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Futures trading and Spot volitality in Indian agricultural commodity market

Vishweswar Sastry V. N. & Dr. Pundareeka Vittala

Abstract

In the present era commodity market can be said as physical and virtual market place for buying, selling and trading of primary products. These commodities are Soft commodities which are agricultural products such as wheat, coffee, cocoa and sugar and Hard commodities like such as gold, rubber and oil. The main objective is to study the correlation between spot and futures commodity price and to determine the intensity of future trading on spot volatility of the selected commodities and to study the trading and settlement pattern of agriculture commodity needs and to facilitate yield to agricultural commodity. The GARCH model is applied to determine the objectives. It is been found that all commodities have positive correlation and also found that Spot market volatility tends to affect futures market trading activity, measured by trading volumes liquidity.

Keywords: Hard and Soft commodities, Futures and Options, Convenience yield, GARCH

INTRODUCTION

Derivatives are monetary contracts, which do the price finding for the future based on underlying assets of the spot market. Basis is the distinction between spot and future price, in a normal market expected basis would be positive where as in an inverted market basis would be negative. Convergence is the phenomenon of decline in the basis at which spot and future prices are approximately the same. It is a function of carrying cost and interest rate. In the case of commodities basis may be positive or negative depending on the supply. In the past agro based economy like India to guard the interest of riots supporting prices were announced. This can be avoided if the farmer's neighborhood is responsive to the trading system of non-perishable cargo trading in commodity market.

Vishweswar Sastry V. N.
Asst. Professor,
Department of PG - Commerce,
Presidency College, Bangalore

Dr. Pundareeka Vittala
HOD & Professor,
Department of PG - Commerce,
Presidency College, Bangalore

REVIEW OF LITERATURE

Sehgel (Sehgal, 2012) examines the effect of futures trading activity on spot price volatility for seven farming merchandise. Researcher putrefies the futures quantity into expected and unexpected components using Hodrick–Prescott filter (HP filter) and to clearly understand the destabilization effect: the relationship of the unexpected liquidity of futures market is done with unexpected volatility of spot market returns which is estimated by taking the residuals of the GARCH model. Researcher found reversed effect for one commodity (pepper) the effect of spot volatility on futures trading and for Barley no causality was revealed either from futures to spot or Vice-Versa. Thus, the researcher has suggested that commodity exchanges must be strengthened and put under strict and active monitoring for early detection of abnormal trading manners.

R. Sendhil (Sendhil, 2013) analyzed the competence of futures trading in wheat, chick-pea, maize and barley in terms of price transmission, price discovery and extent of volatility in prices.

The objective of the study was to analyze the growth and efficiency of futures trading in selected agricultural commodities and also the extent of volatility in prices due to futures trading. The methods used by the researchers were Johansen's multivariate approach to examine co-integration of futures market with spot market prices and the Garbade and Silber's (GS) approach to estimate the efficiency of futures market in terms of price discovery and GARCH model to compute the volatility in spot market. The analysis reveals that volatility's persistence in spot price in selected commodities had exhibited an explosive pattern. Therefore the study states that farmers were not able to participate in the futures market owing to the small-scale production system prevailing in India.

Bose (Bose 2008) studied some of the characteristics of the Indian commodity futures market in order to judge whether prices indicate efficient functioning of the market. Data consisted of the multi-commodity & agricultural commodities spot and futures indices from the MCX and NCDEX and global indices maintained by Dow Jones and Reuters. The methodology used in correlation. Using the available notional price indices for the commodity market the researcher finds that multi-commodity indices, which have higher exposure to metals and energy products, with clear and efficient price dissemination in national and international markets, behaved like the equity indices in terms of efficiency and flow of information. Agricultural indices on the other hand did not exhibit such features very clearly.

Kumar (Kumar, 2011) investigated the relationship between futures trading activity and spot market volatility for agricultural, metal, precious metals and energy commodities in Indian commodity derivatives market. The paper debated whether the futures trading in Indian commodity futures market stabilized or destabilized the spot market. Researcher examined contemporaneous relationship through augmented GARCH model in which spot volatility is modelled as GARCH Researcher found that both expected and unexpected futures trading volume affected contemporaneous spot volatility positively. However, in case of agricultural commodities only unexpected volume affected the contemporaneous spot volatility. Hedging activity measured by open interest did not show significant effect on spot market volatility. The researcher did not find any effect of spot volatility on futures trading activity for most of the commodities.

Brajesh Kumar (Kumar, 2011) found positive and significant correlation between volatility and trading volume for all commodities under consideration. The results of dynamic relationship between volatility and trading activity showed that only overnight volatility drove the trading volume but not open interest. It was more prominent in non- agricultural commodities. They also found asymmetric relationship between trading volume and open interest. The lagged open interest affected volume positively but lagged volume affected open interest negatively. It was also more prominent in case of non-agricultural metals.

Mihir Dash (Dash, 2010) analyzed the effects of futures market trading activity on the price discovery mechanism of Indian commodity futures markets. The effects of futures market on the spot market and vice versa were analysed using Granger causality techniques to identify short-run interactions. Causality in commodities markets can be used to either hedge or speculate price movements: if changes in spot prices drove changes in futures prices, efficient hedging strategies can be formulated; whereas if changes in futures prices drove changes in spot prices, efficient speculation strategies can be formulated. The results of the study suggest that the price discovery mechanism was quite effective for most commodities, but might not be very effective for some commodities.

Mukharjee (Mukharjee, 2011) attempted to validate the market perceptions of different bodies on the usefulness and suitability of futures contract in developing the underlying agricultural commodity market in agricultural based Indian economy. The researcher used various econometric models, such as Multiple Regression,

Vector Auto Regression, Granger Causality Test, GARCH model, etc., to test the concerned objective.

Popli (Popli, 2012) analysed the efficiency of agricultural markets by accessing the relationships between futures prices and spot prices of major agricultural commodities in India. To analyse the market fluctuation in India, UK and US for a particular period of time, he used co-integration model with simple Graph in this study to examine lead-lag relationship between spot and futures prices. The regression analysis with linear relationship has been applied between spot and forward prices of the commodities. It revealed that there was a positive correlation between futures and spot prices of the commodities. It was also observed that there was possibility of arbitrage in those commodities which are traded at both NCDEX and MCX Commodity Exchanges.

STATEMENT OF THE PROBLEM

Inflation erodes purchasing power of money. Demand push inflation occurred in spot prices may be due to speculative content in a future trading on the respective commodity. Such a spot-price volatility over the span of time is due to cost-push and demand-pull. This paper analyses the impact of future trading on the spot prices of selected agricultural commodities like Gaur seed, Maize, Soya Bean & wheat.

OBJECTIVE OF THE STUDY

1. To study the inter-relationship between spot and futures commodity price.
2. To ascertain the impact future trading on spot volatility of the selected commodities.
3. To study the convenience yield to agricultural commodity.

SOURCE OF DATA

Secondary data is used for the analysis, which is collected from MCX for the year 2012 January to July on selected agricultural commodities chosen for the study those are Gaur seed, Maize, Soya Bean & wheat.

TOOLS USED FOR DATA ANALYSIS

For this study ADF unit root test, GARCH model and hedging techniques have been used. ADF unit root test was to check the stationarity of the data. GARCH or Generalized AutoRegressive Conditional Heteroskedasticity process is an econometric model developed in 1982 by Robert F. Engle, an economist and 2003 winner of the Nobel Memorial Prize for Economics to describe an approach to estimate volatility in the prices.

For Gaur Seed the graph (see Table-1) shows that the price has decreased by 1% at the end of November. In the GARCH analysis the coefficient shows the relation between the prices each month. Here the coefficient is perfectly correlated (0.99). Since the probability is (0.00) the chance of error is minimal. Durban Watson detects a relationship between values separated from each other by a given time lag since here the Durban Watson statistic is substantially 2; there is evidence no autocorrelation i.e. there is no problem in significant pricing. Thus volatility is less in this year.

For Maize the graph (see Table-2) shows that the price has decreased by 2% at the end of November. In the GARCH analysis the coefficient shows the relation between the prices each month. Here the coefficient is perfectly correlated (0.99). Since the probability is (0.00) the chance of error is minimal. Durban Watson detects a relationship between values separated from each other by a given time lag since here the Durban Watson statistic is substantially 2; there is evidence no autocorrelation i.e. there is no problem in significant pricing. Thus volatility is less in this year.

For Soya Bean (See Table-3) the graph shows that the price of soya bean has decreased by 18% at the end of November. In the GARCH analysis the coefficient shows the relation between the prices each month. Here the coefficient is perfectly correlated (0.99). Since the probability is (0.00) the chance of error is minimal. Durban Watson detects a relationship between values separated from each other by a given time lag since here the Durban Watson statistic is substantially above 2

therefore there is series of strong negative correlation. There is no relation between spot and futures price thus there is volatility.

For Wheat the graph shows (Table-4) that the price of wheat on November has reached to its original price which was at the beginning of the year. In the GARCH analysis the coefficient shows the relation between the prices each month. Here the coefficient is perfectly correlated (1.00). Since the probability is (0.00) the chance of error is minimal. Durban Watson detects a relationship between values separated from each other by a given time lag since here the Durban Watson statistic is substantially 2; there is evidence no autocorrelation i.e. there is no problem in significant pricing. Thus volatility is less in this year.

FINDINGS

1. From the GARCH analysis, it was found out that, the futures trading and spot price of agriculture commodity is volatile since the results were not persistent.
2. From GARCH analysis it is observed that all the commodities have a perfect correlation and there is minimal error.
3. Hedging technique is used to minimize risk but still there is a loss in 2012 in barley as there are chances of the futures spot price to be more than the short contract price.
4. In gaur seed from 2012-2015 there is price loss though hedging technique is used to minimize risk because futures spot price was higher.
5. There is a price loss in maize from 2012-2015 though hedging technique is used to minimize risk as the contract price is lesser than futures spot price.
6. Soya bean makes profit from 2010-2013 through hedging technique which is used to minimize risk but makes a loss from 2013-2015 as the futures spot price will be high.
7. Though there is increase in the spot price in barley there is a fluctuation in the net gain/loss may be due to price volatility.
8. In gaur seed initially the spot price increases to a high level in the year 2012 and then there is drastic decline till November 2014 though the commodity is making a net gain.
9. The spot price of maize increases in the year 2013 but falls after that may be due to decline in demand and supply and also due to the decline there is a loss in net gain/loss during 2014-2015.
10. In the case of soya bean the spot price increases from 2013-2015 and there is gain in net gain/loss throughout.
11. The spot price from 2012-2015 increases in the case of wheat. There is gain till 2013 and then suddenly there is a loss in the 2014 in the net gains and losses.
12. Spot market volatility tends to affect futures market trading activity, measured by trading volumes liquidity, indicating a strong speculative interest in the market the results may be explained by the fact that spot market is not well-organized and lacks transparency.
13. The changes in trading pattern is due to seasonal variation in demand and supply.

SUGGESTIONS

- The demand and supply should be maintained to avoid price fluctuation. Thus there should be equal demand and supply.
- Price volatility encourages investors to include hedging strategies to minimize risk.
- Futures trading in commodity market play an important role in price discovery and price risk management;this must be encouraged.
- Innovative derivative instruments such as commodity options must be introduced to attract higher trading volumes and provide a better risk management alternative.
- The commodity exchanges must strengthen their surveillance system for early detection of anomalous trading

behaviour for all commodities. In case there is any anomalous behaviour it must be put under active monitoring on continuous basis.

- SEBI must come out with a long term investor education strategy. Investor education is the best way to empower investors and hence the issue needs special attention. A well-informed investor's base shall create greater trading liquidity and help in avoiding price manipulations.

CONCLUSION

The main objective of this study is to find out the impact of futures trading and spot price volatility Indian agriculture commodity market. From the analysis and interpretation it is observed that there is price volatility on Indian agriculture commodity market due to various internal and external factors. The major conclusion from this study is that the spot price, futures price and have a direct relationship with each other. Unexpected volatility of spot market returns was estimated by taking the residuals of Generalized Autoregressive Conditional Hetero-scedasticity (GARCH) model. Spot price and futures price are positively correlated.

Unprecedented volatility in commodity prices has been a source of great risks, impacting economies and stakeholders within an unprecedented scale. Hedging using commodity derivatives remains the best means to achieve price risk management. Thus study found that by using hedging techniques, risk can be minimized irrespective of futures price. Given the high and increasing volatility of commodity prices, the strategic importance of price risk management through hedging should, therefore, be never undermined.

The study also found the trading and settlement of the agriculture commodity affected by demand and supply factors. This means that there is a strong impact of futures trading and spot price volatility on Indian agriculture commodity market.

SCOPE FOR FUTURES RESEARCHERS

This study did not engage options as part of its methodology. This is an area for future studies.

Neither of the models like GARCH or SPSS provides the accurate data on commodities. Extention of analysis with various techniques is always possible.

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ANNEXURE

DATA ANALYSIS & FINDINGS

Table 1: Gaur Seed 2014

Month	Price
January	5007.458333
February	4783.536585
March	4594.767442
April	4796.25
May	5220.25641
June	5217.627907

Month	Price
July	5422.704545
August	5548.973684
September	5670.545455
October	5553.529412
November	4943.029412

Graph: 1 Gaur Seed 2014

Garch Analysis

Dependent Variable: C(1)

Method: ML-ARCH (Marquardt) - Normal Distribution

Date: 01/09/15 Time: 00:02

Sample (adjusted): 1 436

Included observations: 436 after adjustments

Convergence achieved after 16 iterations

Presample variance: backcast (parameter = 0.7)

GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
SERIES01	0.999978	9.01E-05	11102.75	0.0000
	Variance Equation			
C	3.13E-07	1.43E-07	2.182879	0.0290
RESID(-1)^2	0.001145	0.010960	0.104511	0.9168
GARCH(-1)	0.892199	0.048176	18.51946	0.0000

Mean dependent war	1.000000	S. D. dependent var	0.000000
S. E. of regression	0.001757	Akaike info criterion	-9.850567
Sum squared resid	0.001343	Schwarz criterion	-9.813158
Log likehood	2151.424	Hannan - Quinn criterion.	-9.835804
Durbin - Waston stat	1.872581		

Table 2: Maize 2014

Month	Price
January	1209.095238
February	1212.891892
March	1228.071429
April	1232.24
May	1235.473684
June	1241.202439

Month	Price
July	1357.307692
August	1379.396552
September	1277.115385
October	1164.288462
November	1185.225806

Garch Analysis

Dependent Variable: C(1)

Method: ML-ARCH (Marquardt) - Normal Distribution

Date: 01/09/15 Time: 07:10

Sample (adjusted): 1 373

Included observations: 373 after adjustments

Convergence achieved after 16 iterations

Presample variance: backcast (parameter = 0.7)

GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

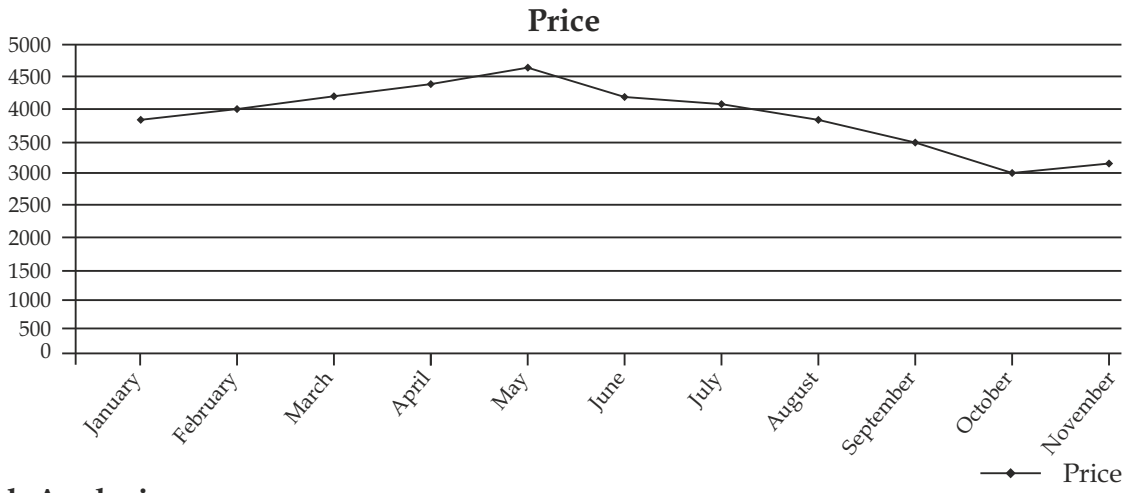
Variable	Coefficient	Std. Error	z-Statistic	Prob.
SERIES01	0.999991	5.24E-05	19091.12	0.0000
	Variance Equation			
C	5.74E-07	2.23E-07	2.577378	0.0100
RESID(-1)^2	0.179299	0.062985	2.846719	0.0044
GARCH(-1)	0.384658	0.200361	1.919822	0.0549

Mean dependent war	1.000000	S. D. dependent var	0.000000
S. E. of regression	0.001128	Akaike info criterion	-10.73576
Sum squared resid	0.000473	Schwarz criterion	-10.69371
Log likehood	2006.219	Hannan - Quinn criterion.	-10.71906
Durbin - Waston stat	2.400958		

Table 3: Soya Bean 2014

Month	Price
January	3854.391304
February	4017.940476
March	4211.155556
April	4300.542857
May	4660.807692
June	4223.025

Month	Price
July	4114.363636
August	3878.118421
September	3471.534091
October	3070.058824
November	3178.060294



Garch Analysis

Dependent Variable: C(1)

Method: ML-ARCH (Marquardt) - Normal Distribution

Date: 01/09/15 Time: 12:14

Sample (adjusted): 1 439

Included observations: 439 after adjustments

Failute to improve Likehood after 45 iterations

Presample variance: backcast (parameter = 0.7)

GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
SERIES01	0.999189	0.003315	301.4167	0.0000
	Variance Equation			
C	0.000402	2.27E-05	17.69987	0.0000
RESID(-1)^2	0.232166	0.156449	1.483976	0.1378

GARCH(-1)	-0.042292	0.081555	-0.518566	0.6041
Mean dependent war	1.000000	S. D. dependent var	0.000000	
S. E. of regression	0.018539	Akaike info criterion	-5.430809	
Sum squared resid	0.150543	Schwarz criterion	-5.393592	
Log likehood	1196.063	Hannan - Quinn criterion.	--5.416126	
Durbin - Waston stat	2.968535			

Table 4: Wheat 2014

Month	Price
January	1643.587234
February	1637.792683
March	1643.018182
April	1536.384848
May	1537.673684
June	1512.623077

Month	Price
July	1564.861364
August	1578.602857
September	1595.9025
October	1615.559091
November	1630.292857

Garch Analysis

Dependent Variable: C(1)

Method: ML-ARCH (Marquardt) - Normal Distribution

Date: 01/09/15 Time: 12:52

Sample (adjusted): 1 408

Included observations: 408 after adjustments

Convergence achieved after 26 iterations

Presample variance: backcast (parameter = 0.7)

GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
SERIES01	1.000017	2.07E-05	48255.22	0.0000
	Variance Equation			
C	2.63E-08	8.30E-09	3.173395	0.0015
RESID(-1)^2	0.221603	0.0455305	4.891417	0.0000
GARCH(-1)	0.728188	0.048220	15.10142	0.0000

Mean dependent war	1.000000	S. D. dependent var	0.000000
S. E. of regression	0.00572	Akaike info criterion	-12.25590
Sum squared resid	0.000133	Schwarz criterion	-12.21657
Log likehood	2504.203	Hannan - Quinn criterion.	-12.24033
Durbin - Waston stat	2.286922		