table: 2 Results of Cointegration Test between Spot and Future Prices of Energy Commodities

| Commodity | Hypothesis | Trace Statistics | | | Max-Eigen Statistics | | |
|-------------|----------------|------------------|---------|---------------------|----------------------|---------|---------------------|
| | | Trace value | p value | 0.05 Critical value | Max-Eigen | p value | 0.05 Critical value |
| Crude Oil | H0: $r = 0$ | 141.3297 | 0.0001 | 15.49471 | 140.3563 | 0.0001 | 14.26460 |
| | H0: $r \leq 1$ | 0.973487 | 0.3238 | 3.841466 | 0.973487 | 0.3238 | 3.841466 |
| Natural Gas | H0: $r = 0$ | 507.7525 | 0.0001 | 15.49471 | 503.9515 | 0.0001 | 14.26460 |
| | H0: $r \leq 1$ | 3.801019 | 0.0512 | 3.841466 | 3.801019 | 0.0512 | 3.841466 |

Note: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level,

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level,

IV. CONCLUSION

The study has been conducted to investigate the relationship between the spot and future prices of the energy commodities. It also examines the statistical relationship that occurs between the price movements in the cash market and future market with reference to Crude Oil and Natural Gas. Firstly Augmented Dickey Fuller (ADF) test and Phillip Perron test were used to check the stationarity of the data sequence, and it possessed stationarity in the 1st difference which legalises the fitness to proceed with further test. Johansen Cointegration test was implied to showcase the relationship between the future and spot prices of commodities traded in MCX. To settle the study, we say that there exists relationship between spot and future prices of commodity traded at MCX India.

V. REFERENCES

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