

CHAPTER 3

REVIEW OF LITERATURE

In this chapter, reviews of previous studies associated to present research matter have been made. The review has been collected on both developed and emerging markets which show up the volatility and association between spot and futures market. A look into these studies brings out various tools and techniques used in the study that brings out the behavior, interrelationship and volatility in these markets. The reviews are divided in the following categories:

1. Market Behaviour
2. Relationship with Macroeconomic Indicators
3. Price Discovery and Volatility

3.1 REVIEWS ON MARKET BEHAVIOUR OF COMMODITY MARKETS:

Mittal et.al. (2018) studied the trends in price transmission and volatility behavior of domestic and international rice and wheat. The wholesale prices and international prices of wheat and rice during the period 1967 to 2010 have been taken in the study. The average annual growth rates have been used to understand the price trends and GARCH technique have been used to understand the volatility behavior. The study revealed that both international and domestic prices are volatile with greater magnitude of volatility in international market. The study attributed domestic price volatility to government involvements and market support policies to farmers by government. The study suggested private sector participation rather than government intervention to increase market efficiency of markets.

Mastroeni et.al. (2018) studied the chaotic behavior of copper traded in COMEX market for a period from 7th December 1989 till 20th February 2017. The analysis discovered the presence of stochastic and disorganized behavior during the period which is reflected in non zero value of correlation entropy and presence of noteworthy noise

level during the period. The recurrence analysis during the period showed a non uniform pattern reflected by causal change with occurrence of drift and temporary change.

Go and Lau (2017) examined the investor demand, market efficiency and spot future relation of crude palm oil during the period January 2000 to July 2016. The study revealed that spot and future prices are highly correlated during backwardation. During the weak Contango period, correlation was found to be lesser and during strong Contango period, the correlation was the least. The study concluded that the preference of holding long position in future market during backwardation period is due to the anticipation of insufficient supply of CPO in future.

Thakre et.al. (2017) studied the changes and trends in arrival and prices of wheat, paddy, onion, potato, groundnut and jaggery of Agricultural Produce Market Committee, Kolhapur. The study found out that arrival of paddy has increased during the period and wheat had shown a decrease in arrivals in APMC Kolhapur. An Increase in arrivals has shown a decrease in price of Jaggery, wheat and groundnut, whereas an increase in arrivals has shown an increase in price for paddy, onion and potato.

Dey and Maitra (2017) discussed the necessity of options trading in commodity market. The study states that introduction of options in commodity market will improve the market liquidity and will also form as an instrument for price risk transfer mechanism. The authors opined that options in non-agro products may be attractive to an investor because of the presence of cash settlement and diverse nature of participation. It is suggested that the exchanges should adopt best practices from other global commodity exchanges like Chicago Mercantile exchange in United States, London Metal Exchange in United Kingdom who have successfully running the operation of options in the exchange with respect to risk management. It was concluded that the regulator and commodity exchanges in India should work together to launch options especially in agricultural commodities so that it benefits the farmers and stake holders.

Pereira et.al. (2016) studied the cyclical behaviour of twelve commodities and S&P 500 index. The study revealed that the commodities are heterogeneous in nature. The study concluded that the value of the portfolio can be increased by including commodities in the portfolio especially in the bear regime.

Masood and Chary (2016) studied the performance of commodity market in terms of volume growth rate of commodities traded by taking value of 2004-05 as the base year. It was found that agricultural commodities grew around 14% and non agricultural commodities grew by 35%. The overall growth rate was found to be 29 %. The study suggested the enhancement of infrastructure, incorporation of regional exchanges with national exchange and proper information flow to the real users of commodity market which will help the market grow further.

Darekar et.al. (2015) studied the behaviour of market arrivals and price of onion in Pune, Lasalgaon, Yeola, Ahmednagar, Pimpalgaon, Lonad, Kolhapur, Solapur, Dhule and Jalgaon markets in Maharashtra for the period 2004-13. The study revealed that unpredictability in market arrivals was found to be lower in case of Pune, Lasalgaon, and Yeola markets compared to other markets. The price variability, on the other hand was found to be higher in Pune, Pimpalgaon and Yeola market. The study highlighted the integration of all other markets with Pune, Lasalgaon and Yeola markets which reveal these are the important markets for Onion in the area. A negative relationship was found between market arrivals and prices of onion during the period in all these markets.

Singh (2015) studied the spot market volatility with reference to agricultural commodities. The study used data of commodities from different categories like pulses (chana), spices (pepper, jeera and chilli), oil and oil seeds(soybean and Mustard seed) traded in NCDEX for a period of 9 years starting from January 2004 to December 2014. The study revealed that average daily returns of all commodities in spot market are positive and that the volatility is also lower in spot market. The study also revealed that there is high cointegration among spot returns, volume and open interest in all commodities.

Bhaskar and Mukherjee (2015) analysed the risk and return of different commodities futures in Indian derivatives market. The study compared real, nominal and excess returns of commodities in agriculture, metal, energy and Oil & oil related commodities. The returns (Nominal, real and excess) were found to be higher in oil and oil related commodities. The risk was also found to be higher in Oil & oil related commodities. Energy futures were found to be least risky and were also found to be low

returns group. Agricultural commodities and metals were found to have moderate risk and return.

Parasuraman & Rao(2014) studied the efficiency of commodity market in India by taking metal and energy indices of MCX over a continuous 90 day trading period ending on Oct 23, 2014 by using an empirical model represented by cost of carry. The study concluded that there is an absence of market efficiency and arbitragers are in a position to make abnormal profit by exploiting the difference in price in futures and spot market

Krithiga and Azhagaiah(2014) studied the linkages among 12 agricultural commodities (Barley, Castor seed, Chana, Coriander, Cotton seed oilcake, Jeera, Mustard seed, Refined soyoil, Soybean, Sugar, Turmeric & Wheat) and their cross hedging potential in India. Karlpearson's Correlation is used to find the relationship between the commodities and it has been found that all the commodities are related and are affected by micro economic aspects. Further long run and short run equilibrium relationship among the commodities is confirmed through ECM. The study revealed that commodities of same category show a significant relationship with futures prices of selected commodities of that category. Further the selected agricultural commodities which are grown in same area and same season have strong relationship with futures prices of other selected commodities. The study concluded that future contract can be used by the hedgers to hedge the risk of one commodity with the other commodity of similar group.

Kaur and Anjum (2014) studied the relationship between commodity future and spot price of wheat. The study has taken daily spot and future price of wheat traded in NCDEX for the period January 2006 to December 2011. The study found out that there is a considerable boost in volume of commodity trading in India after the materialization of national and regional commodity exchanges. The study concluded that there is significant correlation between spot and future prices of wheat during the sample period

Athma and Rao (2013) studied the co-movement of the futures and spot prices of menthe oil and also assess the leadership between the futures and spot markets in mentha oil. The study used 3 day moving average, cross correlation function, Augmented Dickey fuller test, Multiple regression, Johansen's Cointegration approach, VECM and

granger causality test. The study revealed that average spot price of menthe oil is greater than average future price which shows a backwardation. The study also revealed that effect on spot on future price is more compared to the effect of future on spot prices.

Kaur and Anjum (2013) studied the regulatory framework of commodity futures market in India and various developments in Indian commodity derivative market. The study revealed that there is a wide increase in volume of trade and number of commodities which are offered for trade.

Chhajed and Mehta(2013) studied the market behaviour and price discovery in Indian agricultural market for 9 agricultural commodities for a period April 2009 to March 2010. The study used granger causality test to study the causality between the variables. The market behaviour was analysed using contango and backwardation. It was revealed that the commodities showed contango to a great degree. The authors concluded that if variations in spot price force variations in futures market, competent hedging strategies can be devised, on the other hand if futures prices drive changes in spot prices, efficient speculation strategies can be formulated.

Dash and Andrews (2013) analysed the market behaviour and price discovery of 21 commodities traded in NCDEX during the period of Jan 2005 to Mar 2007. The market behaviour was analysed in terms of contango and backwardation where most of the commodities showed contango with few exceptions (Wheat, Barley, Gur and Groundnut(shell)). Analysis showed that price discovery with 16 commodities out of 21 showing a bidirectional relationship between spot and futures prices.

Malhotra(2012) studied the origin and growth of commodity derivatives market and analysed the challenges ahead. The study states that distinctions of commodity and stock exchanges where, in stock exchanges prices are determined in centralized locations of stock exchanges and in commodity market prices are determined in local markets. The study also substantiates that quintessence of commodity market is hedging. The study recommends the use of Information Technology in the exchanges, the integration of commodity derivatives market with spot market and that introduction of options will further pave way for the development of commodities market. The study points out that warehousing need to be reformed.

Dash et.al (2012) studied the market behaviour and price discovery process of commodities market. The study also examines the impact of various macroeconomic indicators on the movement of spot and future prices of commodities. The long term volatility of prices is examined using GARCH model. The study revealed that Gold and US Dollar are inversely related and gold can be used as an effective instrument when US Dollar falls. Silver prices are found to follow gold price trends and it serves as another effective instrument. Base metal prices are affected by changes in inventory level, major consuming industries, political unrest etc. Energy products like crude oil and natural gas are affected by weather/seasonality. The study found out that long run volatility of zinc, gold were low while that of other commodities are found to be high specially that of channa and natural gas. Spot and future price volatility was found to be significantly responsive to shocks. Augmented GARCH (1,1) model indicate that effect of trading volume on future price volatility was significant for gold, crude oil and copper, while it was seen that inflation had a significant effect on the crude oil price volatility but there is no significant effect on future price volatility of gold natural gas and pepper.

Mahalakshmi et.al (2012) analysed the Indian commodities derivatives behaviour by means of ARCH/GARCH models. The study used composite commodity derivatives index of MCX for a period of 5 years from 2006 to 2011. The study revealed that the Composite Index of MCX is influenced by its own past movements. The study concluded that forecasting of commodity index is not possible without bearing in mind its squared residuals and conditional variance.

Dummu (2009) studied the importance of commodity market and the obstacles faced for the development of the market. The study found out that there is tremendous increase in volume and value of business but the growth rate is not sustainable because of various issues. The study found out that there are many unresolved issue which needed to be resolved for the development of commodity market

3.2 REVIEWS ON RELATIONSHIP WITH MACROECONOMIC INDICATORS:

Mishra and Debashish (2018) studied the association of global crude oil prices, exchange rate, inflation and stock market in India using Vector auto regression approach. The monthly data of the variables from the period April 2001 to March 2017 have been

used in the study. A positive association between crude oil and stock index and a negative association was revealed between crude oil and exchange rate in the analysis. A positive relationship between crude oil and inflation which is attributed to the increase in cost of production for an oil importing country.

Patel and Prajapathi (2018) studied the relationship between gold, silver and crude oil with Sensex from the period 2012 to 2016. The correlation analysis revealed a positive relationship between crude oil and Sensex and a negative relationship between gold and silver with Sensex. The regression analysis revealed a significant impact of gold, silver and crude oil on Sensex.

Raza et.al. (2017) studied the asymmetric relationship between oil shocks, U.S. Inflation and energy and non energy commodity indices during the period 1970 to 2016. The short run and long run dynamics have been studied using Non Linear Auto regressive distributive lags (NARDL). The analysis revealed both long run and short run relationship between oil and inflation shocks with commodity prices. The study concluded that the commodities can be used to retain the purchasing power and can be used a hedging tool during inflation.

Aggarwal (2017) analysed the impact of stock prices on commodity prices inflation in India for the period 1997-2016. The study confirmed the linkage between commodity price inflation asset price inflation in which commodity price inflation granger causes asset price inflation.

Barakat et.al ;(2017) studied the impact of macroeconomic variables on stock market of Egypt and Tunisia during the period January 1998 to January 2014. The study used Interest rate, CPI, Exchange rate and Money Supply. The study revealed that all the macroeconomic variables are co integrated with the stock market in long run.

Aleeni et.al (2016) studied the role of gold prices, exchange rates and interest rates on inflation in Pakistan. The study revealed that gold and interest rates are significantly positively correlated with inflation in long run. The exchange rate is found to have insignificant impact on Inflation. In the short run, exchange rate is found to be negatively associated with inflation. The study concluded that inflation adjusted for about 11% a year and will take more than 8 years to eliminate short run equilibrium.

Sri Ram and Ramesh (2016) studied the impact of interest rates, inflation and GDP on spot commodity Index. The study was done for a period of 1st April 2004 to 31st March 2014. The study revealed that there is a high negative correlation between COMDEX and GDP. While COMDEX and Interest rate shows positive correlation

Hemavathy & Gurusamy (2016) studied the causality and cointegration of gold price and NSE Nifty. The study revealed that change in stock market is not influencing gold price. The cointegration results reveal that there is a long run causality relationship between two variables. The study concluded that the gold offers diversification and safe haven to investors in Indian Market.

Ostwal (2016) investigated the causality between stock market return, commodity market, crude oil prices and exchange rates. Composite CNX stock return is used as a proxy for Indian stock market, where as energy index was used as a proxy for commodity market as the study relates to energy sector. The johansen's cointegration test revealed that there is no cointegration between the variables. Granger causality test shows that there is bidirectional granger causality between crude oil prices and commodity market as well as stock return and exchange rate. No granger causality was found between any other variables.

Jena(2016) studied financialisation of commodity market in India. It was seen that stock returns were having more returns with high volatility as compared to commodity returns. The study found out that there is high correlation between commodity and stock market and commodity price does granger cause stock price in India. The study concluded that there is no strong evidence of financialisation of commodity market in India.

Najaf (2016) studied the relationship of gold and oil prices and stock exchange in Pakistan. The study used KSE 100, Gold, oil and GDP from 1996 to 2013 have been used for the study. Correlation and regression have been used to study the relationship between the variables. The study revealed that there is no impact of oil and gold prices on stock market.

Thota & Bandi (2015) examined the effectiveness of commodity futures as an inflation hedge for investors in India during the period January 2004 to December 2014.

The study used regression analysis. The study revealed that future contracts such as ATF, carbon credits, coriander, Heating oil, Maize, Refined soy oil, Rubber, Thermal coal & tin traded in MCX and Aluminium, castor seed, copper, Medium staple cotton, cashew, furnace oil, mentha oil, pepper and yellow peas traded in NCDEX are perfect hedge against inflation, expected and unexpected inflation as their coefficients are found to be higher than 1. Turmeric traded in MCX and Nickel traded in NCDEX is perfect hedge against inflation and unexpected inflation. The study concluded that most of the agricultural futures are perfectly hedgeable against inflation belong to agriculture sectors

Sumathy and Ramya (2015) studied the correlation between Indian and other asian stock markets. The study analysed the returns of Bombay Stock Exchange, Hong Kong Stock Exchange, Singapore Stock Exchange, Korean Stock market and Japan Stock Exchange. The study revealed that there is significant correlation for most of the indices and all indices have more impact on sensdex.

Shiva and Sethi (2015) studied the dynamic relationship among gold price, exchange rate and stock market. Monthly data of Gold price, exchange rate, CNX Nifty , sensdex are used as sample. ADF test, Johansen's Cointegration test, VAR, VECM, OLS and granger causality are used to analyse the relationship. The study revealed that sensdex, Nifty and exchange rate are in equilibrium in long run, while there is a unidirectional causality from gold price to Nifty and gold price to exchange rate.

Noor et.al (2015) studied the long run relationship and short term causal dynamic linkages between Indian stock market and gold prices. Daily prices of BSE Sensdex and Gold prices for a period August 2006 to May 2014 have been taken into consideration. The study revealed that there is a long run relationship between the variables and there is a short run bidirectional relationship between the variables. The study concluded that there is an option of diversification in long run between the variables

Sreeram et.al (2015) studied the impact of commodity market on equity market. The study used Nifty, MCX Comdex, MCX Agri, MCX Metal, MCX Energy, IIP and Inflation. ADF tests, Bivariate Correlation, Granger causality have been used for the study. The study revealed that performance of equity market was inferior before the commencement of commodity market. The study also reveals that metal index is having

strong correlation with Agri and Energy, while energy index is having moderate correlation with Agri Index. It was also found that inflation does not influence comdex and IIP, IIP is not having influence on nifty movement.

Rajyalakshmy et.al (2014) studied the relationship between steel price in commodity market and equity market of steel industries. The study also attempts to find the association between CNX metal index with spot market steel price, spot market commodity metal index and Nifty Index. Regression Analysis is used in the study. The study found out that there is significant relationship between commodity market and equity market in steel industry in 3 lags but not in 0, 1 and 2 lags. A significant positive relation was found to exist between movement of steel industry and MCX metal spot index. CNX metal and MCX metal index was found to have a strong positive correlation in the study. The study concluded that 73% variance of CNX Metal Index are accounted steel index, spot MCX metal index and Nifty taken together

Singh (2014) studied the empirical relationship between Indian stock market and macroeconomic indicators. The study used monthly data of Bse Sensex, Nifty, IIP, WPI, Money supply, Interest rates, trade deficit, FII, crude oil price and gold price from January 2011 to December 2012. The study revealed that gold has an adverse affect on stock market showing increasing interest towards it. The study showed there is a negative impact on exchange rate on stock market on the other hand money supply has a positive impact on the stock market. The study also revealed that there is causal relationship from FII to stock market.

Prabhakaran (2014) studied the dynamic interactions of macroeconomic indicators and stock market movements in India. Nifty, Gold Price, Oil price, Debt traded rate and exchange rate for period 2009-10 to 2011-12 have been used for the study. The study shows that oil price and exchange rate have significant impact on Indian stock market. Further exchange rate shows negative impact on stock market, while gold price show positive effect on stock market.

Chevalier and Ielpo (2014) studied the cross market linkages between commodities, bonds, inflation and Industrial production. The study revealed that all the

variables have at least one co integrating relationship at 1% level. The study also finds that bond market act as a transmission mechanism across commodities and other variables in the economy.

Bhunia (2013) studied the cointegration and causality relationship among crude price, gold price, exchange rate, sensex and nifty. The study used ADF test, Johansen's cointegration test and granger causality test to study the relationship. The study revealed that all the variables are closely Interlinked.

Mensi et.al (2013) studied the correlations and volatility spillover between stock market and energy, food and gold. Daily closing prices of S& P 500, beverage price, wheat price, gold price and two crude oil benchmarks are taken as sample. The study revealed that there is a significant correlation and volatility transmission across commodity and equity market. The study highlighted the importance of including commodity in the portfolio.

Kumar and Shollapur (2012) studied the linkages and co movement of commodity and equity market. The study used correlation, ADF test and engle granger test of cointegration to know the co movement. Sensex, Nifty, MCX Comdex, MCX Agri, MCX Energy and MCX metal for period from 2008 to 2011 have been used for the study. The study shows there is a positive correlation and the cointegration test revealed that there is no significant co-movement between commodity and equity indices

Joshi (2012) studied the impact of stock, forex and crude oil on gold. Trend analysis and correlation are used for the study. Daily closing prices of sensex, exchange rate, crude oil and gold prices are used for the period 30/1/2008 to 14/3/2008 and 3/7/2010 to 4/8/2010. The study revealed that sensex, exchange rate and crude oil should be taken together irrespective of one is volatile and others are stable. The coefficient of determination is moderately high for econometric relationship with gold.

Yamori (2011) studied the co-movement of commodity market and equity market. The daily closing prices of Tokyo commodity exchange and Tolyo Stock exchange was taken from May 31, 1986 to May 31, 2010 are taken into consideration. The study used trend analysis and correlation to analyse the relationship between the

markets. The study concluded that commodity market has lost the character of alternative asset.

Selvarani and Rani (2010) studied the dynamic relationship between commodity market and financial market. The study used indices of MCX- MCX Agri, MCX metal and MCX energy. Nifty and Dow Jones was considered for financial market. The study revealed that Nifty influenced commodity indices and MCX energy influenced commodity and financial market before the crisis period. But after the crisis MCX metal influenced financial indices and other commodity indices. From the analysis it was confirmed that changes in the commodity markets have transmitted into financial markets.

Mukherjee (2007) made a comparative analysis of Indian stock market with US, Russian, HongKong, Japan and Korean stock markets. The period of study is divided into several periods from 1995 to 2006 so as to analyse the effect and movement of stock market. The study revealed that Indian stock markets have started to integrate with other markets especially after 2002-2003.

Raizada and Sahi (2007) studied the commodity market efficiency and its effect on inflation. Daily future and spot prices of wheat, Inflation, oil index and money supply have been used in the study. Wheat futures and spot prices for five horizons- one week, two week, one month, two month and three month prior to maturity of each contract have been taken into consideration. The study revealed that cointegration exists only one month before the expiry of contracts. The study also showed that future prices contain better information about supply and demand when it is closer to maturity. VECM results showed that future prices are an unbiased predictor of spot prices. The study concluded that trade volumes have significant impact on Inflation.

Simpson (2002) studied the relationship between commodity prices and Australian Dollar by using OLS, ADF test, Granger Causality and Cointegration test. Australian Dollar to US dollar exchange rate and indexed commodity prices from 1986 to 2001 have been used for the study. The study revealed that there is a negative relationship between commodity price changes and exchange rate changes in Australia in short term. The analysis showed that there is two way causality with stronger causality running from

first difference of commodity prices to first difference of exchange rate. The study concluded that Australia is a price taker and volatility of commodity prices is reflected in volatility of exchange rate.

3.3 REVIEWS ON PRICE DISCOVERY AND VOLATILITY

Kumar et.al. (2018) studied the price discovery process of derivative market of gold and gold guinea traded in MCX and their spot markets from 1st January 2011 to 31st December 2016. The analysis revealed a long run cointegration relationship between spot and future market of gold and gold guinea markets. The results of granger causality revealed a bi directional relationship between gold derivative and spot markets. A case of non causality is revealed between derivative and spot market in the case of gold guinea contract which is attributed to the small size of contracts.

Seth and Sidhu (2018) studied the price discovery process and volatility spillover in wheat market during the period 1st June 2013 to 31st July 2017 traded in NCDEX. The unit root test revealed the stationarity of the variables in the first difference. The cointegration tests revealed the spot and future market are co integrated in long run. The vector error correction model revealed that the dominance of future market in price discovery process. The volatility spillover analysis using GJR-GARCH model revealed a bidirectional spillover from near to next month future to spot market of wheat.

Narayan and Sharma (2018) analysed the time varying price discovery process and proposed a model based on rolling window error correction framework. The study used monthly time series data on 17 commodities namely, canola, cocoa, coffee, copper, corn, cotton, crude oil, gold, Natural gas, Palladium, Platinum, Silver, soybean yellow, soybean meal, soybean oil and wheat from January 1977 to September 2012. The commodities natural gas and cotton are removed due to non stationarity characteristics of the variables. The evidence of oscillating price discovery was found in the case of the remaining commodities where in some time period a dominance of spot market in price discovery was found and another time period a dominance of future market was found in price discovery which was linked to the specific commodity market events.

Kumar (2017) studied the price discovery process of nine crops namely, Wheat, Maize, Barley, Mustard, Gram, Soybean, Castor seed, Coriander and Cumin traded in

NCDEX during the period 2009-14. Linear and Non linear Granger Causality models have been used in the study. It was found that futures market perform the price discovery function in all market, that is the information is first reflected in futures market after which spot market makes the adjustment so that both are at equilibrium in short run. The study concluded that by providing information of futures prices to the farmers will help farmers to manage the price risk and to take the decision regarding the selling or holding of crop at any point of time.

Trabelsi (2017) analysed the volatility of agricultural commodity and crude oil global markets. The study used four agricultural commodities viz; rice, wheat, cotton and coffee over the period 1980-2014. The volatility co-movement between crude oil and agricultural markets were also examined. The study revealed that international prices of agricultural commodities are highly volatile and are likely to react persistently to shocks. The study also showed that positive shocks have more effect on volatility than negative shocks. A strong evidence of interdependence and oil was not detected during this period suggesting international price of agricultural commodities are dependent on role played by the participating actors within the market rather than price of crude oil.

Velmurugan and Irshad (2017) studied the role of commodity futures on Indian Agricultural Commodities futures on Indian Agricultural Commodity market. The study uses daily price history of spot and futures of five agricultural commodities viz; castor seed, Chana, Chilli, Jeera and Wheat from 2007 to 2014. The study revealed that there is significant co-movement of spot and futures prices in these commodities. The Engle Granger cointegration test confirms that spot and futures prices of agricultural commodities are co integrated.

Mukherjee and Goswami (2017) studied the pattern of volatility of Potato, Gold, Crude oil and Mentha Oil traded in MCX during the period 2004-2012. The study used GARCH model to analyse the volatility pattern of commodity. The study revealed that there is volatility persistence for all the selected commodities future except potato. The study examined Samuelsson hypothesis and volatility features of commodities using Beta term in GARCH model and revealed that gold futures are well developed and organised in Indian Market.

Kumar et.al. (2017) studied the price discovery of Cotton spot and futures contract traded in MCX and NCDEX during the period January 2013 to May 2017. The study revealed that there is long run association between future and spot prices of Cotton. The granger causality test revealed a leading role of future market in price discovery function.

Ranganath et.al. (2017) studied the volatility spillover between future and spot market of agricultural commodities. The study have taken into account five agricultural commodities traded in NCDEX viz; Refined Soy Oil, Guar Seed, Channa, Soya Bean and Castor Seed during the period January 2004 to November 2016. The EGARCH(1,1) model was used to analyse the volatility spill over between future and spot markets. The study revealed a bidirectional spillover from future to spot market with stronger spillover from future to spot. The study found a leverage effect in future and spot market of all commodities. The study concluded that volatility is persistent in all commodities except for Castor Seed.

Shanmugham and Amrah (2017) studied the relative efficiency and Volatility of Indian Agricultural commodities. The study used spot and futures prices of nine commodities from NCDEX (Channa, Barley, Coriander, Maize, Pepper, Soyabean, Jeera, Chilly and Sugar) and six commodities from MCX (CPO, Cardamom, Potato, Refined Soy oil, Turmeric and Wheat) during the period May 2005 to December 2011. The Johansen's Cointegration test revealed that future and spot prices are co integrated in long run for all the selected commodities which reflects the efficiency of these markets. The study revealed a bidirectional flow of information for majority of the commodities. The study concluded that there is high degree of volatility clustering and persistence for all the commodities throughout the study period

Dhineshni & Dhandayuthapani (2016) studied the price discovery mechanism of spot and futures market in agricultural commodities in India for a period 2010 to 2015. The study revealed that there was a long run equilibrium relationship between spot and futures prices of Chilli, Coriander, Jeera, Pepper and turmeric. The VECM model showed bidirectional causality between spot and futures market in these commodities. The study concluded that both spot and futures market are informational efficient and reacts quickly to each other.

Jin et.al (2016) analysed the price discovery in Chinese gold market. The tick by tick data have been taken from Shanghai Gold Exchange and Shanghai future exchange from January 2012 to October 2013. The study revealed that the price discovery process in Chinese gold market is happening in futures market.

Nambiar and Subramaniam (2016) studied the price discovery in rubber market traded in NMCE for a period of 10 years (2004-14) The period have further been divided into pre recession (2004-2008) and post recession (2008-2014). The study revealed that rubber futures do the price discovery function and it has been concluded that futures market can be used for risk management by investors.

Bergmann (2016) studied the price and volatility transmissions in butter, palm oil and crude oil markets. The price and volatility transmission effects between EU and world butter prices, as well as butter, palm oil and crude oil prices, before and after Luxemburg agreement have been analysed. VAR models are applied to capture the price transmission and multivariate GARCH model to study the potential volatility transmissions. The results revealed that there is a strong price and volatility transmission between EU and world butter prices. EU butter shocks shows further spill over to palm oil volatility. The study also showed that there is oil price spill over to world butter prices and world butter volatility.

Malhotra and Sharma (2016) studied the volatility dynamics in the oil and oilseeds market in India. The study used four commodities namely, Soya oil traded in NCDEX, Mentha oil and crude palm oil traded on MCX and Mustard seed traded in NMCE traded during the period 2008-13 for the study. The spill over was found to be more from spot to future for all commodities except mustard seed indicating the informational efficiency of spot market than futures market. The volatility spill over between futures and spot market in case of mustard seed was found to be of equal strength . The study highlighted the importance of participation of farmers, processors and other stake holders in bringing the important information to the future market.

Paul and Bharadwaj (2016) did an econometric modelling for optimal hedging in commodities. The study used Soybean future and spot prices traded in NCDEX for the period November 2012 to April 2013. The study employs ordinary least squares method

and other alternative model from multivariate GARCH family. The study revealed that there is difficulty in hedging in futures because of transaction costs. The study concluded that investors should search for more suitable hedging instrument.

Sinha and Mathur(2016) in their study analysed the linkages of Gold futures traded in MCX and those traded in NYMEX. Johansen's Cointegration test, Wald test, Error Correction model, 3 variants of GARCH model are used in the study. The authors empirically prove that the both markets are cointegrated and there is a long run equilibrium relationship between the markets. Short run causality is rejected from NYMEX to MCX whereas there is a presence of short run causality from MCX to NYMEX. By using the 3 variants of GARCH model, it has been found that the return of MCX gold futures is influenced by the return and volatility of gold traded in NYMEX. The ARMA-GARCH model shows a return and volatility spill-over of Innovation from NYMEX gold futures to gold futures traded on MCX. The analysis also shows a return and volatility spill-over effect of Innovation from Gold futures traded in MCX to those traded in NYMEX.

Bhavani et.al; (2015) studied the price volatility in chilli market of Guntur, Khammam, Virudnagar and Nagpur during the period 1997 to 2011. The study used ARCH and GARCH models to model the volatility. The study revealed that market persistence and volatility is high in all chilli markets and is found the highest in Nagpur Market.

Behera (2015) studied the long memory and spill over effect of daily future and spot return of Gold, Silver, Copper Natural Gas and Crude oil traded in MCX during the period 2005 to 2011. The study uses FIGARCH model which revealed long term memory properties in spot and future return of gold, silver, crude oil and copper and the spot return series of Natural gas. BEKK Model revealed a bidirectional shock transmission in all commodities.

Singh(2015) in his study has analysed the role of futures market in price discovery by taking two non-precious metals (Zinc and Nickel) as sample. The daily data has been taken for the period Apr 2011 to Mar 2014. Stationarity of data is checked through Augmented Dickey Fuller test and are found to be stationary at first difference. A

Johansen cointegration test reveals there is a long run equilibrium between spot and futures prices. By employing a Vector Error Correction model it has been revealed that the spot prices respond significantly to re-establish equilibrium when deviation occurs. A bidirectional causality is shown between futures and spot prices but futures market is found to be more efficient than spot market which show more info flows from futures to spot.

Sharma(2015) studied the long run and short run causality between spot and futures prices of selected agricultural commodities of NCDEX in India. Daily spot and futures prices of Chana, Soyabean, Soya refined, Guar gum, Potato and Pepper are included in the study. Cointegration of spot and futures was found for all commodities except Guar gum and Potato. Vector Error Control model and Wald is applied to examine the long run and short run causality between futures and spot prices. The study empirically proves that futures price leads to spot price in case of Soya and Soya oil and there is a bidirectional relationship between futures and spot price of Chana and Pepper.

Kumar(2015) his study analysed the performance and efficiency of Pepper futures in India. Performance is analysed in terms of the extent of liquidity, price volatility and basis risk. It has been found that the producers do not find futures market as useful for them as it is not profitable and futures market is showing speculative activities or information is not incorporated fully. The efficiency of the market is analysed by using cointegration, Vector Error Correction model, Granger causality, Impulse response and Variance decomposition. The result shows that the markets are cointegrated; short run adjustment is analysed through Vector Error Correction model which shows that spot price tends to make adjustment when there is disequilibrium. Granger causality results show there is a unidirectional relationship from spot to futures which shows that spot prices can be used for pricing futures market transactions. The impulse response graph and Variance decomposition analysis show that response of spot market to the shocks in futures market is more and spot prices variations explained by future prices are much larger. The study concludes that Pepper has not done performed well but the hedgers can use futures market to manage the price risk.

Nirmala et.al (2015) studied the price discovery in cardamom futures and spot prices traded in MCX from 12/6/2005 to 31/12/2008. The study used ADF test, Johansen's Cointegration test, Granger causality test to analyse the price discovery process. The study revealed that there is at most 2 co integrating equations which confirms the long run equilibrium relationship between spot and future market. The granger causality test revealed that there is a unidirectional relationship between cardamom futures to spot price.

Pani and Jadhav(2015) in their study analysed the linkages of Crude oil futures of Indian and International markets using Vector Error model and Granger Causality tests. They empirically prove that there is long run equilibrium relationship between the markets. They have concluded that both markets influence each other but NYME has stronger impact on Indian prices

Swain and Samal (2015) studied price discovery in Indian raw jute market. The study revealed that there is a long run cointegration relationship between the variables. It was seen that futures has long run causality on the spot and one and two day lagged prices on the other hand the spot price has no long run causality on the futures prices and one day lagged price can cause future price. The study concluded that spot market leads the futures market and the cost of carry model holds good for Indian raw jute market.

Joshy and Ganesh (2015) studied the price discovery in spot and futures market of gold traded in NCDEX for a period 2008-12. ADF test, Johansen's Cointegration test, VECM and GARCH model have been used in the study. After confirming stationarity at first difference, the study revealed that there is long run equilibrium relationship between spot and futures. The study concluded that in gold, spot price plays the dominant role.

Kumar and Shollapur(2015) studied the price discovery and volatility spill over in the agriculture future market in India. The study used soy oil, soy bean, mustard seed and chana as sample. The study revealed that futures market are able to do price discovery process and also aid in risk hedging.

Natarajan and Nirupama(2015) studied the relationship between spot and future prices of MCX during 2006 to 2012. The cointegration test revealed that there is a long

run equilibrium relationship. The granger causality revealed that there is a bidirectional relationship between variables.

Zhong(2015) analysed the price discovery process for Chinese Gold market. The study adopts Classic information Share and Component Share to analyse the informational leadership. The study revealed that Chinese gold futures market facilitates price discovery for Chinese spot market.

Behera(2015) studied price discovery and market efficiency of Indian commodities futures market. The study used daily futures and spot prices of 1/9/05 to 30/12/11 for gold, silver, copper, crude oil and natural gas. The study revealed that futures and spot prices of all commodities are cointegrated and the error correction term reveals that prices are first reflected in futures market and then transmitted to spot market.

Ahmed (2015) studied the price discovery function of Malaysian CPO during the period January 2007 to December 2011. The study revealed that both future and spot prices are cointegrated in long run. The Vector Error Correction Model revealed a upper hand of Spot market in Price Discovery function.

Mehrara and Hamldar (2014) studied the relationship between future and spot prices of Brent Crude oil. The study used daily future and spot prices during the period 17/8/1990 to 3/11/2014. The study revealed that there is a long run equilibrium relationship between future and spot prices. The granger causality test revealed that there is a bidirectional relationship between future and spot prices of Brent crude oil.

Shakeel and Purankar (2014) studied the price discovery mechanism of three top traded agricultural commodities on NCDEX viz; Soybean, Castor seed and chana. The Johansen's cointegration test revealed that there is a long run equilibrium relationship between spot and futures prices of the variables. The VECM results revealed that there is bidirectional causality between spot and futures market of the selected commodities and these commodities are said to be informationally efficient and reacts quickly to each other.

Prassanna (2014) made a performance evaluation of Agricultural commodity futures market in India. The study have used ten agricultural commodities (Barley, Chan, Castor seed, Soyabean, Potato, Guargum, Guarseed, Jeera, Pepper, Turmeric) for the study. The study used Johansen's cointegration test, Granger causality and VECM to measure the performance of these commodities. The depth of the market is measured by the number of contracts traded. The study revealed that Barley, Castor seed, Jeera and pepper have their spot market leading to future market in price discovery because of the low participation in futures market. Chana is having high level of participation, which reflects in future market which leads the spot market for price discovery. Guar gum, Guarseed, even though have high participation, spot prices leads to futures because of frequent bans and abnormal trading due to unprecedented demand. Soyabean is considered as an international commodity an international commodity and for turmeric futures market is not explained by the participation level in futures market. Thus the study concluded that the strength of futures market is weak in many commodities.

Sendhil.R and Ramasundaram.P (2014) examined the performance and integration of wheat futures trading by examining the integration of India and US futures and domestic futures and spot market. The role of wheat futures in price stabilization and volatility reduction has been examined. The study revealed that domestic futures and spot market are cointegrated but cointegration is rejected in the case of India and US futures. The GARCH model revealed that volatility persistence was low during the ban period and was found to be higher during the trading and revival period. The study concluded that futures market are efficient in price discovery but inefficient in price stabilization.

Sahai(2014) in his study analysed the efficiency of Refined Soya Oil using Engle Granger Cointegration test and Granger Causality test of coefficient restrictions is done using Wald test. It has been found that eventhough the markets are Cointegrated the test of coefficient restrictions does not support price discovery and unbiasedness. The study concludes that Refined Soya Oil market is not fully efficient and cannot be used for optimal portfolio hedging.

Haq and Rao (2014) in their study have analysed the efficiency of 10 agricultural commodities traded in NCDEX. It has been found that there is a long run equilibrium of

spot and futures for all the commodities. They have concluded that there is existence of short run inefficiencies and pricing bias.

John (2014) studied the price relations between international rice markets. The study used 5 major rice exporting markets from Asia and America to study the price transmission. The study used Vector Auto regressive frame work, as well as granger and Toda Yamamoto Causality test and generalised impulse response functions to interpret the model results. The study revealed that Asian prices act as price leaders for North and South American prices. The study concluded that Vietnamese rice export price is suitable as reference price for rice markets.

Saranya(2014) studied the volatility and price discovery process of non-agricultural commodities for the period 2008 – 2014. The study revealed that both the market are Cointegrated and are in equilibrium in the long run. Granger causality test revealed that a bidirectional causality for Copper, a unidirectional relationship from spot to futures for Tin and Silver. The study concluded the existence of volatility in spot and futures market in the non-agricultural commodities.

Peri et.al (2013) studied the long run relationship between spot and futures prices for corn and soybean. Cointegration methodology allowing the presence of potentially unknown structural breaks is used in the study. The causality relationship between spot and future prices within each sub period is identified with the aim of analysing price discovery. The study revealed that multiple breaks exist in cointegrating relationship between prices. The study also found the different dynamics in causal relationship between spot and futures prices. The study concluded that price discovery is more related to fundamental patterns rather than financial trading on futures market.

Sinha and Mathur (2013) studied the price, return and volatility linkages of base metals(Aluminium, Copper, Nickel, lead and Zinc) traded in MCX and LME. The study uses Johansen Cointegration test, Vector Error Correction model and ARMA-GARCH model. The study found strong linkages with Indian and International markets. The study also questions the imposition of commodity transaction tax which would lead to a shift in investment from Indian commodity market to International commodity markets where transaction cost is lower.

Chevallier and Ielpo (2013) studied the volatility spillovers in commodity market. The study used the methodology followed by Diebold and Yilmaz to assess the extent of volatility spillovers. The study analyses volatility spillover within commodities, between standard assets and commodities and between commodities and commodity currencies. The study indicates commodities exhibit spillovers weaker than other asset classes. The study empirically proves that agricultural commodities exhibit lowest spillovers whereas; precious metals and energy are the biggest net contributors. The study also found out that some currencies are more responsive than others to commodity volatility spillovers. The study concluded that in a diversified portfolio- including agricultural products helps in decreasing total spillover index.

Sendhil et.al(2013) studied the market efficiency of Indian Wheat futures in terms of price transmission, price discovery and extent of volatility. Through Johansen's Cointegration it has been found that both futures and spot prices are having a long term equilibrium relationship. Through Vector Error Correction model it has been found that short run price deviations are adjusted more in spot price than futures price. Garrett model reveals the existence of price volatility. The study reveals the inefficiency of Wheat futures and suggests the farmer participation with institutional interventions which will improve the efficiency of market.

Sehgal et.al(2013) studies the price discovery and volatility spill over of 12 sample commodities traded in MCX and 4 indices of MCX for a period of Nov 2003 to Mar 2011. The results show that there is a long run association between 8 out of 12 commodities and 3 out of 4 indices. Further short term dynamics is analysed by using Vector Error Correction Model which reveals that all the commodities/indices except Natural gas, spot prices make greater adjustment in-order to re-establish the equilibrium if there is a deviation in short run. The variance decomposition results show the dominant role of futures market in the price discovery process. The volatility spill-over is analysed using EGARCH model where a bivariate volatility spill-over is found for 3 commodities (Soybean, Zinc and Natural gas) whereas there is no significant volatility spill-over for other commodities. It has been concluded that commodity market is still not perfectly competitive for some commodities. Even though price discovery is present in the market,

the volatility spill-over results are weak, which shows that efficient risk transfer system is yet to evolve for most of the commodities.

Gupta and Ravi (2013) studied the volatility spillover in Indian Commodity futures market and Inflation. The study uses five commodities viz; Chana, Guarseed, Refined Soy oil, Gold and Silver traded in MCX, NCDEX and NMCE during the period 2005 to 2012. The study revealed that future prices play a prominent role in price discovery process. The results of EGARCH(1,1) model confirmed the presence of bidirectional volatility spillover in all the commodities.

Berlia and Sehgal(2013) studied the Information transmission between India and International commodities market. They included Bullion(Gold and Silver) and metals(Aluminium, Copper, Zinc) traded in MCX, COMEX, LME, and SHFE for a period of 2005 to 2012. The analysis of price discovery was done through Cointegration test and it was found that there is a long run equilibrium relationship among the futures prices within the exchanges with the exception of aluminium. MGARCH method is used to analyse the volatility spill-over which reveals that in case of bullion, MCX is more dominant than COMEX while in case of metals, LME seems to play the dominant role followed by MCX and SHFE.

Chauhan et.al (2013) studied the market efficiency and volatility spillover in future and spot market of agriculture commodities. Chana and guarseed was taken as sample. The period chosen for the study was April 2004 to March 2012. The study revealed that there is a bidirectional causality of spot and future prices of guarseed and unidirectional causality from future to spot is found for chana. The study concluded that spot prices respond more to the shocks in future prices of both commodities.

Barsavaraj and chowdri (2013) studied price discovery of red chilli futures traded in NCDEX for period of 2006 to 2011. The study revealed that there is long run equilibrium relationship between futures and spot prices. It was also found that there is a unidirectional causality relationship from future market to spot market but not vice versa. The study concluded that future market for red chilli is more efficient in discovering the future spot prices.

Shivakumar(2013) attempts to compare the price trends of pepper, cardamom, coffee and rubber with non exchange traded commodity like tea using various statistical and econometric tools. The study revealed that price instability was more in cardamom followed by pepper, coffee and rubber before the commencement of futures trading during 2003. But after the commencement of futures trading price instability in spot markets were comparatively lower in all commodities except rubber. The granger causality test revealed that there is a bidirectional causality for coffee and pepper prices. A uni directional causality from spot to future was found in cardamom and rubber. The volatility analysis revealed that cardamom is most volatile among selected commodities.

Sehgal et.al(2013) studied the price discovery and volatility spill-overs of Crude oil in globally linked commodity oil markets in ICE, MCX and NYMEX from 5th Feb'06 to 15th Oct '12. They empirically prove the price discovery between spot and futures in the market with futures prices doing the price discovery process. The analysis also found the ICE is the dominant trading platform followed by NYMEX and MCX. The volatility spill-over results show that there is long term spill-over from ICE to MCX and from MCX to NYMEX. The GARCH-LLL and DLL model confirms the co-movement becomes weak during crisis period and stronger during stable period. The study concludes MCX as an emerging platform and acts as a satellite market vs. International platforms

Yagati and Kamaiah (2012) studied the hedging efficiency of commodities future market in India. Redchilly, Jeera, Pepper and turmeric from NCDEX, cardamom from MCX and base metals from MCX have been taken into consideration. OLS regression model and error correction model have been used in the study. The study found that Red chilly is having hedge ratio and hedging effectiveness higher than Jeera, pepper and turmeric. The study found out that cardamom's hedging performance is poor due to low volume of trade. The study concluded that hedging efficiency of base metals is high compared to agricultural commodity futures

Ferretti and Gonzalo(2012) tried to model and measure price discovery in non-ferrous metals (Aluminium, Copper, Nickel, Zinc and Lead) traded in LME. The analysis concluded that all markets except Copper are backwarded in equilibrium. The study

shows that futures price is information dominant in all market except Lead where spot market is dominant, the reason being it is the least liquid commodity in LME.

Reddy (2012) studied the market integration of chick pea across twelve markets in India. The study revealed that out of 12 only three markets are co integrated. The study also revealed a weak cointegration of chick pea market and the terminal markets located in Delhi, which is the major consuming market and Dohad /Gujarat, which is the major export/ import location, play an important role in price discovery, and also influences the other markets in North India.

Srinivasan and Ibrahim (2012) studied price discovery and asymmetric volatility spill over in Indian gold market traded in NCDEX. ADF test, Johansen's cointegration test and VECM are used in the study. The study revealed that spot market performs the price discovery function in gold market. The study also showed that there is a significant volatility spill over between the markets, with stronger spill over from spot to futures which shows that information flow from spot to futures is stronger.

Goyal & Tripathi (2012) studied the regulation and price discovery in oil spot and futures market for the period February 2005 to June 2010. The study uses US WTI crude oil spot, UK Brent spot, MCX WTI spot and future prices. The granger causality tests revealed that spot price leads futures prices. The analysis concluded that mature market is the leader in price discovery process.

Srinivasan (2012) studied price discovery and volatility spillover in Indian spot-futures commodity market. The study used spot and future prices of MCX indices such as MCX Comdex, MCX Metal, MCX Agri and MCX Energy. The study used Johansen's cointegration test, VECM and bi variate EGARCH model. The study revealed that there is long run equilibrium relationship between the spot and future prices. The study also showed that spot market plays a dominant role in price discovery process. The study concluded that volatility spillovers from spot to futures are dominant.

Ali and Gupta(2011) studied the efficiency of agricultural commodity futures using Cointegration and Causality tests. Daily closing prices of futures and spot of 12 agricultural commodities: Wheat, Rice, Maize, Chickpea, Black lentil, Red lentil, Gaur

seed, Pepper, Cashew, Castor seed, Soybean and Sugar grade M that are traded in NCDEX are taken into account. The series are checked for stationarity and are found to be stationary at first difference. The Johansen's cointegration technique is used to check the long run predictability between spot and futures prices. The results reveal there is cointegration between spot and futures prices for all commodities except Wheat and Rice. Granger Causality test is applied to analyse the direction of relationship. It has been found that there is a unidirectional relationship between futures and spot prices for some commodities (Wheat, Chickpea, Castor seed, Soybean, Sugar and Guar seed) whereas unidirectional relationship between spot and futures prices was found for Rice, Red lentil and Cashew. A bidirectional relationship was found between Maize, Black lentil and Pepper. It has been concluded that futures market performs price discovery process for most of the commodities while price discovery in spot price is also present in some commodities in short run. It is also found that futures market for Wheat is not efficient as there is no Cointegration between futures and spot price but there is a unidirectional relationship where futures price is leading to spot price which can cause an increase in Wheat price.

Singhal et.al (2011) studied the impact of commodity trading on volatility of commodity spot prices by taking into consideration 3 commodities viz; sugar, chana and turmeric traded in NCDEX during the period 01/01/2010 to 31/12/2010. The study used correlation, regression and granger causality tests. Garch (1,1) model was used to study the volatility. The study revealed that there is no sufficient evidence that shows future market leads to inflation.

Ivanov(2011) examined the relative price discovery between futures and cash prices in 30 Indices and commodity markets based on Gonzalo and Grauper permanent transitory methodology. With exception of feeder cattle and Wheat Minneapolis, the price discovery is occurring in futures market. A cross section of variability of Informational shares reveals that information share of futures market is lower when trading volume is lower or if the commodity is a energy commodity or agricultural commodity or if it has traded in ETF.

Shihabudheen and Padhi (2010) studied the price discovery and volatility spillover effect in Indian Commodity Market. The future and spot prices of castor seed, jeera, sugar from NCDEX and gold, silver and crude oil from MCX is used for the study. The study revealed that there is cointegration of spot and futures for all market during the study. Thus necessary condition for price discovery is satisfied. The VECM results reveal that future market lead the spot market in all commodities except sugar where spot market plays a major role in price discovery. The bi variate EGARCH model reveals that past innovation in futures significantly influence spot volatility except in sugar where the volatility spill over is from spot to future which may be due to low trading volume in sugar futures market.

Kumar and Arora(2010) studied the price discovery of gold traded in MCX through Augmented Dickey Fuller test, Johansen's Cointegration test and Granger Causality test. In the study closing prices of futures and spot price of gold are taken into account for a period of June 2005 – December 2009. From the analysis it has been found that futures market is performing the price discovery process.

Easwaran (2009) studied price discovery and price risk management of commodity futures and derivatives by taking cotton as a case. The study used future and spot prices of medium and long staple cotton traded in MCX and NCDEX from the period February 2005 to January 2007. The study used Ordinary Least squares for estimating regression, Wald chi square procedure was used to test market efficiency and unbiasedness of future prices. Bartlett's homogeneity variance test was used for testing integration between spot and futures market. The study revealed that future contracts are not perfect hedge against variations in spot prices. The Bartlett's test reveals that the future market is not aligned with their respective spot market. The study concluded that the inefficiency indicates the market is underdeveloped.

Mahalik et.al (2009) studied the price discovery and volatility spillover of indices of MCX- MCX Agri, MCX Energy, MCX Metal and MCX Comdex for a period 12th June 2005 to 31st December 2008. The study revealed that there is a long run equilibrium relationship between spot and futures in all markets, except MCX Metal. Futures market is found to play dominant role in MCX Agri, MCX Energy and MCX

Comdex. The volatility spillover was found to exist from future to spot in all market except MCX Agri

Morales (2008) studied the volatility spillovers on precious metal markets over the 1995-July 2007 period. The study used GARCH and EGARCH modelling. The results showed that there is clear evidence of volatility persistence between precious metals returns. The results also showed the evidence of bidirectional volatility spill over in all cases with exception of gold that tend to generate effect on all markets but with little evidence of other precious metals influencing gold. The results of asymmetric spill over show that negative news have stronger impact on these market than positive news.

Long and Wang(2008) studied the dynamic relationship between China's metal futures and spot price and London's futures price. For the analysis, Copper and Aluminium have been used as the sample. The study used Johanson's Cointegration list, Granger causality, Vector Error Control model, Impulse response function and Variance decomposition test. The study concluded that there is a long run equilibrium relationship between SHFE, LME futures and spot price. The Vector Error Control model and causality test for Copper shows a bidirectional relationship between SHFE futures and spot. On the other hand LME futures show a unidirectional relationship towards spot price. LME futures and spot price also show a bidirectional relationship for Aluminium. LME futures have a unidirectional relationship towards SHFE futures and spot.

Easwaran and Ramasundaram(2008) studied whether there is efficient price discovery in 4 agricultural commodities viz., Castor, Cotton, Pepper and Soya. It was found that there is no price discovery in the sample market and that the sample market is inefficient. The results indicated that futures market failed in hedge against volatile prices.

Thenmozhi and Priya (2008) studied the volatility spill over of futures and spot markets in Gold, Silver and Crude oil traded in NYMEX, TOCOM and MCX. The study revealed the existence of bidirectional volatility spill over for all the commodities except for crude oil traded in MCX. The asymmetric affect was found in all markets and all commodities except for gold traded in MCX. A stronger volatility spill over from spot to

future was found in gold and crude oil in all exchanges and a strong volatility spill over from future to spot was found in silver in all exchanges.

Nath and Lingreddy(2008) studied the impact of commodity derivative market on spot market. The study used urad, tur and wheat have been taken as sample. The study revealed that introduction of futures in commodities has not affected the seasonal and cyclical fluctuations of commodities under study.

Fu and Qing (2006) studied the price discovery and volatility spill over from Chinese spot and futures market. The study used daily data of copper, aluminium, rubber futures traded in Shanghai future exchange, Soybean futures traded in Dalian commodity exchange and wheat futures traded in Zheng Zhong commodity exchange from January 1997 to December 2004. Cointegration test revealed that there is cointegration between future and spot market. The VECM indicates that it is spot price that makes greater adjustment in order to establish equilibrium that is future price leads to spot price in price discovery. Granger causality results reveal that there is a bidirectional granger lead relationship between spot and futures in copper, aluminium and soybean and single granger lead relationship from future to spot in rubber and wheat market respectively. The analysis confirmed that future market is more informationally efficient than underlying spot market.

Zapata et.al (2005) examined the relationship between sugar futures traded in NewYork and the world cash prices for exported sugar. The study revealed that future market for sugar leads the cash market, but not vice versa. The impulse response functions revealed that a shock in future price innovation generates a quick and positive response in futures and cash prices but not vice versa

Mattos and Gracia (2004) studied the price discovery in thinly traded agricultural future and spot markets in Brazil. The study used coffee, corn, cotton, live cattle, soybeans and sugar. The study revealed that higher trading activity in markets like coffee and live cattle is linked to the presence of long run equilibrium relationship between cash and future prices. In these markets future prices appears to play a more dominant role in pricing process. In case of thinly traded markets like sugar, there showed some degree of cointegration with future prices, with future prices playing a

dominant role. In case of lightly traded markets, like corn, shows almost no cointegration with futures and cash prices. Finally, with cotton and soybeans which stopped trading, showed no long run relationship during the sample period. The study concluded that level of trading activity necessary to promote the transmission of price information between cash and futures market is remarkably small.

Kenougiou and Samantas (2004) studied the efficiency of the copper futures market traded in London Metal Exchange. The data of copper futures from two different futures contract has been taken for the study. The long run and short run efficiency has been tested using cointegration and error correction model. The study concluded that the copper market is not efficient and do not provide unbiased estimates of future copper spot price.

Sahadevan (2002) studied the risk management in agricultural commodities by taking six commodities viz; pepper, cotton, castor seed, castor oil, mustard seed and gur traded in pepper exchange in cochin, Cotton exchange in Mumbai, Bombay commodity exchange and Kanpur commodity exchange respectively. The study revealed that there is a significant Wald Chi square value which indicates that future market is not efficient in predicting future ready prices. The study concluded that future market is not an unbiased predictor of future ready market and he also suggested a pragmatic approach from government, the regulator and exchange for making agricultural futures market a vibrant one for risk management.

Wang and Ke(2002) examined the efficiency of commodity futures market in China by taking Wheat and Soybean as sample. In the study Johansen Cointegration test was used and was found that soybean futures market have a long run equilibrium relationship and are efficient in short run but Wheat futures market is found to be inefficient because of overspeculation and government interventions.

Sahadevan (2002) studied the price discovery, return and market conditions of the commodity futures market. The results from the sample of 6 commodities traded in the commodity market reveal that futures exchanges fail to provide efficient hedge against the volatile prices. An analysis of relationship between price, return and depth and volatility of a sample of 12 markets in 6 commodities reveal that market volume and

depth are not significantly influenced by the return and volatility of futures as well as ready markets.

Thomas and Karande (2001) studied the price discovery in castor seed across multiple spot and future market. The study analysed how market that trade in the same asset in the same time zone react differently to information. The study found out that futures market in Bombay dominates the price discovery in the three out of four contracts, however for March contracts which nears the harvest, spot market in Ahmedabad dominates the price discovery.

Yang and Leatham(1999) studied the price discovery in Wheat futures market across 3 US futures markets. Johanson's Cointegration list revealed that there is no Cointegration between cash markets of these 3 US markets but a Cointegration is found between the futures market. It has also been found that Kansas City Board of Trade(KCBT) had an impact on price changes in both CBT and MGE in long run. The study also questioned the need of 3 futures market when the price movement of KCBT is significantly affecting the futures prices in other markets.

Mckenzie & Holt(1998) examined the efficiency of 5 agricultural commodities viz., Live cattle, Live hogs, Corn, Soybean, and iced broilers for a period of 1966 – 1995. The analysis found that all the markets are efficient in the longrun. Unbiasedness is confirmed for all markets except iced broilers in the long run. Short run inefficiencies were found to be existing in all markets with iced broilers having a constant risk premia.

Garabde and Silber (1983) studied the price movement and price discovery in futures and cash market of wheat, corn, oats, orange juice, copper, silver and gold traded in CBOT. The study revealed that the markets are integrated over a month or two. The study concluded that futures market dominates spot market and cash market acts like a satellite markets in the case of wheat, corn and orange juice where new information is reflected first in futures market and then in spot market.

3.4 RESEARCH GAP

1. From the review of literature, it is seen that commodity market in India has grown manifold within a short span of time. But number of quality research in this area is few compared to equity markets.
2. From the review of literature, it is seen that most of the Indian research studies on commodity market focuses on agricultural commodities or commodities of similar nature. Very little research works are available on commodities from all sectors viz; Bullion, Base Metals, Energy and Agricultural Commodities together. Such a study on commodities market gives a very explicit, wider & an overall view of the commodities market.
3. Further, though there are many studies relating to price discovery in commodities market, there is a large amount of inconsistency in the findings of these studies. As each commodity differs in nature and frequency of trading, an overall study of commodity market is found to be essential for the investors to understand the market better.
4. Long term market trends are critical to understand the movement and volatility of the market. In commodities market most of the studies tend to limit itself to a short span of time period. There is a serious dearth of studies reflecting long term trends of the commodities.

Hence a comprehensive study about commodity market relating to price discovery and volatility spillover for a longer period of time is found to be essential requirement of which has not been done so far. Hence the study has been taken up.