A Study of Relationship Between Spot And Futures Markets of Selected Commodities in India

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CERTIFICATE

I have the pleasure to certify that Shri Anupam Mishra has pursued his research work and prepared the present dissertation titled **A Study of Relationship Between Spot And Futures Markets of Selected Commodities in India** under my guidance and supervision. The dissertation is the result of his own work and to the best of my knowledge, no part of it has earlier comprised any other monograph, dissertation or book. This is being submitted to Panjab University, Chandigarh for the degree of Master of Philosophy in Social Sciences in partial fulfillment of the requirement for the Advanced Professional Programme in Public Administration (APPPA) of the Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that dissertation of Shri Anupam Mishra is worthy of consideration for the award of M. Phil degree of Panjab University.

Approved by the Guide Prof. Suresh Misra

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SELF DECLARATION

I declare that the dissertation titled **A Study of Relationship Between Spot And Futures Markets of Selected Commodities in India** for the award of the degree of Master of Philosophy in Social Sciences in partial fulfillment of the requirement for the Advanced Professional Programme in Public Administration (APPPA) of the Indian Institute of Public Administration (IIPA), New Delhi is original research work and that as per the best of my knowledge the work or part thereof has not been submitted earlier for the award of Master of Philosophy of either IIPA or any other University.

Date: March 2020

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Efficiency of the commodity derivatives markets was a major policy debate for 10 years when I worked with the Forward Markets Commission. The debate still continues. It was then that I came across reports of various academicians / researchers which provided useful policy insights. I often wished, if I had time, resources and an encouraging guide to help me study and analyze all this myself. APPPA programme provided ideal opportunity wherein I could apply my years of official experience in an academic work.

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LIST OF ABBREVIATIONS

APMC	Agricultural Produce Market Committees
BSE	Bombay Stock Exchange
CBOT	Chicago Board of Trade, USA
CBOT	Chicago Board od Trade
CFTC	Commodity Futures Trading Commission of USA
CSRC	China Security Regulatory Commission
CTT	Commodity Transaction Tax
FCRA	Forward Contracts (Regulation) Act 1952
FMC	Forward Markets Commission
FPO	Farmer's Produce Organisation
MCX	Multi Commodity Exchange of India Limited, Mumbai
NABARD	National Bank for Agricultural and Rural Development
NAP	National Agricultural Policy 2000
NCDEX	National Commodity & Derivative Exchange of India Limited, Mumbai
NMCE	National Multi Commodity Exchange of India Limited, Ahmedabad
NSE	National Stock Exchange of India Limited
NSEIL	National Spot Exchange of India Limited
SCRA	Securities Contracts (Regulation) Act 1956
SEBI	Securities and Exchange Board of India

EXECUTIVE SUMMARY

Tradition of futures markets in India is very old and finds reference even in Kautilya's Arthashastra. The organized futures markets in the present form dates back to 1875, with trading in cotton futures at Bombay Cotton Trade Association, which was only a decade after Chicago (United States of America) had traded it's first futures contracts. India had liquid, vibrant and thriving futures markets in various commodities till the Second beginning of World War, which started in 1939. Because of scarcity conditions, then British Government suspended futures trading in various commodities under Defense of India Act 1939. These restrictions, imposed as an emergency measure, continued even after Independence. After Independence, Forward Contracts (Regulation) Act of 1952 was enacted to regulate futures markets in commodities and Forward Markets Commission was set up as a regulator of commodity derivatives markets. After independence, futures markets in commodities by and large remain suspended, but for few minor commodities. Futures trading was conducted thorough various regional, single commodity exchanges which were bereft of both modernity and tradition. During this long period of ban commodity derivatives markets in various countries such as China and USA attained maturity and depth.

Futures markets in commodities provide a market- based mechanism for price discovery and price risk management. It was primarily with this objective that National Agriculture Policy of 2000 and some of the earlier Committees {Kabra Committee, (1993)} had recommended for introduction of future markets in commodities. Government of India while opening up of these markets prescribed certain criteria for the new commodity exchanges, based on the best practices

prevalent internationally and in the securities markets. Three national online exchanges were granted recognition for futures trading in commodities. Volume and value of trading in these markets grew exponentially after opening up.

Futures and spot markets react to the same set of price sensitive information. Causal relationship between the spot and futures market – which market reacts first to the price sensitive information has been a subject of constant debate. Therefore this dissertation seeks to analyze the causal relationship between futures and spot prices which would be of interest to various stakeholders associated with the physical market of the commodities and policy makers. After analyzing nature and concept of futures markets in India and causal relationship between futures and spot markets measures have been suggested to improve the working of these markets.

Spot and future prices of Chana, Guarseed, and Soya Oil for 2005-08, 2011-14 and 2017-19 and nine contracts have been taken for analysis. Spot and futures prices available at NCDEX has been used for the purpose of analysis. These are major agricultural commodities traded on the NCDEX platform and futures tradiing in these commdities has been subject of constant debate & were suspended at diffrrent points of time. Besides this, Reports of the various Committees, which had examined the issue of the commodity derivatives markets and journals have been relied upon. The findings of the research study on the efficiency of futures markets was also validated by interacting with physical market participants in two Mandis.

It is observed that futures and spot prices are highly integrated. Volatility in spot prices is generally observed to be lower than futures markets which is logical as

futures markets are expected to react first to any price sensitive information. Causality between the spot and futures markets was examined by applying Granger Causality test and it is observed that

- Near month futures prices and spot prices have bidirectional relationship {price discovery takes place in both (futures and spot) markets and each impacts the other} in eight out of ten instances.

- Futures and spot prices of a contract during it's full currency indicate uni-directional relationship from future to spot (i.e price discovery takes place in the futures markets and the spot markets take price signals from the futures markets) in seven out of nine contracts. Only for two contracts Chana (March 2019) and Soy Oil (December 2012) have shown bi directional relationship between futures and spot prices i.e price discovery was taking place in both (spot & future) markets.

Bidirectional relationship between the spot and futures prices is seen in the near month contract as it is very close to expiry and spot prices also start influencing the futures prices. That's the reason why various restrictions in terms of open positions, margins, delivery obligations are prescribed for near month contracts. However when futures and spot prices of the entire contract are studied we find unidirectional relationship from futures to spot markets in most of the contracts. This indicates that the futures markets are an effective platform for price discovery and risk management. It would be therefore be appropriate that the market eco system is

designed in such a way that all the stakeholders can derive economic benefits from the functioning of these markets. In this regard following is suggested:

- Suspension of futures markets had a dampening effect on the markets and should be avoided in future.
- Marketing federations and farmers cooperatives should be encouraged for greater participation in the futures markets.
- Options are a useful tool for price risk management. Options in agricultural commodities should be introduced.
- FPOs can play a useful role in ensuring participation of the farmers. In line with the announcement in Union Budget 2018-2019 FPOs should be established at the earliest.

CHAPTER I: INTRODUCTION, OBJECTIVES, METHODOLOGY AND LIMITATIONS

1. Introduction & Statement of the Problem

1.1. Futures markets in commodities serve the economic purpose of price discovery and price risk management. Efficient functioning of futures market requires that it efficiently predict the future spot price of a particular commodity. Liberalisation of the derivatives trading in commodities and debate surrounding its efficacy (which led to suspension of trading in various commodities from time to time) generated lot of interests amongst researchers and academia. However research studies are not unanimous regarding efficiency and causal relationship between spot and futures markets.

1.2. Price discovery functions of the futures markets mainly emanate due to larger participation of speculators and arbitrageurs along with the physical market participants thereby helping the futures markets react first to any price sensitive information. Futures markets therefore give advanced forecast of expected spot prices at a future point and have therefore been rightly referred to as ‘messenger’. However spot market reacts first when there is some market wide information (stock specific information) or imperfections in the markets owing to higher transaction cost, lack of adequate participation, poor liquidity etc. and spot market leads the futures prices.

1.3. Spot and futures markets react to same set of price sensitive information. Therefore causal relationship between the spot and futures market – which market reacts first to price sensitive information has been a subject of constant debate.

1.4. India has a very old tradition in commodity futures trading. Forward trading in cotton started in 1875 at Bombay Cotton Trade Association, just after 10 years when the Chicago Board of Trade initiated trade in grain futures (1865) (Bhattacharya, 2007). Before independence various commodities were actively traded on the commodity exchanges. Options were also actively traded. Markets were liquid with high turnover. The commodity derivative trading was by and large out of the purview of any regulation till the start of the Second World War in 1939. However shortages in the production of agricultural commodities witnessed during the Second World War and subsequently during the 1960s and 70s led to the suspension of the Futures market and by 1977 futures trading was conducted in only two commodities (Bhattacharya, 2007).

1.5. Opening up and the liberalisation process, set in motion in 1991 saw gradual withdrawal of Government from the procurement and distribution channel. This necessitated setting in place a market mechanism to perform economic functions of the price discovery and risk management. Accordingly National Agricultural Policy of July 2000 declared that price discovery and risk management benefits of these markets should reach to the farmers. This laid the foundation for opening up of the commodity derivatives markets in India. After the opening up of these markets and setting up of the 3 nation wide and online commodity exchanges volume of trading in the markets grew exponentially from Rs 27,000 crores to Rs 77.65 lakh crores in 2009-2010. However even in this initial phase of the opening up of the derivatives markets, futures trading in commodities were suspended at different points of time on the perception that futures markets in the commodities do not reflect

realities of underlying spot markets and are speculative in nature. The debate still continues and has been the subject of various research work and academia. Imposition of the Commodity Transaction Tax[1], NSEL Scam[2], frequent suspensions of commodities had a dampening effect on the value of trading in commodity derivatives markets. Total volumes in the commodity derivatives markets in 2018-2019 was at Rs 77 lakh crores.

1.6. However, globally, these markets have grown phenomenally. In 2018, globally 5.6 billion commodity futures contracts (0.564 billion contracts in 2005) were traded and it was the most actively traded derivatives product accounting for 18.8% of overall derivatives volumes. Globally, number of contracts traded in single stock futures were at 1.4 billion contracts, currency futures at 2.5 billion contracts and interest futures at 3.6 billion contracts. During 2018, CME Group (exchange located in USA) contributed 19.91% of the global commodity derivative volumes, Shanghai Futures Exchange and Dalian Commodity Exchange (exchanges located in China) 19.85% and 16.58 % respectively. Share of Multi Commodity Exchange of India Limited the only Indian commodity exchange to figure in the list of top 10 commodity exchanges of the world was at 3.89%.[3]

1.7. Steel futures traded on the Shanghai Futures Exchange, Moscow Exchange's Crude Oil Brent futures, CME Group's[4], Crude Oil futures and Soybean Meal traded at Dalian Commodity Exchange were among the most traded

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1 CTT of 0.01% was imposed on non-agro commodities in the Union Budget 2013-2014. Refer Chapter IV Para 3.1

2 Refer Chapter IV Para 3.2

3 World Federation of the Exchanges 2018 Derivatives Report (April 2019). Globally, the volume of trading in derivatives markets is measured in terms of number of contracts trade. https://www.world-exchanges.org/our-work/articles/wfe-ioma-2018-derivatives-report.

4 Created after the merger of Chicago Mercantile Exchange, New York Mercantile Exchange & The Commodity Exchange in 2007.

commodity derivatives contracts in 2017. Agriculture, energy and non-precious metals accounted for bulk (32%, 31% and 26% respectively) of global commodity derivatives volumes.[5]

1.8. There is lot that India can learn from the growth and development of commodity derivatives exchanges in China, which originated very recently in 1993, as compared to India, which has around more than 150 years of tradition of commodity derivatives trading. In China development of derivatives market was a conscious effort and policy frameworks were put in place for orderly growth of the markets. Spot and physical markets were first developed in size and depth before derivatives markets in commodities were started. Wheat, corn and soya bean were the first commodities to be traded in Chinese commodity exchanges. Just as in India, in initial phase there were a large number of commodity exchanges in China with massive speculative trading. Trading was not standardized. Systematic reforms were initiated by the Government of China, which included merger of various commodity exchanges in to three exchanges, (Dalian, Shanghai and Zhengzhou) prescribing rules and regulation and establishing CSRC for regulation of derivatives markets. An interesting feature of Chinese agri-futures market which might have aided in its development is participation of State Trading Enterprises (such as China National Cereals, Oils and Foodstuffs Corporation (Futures Group in China) which have full trading rights. Participation of state enterprises like COFCO in futures market instills positive sentiments and reliability among other players in the market (Gulati, Chatterjee & Hussain 2017). Soybean complex (34 percent), rapeseed complex (25 percent), sugar

[5] World Federation of the Exchanges 2018 Derivatives Report (April 2019) https://www.world-exchanges.org/our-work/articles/wfe-ioma-2018-derivatives-report.

(12 percent) and palm oil (9 percent) are the most actively traded commodities in Chinese commodity exchanges at present. Provision of compulsory delivery of contracts at exchanges ensures that contracts are not susceptible to manipulation.

1.9. CBOT in USA is oldest organized derivative commodity exchange in world. Corn and wheat were one of the first commodities to be traded at CBOT in 1865. Futures market in USA evolved gradually and various commodities such as cotton (at New York Cotton Exchange in 1870), eggs (1891) soya been (1936) etc began to be conducted. CFTC, regulator of derivative trading in USA was established in 1974. Chicago Board of Trade, Chicago Mercantile Exchange, Minneapolis Grain Exchange and Intercontinental Exchange Futures US are the major commodity exchanges of USA. CBOT however accounts for around 70% of total agricultural contracts. Soybean complex (34 percent), corn (26 percent), wheat (13 percent) and sugar (11 percent) are the most actively traded agricultural contracts in USA.

1.10. Characteristics of emerging markets are very different from that of developed markets. New commodity futures markets in developing economies like India usually have thin volumes and low market depth, lack of well developed spot markets, poor delivery systems, policy restrictions and taxes on the movement of commodities, and other market imperfections. Given these differences, it is important to investigate empirically the Indian commodity futures markets more extensively so as to shed light on the role played by the futures markets in the price discovery process (Sanjay, Namita Rajput, Rajeev Kumar Dua, (2012).

2. Objective of the Study

2.1. This dissertation analyzes the causal relationship between prices of futures and spot markets which would be of interest to various stakeholders associated with the physical market of the commodities and policy makers. Based on the research gap following objectives have been set:

- To understand nature and concept of futures markets in India
- To analyze inter-relationship between spot and futures commodity markets in India.
- To suggest measures to improve working of the futures markets.

3. Agricultural Commodities selected for the purpose of analysis

3.1. Relationship between the spot and future prices of Chana, Guarseed, and Soya Oil, over three different periods 2005-08, 2011-14 and 2017-19 was analysed using the spot and futures prices data available at NCDEX. Chana, Soy Oil and Guar Seed are major agricultural commodities traded on NCDEX. These commodities together contributed to 40% of total value of agricultural commodities traded at NCDEX. Besides, futures trading in these commodities has been subject of constant debate and were suspended at diffrrent points of time on the perception that futures trading in these commodities is speculative and not in sync with the physical market realities. Futures Trading in Chana was susended from 8th May 2008 to 30th December 2008 and again 28th July 2016 to 13th July 2017. Futures trading in Guar Seed was suspended from 28th March 2012 to 13th May 2013 and in Soy Oil from 8th May 2008 to 30th December 2008.

- **Chana** is an important pulse crop with a total domestic production of 80-90 lakh tonnes annually. Madhya Pradesh, Rajasthan, Maharashtra,

Karnataka and Uttar Pradesh are the major producers of Chana which contribute around 87 % of the total production. It's sown during October-December and harvested in February – March. Chana is an actively traded commodity at NCDEX. All outstanding contracts of Chana traded on NCDEX have to be compulsorily delivered on the expiry of the contract. The total value of trading of Chana at NCDEX during 2017-2018 was around Rs 56,000 crores. The delivery center of the Chana traded at NCDEX is Bikaner with Jaipur, Indore and Akola as additional delivery centers. NCDEX lays down detailed quality specification of Chana traded on its platform in terms of permissible foreign matter (1% max), broken splits (max 3%), damaged (max 4%), moisture (max 11%) etc.

- **Guar Seed** is also one of the most actively traded commodity on the NCDEX platform. All outstanding contracts of Guar seed are settled on compulsorily delivery. During 2017-2018 total value of trade of guarseed at NCDEX was Rs 1.30 lakh crores, comprising around 22% of the total value of trade of agricultural commodities at NCDEX. Guar seed once known as a 'cow feed', has emerged as one of the most lucrative crops in the recent past. Guar seed is most popular cattle feed in India and after processing it is sold as guar gum. India accounts for 80 % of total world guar seed production. In India, Rajasthan accounts for 70-80 % of total guar seed produced in the country. Guar seed is sown in the months of July – August and harvested in the month of November – December. Delivery center of Guar seed traded at NCDEX platform is Jodhpur with Bikaner, Nokha Sri Ganganagar and Deesa as additional delivery centers. NCDEX has prescribed detailed quality specifications for guar seed prescribing the

moisture (8% basis), Whitish (98% basis), damaged seed (1% basis) etc.

- **Refined Soy oil** is one of the most important edible oils used in India. Production of Soybean is dependent upon various agro climatic conditions such as rainfall, temperature etc. Production base of soybean is concentrated in few countries (USA, Brazil and Argentina) as against its widespread consumption base. Refined Soy Oil is an actively traded agricultural commodity on the NCDEX platform. During 2017-18 the total value of trading of Soy Oil at NCDEX was Rs 75,000 crores. The contract specifications of the NCDEX prescribe Indore as a delivery centers with "intention matching" as the delivery logic which means that delivery would take place only when the intention of the seller / buyer to give or take delivery matches with the intention of the buyer / seller to take or give delivery. Unlike Guar seed and Chana all the outstanding position of Soy oil are therefore not compulsorily delivered.

4. Research Method, Hypothesis and Data Sources

4.1. Research was conducted through a desk based analysis of the secondary data which was anayalysed to study the causal relationship between futures and spot prices of Chana, Guarseed, and Soya Oil, over three different time periods 2005-08, 2011-14 and 2017-19. Daily spot and futures price data available at NCDEX, major exchange specializing in trading of agricultural commodities, was used for the purpose of the analysis. Besides this, Reports of the various Committees[6] which had examined the issue of the commodity derivatives markets and journals have been relied upon. Findings of the research study on the efficiency of futures markets were also validated by

[6] Khusro Committee (1980) Kabra Committee (1993), & National Agricultural Policy 2000

interacting with physical market participants in two Mandis. The study, without breaching any confidentiality requirement also draws upon the experience and knowledge gained by the author during long years of work at the Forward Markets Commission, the regulator of the Commodity Derivatives markets in India.

4.2. Near month futures contract prices and the few contracts of Chana, Guar Seed and Soy Oil and futures prices of few contracts as detailed at **Table I.1 and 1.2** have been taken for purpose of studying the causal relationship between the future and spot prices. Near month contract is the contract that is closest to expiry and is therefore most liquid and actively traded and has therefore been taken for the purpose of this analysis.

4.3. On the basis of above mentioned objectives the following ***hypothesis*** have been set-up:

H0: There is a no significant relationship between spot and commodity derivatives markets in India and therefore derivative markets are not efficient.

H1: There is a significant relationship between spot and commodity derivatives markets in India and therefore markets are efficient.

4.4. **Table 1.1** below gives details of periods for which the near month futures and spot prices have been taken for the purpose of the study. Besides, futures and spot prices for the expiry of few contracts of Chana, Guar Seed and Soy Oil have also been taken to study the relationship between futures and spot prices for the entire contract period which are given in **Table 1.2**

Table 1.1: Details of the agricultural commodities selected for analysis

Commodity	Period of Study		No of observations	Period of suspension from futures trading
Chana	2005-2008	January 01, 2005 to May 07, 2008	954	May 08, 2008 to December 30, 2008
	2011-2014	January 01, 2011 to December 31, 2014	1105	-
	2017-2019	July 14, 2017 to December 31, 2019	555	July 27, 2016 to July 13, 2017
Guar Seed	2005-2008	January 01, 2005 to December 31, 2008	1157	-
	2011-2014	January 01, 2011 to March 27, 2012 & May 14, 2013 to Dec 31, 2014	362 423	March 28, 2012 to May 13, 2013
	2017-2019	January 02, 2017 to December 31, 2019	692	-
Soy Oil	2005-2008	January 01, 2005 to May 07, 2008	946	May 08, 2008 to December 30, 2008
	2011-2014	January 01, 2011 to December 31, 2014	1098	_
	2017-2019	January 02, 2017 to December 31, 2019	686	_

Table 1.2: Details of the agricultural contracts selected for analysis

Commodity	Contract Expiry	Duration of the Contract	No of Observations
Chana	April 2007	10th Nov 2006 to 20th April 2007	137
	April 2012	11th Nov 2011 to 20th April 2012	133
	March 2019	1st Oct 2018 to19th March 2019	109
Guar Seed	December 2007	10th April 2007 to 20th Dec 2007	84
	December 2012	10th July 2012 to20th Dec 2012	157
	December 2019	2nd May 2019 to 20th Dec 2019	158
Soy Oil	December 2007	10th Sep 2007 to20th Dec 2007	86
	December 2011	10th June 2011 to 20th Dec 2011	165
	December 2019	3rd June 2019 to 20th Dec 2019	136

4.5. To study the relationship between the spot and futures markets, unit root test {Augmented Dickey- Fuller (ADF) test & Phillips-Perron (PP) test}, Johansen Co-integration test and Granger Causality test have been conducted in E-views. Augmented Dickey-Fuller and Phillips-Perron tests are the unit root test employed to verify the stationarity of the data series. Necessary lead / lag length of the data series for ADF test was taken on the basis of Schwarz Information Criterion (SC) in the E-views software. In the E-views software Schwarz Criterion automatically identifies the lead – lag period which gives us the least complex probability model among multiple options. The conventional way of testing stationarity is with intercept, trend and intercept and without using trend and intercept.

4.6. Johansen's Co-integration and Granger Causality were used to study the relationship between spot and futures markets of the selected agricultural commodities. Johansen's Co-integration test is employed to examine long-run relationship among the variables. Granger Causality is employed to study the causal relationship between spot and future prices. That is whether past

values of future prices contain information to help predict spot prices above and beyond the information already contained in past values of spot prices.

5. Limitations of the Study

5.1. The following are the broad limitations of the study:

- This study is purely based on secondary data and therefore the quality of the study and findings suffer from the imperfections of these data sources. The spot prices disseminated on the exchange website are arrived through a polling process [7] using a scientific method and are not actual traded price. Therefore findings of the study would be subject to any imperfections in spot price collection mechanism of the exchanges.
- The study is limited to the relationship between spot and future markets and does not cover how the signals emanating from futures markets can be effectively used by physical market participants.
- The study is limited to only three agricultural commodities traded on NCDEX and number of physical market participants interacted is restricted to only one commodity at two Mandis with a very limited sample size.
- Spot prices of all the three agricultural commodities selected for study had exhibited significant inflationary pressures during period of study, which may have been governed by physical market fundamentals. The present study is limited in analyzing the causal relationship between futures and spot prices of commodities. Increase in the spot market prices of these commodities is beyond the subject of the present study.

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[7] Refer Chapter III Para 7

CHAPTER II: LITERATURE REVIEW

1. This chapter analyses the previous studies, which have attempted to analyze causal relationship between the spot and futures prices of commodities. Since opening up of derivatives markets there is a constant debate that futures markets are speculative in nature and out of sync with physical market fundamentals. This debate led to frequent suspension of futures trading in various commodities from time to time. This study adds to existing literature on the subject, by analyzing spot and futures price relationship of selected commodities over three different time periods between 2002-2003 to 2018-2019, by applying various statistical tools.
2. Samal, Swain, Sahoo and Soni, (2015) in a study of market efficiency of cotton, turmeric and castor seed traded on NCDEX during 2013 showed that there was a strong correlation between futures and spot prices and futures prices are efficiently able to predict spot prices or all the selected agricultural commodities. Study was also restricted to price data of only 2013 and for 3 commodities.
3. Vijayakumar, Parvadavardini and Dharani (2013) analyzed relationship between spot and futures prices for five agricultural commodities (Chilli, Coriander, Jeera, Pepper and Turmeric) over a period of 36 months (from Jan 2008 to Dec 2010) and observed existence of long run relationship between selected spot and futures market. The study used Johansen co-integration test for the analysis. Findings of the study that spot markets drive futures markets negate the very price discovery function of the derivatives markets. Moreover the study was limited to the spices such as coriander, pepper which are not very actively traded at NCDEX. Therefore the findings need to be verified with the price analysis of the commodities which are actively traded and over a longer time period.

4. Raghavendra, Velmurugan and Saravanan (2015) empirically examined the relationship between spot and future prices of agricultural commodities (Soya bean, Chana, Maize, Jeera and Turmeric) for a period from January 2010 to March 2015 traded at NCDEX. Empirical results suggested, existence of long-run equilibrium relationships between futures and spot prices for all five agricultural commodities that were taken for this study. The study observed that there is one-way causal linkage from future market to spot market prices for Soya bean and Chana and bidirectional relationship between commodity futures and spot market for Maize, Jeera and Turmeric.
5. Chakraborty and Das (2015) studied the relationship between spot and futures prices of Barley, Chickpea, Chilli, Cumin, Maize, Mustard Seed, Pepper, Brent Crude Oil and Gold obtained from the website of NCDEX. The lead/lag relationship between spot and futures prices were examined by using Granger causality test. The study showed that spot and futures prices are co-integrated in long-run for most of the commodities. The study further showed that for most of the commodities information spillover is observed in the direction from spot market to futures market. Results of this study indicated that in Indian commodity market spot market is more active compared to the futures market. Findings need to be further validated as the study negates the very concept of price discovery function of the futures exchange. Some of the commodities chosen such as Chickpea and Barley had very little trading on NCDEX therefore the findings emanating from these studies could be erroneous.
6. Wadhwa, Gupta, and Sehgal (2016) studied the relationship of the futures and spot prices of Channa, Gaur Seed, Kapas, Soybean, Pepper, Potato, Refined Soya Oil and Wheat at NCDEX (from 1st January 2003 to 31st December 2013) using

daily closing future prices of middle month contracts for all commodities. For studying long term equilibrium relationship between the spot futures markets Johansen co-integration test was used where as short term adjustment process was studied by VECM which explains the speed of adjustment of the future and spot market for any price change in the other market. It was observed that for all commodities except Kapas, future and spot market is co integrated. Futures markets play an important role in determining the spot prices for all commodities except Guarseed and Potato. Results were therefore in conformity with the theory that information processing and price change first happens in futures market and is then transmitted to the spot market. Therefore, future market plays a leading role in the price discovery process.

7. Hernandez and Torero (2010) examined the empirical relationship between spot and futures prices of corn, wheat, and soybeans traded at Chicago Board of Trade (CBOT) through Granger causality tests. Their results indicated that spot prices are discovered in the futures markets i.e. changes in futures prices lead changes in spot prices more often than the reverse.
8. Zavadska, Morales and Coughlan (2018) did a literature review of various studies to analyze the relationship between spot and futures prices of Crude oil and observed that "*there are significant disagreements and incongruities among researchers regarding the price that plays a dominant role*"
9. Baldi, Peri, and Vandone (2011) analyzed the long-run causal relationship between spot and futures prices for corn and soybeans, traded at Chicago Board of Trade for the period January 2004 - September 2010 by applying co integration methodology. They observed that futures prices play a major role in price discovery. Future markets react more quickly to new or unexpected information

than the underlying spot market. However, they further observed that in times of crisis and in particular in phases of strong price increase, the cash market also becomes an important actor in the price discovery process. The finding that in times of crises spot markets also play an important role in price discovery needs further analysis. The study was limited to foreign exchanges only and Indian Exchanges were not taken up for the purpose of the study.

10. Sanjay, Rajput, and Dua, (2012) studied the relationship between spot and commodity derivatives markets and observed that despite the fact that markets are in nascent stage, efficient price discovery is taking place through commodity exchanges. It also recommended that commodity exchanges should strengthen their surveillance systems and Forward Markets Commission, regulator of commodity derivatives markets in the country, should be made autonomous and given more powers to effectively regulate commodity derivatives markets.
11. Zelda (2018) studied the futures markets for maize and wheat in India in order to determine their efficiencies. Co integration models were used to determine the presence of co-integration and short-run equilibrium relationship between the futures and spot prices. Convergence of the futures and spot price series suggested that futures markets play the expected role of price discovery and risk management.
12. Sendhil, Kar, Mathur and Jha (2014) studied price volatility in twenty agricultural commodities that are traded in NCDEX platform both for 2009-10 (period of peak inflation) and right from the date of commencement of trading till June 2014. Empirical results indicated low price volatility in maize, soybean, cotton seed oilcake, castor, palm oil, cumin and chili during the peak inflation period i.e., 2009-10; whereas, chickpea, cotton seed oilcake, mustard and cumin experienced

the same level of volatility right from inception of trading. He concluded that futures market helps to reduce price volatility but not necessarily in all commodities and therefore commodity exchanges should continue trading in commodities that exhibit low volatility.

13. Periasamy and Satish (2014) analysed various initiatives taken by the Forward Markets Commission, various regulatory provisions, operation of commodity markets, different players associated with the commodity exchanges and promotional activities taken by the Forward Markets Commission.
14. Sendhil, Kar, Mathur and Jha (2014) analysed the efficiency of wheat futures trading in terms of price transmission, price discovery and extent of volatility. Co-integration analysis of futures and spot prices revealed a long-run equilibrium, which resulted in price transmission between futures and spot markets for three contracts. Analysis on price discovery indicates hedging only in one contract and in rest it was speculative. The analysis pointed about the inefficiency in wheat futures. It was also concluded that farmer participation through institutional intervention and innovation will improve its efficiency substantially.
15. Sahoo & Kumar (2009) while analyzing the efficiency of futures trading in five highly traded commodities (gold, copper, petroleum crude, soya oil, and chana (chickpea) in India. The results suggested that the futures market is efficient for all five commodities. He further concluded that the evidence is not sufficient to support the view that futures market leads to higher inflation.
16. Shanmugam & Armah (2017) analysed the study on interrelationship between spot and futures prices of 15 agricultural commodities. The study concluded that spot and futures prices of selected commodities are highly co-integrated proving that market was efficient and agriculture commodity futures exchanges provided

efficient hedge against price risk. It was also observed in the study that in majority (9 out of 15) of the commodities there was bi-directional relationship between futures and spot prices indicating that both the markets are equally responsible for the price discovery process. In remaining six commodities there was unidirectional causal relationship between futures and spot markets.

17. Government had appointed a Committee under the chairmanship of Prof. Abhijit Sen, Member, Planning Commission to study the impact, if any, on futures trading on agricultural commodity prices on 2nd March, 2007[8]. The Committee after examining the issue made various recommendations. Some of the major recommendations of the Abhijit Sen Committee Report are reproduced below:

    (i) Negative sentiments have been created by the decision to de-list futures trade in some important agricultural commodities.

    (ii) The fact that agricultural price inflation accelerated during the post futures period does not, however, necessarily mean that this was caused by futures trading. One reason for the acceleration of price increase in the post futures period was that the immediate pre-futures period had been one of relatively low agricultural prices, reflecting an international downturn in commodity prices. A part of the acceleration in the post futures period may be due to rebound/recovery of the post trend. The period during which futures trading has been in operation is too short to discriminate adequately between the effect of opening up of futures markets and what might simply be the normal cyclical adjustment.

8 PIB Release dated 29.4.2008 https://pib.gov.in/newsite/erelcontent.aspx?relid=38244

(iii) *In contrast to the view that futures markets cause increases in prices, the bulk of the existing literature on the subject emphasizes that such markets help in price discovery, provide price risk management and also bring about spatial and temporal integration of markets, futures markets have the potential to bring about better price stability over a medium to long term although the literature on futures markets itself is rather divided on the subject of price variability. Indian data analysed in this report does not show any clear evidence of either reduced or increased volatility of spot prices due to futures trading.*

(iv) *The ability of futures markets and contracts to provide instruments of risk management has not grown correspondingly and in fact has been quite poor.*

18. Above analysis indicates that there is little unanimity amongst researchers about efficiency of futures markets and there are diverse views. It's hoped that present study would throw more light on the subject.

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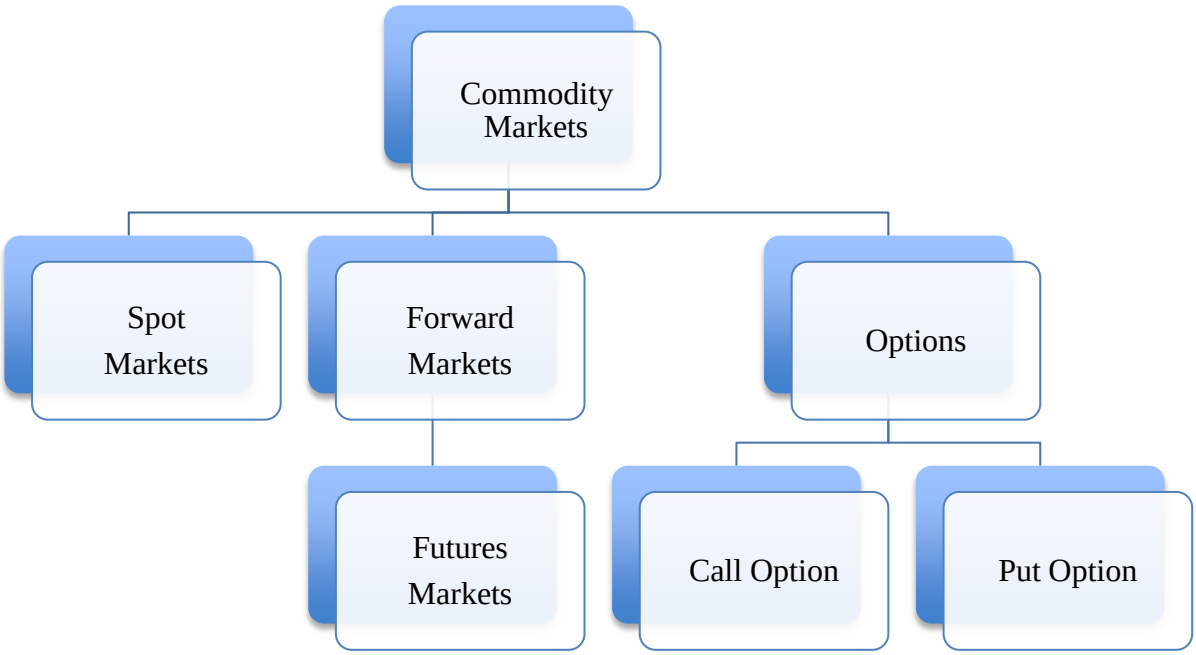
CHAPTER III: NATURE AND CONCEPT OF FUTURES MARKETS

1. What are Futures Markets?

1.1. The commodity markets can be broadly classified as follows:



1.2. Spot markets are the markets where transaction and delivery of the goods takes place immediately and the prices prevailing in these markets are referred to as spot prices. Most of the transactions that we see in the commodity markets are spot transactions. The transactions that takes place in agricultural Mandis /APMCs are spot transactions where buyers and sellers agree to buy and sell the goods at a mutually agreed price. Securities Contracts (Regulation) Act 1956 (SCRA) defines a *ready delivery contract* which is generally known as spot contract as follows-

Ready delivery contract is a contract where the payment and delivery takes place within a period not exceeding 11 days"

1.3. Forward contracts are contracts for the delivery at a future point of time. SCRA 1956 defines a forward contract which is *not a ready delivery contract*. These are customized, party to party contracts, where are the terms of the contracts such as price, time of delivery, place of delivery, quality, quantity etc are laid down in terms of contracts. These contracts are difficult to transfer therefore exiting such contracts or financial closure is either difficult or not possible. These contracts are therefore illiquid. Futures contracts on the other hand are standardised forward contracts traded on the plate form of the exchange. Standardised nature of these contracts and trading on exchange platform makes these contracts liquid thereby making it easy for a participant to take position or exit a contract. Futures contracts are a sub set of forward contracts.

1.4. Options', contracts gives buyer (owner or holder of option) the right, but not obligation, to buy or sell an underlying. For owning this right, option holder pays a price (called 'option premium') to the seller of this right. Seller (writer) of option, on the other hand, bears the obligation to honour the contract, should the buyer choose to exercise the option. The option buyer will exercise their option only when the price of the underlying is favourable to them, otherwise they will let the option expire worthless. In India Options on commodities were permitted again in October 2017 in Gold. With this, prohibition on options, which was there since 1947, was removed which prohibited all types of options in commodities. Based on the right of the holder, options are of two types:

Call options: It gives buyer the right to buy the underlying

Put options: It gives buyer the right to sell the underlying

2. Relationship between Futures and Spot Markets

2.1. Spot price as explained earlier is the price for immediate delivery and payment of a commodity. The forward/ future price of a commodity on the other hand is the price for delivery of commodity at a future point of time. In simple words the future price of a commodity should be equal to the spot price + storage cost + cost of interest. Cost of interest + storage cost is referred to cost of carrying. The relationship between the futures markets and spot markets can be described as follows which is know as cost –of – carry model.

Futures Price = Spot price + cost of carry

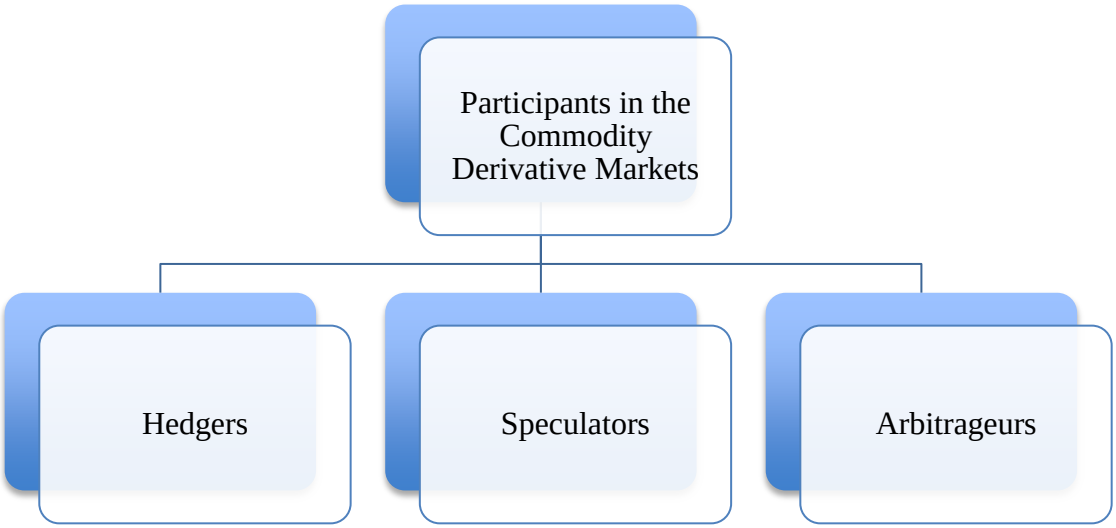
2.2. Difference between spot and futures prices is called "Basis". When futures price is higher than spot price (implying that basis is positive -which is normal market situation) market is said to be in contango. When futures are lower than spot prices (implying that the basis is negative) market is said to be in backwardation. Agricultural futures contracts could be in backwardation if the contracts are maturing during harvest period or increase is supply is expected during maturity of contract.

2.3. Futures and spot markets both react to same set of information. However, issue is which of the markets react first to the new information having a bearing on the prices of the commodities i.e. whether the spot markets reacts first to the price sensitive information which is followed by the futures markets or it's the futures markets which first reacts to the price sensitive information which is then followed by the spot markets. In case both markets

react to the new information then the relationship is said to be unidirectional. Accordingly, there exists, diversified theoretical arguments pertaining to the causal relationship between spot and futures markets. Arguments supporting the hypothesis that futures prices lead spot prices are mainly concentrated around higher liquidity, lower transaction costs, lower margins, easy leverage positions, rapid execution and greater flexibility for short positions in futures markets (Raghavendra, Velmurugan and Saravanan, 2015).

3. Categories of Participants in the Derivatives Markets

3.1. Efficient commodity derivative market requires various categories of participants – hedgers, speculators and arbitrageurs. These market participants with diverse risk profiles provide liquidity to the market and help it effectively perform the functions of price discovery and risk management.



3.2. Hedgers are physical market participants who carry a risk of price fluctuation in spot markets. Hedgers are risk averse, who use the commodity derivatives markets to manage price risk arising from the spot markets. Derivatives markets provide them alternate platform wherein by taking an opposite

position they manage their risks. For hedgers derivatives market provide a platform for insuring the price risk arising in the spot markets.

3.3. Speculators provide liquidity to these markets and are willing to take price risk that hedgers intend to transfer. Speculators depending on their likely forecast of expected prices at future point of time, take positions in the markets. Speculators participate in derivatives markets as an investment options. Speculators generally do not take deliveries in the futures markets and tend to square off their positions before expiry of the contract.

3.4. Arbitrageurs tend to make money on price differences prevailing in different markets and spot and futures prices. Arbitrageurs thus ensure that prices in different markets and futures and spot prices are not out of sync and are reflected by their fundamentals.

4. Economic Functions of Futures Markets

4.1. Futures trading performs two important economic functions, viz., **price discovery** and **price risk management**.

4.2. When price of a commodity is determined because of interplay of a large number of buyers and sellers, price of that commodity is said to have been discovered by the market. Futures prices because of large number of buyers and sellers give advance signals of the expected spot price at a future point of time which is known as the process of **price discovery**. All the stakeholders associated with the commodity's markets (exporters, importers, processors, stockists, farmers) benefit from the process of price discovery. For the commodity exchanges to effectively perform these functions a strong linkage with the underlying spot markets is required.

4.3. Futures markets provide a platform for physical market participants (such as farmers, stockists, exporters, importers, processors, consumers etc) to manage the price risks underlying the commodity. This is known as **price risk management or hedging**. Physical market participants are exposed to a future rise / fall in prices and the derivatives markets provide a plate-form to manage this risk. For example, a wheat farmer who plants a crop runs the risk of losing money if the price of wheat falls before harvest and sale. The farmer can minimize this risk by selling wheat futures contracts, which guarantee that the farmer will receive a predetermined price. Hedging allows commodities producers (such as farmers) and consumers (such as millers) to conduct their businesses with greater certainty over how much they can expect to earn from and pay for commodities. Hedging therefore provides for price insurance.

5. Recommendations of Committees

5.1. Various committees were constituted from time to time namely, A.D. Shroff Committee (1950), M. L. Dantwala Committee (1966) and A.M. Khusro Committee (1980), K.N. Kabra Committee (1993), Shankarlal Guru Committee (2001) and Habibullah Committee (2003). All these Committees assessed the role of futures trading in India, its impact on the spot prices, examined to what extent futures market in the commodities fulfill economic functions of price discovery and risk management and also recommended the commodities in futures markets could be introduced.

5.2. Recommendations of the **Shroff Committee (1950)** were instrumental in the enactment of the Forward Contracts (Regulation) Act 1952 and the setting up of the Forward Markets Commission in 1953. **Danwala Committee (1966)**

highlighted the importance of the commodity derivative trading towards risk management and price discovery. Despite these recommendations the Government of India banned futures trading in all the major agricultural and non agricultural commodities. **Khusro Committee (1980)** besides recommending introduction of futures trading in various commodities also listed major criteria for a commodity to be suitable for futures trading which included homogeneity, susceptible to standardization, large supply and demand, uncertain supply and demand, supply flowing naturally to the market and non perishability of commodity. On the recommendations of Khusro Committee futures trading in cotton, jute and potato were launched.

5.3. Paradigm shift on the approach to the commodity derivatives markets is seen in the recommendations of **Kabra Committee (1993)** headed by Professor K. N. Kabra. Major recommendations of the Kabra Committee were as follows:

- Strengthening of the Forward Markets Commission and Forward Contracts (Regulation) Act 1952.
- Lack of infrastructural facilities coming in the way of the efficient functioning of the commodity exchanges. Commodity exchanges need to be strengthened by enlisting more members, computerization, and improved capital adequacy norms.
- Some of the commodity exchanges particularly those dealing in castor seed and pepper be upgraded to the level of international futures markets.
- Introduction of futures trading in 17 commodity groups which covered major oil seed complexes (groundnut, rapeseed/ mustard seed, cottonseed sesame seed, safflower seed, copra and soybean and their oils and

oilcakes), basmati rice, cotton and kapas, raw jute and jute goods, rice bran oil, castor oil and its oil cake, linseed, silver and onions.

5.4. National Agricultural Policy of July 2000 declared that the **price discovery** and **risk management** benefits of these markets should reach to the farmers. This laid the foundation for the opening up of the commodity derivatives markets in India.

5.5. Habibullah Committee (2003) made a far-reaching recommendation pertaining to convergence of the commodity and securities markets and recommended for one unified regulator of the commodities and securities markets. The recommendations finally led to the merger of the Forward Markets Commission with the Securities and Exchange Board of India in 2015.

5.6. The policy changes led to the opening up of the futures trading in all the commodities and establishment of **3 National Electronic Commodity Exchanges** in 2003-2004.

6. **Regulatory Architecture Governing Commodity Derivatives Markets:**

6.1. Regulation of commodity derivatives market after its opening up can be broadly classified in three distinct phases.

6.1.1. Early Phase from (2002-03 to 2007-08) when the markets were nascent and Forward Markets Commission (FMC) the erstwhile regulator of the commodity derivatives market was entrusted with the task of developing as well as regulating these markets. It had to make a fine balance between these twin objectives. FMC itself had limited resources and capabilities to regulate the new market ecosystem and was perceived by the market intermediaries as a weak regulator with limited powers.

During this phase derivatives markets were blamed for the inflationary pressure witnessed in various agricultural commodities. FMC to address these concerns had to frequently resort to suspension of futures trading in these commodities which are unheard of in other countries such as USA, Brazil, China, UK etc.

6.1.2. Strengthening of the Regulation by the FMC during the second phase from 2007-08 to 2014-15: During this phase the FMC had considerably strengthened the regulation of the commodity derivatives markets through issue of various guidelines, circulars etc. Brokers and Commodity Exchanges were subjected to much higher level of oversight and various policy measures were initiated for ensuring that the futures markets efficiently perform the intended functions of the price discovery and risk management. However the limited powers under the Forward Contracts (Regulation) Act of 1952 constrained the regulatory powers of the FMC.

6.1.3. Third Phase: Merger of the FMC with the Securities and Exchange Board of India (SEBI) in September 2015 considerably enhanced the regulatory architecture and paved the way for the development of these markets to their full potential. SEBI in due course permitted participation of banks, mutual funds and FIIs into commodity derivatives markets and trading various new products like options and indices was also permitted. Participation of various stakeholders and introduction of new products would increase the depth of the commodity markets and which is expected to result in better price discovery and risk management.

7. Methodology of polling of spot prices by the Commodity Exchanges[9]

7.1. Polling is process of eliciting information from a cross section of market players about the prevailing spot price of the commodity in the market. Primarily data on spot prices is captured at the identified basis centres which are also termed as the primary centre of a commodity, by inviting price quotes from the empanelled polling participants representing the value chain comprising various user class viz. traders/ brokers, processors, importers/ exporters and users. Active players in the market belonging to different segments in the value chain are chosen as polling participants to ensure that they are aware of the prevailing prices.

7.2. Bootstrapping is the process of sorting all BID and ASK quotes in ascending order and trimming the extreme quotes from the total quotes through adaptive trimming procedure. The values are sampled with replacement multiple number of times, for which software computes different means with their respective standard deviation.

7.3. The mean with the least standard deviation is the spot price that is uploaded by the Polling Agency through the Polling Application provided by the Exchange.

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[9] The website of the commodity exchanges describe in details about the polling process. The present analysis is sourced from the website of NCDEX at *http://www.ncdex.com/Downloads/Spot_Price_Polling_Proces s.pdf)*

CHAPTER IV: COMMODITY DERIVATIVES MARKET IN INDIA

1. Long Period of Ban on Futures Trading and Gradual Opening up (1947 to 2000)

1.1. The subject of regulation of futures market is in the Central List of the Constitution of India and Central Government has powers to legislate on this subject. Accordingly Forward Contracts (Regulation) Act 1952 (FCRA) was enacted to regulate the commodity derivatives market and Forward Markets Commission set up in 1953 to for its regulation.

1.2. There had been a general perception that futures markets have inflationary pressures on a commodity and this perception led to suspension of futures markets in all major commodities for a larger part of the 60s, 70s, 80s and 90s. It were only some minor commodities like castor seed and spices which were permitted for futures trading. During this long period of prohibition of futures trading these markets moved to grey or illegal centres. There were various illegal centers of commodity futures trading in Gujarat, Rajasthan Maharashtra, Delhi, Uttar Pradesh and Haryana. During this long period of suspension of futures markets not only tradition of futures markets was lost, these markets also became out of sync with various developments taking place in securities market in India and commodities market internationally.

2. Setting up of the National Commodity Exchanges and Early Growth Phase (2000 -2011)

2.1. Different expert committees (such as Shroff Committee, Dantwala Committee, Khusro and Kabra Committee) were set up from time to time to examine the subject of the futures trading in commodities. All these

Committees as detailed at Para 5 of Chapter III recommended for gradual introduction of commodity futures market in selected commodities.

2.2. Based on the recommendations of the Kabra Committee (1993) and National Agricultural Policy of 2000, Government of India gradually removed prohibition on futures trading for all commodities. Commodity exchanges that were in operation at that point of time such as those at Rajkot & Ahmedabad (Gujarat), Akola (Maharashtra), Kochi (Kerala) Bikaner & Jaipur (Rajasthan), Bhatinda (Punjab) & Hapur (UP) were all regional, mutual exchanges (managed by trading members of the exchanges), open out cry and with little or no self governance. These exchanges were bereft of modernisation and governance which had been put in place in the securities market by the SEBI.

2.3. Forward Markets Commission therefore thought it appropriate to establish new national exchanges with online nationwide trade, which would be established after incorporating best principles of governance, trading and settlement. Applications from the interested participants were invited through a Press Note prescribing in details the criteria (based on best practises internationally and securities markets) for setting up of National Commodity Exchanges. After examining various applications Government of India in 2002 gave permission to three nation wide online multi commodity exchanges. These were:

2.3.1. National Commodity & **Derivative Exchange of India Limited,** which was originally promoted by ICICI Bank, National Stock Exchange of India Limited (NSE), National Bank for Agriculture and Rural Development (NABARD) and Life Insurance Corporation of India

(LIC). NCDEX over a period of time became major exchange for trading of agricultural commodities.

2.3.2. Multi commodity Exchange of India Limited, which was originally promoted by Financial Technologies Limited, a software company. MCX over a period of time became a major exchange for trading in metals and energy contracts.

2.3.3. National Multi Commodity Exchange of India Limited, which was originally promoted by Neptune Overseas Limited and Central Warehousing Corporation (CWC). NMCE over a period of time became a major exchange for trading in spices and coffee.

2.4. Even in initial phase of opening up of derivative markets these markets were subjected to lot of criticism. Accordingly an Expert Committee on Commodity Futures was constituted under the Chairmanship of Professor Abhijit Sen, Member Planning Commission in March 2007. One of the Terms of the Reference of the Committee was to study impact of futures trading on retail and wholesale prices of agricultural commodities. Findings of the report turned out to be inconclusive when everyone associated with the commodities markets had been waiting to know the impact of futures trading on spot prices (Lingareddy, 2008, p. 35).

2.5. Futures trading through national-level exchanges brought significant changes in commodity derivatives market. **Table 4.1** gives the volume and value of trade at the commodity exchanges since from 2000 to 2010. The commodity derivatives markets witnessed exponential growth in the first five years (2000 to 2010) and increased from Rs 27,000 crore in 2000 to Rs 77. 65 lakh crore in 2010. The turn over increased to around Rs. 100 lakh crore by 2010-11.

The commodity derivative trading during this period had around 90 per cent market share, with NCDEX as a distant second with 7-8 per cent of market share. The most actively traded contracts are the crude oil, gold, silver, edible oils, spices and Guar seed etc. The volume and value of trade at the commodity Exchanges since 2000-2001 is given below:

Table 4.1: Volume and Value of Trade in Commodity Exchanges

Year	Volume (in Lakh Tonnes)	Value (Rs Lakh Crores)
2000-2001	179.80	0.27
2001-2002	217.72	0.35
2002-2003	314.46	0.66
2003-2004	492.99	1.29
2004-2005	1942.10	5.71
2005-2006	6788.71	21.55
2006-2007	6129.29	36.76
2007-2008	5573.41	40.65
2008-2009	6863.49	52.48
2009-2010	10142.93	77.65

Source: Annual Reports of the Forward Markets Commission

3. Dwindling volumes at National Commodity Exchanges & Shifting of Regulation of Commodity Derivatives Market to SEBI (2012-2019)

3.1. The exponential growth that was seen in the initial year of the opening up of the commodity derivatives market declined subsequently because of various factors such as the imposition of the Commodity Transaction tax (CTT) and National Spot Exchange Limited (NSEL) Scam. Commodity Transaction Tax (CTT) of 0.01 percent was imposed on non-agro commodity futures trading in the Union Budget 2013-14 and was implemented from July 2013. The objective behind imposing CTT was to regulate the activities of speculators and also mobilize revenue. Ray and Malik (2014) conducted two event studies, one for 50 day period and the other for 120 day period before and

after CTT implementation on July 1, 2013 to test the impact of CTT on trading volume and open interest. They found that there was a significant drop in volumes traded of commodities such as gold, copper, crude oil and mentha oil, which were all subject to CTT.[10]

3.2. NSEL Scam led to a paradigm shift in regulatory architecture of commodity derivatives markets and regulation of the commodities derivatives markets shifted from Forward Markets Commission (FMC) to Securities and Exchange Board of India (SEBI). Frequent suspension of futures trading, very high margins (100 % for potato in 2014, 95% for Chana in June 2016 and 80% for Sugar in September 2016) all along with imposition of CTT and NSEL Scam had a dampening impact on the volume of trading at the commodity exchanges. Volume of trading in the commodity derivate exchanges during 2018-19 was at Rs 77 Lakh crores.

3.3. In September 2015, Government of India repealed Forward Contracts (Regulation) Act, 1952 (FCRA) and shifted regulation of commodity futures market to Security Exchange Board of India under Securities Contracts Regulation Act (SCRA) 1956. After shifting of the regulation of the commodity derivatives market to SEBI, two stock exchanges i.e National Stock Exchange and BSE Stock Exchange have also recently started trading in commodity derivatives and trading in options has also been permitted. Presently futures and options are permitted for trading at National Exchanges. **Table 4.2** gives the number of commodities permitted for trading and actually

[10] Impact of Transaction Taxes on Commodity Derivatives Trading in India" Working Paper No. 272, Indian Council For Research On International Economic Relations

traded category wise (Agriculture, metal other than Bullion, Bullion, Energy and gems and Stones).

Table 4.2: Number of commodities permitted for trading and number of commodities actually traded

Number of commodities permitted and traded at exchanges

Exchanges	Particulars	Futures					Options			
		Agriculture	Metals other than bullion	Bullion	Energy	Gems and Stones	Agriculture	Metals other than bullion	Bullion	Energy
NCDEX	Permitted for trading	22	2	1	1	0	5	0	0	0
	Contracts floated	21	0	0	0	0	5	0	0	0
	Traded	16	0	0	0	0	1	0	0	0
MCX	Permitted for trading	9	6	2	2	0	0	2	2	1
	Contracts floated	8	6	2	2	0	0	2	2	1
	Traded	5	5	2	2	0	0	2	2	1
ICEX	Permitted for trading	10	1	0	0	1	0	0	0	0
	Contracts floated	10	1	0	0	1	0	0	0	0
	Traded	3	1	0	0	1	0	0	0	0
BSE	Permitted for trading	7	1	2	1	0	0	0	0	0
	Contracts floated	7	1	2	1	0	0	0	0	0
	Traded	6	0	2	0	0	0	0	0	0
NSE	Permitted for trading	0	1	2	1	0	0	0	0	0
	Contracts floated	0	0	2	1	0	0	0	0	0
	Traded	0	0	2	1	0	0	0	0	0

Source: Securities and Exchange Board of India Handbook Book of Statistics 2018.

4. Participation of Farmers in Commodity Derivatives Markets

4.1. National Agricultural Policy of 2000 aimed at protecting small and marginal farmers from price risks and futures markets in agricultural commodities were launched to provide a market based platform for risk management. National Commodity Exchanges initiated various steps to ensure that the benefits of

the futures markets reach the farmers and they are able to benefit from price discovery and risk management functions of these markets. Direct participation of farmers in futures markets has not been seen because of lack of understanding of exchange trading platform, lack of trust on intermediaries, high membership fees, margin money requirement, daily mark to market (daily settlement of loss and profits), large contract size, delivery of product as per exchange specifications, uncertainties associated with futures markets etc.

4.2. There have been some experiments made by exchanges in this regard. HAFED – an apex producer agricultural cooperative in Haryana – participated in the NCDEX wheat futures during 2006-2007 to hedge member-producer risks. A combination of the closing out or offsetting and short hedging strategy helped the cooperative realize profits of Rs 108 a quintal (Dey, Gandhi and Debnath, 2019). MCX also had taken a similar initiative in this regard for creating awareness amongst cotton growers in Gujarat in 2007-2008, which was funded by NABARD. Daily mark to market losses were incurred by farmers on the positions held by growers and the experiment was very short lived. Sahadevan (2008) has observed that despite the efforts of MCX to accommodate a group of farmers in mentha oil and potato futures during 2007-2008, speculative intent of market agents prohibited them from participation. Growers and produces in Kerala thorough Rubber Producer's Societies (RPS) have participated in rubber futures and benefitted from it. From results of hedging efficiency, spot price volatility, and price discovery, it can be concluded that rubber futures market fulfills all

the economic functions expected from a commodity futures market (Pillai, 2015).

4.3. China and India, where small holder production is the predominant pattern, exchanges must broaden access to markets; empowering farmers to make better cropping and selling decisions; reducing information asymmetries that have been previously taken advantage by the more powerful market actors upgrading storage, grading and technology infrastructure and expanding access to cheaper sources of finance UNCTAD (2007).

4.4. Farmers' Producer Organizations (FPOs) can play a critical role in ensuring farmer's participation in the futures markets. In the Union Budget 2019-2020 it is targeted to set up 10,000 FPOs across the country. NABARD has already set in motion the process of setting up of the FPOs and is likely to play a key role in this regard. Chatterjee, Raghunathan & Gulati (2019) studied how the farmers could be linked to futures markets and suggested certain measures which inter- alia included *(i) FPOs and exchanges need to focus initially on commodities which are not 'sensitive' from food security point (ii) exchanges to identify production centres, build delivery centres around them and encourage futures trading in these areas; (iii) resource Institutions involved in educating and hand-holding FPOs in futures trading, themselves need to upgrade their knowledge and skills about functioning of futures trading. (iv) Instruments like forwards and options have to be encouraged to invite greater participation by FPOs.*

5. Volume of Trading at MCX and NCDEX

5.1. The volume of trading and total turnover at Multi Commodity Exchange of India Limited and National Commodity and Derivative Exchange of India Limited is given in **Table 4.3** and **Table 4.4**. It may be seen that MCX is the leading commodity exchange with more than 90% of the total value of trade and NCDEX at a distant second. The commodity wise volume of trading of major commodities at NCDEX is given at **Table 4.5.**

Table 4.3 Volume and Value of Trade at MCX

Period	Trading day	Agriculture		Metals		Bullion		Energy		Total	
		Volume (000 tonnes)	Turnover (Rs crore)	Volume (000 tonnes)	Turnover (Rs crore)	Volume ('000 tonnes)	Turnover (Rs crore)	Volume (000 tonnes)	Turnover (Rs crore)	Volume ('000 tonnes)	Turnover (Rs crore)
1	2	3	5	6	8	9	11	12	14	15	17
2013-14	310	20,878	1,71,391	85,674	17,26,336	400	42,63,195	4,21,354	24,50,527	5,28,306	86,11,449
2014-15	255	13,504	1,10,268	62,083	12,74,213	240	21,53,427	4,04,556	16,45,799	4,80,383	51,83,707
2015-16	257	13,961	1,21,699	89,331	15,05,004	234	20,70,147	8,07,702	19,37,345	9,11,229	56,34,194
2016-17	260	15,947	1,39,312	93,078	17,53,887	207	20,40,270	6,74,225	19,32,191	7,83,457	58,65,661
2017-18	254	11,648	1,14,082	95,153	21,12,532	164	13,63,703	5,74,029	17,92,678	6,80,995	53,82,996

Notes:

1. Natural Gas volume are in mm BTU and is not included for computing for total volume and total open interest in '000 tonnes.

2. Conversion factors: Cotton (1 Bale=170 kg), Crude Oil (1 Tonne = 7.33 Barrels)

Source: Securities and Exchange Board of India Handbook Book of Statistics 2018.

Table 4.4 Volume and Value of Trade at NCDEX

Period	No. of Trading days	Agriculture		Metals		Bullion		Energy		Total	
		Volume (000 tonnes)	Turnover (Rs crore)	Volume (000 tones)	Turnover (Rs crore)	Volume (000 tonnes)	Turnover (Rs crore)	Volume (000 tonnes)	Turnover (Rs crore)	Volume (000 tonnes)	Turnover (Rs crore)
1	2	3	5	6	8	9	11	12	14	15	17
2013-14	309	2,74,282	11,38,862	3	58	0.1	6,233	257	1,175	2,74,544	11,46,328
2014-15	255	1,94,255	8,70,863	2	7	1.4	32,708	107	485	1,94,365	9,04,063
2015-16	257	2,17,736	9,98,811	0	0	0.6	20,778	0	0	2,17,737	10,19,588
2016-17	260	1,28,790	5,96,530	0	0	0.0	322	0	0	1,28,790	5,96,852
2017-18	248	1,33,172	5,89,497	Na	Na	Na	Na	Na	Na	1,33,172	5,89,497

Source: Securities and Exchange Board of India Handbook Book of Statistics 2018.

Table 4.5 Commodity wise volumes at NCDEX

Sr. No	Name of Commodity	2013-14		2014-15		2015-16		2016-17		2017-18	
		Volume	Value	Volume	Value	Volume	Value	Volume	Value	Volume	Value
1	2	10	11	12	13	14	15	16	17	18	19
A.	**Bullion (Gold and Silver)**	**0**	**6,233**	**1**	**32,708**	**1**	**20,778**	**1**	**322**	**NA**	**NA**
B	**Metals other than Bullion**	**3**	**58**	**2**	**7**	**0**	**0**	0	0	NA	NA
C	**Agricultural commodities**										
1	Bajra	0	0	4	5	0	0	0	0.00	NA	NA
2	Barley	1,879	2,508	872	1,168	1,582	2,029	553	875	205	302
3	Castorseed	2	7	28	121	0	0	0	0.00	NA	NA
		0	0	2	9	2	9	0	0.00	NA	NA
		40,502	1,61,062	38,392	1,66,952	22,599	90,348	3,233	14,211	9,189	41,212
4	Chana	16	52	160	467	0	0	0	0.00	NA	NA
		0	0	36	128	114	514	3	15.85	NA	NA
		42,371	1,32,914	32,379	1,02,306	35,255	1,59,844	2,354	13,057	11,902	56,382
5	Chilli	1,253	7,537	58	517	38	357	0	0.65	NA	NA
6	Cotton seed oil cake	32,885	51,044	15,976	24,721	18,488	35,466	14,012	31,991	14,776	25,100
7	Cotton	0	1	9	94	36	1,458	5	195.55	NA	NA
8	Cotton seed	70	136	1	2	0	0	0	0.00	NA	NA
9	Crude palm oil	49	274	6	32	0	0	0	0.11	NA	NA
10	Coriander	12,560	95,259	7,731	79,879	5,620	59,809	1,853	13,698	3,106	17,020
11	Guar seed	0	0	1	3	6	27	0	0.10	NA	NA
		3,642	19,567	2,282	12,299	0	0	0	0.00	NA	NA
		6	42	9,897	46,739	29,358	1,14,798	25,971	91,407	33,122	1,30,686
12	Guargum	737	11,058	2,338	31,331	4,619	37,649	3,314	20,618	0	0
		0	0	0	0	0	0	2,755	19,503	7,577	64,616
13	Gur	1,987	5,824	861	2,461	0	0	0	0	NA	NA
14	Jeera	2,248	28,918	2,319	31,229	3,377	54,899	2,790	49,547	1,710	32,285
15	Kapas	7,303	35,461	4,755	19,445	1,329	22,421	1,231	23,662	3,775	17,719
16	Maize	49	63	0	0	0	0	0	0	NA	NA
		1,282	1,613	710	810	472	697	438	624	NA	NA
		3,399	4,492	1,435	1,669	545	670	1,040	1,543	250	332
17	Potato	101	79	0	0	0	0	0	0.00	NA	NA
18	Pepper	17	589	0	0	0	0	0	0.00	5	221.07
19	Rubber	0	0	0	0	0	0	0	0.00	NA	NA
20	Rmseed	23,978	84,218	14,780	52,860	24,852	1,05,951	18,576	84,795	10,860	41,993
		0	0	1	4	3	14	0	0.00	NA	NA
21	Rmseed oilcake	0	0	0	0	0	0	0	0.00	15	26.71

22	Soya bean meal	0	0	0	0	0	0	22	52.21	1	1.89
23	Sugar	0	0	745	1,996	7,113	20,006	2,277	8,082	14	51
		4,256	12,646	2,108	6,590			0	0.00	NA	NA
		0	0	1	2	1	1	0	0.00	NA	NA
		0	0	0	0	0	0	0	0.00	NA	NA
24	Soya bean	0	0	1	3	12	46	0	0.00	NA	NA
		48,829	1,82,336	26,661	98,131	28,730	1,06,706	22,019	75,536	23,669	76,485
25	Degummed Soy oil	0	0	0	0	0	0	0	0	12	73
26	Soya oil	38,886	2,69,915	25,452	1,61,422	23,833	1,43,165	19,398	1,28,220	10,847	74,070
27	Turmeric	4,931	29,606	3,591	26,424	4,862	40,733	2,202	17,042	1,433	9,754
28	Wheat	1,047	1,637	662	1,043	788	1,195	1,037	1,852	705	1,170
	Total for C	**2,74,283**	**1138,862**	**1,94,255**	**8,70,863**	**2,13,632**	**9,98,811**	**1,25,082**	**5,96,530**	**1,33,172**	**5,89,499**
D	**Energy**							0		0	
1	Brentcrude	0	0	3	13	0	0	0	0	0	0
2	Crude oil	257	1,175	105	472	0	0	0	0	0	0
	Total for D	**257**	**1,175**	**107**	**485**	**0**	**0**	0	**0**	0	**0**
E	**Others**							0		0	
1	Polyvinyl chloride	0	0	0	0	0	0	0	0	0	0
Grand Total (A+B+C+D+E)		**2,74,544**	**1146,328**	**1,94,365**	**9,04,063**	**2,13,633**	**1019,588**	**1,25,084**	**5,96,852**	**1,33,172**	**5,89,499**
Source: Securities and Exchange Board of India Handbook Book of Statistics 2018.											

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CHAPTER V: ANALYSIS OF THE SPOT AND FUTURES PRICES OF CHANA, SOY OIL AND GUAR SEED

1. Analysis of Spot and Near Month Futures Prices

1.1. Near month futures and spot prices of Chana, Soy Oil and Guar Seed are given at **Figure 5.1 to 5.9.** Commodity exchanges trade contracts of various maturities. Contract nearest to expiry is known as '*near month'* contract. As near month contract is very close to expiry it is highly susceptible to manipulation and closely mirrors spot prices and both tend to move in the same direction. It may be seen in Figures that difference between the futures and spot price (basis) is very small which on the expiry tends to be zero. Three commodities identified for the purpose of analysis have been suspended from futures trading at some point or other on the perception that futures markets in these commodities were speculative and out of sync with spot markets. When the futures trading is suspended in a particular commodity exchanges stop displaying spot prices of that commodity. That's why in **Figure 5.1 and 5.3** spot and futures prices only till 7th May 2008 have been depicted as after that futures market in Chana and Soya Oil were suspended. Spot prices of Chana during 2005 - 2008 were at their lowest on 1st January 2005 at Rs 1431.15 which went up to Rs 3326.25 on 27th September 2006 and came down to around Rs 2058 by January 2008. The Spot prices were at Rs 2400 and Futures prices were at Rs 2500 when the futures markets in Chana were suspended. The spot prices of Soy Oil varied between Rs 337.20 (30th December 2005) and Rs 718.15 (3rd March 2008). When the futures markets in Soy Oil were suspended on 7th May 2008 the

spot and futures price of Soya Oil were at Rs 583.60. In **Figure 5.5** futures and spot prices of Guar seed have not been depicted from 28th March 2012 to 13th May 2013 as during that period the futures market in Guar seed was suspended. During 2011 -2012 spot and futures prices of guar seed had shown an increasing trend. Spot and futures prices of Guar seed which were at around Rs 2234 on 1st January 2011 increased to Rs 30432 (futures price 29,900) on 24th March 2012. Futures market in Guar seed were suspended on 28th March 2012. In **Figure 5.8** spot and futures prices have been depicted from 14th July 2017 till 31st December 2019 as between 27th July 2016 to 13th July 2017 futures markets in Chana were suspended.

FIGURE 5.1: NEAR MONTH FUTURES & SPOT PRICES 2005-2008 OF CHANA TRADED AT NCDEX

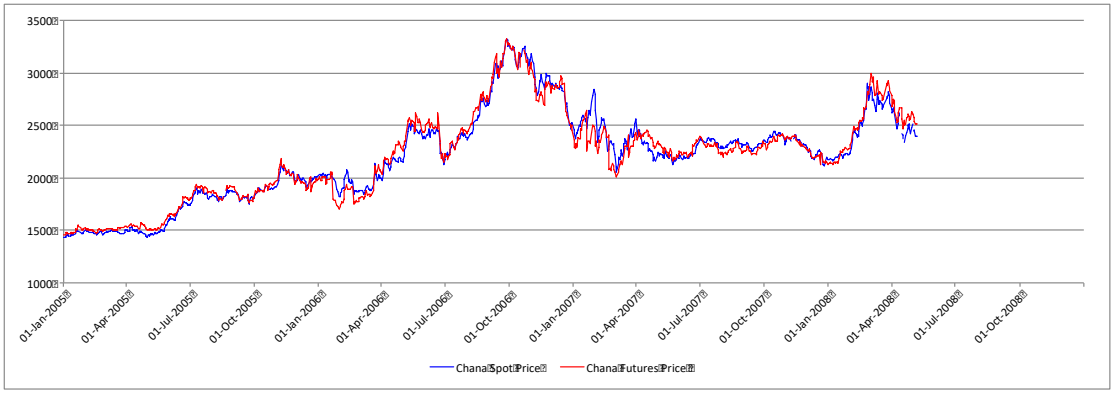


FIGURE 5.2: NEAR MONTH FUTURES AND SPOT PRICES 2005-2008 OF GUAR SEED TRADED AT NCDEX

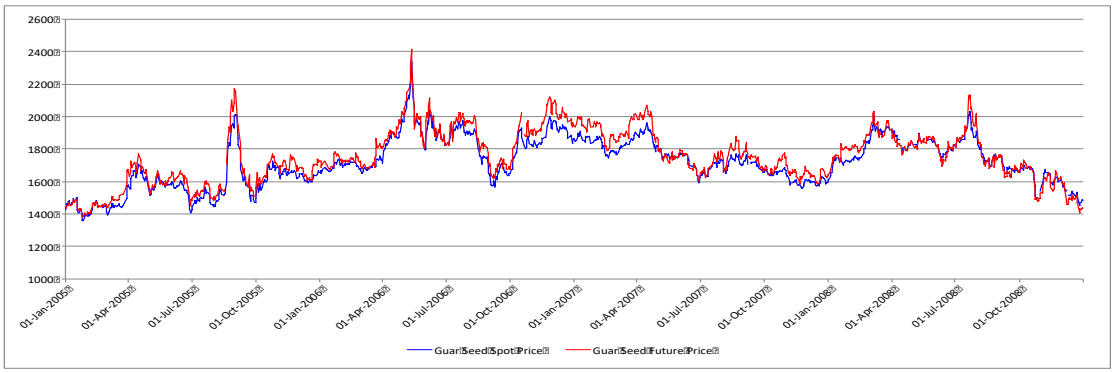


FIGURE 5.3: NEAR MONTH FUTURES AND SPOT PRICES 2005-2008 OF SOY OIL TRADED AT NCDEX

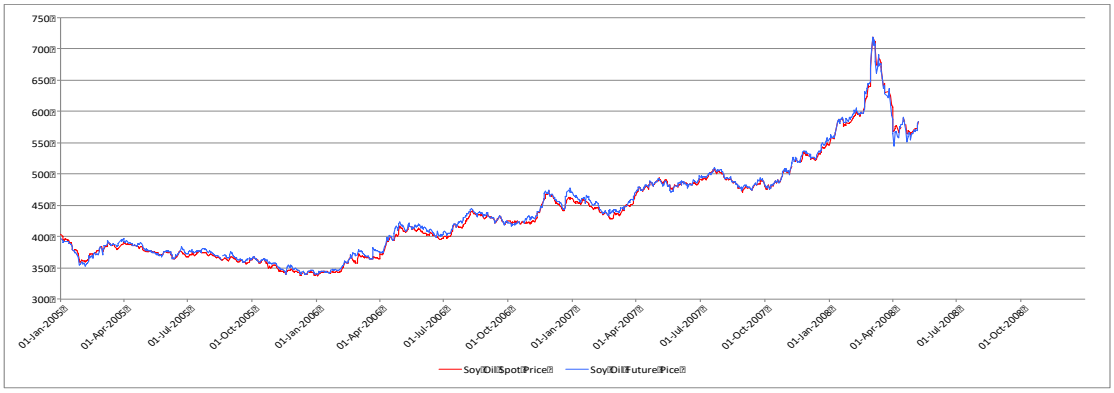


FIGURE 5.4: NEAR MONTH FUTURES AND SPOT PRICES 2011-2014 OF CHANA TRADED AT NCDEX

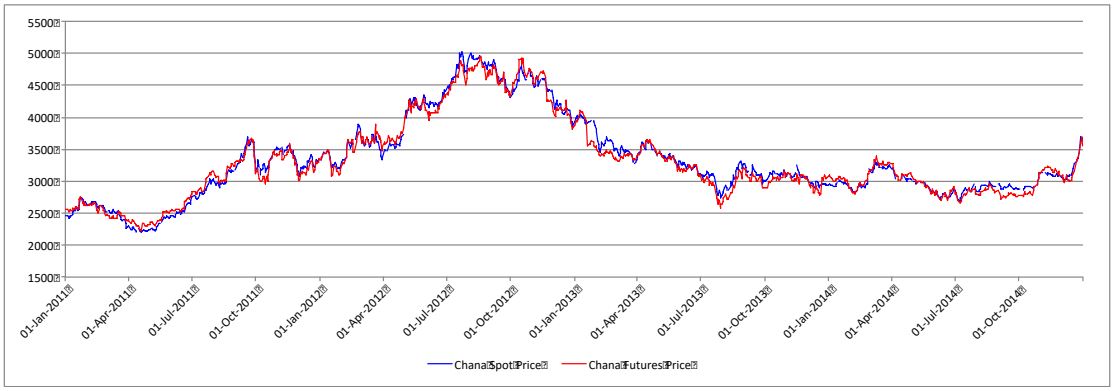


FIGURE 5.5: NEAR MONTH FUTURES AND SPOT PRICES 2011-2014 OF GUAR SEED TRADED AT NCDEX.

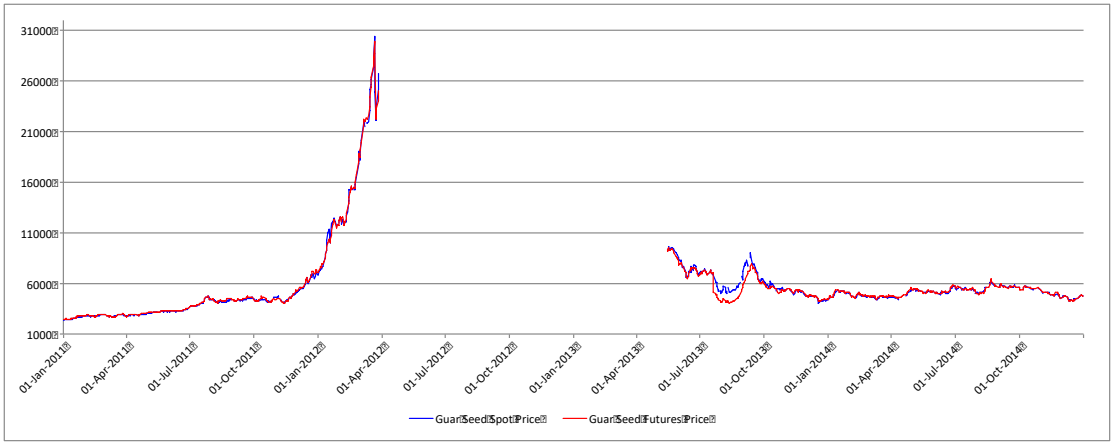


FIGURE 5.6: NEAR MONTH FUTURES AND SPOT PRICES 2011-2014 OF SOY OIL TRADED AT NCDEX

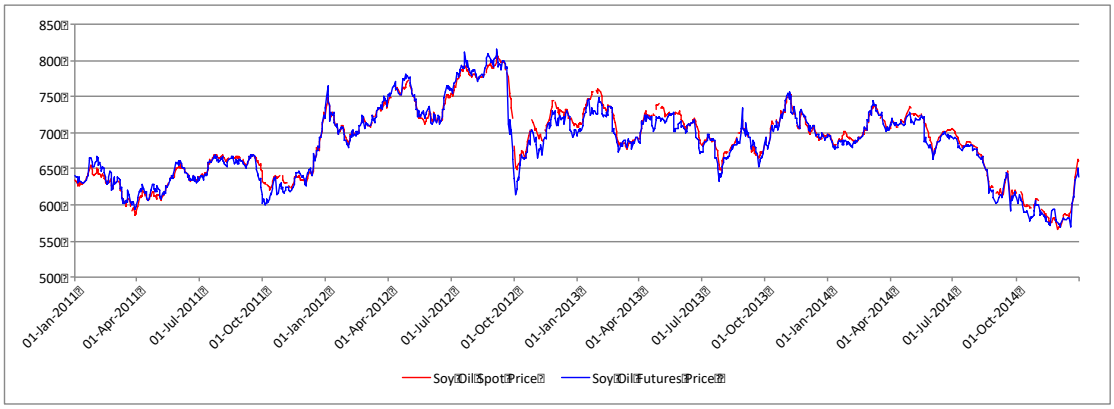


FIGURE 5.7: NEAR MONTH FUTURES AND SPOT PRICES 2017-2019 OF GUAR SEED TRADED AT NCDEX.

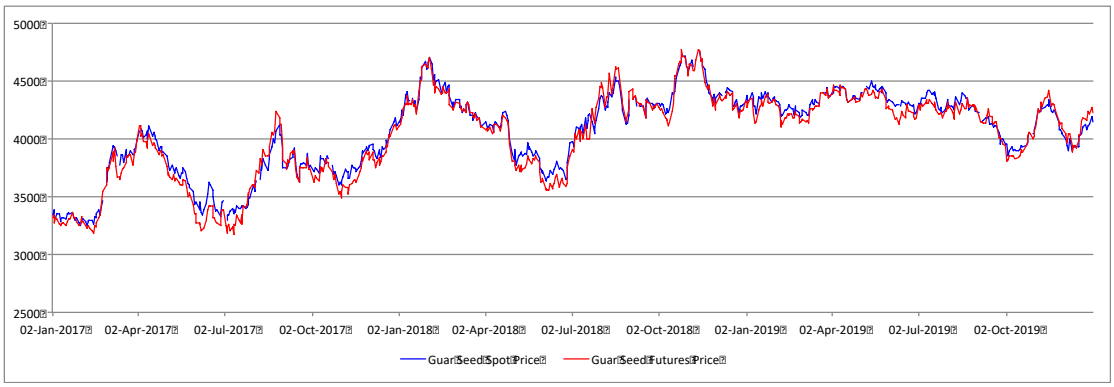


FIGURE 5.8: NEAR MONTH FUTURES AND SPOT PRICES 2017-2019 OF CHANA TRADED AT NCDEX.

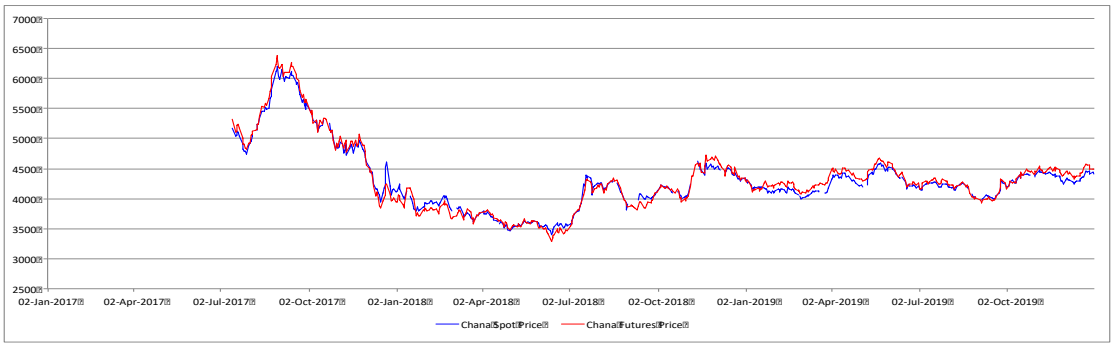
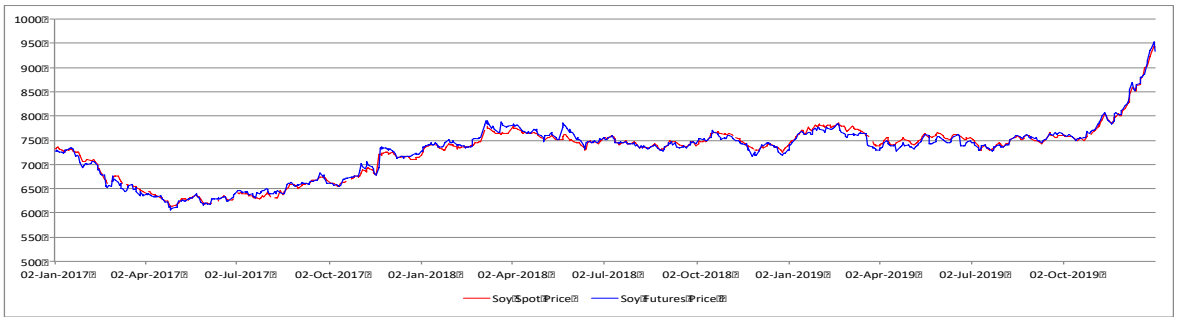


FIGURE 5.9: NEAR MONTH FUTURES AND SPOT PRICES 2017-2019 OF SOY OIL TRADED AT NCDEX



2. Analysis of the spot and futures prices selected contracts

2.1. Futures and spot prices of Chana (April 2007, April 2012 and March 2019 expiry contracts), Soy Oil (December 2007, December 2012, December 2019 expiry contracts) and Guar Seed (December 2007, December 2011, December 2019 expiry contracts) are presented in the **Figure 5.9 to 5.18.** Futures prices are higher than the spot prices at the beginning of the contract. This difference between the futures and spot prices in known as *basis*. The concept of *basis* has been explained in detail in Para 2.2 of Chapter III while discussing the relationship between the futures and spot prices. Futures prices of Chana are lower than the spot prices for April 2007, April 2012 and April 2019 expiry contracts **(Figure 5.10, 5.11 and 5.12)** and the market is said to be in *backwardation*. This is logical as March -April is the harvest season of Chana when the new crop is expected. The contracts were launched in November which is the lean season for Chana and are for expiry for April which is the harvest period for Chana. Price of a commodity are logically expected to be higher in the lean season and lower during the harvest period. The Soy Oil spot prices are also higher than the futures prices **(Figure 5.16 to Figure 5.19)** and the markets are in *backwardation.* In case of Guar seed

we find that the futures prices are higher than the spot prices **(Figure 5.13 to 5.15)** and the markets are said to be in *contango.* The *basis* gets narrower as the contract nears expiry. On expiry, futures price tend to converge with the spot prices and *basis* tends to be zero. Here also we see the unidirectional relationship between the spot and futures prices and both tend to move in the same direction. The reason for this unidirectional movement is that futures market of a commodity are governed by the same fundamentals which govern spot and physical markets. As spot and future prices tend to move in same direction there is a strong possibility that past prices of either spot or futures would be having an impact on the other price. Purpose of study is to find out the causality between spot and futures around which the entire debate about efficacy of future markets has largely been centered around.

FIGURE 5.10 FUTURES AND SPOT PRICE OF APRIL 2007 EXPIRY CONTRACT OF CHANA AT NCDEX

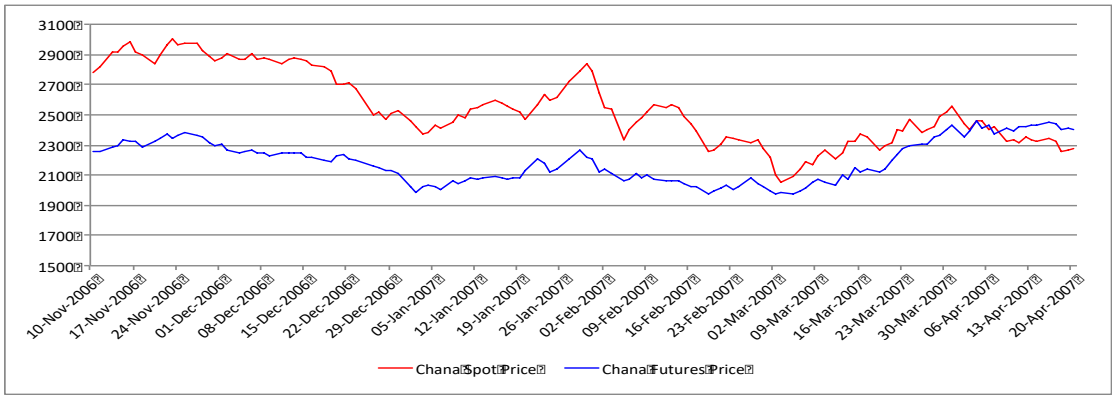


FIGURE 5.11 FUTURES AND SPOT PRICE OF APRIL 2012 EXPIRY CONTRACT OF CHANA AT NCDEX

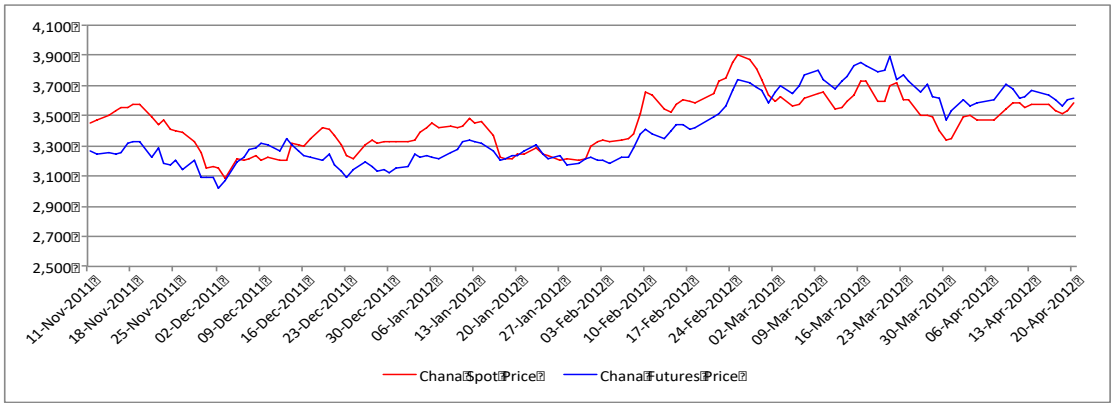


FIGURE 5.12 FUTURES AND SPOT PRICE OF MARCH 2019 EXPIRY CONTRACT OF CHANA AT NCDEX

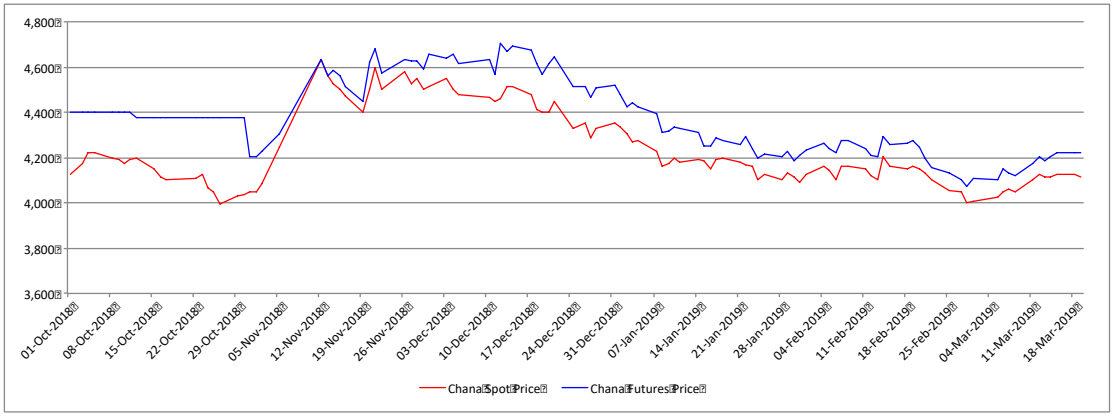


FIGURE 5.13 FUTURES AND SPOT PRICE OF DECEMBER 2007 EXPIRY CONTRACT OF GUAR SEED AT NCDEX

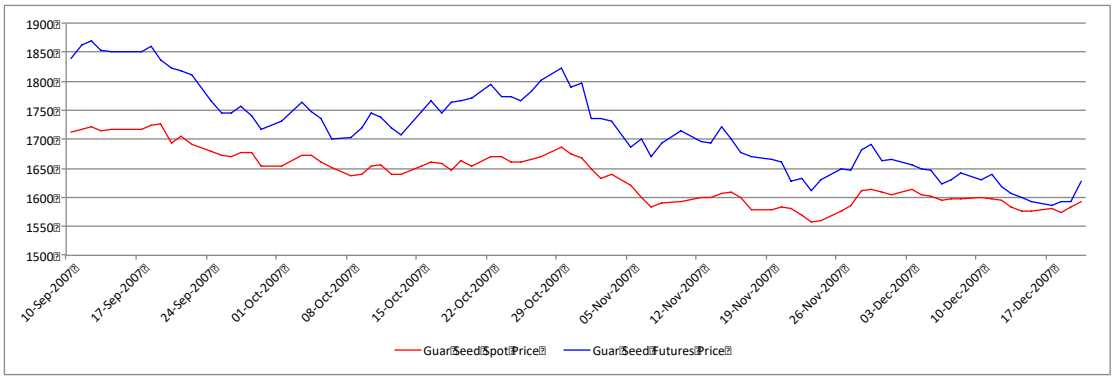


FIGURE 5.14 FUTURES AND SPOT PRICE OF DECEMBER 2011 EXPIRY CONTRACT OF GUAR SEED AT NCDEX

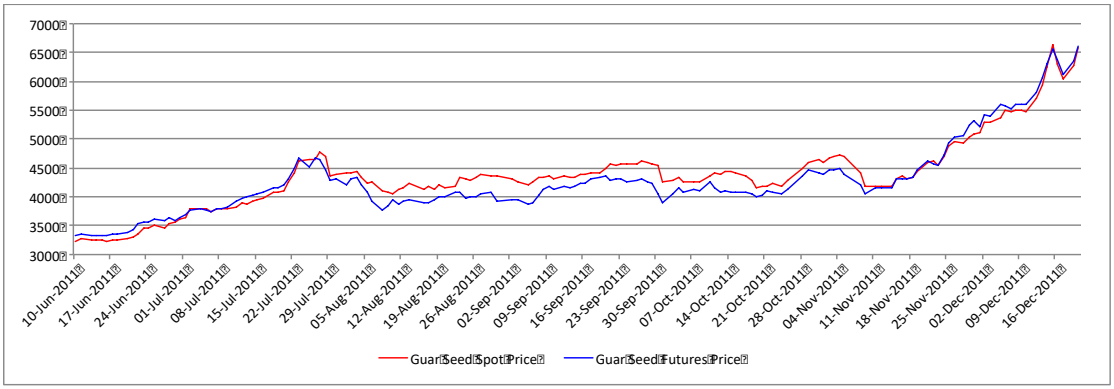


FIGURE 5.15 FUTURES AND SPOT PRICE OF DECEMBER 2019 EXPIRY CONTRACT OF GUAR SEED AT NCDEX

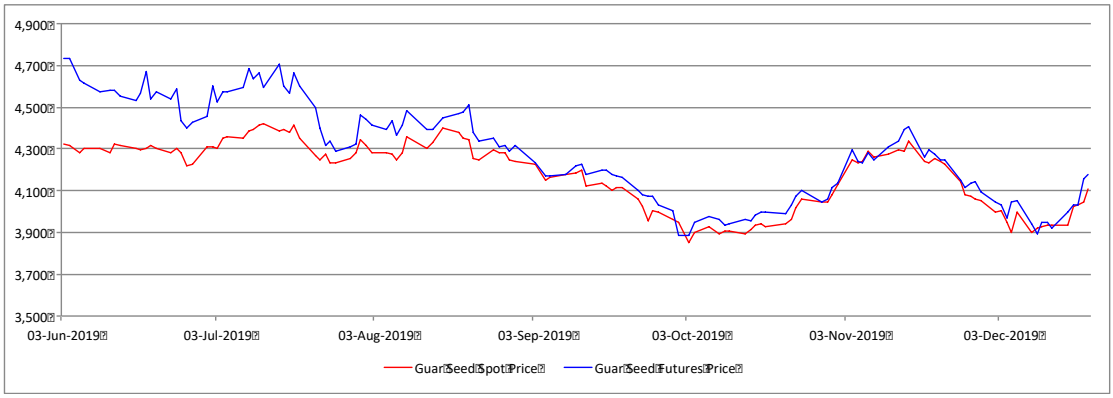


FIGURE 5.16 FUTURES AND SPOT PRICE OF DECEMBER 2007 EXPIRY CONTRACT OF SOY OIL

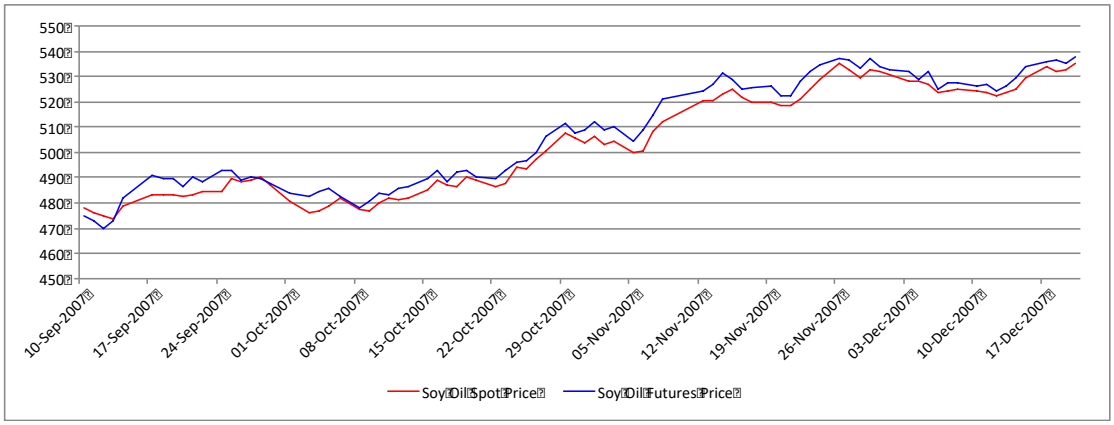


FIGURE 5.17 FUTURES AND SPOT PRICE OF DECEMBER 2012 EXPIRY CONTRACT OF SOY OIL

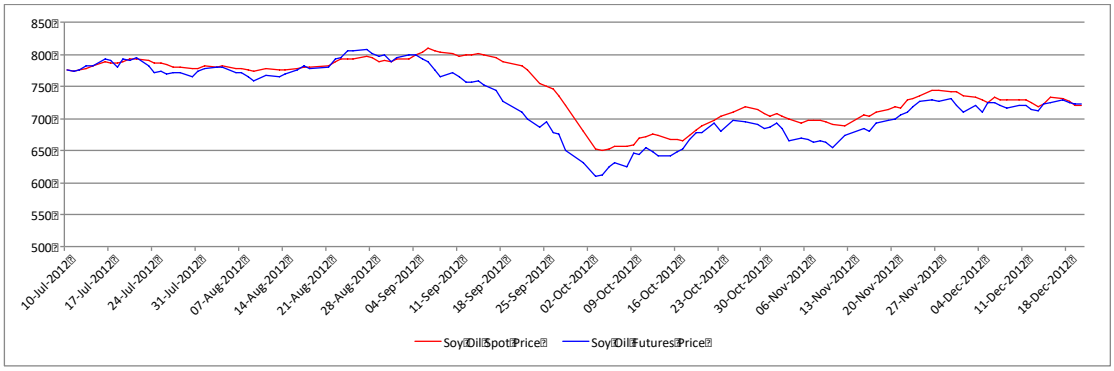
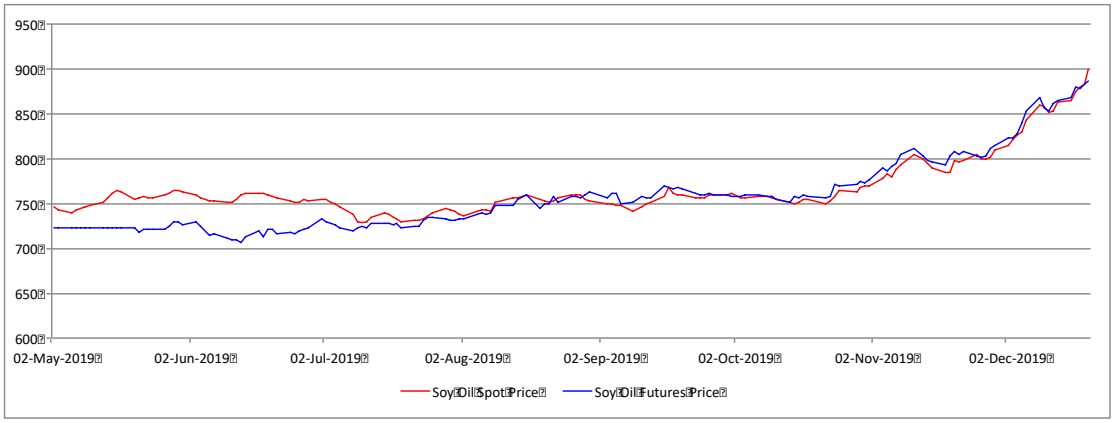


FIGURE 5.18 FUTURES AND SPOT PRICE OF DECEMBER 2012 EXPIRY CONTRACT OF SOY OIL



3. Descriptive Statistics

3.1. Table **5.1** below presents descriptive statistics for Chana, Soy Oil and Guar seed traded at NCDEX during the period 2005-2008, 2011-2014 and 2017-2019. The mean of spot and futures prices for April 2007, April 2012 and March 2019 delivery of Chana, December 2007, December 2012 and December 2019 for Soy Oil and December 2007, December 2011 and December 2019 expiry for Guar Seed is given in **Table 5.2**

3.2. Mean spot and near month futures prices of Chana, Soya Oil and Guar seed have been examined for the period 2005-2008, 2011-14 and 2017-19 and for the selected delivery contracts and are observed to be as follows

- Mean of the spot prices of Chana (2005-2008 and 2017-2019) and Guarseed (2005-2008) was lower than the futures prices.
- Mean of the spot prices was higher for Chana (2011-2014), Soy Oil (2011-2014) and Guar Seed (2017-2019) than the futures prices.
- The mean spot prices were lower than the futures prices for Chana (March 2019), Soy Oil (December 2007 delivery) and Guar Seed (December 2007 and December 2019 delivery).
- Mean of spot prices for Chana (April 2007 and April 2012 delivery), Soy Oil (December 2012 and December 2019 delivery) and Guar Seed (December 2011 delivery) were higher than the futures prices.

3.3. Standard **Deviation** (**σ)** is the measure of the volatility. With regard to the standard deviation of the spot and future prices of the Chana, Soy Oil. Standard Deviation of Spot and Futures prices of Chana and Guarseed was found to be higher than Soy Oil. The results of Standard Deviations as observed in **Table 5.1 and 5.2** can be summarized as follows:

- Higher volatility in spot prices of Chana was observed in 2005-2008 and 2011-14 and for Soy oil in 2017-19.
- Futures prices were more volatile than spot prices for Chana in 2017-19, Soy Oil in 2011-14 and Guarseed in 2005-08 and 2017-19.
- Spot Prices of Chana, Soy Oil and Guar Seed for all delivery contracts were less volatile than futures prices.

The finding that spot prices are less volatile than futures markets is significant as theoretically futures market are expected to be more volatile than spot prices as it is the futures markets that first reacts to any information having bearing on the prices of the commodities.

3.4. Skewness measures the asymmetry of distribution around its mean. The table indicates that the level of skewness between the spot and futures prices is almost similar which flows from the above Graphs which indicate that future and spot prices tend to move in the same direction and have high degree of correlation. Except for Chana for the period 2017-2019 skewness for all other periods for each commodity is found to between 0.5 to -0.5 and therefore the data series is either symmetrical or at the most moderately skewed.

- **Skewness between 0.5 to -0.5 (symmetrical around mean)**
    - ✓ Spot and Future Prices of Chana for period 2005-2008, of Soy Oil for the period 2011-2014 and 2017-2019 and Guar Seed for period 2005-2008, have their skewness between 0.5 to -0.5 which means that prices are by and large symmetrical around their mean.
    - ✓ Spot and Futures Prices of Chana (April 2007 and April 2012 delivery), Soy Oil (December 2007 and December 2012 expiry) and Guar Seed (December 2007 and December 2011 expiry) have their skewness between 0.5 to -0.5 which that prices are by and large symmetrical around their mean.
- **Skewness between -0.5 to -1.0 and 0.5 to 1.0 (moderately skewed)**
    - ✓ Skewness of Spot and Future prices of Chana 2011-2014, and Guarseed 2017-2019 are between -0.5 to -1.0 and 0.5 to 1.0 which means that there prices are moderately skewed.

- ✓ Spot prices of Chana (March 2019 delivery) has a skewness of 0.5 to 1.0 which means that the prices are moderately skewed

- **Skewness greater than 1.0 or -1.0 (highly skewed)**
  - ✓ Spot and Futures prices of Chana for 2017-2019 is at 1.33 which is greater than 1 which means that Spot and Future Prices of Chana were highly skewed during the period 2017-2019.
  - ✓ Spot and Futures Prices of soy Oil (December 2012 delivery) and Guar Seed December 2011) have a skewness greater than 1 which means they are highly skewed.

3.5. **Kurtosis** is a measure of whether the distribution is too peaked (a very narrow distribution with most of the responses in the center). Kurtosis for all the there commodities over three different time periods is more than +1 indicating that distribution has heavier tails than the normal distribution.

Table 5.1: Descriptive Statistics of Near Month futures and Spot Prices

			No of Observations	Mean	Median	Maximum	Minimum	Std . Dev	Skewness	Kurtosis
Chana	Spot	2005-2008	954	2195.447	2231.400	3326.250	1431.150	423.3361	0.100232	2.748310
		2011-2014	1105	3322.987	3183.850	5021.900	2200.000	641.9032	0.790552	3.085446
		2017-2019	555	4308.741	4211.800	6195.000	3400.000	545.3357	1.333765	5.140678
	Futures	2005-2008	954	2201.073	2239.000	3318.000	1457.000	419.7546	0.176529	2.666711
		2011-2014	1105	3299.795	3143.000	4940.000	2216.000	622.6224	0.845809	3.053626
		2017-2019	555	4329.198	4247.000	6393.000	3286.000	582.7003	1.243865	4.950868
Soy Oil	Spot	2005-2008	946	437.3719	423.5500	718.1500	337.2000	77.00266	0.984715	3.680171
		2011-2014	1098	688.2980	693.7750	809.1000	566.0000	50.11307	-0.135845	2.517712
		2017-2019	686	728.1773	741.8500	944.8000	612.9500	54.31210	-0.052579	4.057847
	Futures	2005-2008	946	439.7585	426.4000	718.7500	339.0000	76.26402	0.949944	3.606227
		2011-2014	1098	685.6123	689.0500	815.6000	568.5000	50.62058	0.002186	2.690788
		2017-2019	686	727.7676	740.2500	952.2000	606.0500	54.14402	-0.043328	4.040113
Guar Seed	Spot	2005-2008	1157	1717.659	1711.750	2336.350	1358.700	148.1909	0.020186	2.664559
		2011-2012	362	6144.574	4238.075	30432.00	2234.300	5549.876	2.310379	7.729610
		2013-2014	423	5605.181	5289.600	9610.650	4056.650	1134.953	1.603185	5.229201
		2017-2019	692	4046.775	4123.875	4774.450	3250.000	349.3296	-0.520243	2.437330
	Futures	2005-2008	1158	1753.442	1737.000	2416.000	1380.000	1631924	0.141291	2.731441
		2011-2012	362	6184.088	4280.500	29900.00	2439.000	5554.116	2.325302	7.803865
		2013-2014	423	5493.525	5210.000	9570.000	4040.000	1076.838	1.646518	5.675330
		2017-2019	692	4013.146	4123.750	4774.500	3174.000	369.7311	-0.526205	2.418879

Table 5.2: Descriptive Statistics of Futures and Spot prices of Selected Contracts

			No of Observations	Mean	Median	Maximum	Minimum	Std . Dev	Skewness	Kurtosis
Chana	Spot	April 2007	137	2543.160	2500.000	3000.000	2052.05	242.2057	0.301354	1.980316
		April 2012	133	3447.143	3450.000	3084.700	173.7336	173.7336	0.207066	2.433053
		March 2019	109	4234.690	4171.250	4631.350	3993.500	169.3974	0.754699	2.258459
	Futures	April 2007	137	2192.438	2199.000	2458.000	1973.000	139.8966	0.227883	1.799806
		April 2012	133	3401.853	3316.500	3891.000	3017.000	228.0129	0.463573	1.818548
		March 2019	109	4375.388	4376.000	4704.000	4073.000	171.7378	0.314442	1.921951
Soy Oil	Spot	Dec 2007	84	503.7548	501.8750	535.2500	473.6500	20.55712	0.094108	1.408430
		Dec 2012	157	743.5734	742.7500	809.1000	649.4000	45.53047	-0.378204	1.868701
		Dec 2019	158	766.8217	756.5500	900.0000	728.7000	33.88516	1.985661	6.603959
	Futures	Dec 2007	84	507.8965	508.7250	537.5500	469.8500	20.97734	-0.047709	1.464773
		Dec 2012	157	726.5815	724.8250	807.0500	609.5000	52.45791	-0.277422	1.933720
		Dec 2019	158	758.2503	753.3000	887.0000	706.5000	42.18001	1.294692	4.129116
Guar Seed	Spot	Dec 2007	86	1635.166	1639.200	1725.750	1557.450	46.00893	0.230742	1.947897
		Dec 2011	165	4379.775	4336.600	6632.500	3224.350	644.6938	1.000423	5.121388
		Dec 2019	136	4177.800	4241.150	4420.900	3850.000	158.8842	-0.470451	1.871697
	Futures	Dec 2007	86	1717.314	1718.000	1870.000	1586.000	74.78916	0.187542	2.182358
		Dec 2011	165	4281.958	4134.000	6616.000	3320.000	653.7730	1.608857	5.782894
		Dec 2019	136	4283.478	4283.000	4733.500	3882.500	231.8623	0.099637	1.869466

4. Unit Root Test of Spot and Futures Prices

4.1. Integration of the spot and futures prices of the selected commodities was studied through **Unit Root Test by employing Augmented Dickey – Fuller Test (ADF) and the Phillips Perron (PP)** with intercept, with intercept and trend and without intercept and trend. The E-Views software was employed to run the tests. The results of the tests are presented in **Table 5.3 and 5.4** below. ADF and PP tests the null hypothesis that Unit Root is present in the data under study. ADF test assumes serial correlation in the data and appropriate lag periods are automatically selected using SIC criteria in E Views. PP test on the other hand does not assume anything about the underlying data series and is therefore *non parametric*. PP takes the same estimation scheme as in DF test, but corrects the statistic to conduct for auto correlations and heteroscedasticity. Hetroscedasticity in a data series is because of the presence of the outliers, i.e observations with respect to other observations are present in data series which may be large or small. The First difference of the spot and futures indicates indicate that series is stationary after first difference.

Table 5.3: Unit Root Test of Spot and Near Month Futures Prices employing Augmented Dickey – Fuller Test (ADF) and the Phillips Perron (PP)

			ADF Test			PP test		
			Intercept	Intercept &Trend	No Intercept or Trend	Intercept	Intercept &Trend	No Intercept or Trend
A. Level								
Chana	Spot	2005-2008	-1.999969	-2.026365	0.367926	-1.929286	-1.863631	0.457388
		2011-2014	-1.684964	-1.686474	0.334564	-1.631305	-1.630619	0.381633
		2017-2019	-1.864626	-1.594304	-0.724575	-1.963874	-1.729894	-0.696744
	Futures	2005-2008	-1.997080	-2.189350	0.405646	-1.965916	-2.169778	0.434239
		2011-2014	-1.622682	-1.631797	0.315117	-1.704584	-1.712371	0.267149
		2017-2019	-1.851223	-1.675422	-0.562177	-2.043799	-1.809833	-0.725858
Soy Oil	Spot	2005-2008	-0.083365	-2.697650	1.195669	-0.287472	-2.898511	1.019162
		2011-2014	-2.438680	-2.384376	-0.065801	-2.581868	-2.526861	-0.080000
		2017-2019	1.572239	-0.710722	1.519069	1.808039	-0.472622	1.556464
	Futures	2005-2008	-0.247435	-2.736456	1.151162	-0.228066	-2.761754	1.143001
		2011-2014	-2.380273	-2.340884	-0.182048	-2.669549	-2.631185	-0.198719
		2017-2019	1.777546	-0.271283	1.639225	1.607944	-0.448596	1.493413
Guar Seed	Spot	2005-2008	-3.143306	-2.972234	-0.203032	-3.284490	-3.139647	-0.203032
		2012-2014	-3.147919	-2.990505	-1.703198	-3.158338	-3.040947	-1.677279
		2017-2019	-2.525411	-2.703401	0.350957	2.518015	-2.703401	0.343514
	Futures	2005-2008	-3.669888	-3.547162	-0.336835	-3.557802	-3.423444	-0.318164
		2012-2014	-3.476470	-3.252988	-1.696791	-3.691391	-3.498801	-1.715610
		2017-2019	-2.564204	-2.968877	0.321147	-2.574245	-3.049053	0.352083

			ADF Test			PP test		
			Intercept	Intercept &Trend	No Intercept or Trend	Intercept	Intercept &Trend	No Intercept or Trend
B. First Difference								
Chana	Spot	2005-2008	-28.12733	-28.131316	-28.12335	-28.01365	-28.01589	-28.01224
		2011-2014	-28.02916	-28.02339	-28.02833	-27.84487	-27.83653	-27.84679
		2017-2019	-21.35729	-21.36758	-21.37112	-21.43118	-21.36758	-21.37112
	Futures	2005-2008	-31.54605	-31.53996	-31.54149	-31.55521	-31.54945	-31.55370
		2011-2014	-32.54003	-32.52828	-32.54331	-32.57661	-32.56461	-32.58065
		2017-2019	-21.11870	-21.13072	-21.13072	-21.17567	-21.18719	-21.19060
Soy Oil	Spot	2005-2008	-23.04792	-23.09164	-23.00922	-23.81784	-23.82522	-23.87851
		2011-2014	-22.64123	-22.64360	-22.65117	-23.31212	-23.24431	-23.32115
		2017-2019	-20.43237	-20.69428	-20.36917	-20.51178	-20.64929	-20.47252
	Futures	2005-2008	-26.83410	-26.85842	-26.80037	-31.71402	-26.85842	-26.77667
		2011-2014	-31.60789	-31.60648	-31.62237	-31.71402	-31.70938	-31.72782
		2017-2019	-24.01507	-24.22272	-23.95739	-24.04294	-24.17733	-24.01113
Guar Seed	Spot	2005-2008	-34.35158	-34.36373	-34.36649	-34.35140	-34.36373	-34.36630
		2012-2014	-22.12737	-22.18693	-22.08496	-22.08676	-22.12108	-22.05751
		2017-2019	-27.26459	-27.26495	-27.27240	-27.24586	-27.24611	-27.25392
	Futures	2005-2008	-35.92591	-35.93727	-35.94148	-35.96920	-35.98265	-35.98507
		2012-2014	-17.94701	-18.00488	-17.91318	-18.24406	-15.49035	-14.87124
		2017-2019	-28.44870	-28.43875	-28.45574	-28.36616	-28.43875	-28.37260

Table 5.4: Unit Root Test of Spot and Futures Prices of selected contracts employing Augmented Dickey – Fuller Test (ADF) and the Phillips Perron (PP)

			ADF Test			PP test		
			Intercept	Intercept &Trend	No Intercept or Trend	Intercept	Intercept &Trend	No Intercept or Trend
A. Level								
Chana	Spot	April 2007	-1.250179	-2.328143	-0.917541	-1.406610	-2.328143	-0.864626
		April 2012	-2.620501	-3.185646	-0.363761	-2.028717	-2.585628	-0.60587
		March 2019	-2.324739	-2.494371	-0.972366	-2.324739	-2.494371	-1.025323
	Futures	April 2007	-0.913166	-0.973912	0.347377	0.886036	-0.973912	0.358745
		April 2012	-1.166675	-2.382835	0.537748	1.098591	-2.366415	0.627243
		March 2019	-1.390465	-2.041362	-0.397538	-1.252030	-1.923423	-0.409142
Soy Oil	Spot	Dec 2007	-0.503172	-2.281704	1.822194	-0.560879	-2.281704	1.692550
		Dec 2012	-2.099388	-2.653486	-0.132321	-1.117086	-1.492822	-0.550834
		Dec 2019	2.835631	1.437062	2.157120	4.299933	2.272020	2.333707
	Futures	Dec 2007	-0.922351	-2.105272	1.915026	-0.926272	-2.162957	1.919108
		Dec 2012	-1.174884	-0.862676	-0.632716	-1.398713	-1.295591	-0.526177
		Dec 2019	2.341445	-0.057225	2.809867	3.558493	0.472698	2.855363
Guar Seed	Spot	Dec 2007	-1.491235	-2.479230	-1.271614	-1.491182	-2.337161	-1.274107
		Dec 2012	-2.099388	-2.653486	-0.132321	-1.117086	-1.492822	-0.550834
		Dec 2019	-1.521487	-1.865744	-0.284561	-1.592560	-2.087783	0.283743
	Futures	Dec 2007	-1.483614	-2.595053	-1.231896	-1.452545	-2.600001	-1.345821
		Dec 2012	-1.174884	-0.862676	-0.632716	-1.398713	-1.295591	-0.526177
		Dec 2019	-2.077437	-2.319051	-0.941948	-2.049105	-2.296769	-0.980577

			ADF Test			PP test		
			Intercept	Intercept &Trend	No Intercept or Trend	Intercept	Intercept &Trend	No Intercept or Trend
B. First Difference								
Chana	Spot	April 2007	-10.08738	-10.04848	-10.07615	-10.00527	-2.328143	-10.00262
		April 2012	-8.598695	-8.563697	-8.631022	-8.339014	-8.291976	-8.379215
		March 2019	-7.003006	-6.958204	-10.55801	-10.59631	-10.54410	-10.56595
	Futures	April 2007	-12.03429	-12.15286	-12.06371	-12.03419	-12.15742	-12.06364
		April 2012	-12.23438	-12.19116	-12.24057	-12.27484	-12.23120	-12.26978
		March 2019	-11.44162	-11.41121	-11.47958	-11.51000	-9.580697	-9.456127
Soy Oil	Spot	April 2007	-7.204689	-7.158948	-6.958973	-7.099493	-7.050322	-6.893988
		April 2012	-7.204689	-7.158948	-6.958973	-7.099493	-8.076550	-8.153520
		March 2019	-8.375151	-8.944071	-8.048071	-8.393141	-8.754903	-8.055951
	Futures	April 2007	-8.997722	-8.953926	-8.640110	-8.997109	-8.953000	-8.638475
		April 2012	-11.17769	-11.18389	-11.19689	-11.49559	-11.18389	-11.19689
		March 2019	-12.71981	-13.29196	-12.19267	-12.71981	-13.47280	-12.22201
Guar Seed	Spot	April 2007	-8.001756	-7.992462	-7.896582	-7.936365	-7.927642	-7.873419
		April 2012	-9.383514	-9.113519	-8.937954	-9.173832	-9.356999	-9.001379
		March 2019	-11.36355	-11.32078	-1139838	-11.37213	-11.33188	-11.40673
	Futures	April 2007	-9.607042	-9.564334	-9.455524	-9.622283	-9.580697	-9.456127
		April 2012	-10.05517	-10.25046	-9.712450	-9.962550	-10.11825	-9.747831
		March 2019	-12.57001	-12.61028	-12.54546	-12.57052	-12.61543	12.54574

5. Johansen's Co-integration Test of Spot and Futures Prices

5.1. As explained in the above Para after the Unit Root Test, **Johansen's Co-integration** test is employed to examine long-run relationship between futures and spot prices of selected commodities traded at NCDEX. Johnson's Test can be conducted in two types – either trace values or with eigenvalues. The findings of the Johnson's Co-integration on the basis of trace values and eigenvalues are summarized in **Table 5.5 and 5.6**. Results show that futures and spot prices of all three selected agricultural commodities are co-integrated with a co-integrating vector. Findings of co-integration result support general perception about futures markets that spot and futures prices of a commodity are related (integrated) over long run and tend to move in the same direction. This long relationship between futures and spot markets results in various economic benefits emanating (price discovery and risk management functions which have been explained in detail earlier) from well functioning derivatives markets. However, the debate surrounding commodity derivative markets is not about the long run relationship between futures and spot markets, but about whether the futures prices are impacted by the spot prices or the spot prices are impacted by the futures prices.

Table 5.5: Johansen's Co integration on Spot and Near Month Futures Prices

Commodity	Year	Ho: vector (r)	Trace Statistic	p value	Max Eigen Values	p values
Chana	2005-2008	r=0	35.52690	0.0000	31.72550	0.0000
		R at most 1	3.801406	0.0512	3.801406	0.0512
	2011-2014	r=0	42.97955	0.0000	40.27504	0.0000
		R at most 1	2.704508	0.1001	2.704508	0.1001
	2017-2019	r=0	24.61475	0.0016	20.81059	0.0040
		R at most 1	3.804163	0.0511	3.804163	0.0511
Soy Oil	2005-2008	r=0	64.86024	0.0000	64.72289	0.0000
		R at most 1	0.137350	0.7109	0.137350	0.7109
	2011-2014	r=0	58.22363	0.0000	50.30568	0.0000
		R at most 1	7.917947	0.0049	7.917947	0.0049
	2017-2019	r=0	40.59791	0.0000	38.29626	0.0000
		R at most 1	2.301654	0.1292	2.301654	0.1292
Guar Seed	2005-2008	r=0	38.66577	0.0000	27.85649	0.0002
		R at most 1	10.80928	0.0010	10.80928	0.0010
	2011-2012	r=0	57.24850	0.0000	33.93257	0.0000
		R at most 1	23.31593	0.0000	23.31593	0.0000
	2013-2014	r=0	28.76512	0.0003	21.87158	0.0026
		R at most 1	6.893539	0.0086	6.893539	0.0086
	2017-2019	r=0	33.78125	0.0000	27.22810	0.0003
		R at most 1	6.553143	0.0105	6.553143	0.0105

Table 5.6: Johansen's Co integration on Spot and Futures Prices of Selected Contracts

Commodity	Contract Expiry	Ho: vector (r)	Trace Statistic	p value	Max Eigen Values	p values
Chana	April 2007	r=0	6.325536	0.6571	6.132620	0.5962
		R at most 1	0.192916	0.6605	0.192916	0.6605
	April 2012	r=0	12.84271	0.1207	10.99598	0.1544
		R at most 1	1.846729	0.1742	1.846729	0.1742
	March 2019	r=0	24.41588	0.0018	20.36026	0.0048
		R at most 1	4.055616	0.0440	4.055616	0.0440
Soy Oil	Dec 2007	r=0	25.76332	0.0010	25.09970	0.0007
		R at most 1	0.663621	0.4153	0.663621	0.4153
	December 2012	r=0	13.27433	0.1051	9.757241	0.2284
		R at most 1	3.517092	0.0607	3.517092	0.0607
	Dec 2019	r=0	13.51088	0.0974	13.45631	0.0668
		R at most 1	0.054577	0.8153	0.054577	0.8153
Guar Seed	December 2007	r=0	4.654434	0.8444	3.374306	0.9188
		R at most 1	1.280127	0.2579	1.280127	0.2579
	December 2011	r=0	18.09072	0.0199	17.80877	0.0132
		R at most 1	0.281949	0.5954	0.281949	0.5954
	Dec 2019	r=0	9.695763	0.3049	6.213136	0.5860
		R at most 1	3.482627	0.0620	3.482627	0.0620

6. Analysis of the Granger Causality Results

6.1. Granger Causality is a useful statistical tool for determining whether one time series is useful in forecasting the other. The paper applies Granger Causality Test to study the causal relationship between the spot and futures prices of selected agricultural commodities. That is whether past values of Future Prices contain information to help predict Spot Prices above and beyond information already contained in past values of futures prices.

6.2. Granger Causality Test has been run first on null hypothesis that spot price of the Chana, Soy oil and Guar Seed does not impact futures price and subsequently Granger Causality Test of future prices impacting spot prices has been done for each of the three commodities (Chana, Soy Oil and Guar Seed) for the 2005-2008, 2011-2014 and 2017-2019 and the results given in **Table 5.7**

6.3. Similarly Granger Causality test has been done on the null hypothesis the spot prices and futures prices of Chana (April 2007, April 2012 and March 2019 delivery), Soy Oil (December 2007, December 2012 and December 2019 delivery) and Guar Seed (December 2007, December 2011 and December 2019) The results of the Granger Causality for are given in **Table 5.8**

6.4. Row S/$\rightarrow$F for each commodity describes that F- statistic and Probability that Spot prices do not Granger cause futures prices. Similarly row F/$\rightarrow$S describes for each commodity the F -Statistic and Probability that futures prices do not granger cause the spot prices.

6.5. Table **5.7** indicates that the futures and spot prices show bi directional relationship for Chana and Soy Oil for 2005-2008 and 2011 -14 and for Guar Seed for 2005- 2008, 2011-2012, 2013-2014 and 2017-2019. **Table 5.7** also

indicates that Futures prices had Granger caused spot prices for Chana for the period 2017-2019 and the spot prices of Soy Oil had Granger caused futures prices for the period 2017-2019.

Table 5.7: Granger Causality test on Spot and Near Month Futures Prices

		No of Observation	Hypothesis	F-Statistic	Probability	Direction	Relation
Chana	2005-2008	951	S/→F	7.74810	0.0005	Bidirectional	F⇔S
			F/→S	61.0804	1.E-25		
	2011-2014	1102	S/→F	9.92216	5.E-05	Bidirectional	F⇔S
			F/→S	104.068	4.E-42		
	2017-2019	552	S/→F	1.78965	0.1680	Unidirectional	F→S
			F/→S	22.7596	3.E-10		
Soy Oil	2005-2008	943	S/→F	46.0947	8.E-20	Bidirectional	F⇔S
			F/→S	11.0169	2.E-05		
	2011-2014	1095	S/→F	61.7740	4.E-26	Bidirectional	F⇔S
			F/→S	12.4290	5.E-06		
	2017-2019	683	S/→F	123.048	3.E-46	Unidirectional	S→F
			F/→S	1.81493	0.1636		
Guar Seed	2005-2008	1154	S/→F	5.55386	0.0040	Bidirectional	F⇔S
			F/→S	91.0206	2E-37		
	2011-2012	360	S/→F	180.121	1.E-54	Bidirectional	F⇔S
			F/→S	8.12932	0.0004		
	2012-2014	421	S/→F	4.97633	0.0073	Bidirectional	F⇔S
			F/→S	21.7902	1.E-09		
	2017-2019	689	S/→F	7.70347	0.0005	Bidirectional	F⇔S
			F/→S	47.0629	7.E-20		

6.6. **Table 5.10** shows the results of the Granger Causality Test for Chana, Soy Oil and Guar Seed for various deliveries. Its seen from the results of the Granger causality Test that Futures prices and Spot Prices of Chana (April 2007 and April 2012 Delivery), Soy Oil (December 2007 and December 2019) and Guar Seed (December 2007, December 2011 and December 2019) had a unidirectional relationship and futures prices had an impact on the spot prices. However bidirectional relationship was observed in the future and spot prices of Chana (March 2019 delivery) & Soy Oil (December 2012 delivery). The findings that the futures prices of seven out of the nine contracts

examined indicate that commodity derivative exchanges perform the function of the price discovery. Price Discovery took place first in the futures market which was then transmitted to spot market. Two of the nine contracts studied indicate unidirectional relationship between the futures and the spot markets i.e. that price discovery took place in the spot and futures market and both futures and spot markets had impact on each other.

Table 5.8: Granger Causality test on Spot and Futures Prices of selected contracts

		No of Observation	Hypothesis	F-Statistic	Probability	Direction	Relation
Chana	April 2007	135	S/→F	1.69564	0.1875	Unidirectional	F→S
			F/→S	21.3264	1.E-0.8		
	April 2012	125	S/→F	0.10969	0.8962	Unidirectional	F→S
			F/→S	25.8759	5.E-10		
	March 2019	99	S/→F	2.94354	0.0576	Bidirectional	F⇔S
			F/→S	3.19737	0.0454		
Soy Oil	Dec 2007	80	S/→F	0.81871	0.4449	Unidirectional	F→S
			F/→S	11.6039	4.E-05		
	Dec 2012	106	S/→F	6.98933	0.0014	Bidirectional	F⇔S
			F/→S	21.9939	1.E-08		
	Dec 2019	153	S/→F	0.13327	0.8753	Unidirectional	F→S
			F/→S	19.8809	2.E-08		
Guar Seed	Dec 2007	81	S/→F	0.10577	0.8998	Unidirectional	F→S
			F/→S	11.8817	3.E-05		
	Dec 2011	146	S/→F	4.14684	0.0178	Unidirectional	F→S
			F/→S	18.8868	5.E-08		
	Dec 2019	125	S/→F	2.70588	0.0709	Unidirectional	F→S
			F/→S	4.13107	0.0184		

7. Interaction with various market intermediaries

7.1. Improving agricultural marketing and reducing price risk for India's small and marginal farmers has been an important policy agenda for several decades (Sahadevan, 2012). Participation, direct or indirect, of a good number of small holders in the derivative markets is important for inclusive

benefits and impact (Dey and Maitra, 2016). National Commodity Exchanges since inception have been conscious of this fact and tried various models for enhancing farmers participations in commodities markets which included experimentation with a concept of 'aggregator' so that collectively farmers could participate in commodities markets. To ensure indirect participation of the farmers in the futures markets various awareness progarmmes especially focused at farmers and price ticker boards, which disseminate real time data of futures prices of commodities have been installed by various Mandis which helps in price dissemination and improving the bargaining capacity of farmers. Similarly other physical market stakeholders such as exporters, importers, stockiest need to increasingly participate in these markets to ensure a balanced participation of hedgers and speculators for the markets to effectively perform the functions of price discovery and risk management.

7.2. Interactions were held with physical market participants, which included farmers, stockeists and traders at Anaz Mandi, Hisar (Haryana) and Grain Market, Narela (Delhi) to understand their perception of the commodity futures markets. A visit was made to these markets and randomly few participants in the market were interviewed and their responses elicited. Responses from fifteen farmers and twenty traders were obtained. Interactions with market participants primarily focused on questions as to whether they are aware of the futures markets in commodities and whether they participate in futures markets (if 'yes' then what has been their experience and if 'no' then the reason for their non participation). Market participants, even though, were not very comfortable in sharing their financial details such as the size of their business and their average transaction, but

were quite candid and open in sharing their opinion and perceptions about the futures markets.

7.3. All farmers who were contacted were aware of futures markets in commodities known as *vayda bazar*. None of the farmers interviewed had ever participated in futures markets. However they agreed that a farmer by participating in these markets can get better returns. Reason for non-participation was that trading is a specialized activity and requires constant monitoring of the position and payment of margins & daily mark to market (payment of losses and receipt of profits on a daily basis), which is cumbersome. They observed that farming, which is a full time activity, leaves hardly any time for trading at the commodity exchanges. For chana and wheat minimum unit of trading and delivery is 10 Metric Tone[11] which is beyond the reach of a small and marginal farmer. Despite various constraints which inhibit direct participation of the farmers in the commodity derivatives markets seven out of the fifteen farmers interviewed observed that they are aware of the prices disseminated on the futures exchange and this has improved their bargaining capacity and better realization of the prices of their harvest. However they observed that they are unable to effectively use price signals emanating from the futures exchange in the sowing and marketing decision.

7.4. The dealers/ traders (some of whom were trading at the National Commodity Exchanges) had a mixed opinion of the impact of the futures markets on the spot prices. All the dealers/ traders interviewed were of the opinion that

[11] https://www.ncdex.com/Downloads/ContractSpace/Chana_CS_12072017.pdf & https://www.ncdex.com/Downloads/ContractSpace/Contract_Specifications_Wheat_24102016.pdf

futures markets have brought transparency in functioning of these markets. Commodities are now been considered as an investment class which has resulted in an increase in the prices and farmers are getting better prices of their harvest which has resulted in an increase in their income. Some of the traders interviewed, however, were skeptical of the role of the commodity derivatives market and observed that futures market lead to uncertainties in the market and make it more volatile leading to higher peaks and lower troughs than would have happened in the absence of futures markets. They also observed that frequent suspension of futures trading and high margins also lead to uncertainties in the markets. It was also observed that poor liquidity in some of the contracts increase cost of transaction and make hedging in these contracts unviable. It was also suggested that limited number of delivery centers (for Chana delivery center is Bikaner with Jaipur and Akola as other delivery centers) makes it difficult for participants from other places to take or delivery. Only three of the intermediaries interviewed had used the exchange platform for the hedging the price risk. They observed that 'options' are a better tool for the management of price risk than the futures contracts.

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CHAPTER VI: CONCLUSIONS AND RECOMMENDATIONS

1. India had a highly liquid and well developed futures market till 1939 that is the beginning of the Second World War. More than five decade of ban / prohibition (first imposed during Second World War which continued even after Independence) resulted in loss of tradition and modernity in commodity derivatives markets. USA, where the organized futures markets had started at around the same time when they started in India (1875) was well ahead of us. China, a socialist economy, was the new leader in the commodity derivatives markets and successfully used it as an policy instrument in various large commodities which were significant to it's economy. However, in India debate continued and even after it's late opening up leading to frequent suspensions of various commodities from the futures market, un realistic margins (which sometimes were as high as 100%), frequent changes in contract specifications and fragmented spot markets seriously undermined the growth of these markets. Futures markets play an important role in price discovery and with the gradual withdrawal of the Government from procurement and distribution channel, these markets can provide and efficient market platform for price discovery and risk management.
2. Relationship between spot and futures prices have been the subject of this study. Chana, Soy Oil and Guar seed, three agricultural commodities, which are actively traded on the commodity futures exchanges were selected for the purpose of the analysis. Near month futures prices and futures prices of nine contracts were taken up for the purpose of the analysis. Spot and futures prices of NCDEX were used for the purpose. It is observed that futures and spot prices are highly integrated.

Volatility in the spot prices (except for Chana 2005-2008 and 2011-14 and Soy Oil 2017-19) was less than the futures markets which is logical as futures markets are expected to react first to any price sensitive information.

3. Causality between the spot and futures markets was examined by applying Granger Causality test. Futures prices and spot prices of Chana (2005-2008, 2011-201), Soy Oil (2005-2008, 2011-2014) Guar Seed (2005-2008, 2011-2012, 2012-2014 and 2017-2019) had bidirectional relationship i.e. price discovery was taking place in futures and spot markets and both markets were impacting the other. Futures and spot prices of Chana (2017-2019) were unidirectional from futures to spot that is the price discovery is taking place in the futures market and the spot markets are taking signals from it. Soy Oil (2017-2019) prices were unidirectional from spot to futures i.e the price discovery is taking place in the spot market and then transmitted to futures markets. However when the futures and spot prices of a contract during it's full currency are examined it is observed that Chana (April 2007, April 2012) Soy Oil (December 2007, December 2019) Guar Seed (December 2007, December 2011, December 2019) had unidirectional relationship and in all these cases the price discovery was taking place in the futures markets and the spot markets were taking the price signals from the futures markets. Only for two contracts (out of nine) of Chana (March 2019) and Soy Oil (December 2012) have shown bi directional relationship between futures and spot prices i.e price discovery was taking place in both the markets. The findings are significant as it proves that futures markets effectively forecast the expected spot price at a future point of time.
4. Futures markets play an effective role in price discovery and risk management. It would be therefore be appropriate that the market eco system is designed in such a

way that all the stakeholders can derive economic benefits from the functioning of these markets. In this regard following is suggested:

4.1. Suspension of futures markets have a dampening effect on the markets and it is often difficult to get back the liquidity that is lost due to suspension of futures markets. The Regulators should not therefore resort to frequent suspension of futures markets.

4.2. Marketing federations and farmers cooperatives should be encouraged for greater participation in the futures markets. The successof derivatives markets in China are a pointer to the role that can be played by these cooperatives. This would instill confidence amongst different stakeholders.

4.3. Options are a useful tool for price risk management. Options in agricultural commodities should be introduced.

4.4. FPOs can play a useful role in ensuring participation of the farmers. In line with the Union Budget Announcement FPOs should be established at the earliest.

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REFERENCES

1. Bhattacharya, H. (2007). Commodity derivatives market in India. *Economic and Political weekly*, 1151-1162.
2. Chatterjee Tirtha, Raghunathan Raghav and Gulati Ashok (2019) Linking farmers to futures market in India, Working Paper No. 383, Indian Council For Research On International Economic Relations. Available: https://icrier.org/pdf/Working_Paper_383.pdf (accessed 16 November 2019)
3. Dey Kushankur, Gandhi P. Vasant and Debnath Kanish (2019) Farmers' Participation in India's Futures Markets: Potential, Experience, and Constraints
4. Dey, K. and Maitra, D. (2016). Can futures markets accommodate Indian farmers? *Journal of Agribusiness in Developing and Emerging Economies*, 6(2), 150-172.
5. Government of India (1966). The Forward Markets Review Committee (Dantawala Committee Report).
6. Government of India (1979). Report of the Committee on Forward Markets (Khusro Committee Report)
7. Government of India (1993). Report of the Committee on Forward Markets (Kabra Committee Report)
8. Government of India (2007). Report of the expert committee to study the impact of futures trading on agricultural commodity prices (Abhijit Sen Committee Report)
9. Gulati Ashok, Chatterjee Tirtha & Hussain Siraj (2017). "Agricultural Commodity Futures: Searching for Potential Winners" Working Paper No. 349, Indian Council For Research On International Economic Relations. Available: http://icrier.org/pdf/Working_Paper_349.pdf (accessed 16 November 2019)

10. Pillai p. Sudarsanan (2015) A Study on Futures Trading in Commodities with Special Reference to Rubber Available: https://shodhganga.inflibnet.ac.in/bitstream/10603/102153/1/01-%20title%20.pdf (accessed on 20th December 2019)
11. Raghavendra RH, Velmurugan PS & Saravanan (2015). 'A Relationship between Spot and Futures Markets of Selected Agricultural Commodities in India: An Efficiency and Causation Analysis' *Journal of Business & Financial Affairs*, Vol 5 Issue 1 Available: https://www.researchgate.net/publication/301353676 (Accessed 16 November 2019)
12. Ray Saon & Malik Malik (2014) "Impact of Transaction Taxes on Commodity Derivatives Trading in India" Working Paper No. 272, Indian Council For Research On International Economic Relations. Available: http://icrier.org/pdf/working_paper_272.pdf (accessed 16 November 2019)
13. Sahavevan, K. G. (2012). Commodity Futures and Regulation. *Economic and Political Weekly*, 47(52), 106-112.
14. Securities and Exchange Board of India, Hand Book of Statistics (2019) Available: https://www.sebi.gov.in/sebiweb/home/HomeAction.do?doListing=yes&sid=4&ssid=80&smid=105 (accessed 10 February 2020)
15. Sehgal Sanjay, Namita Rajput & Dua Rajeev Kumar (2012) 'Price Discovery in Indian Agricultural Commodity Markets' *International Journal of Accounting and Financial Reporting* Vol. 2, No. 2 Available: http://www.macrothink.org/journal/index.php/ijafr/article/view/2224/1895

16. United Nations Conference on Trade and Development, (2007). Trade and Development Report 2007. Available: https://unctad.org/en/docs/tdr2007overview_en.pdf

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BIBLIOGRAPHY

1. Gouri Prava Samal, Dr. Anil Kumar Swain, Dr. Ansuman Sahoo, & Amit Soni (2015). 'Market Efficiency of Agricultural Commodity Futures in India: A Case of Selected Commodity Derivatives traded on NCDEX during 2013' *International Journal of Business and Management Invention*, Volume 4 Issue 1: 32-49. Available: https://www.semanticscholar.org/paper/Market-Efficiency-of-Agricultural-Commodity-Futures-Samal-Swain/87a5c34c39af5a6aa7cae110bcfd4db7c4f978cf (Accessed on 20th December 2019)
2. Lucia Baldi, Massimo Peri, & Daniela Vandone (2011) 'Spot And Future Prices Of Agricultural Commodities: Fundamentals And Speculation' *Working Paper n. 2011-03* Dipartimento Di Scienze Economiche Aziendali E Statistiche, Università Degli Studi di Milano (University of Milan). Available: https://www.researchgate.net/publication/241761592_Spot_and_future_prices_of_agricultural_commodities_fundamentals_and_speculation (Accessed on 20th December 2019)
3. Manuel Hernandez & Maximo Torero (2010) 'Examining the Dynamic Relationship between Spot and Future Prices of Agricultural Commodities' *International Food Policy Research Institute* Discussion Paper 00988 June 2010. Available: https://core.ac.uk/download/pdf/6270326.pdf (accessed on 20th December 2019)
4. Miroslava Zavadska , Lucía Morales & Joseph Coughlan (2018) 'The Lead–Lag Relationship between Oil Futures and Spot Prices—A Literature Review'

International Journal of Financial Studies **2018**, *6*, 89 Available: https://www.mdpi.com/2227-7072/6/4/89 (accessed on 20th December 2019)

5. Palaniappan Shanmugam, Velmurugan and Armah, Paul, (2017) 'A New Look at the Efficiency & Volatility of Indian Agricultural Commodity Futures Markets Available at SSRN: http://dx.doi.org/10.2139/ssrn.2975269 (Accessed: 20th December 2019)
6. Periasamy P and Satish R (2014) 'Commodity future market and New Initiatives taken the Forward market commission in India to regularize and popularize Commodity future market among the potential investors – A Descriptive Study' *IOSR Journal of Business and Management* Volume 15, Issue 6 (Jan. 2014), PP 01-09 Available: http://www.iosrjournals.org/iosr-jbm/papers/Vol15-issue6/A01560109.pdf (Accessed: 20th December 2019)
7. Ranajit Chakraborty & Rahuldeb Das (2015) 'Do the Spot and Futures Markets for Commodities in India Move Together?' *International Journal of Financial Economics* Vol. 4, No. 3, 2015, 150-159 Available: https://ideas.repec.org/a/rss/jnljfe/v4i3p3.html (Accessed on 20th December 2019)
8. Sahaj Wadhwa, Chander Prakash Gupta & Sanjay Sehgal (2016) 'Price Discovery and Spillovers in Indian Agricultural Commodity Markets' Paper prepared for the 34th IARIW General Conference Dresden, Germany. Available: http://www.iariw.org/dresden/wadhwa.pdf (Accessed on 20th December 2019)
9. Sahoo Pravakar & Kumar Rajiv (2009) 'Efficiency and Futures Trading–Price Nexus in Indian Commodity Futures Markets' *Global Business Review*, 10:2 (2009): 187–201 Available:

https://www.researchgate.net/publication/247766976_Efficiency_and_Futures_Trading-Price_Nexus_in_Indian_Commodity_Futures_Markets (Accessed: 20th December 2019)

10. Sendhil R, Kar Amit, Mathur and Jha Girish (2013) 'Testing the Efficiency of Indian Wheat Futures' *Int. Journal of Economics and Management*: 408-430 Available : http://www.ijem.upm.edu.my/vol7no2/bab12.pdf (Accessed: 20th December 2019)
11. Sendhil R, Kar Amit, Mathur and Jha Girish (2014) 'Price Volatility in Agricultural Commodity Futures - An Application of GARCH Model' *Journal of the Indian Society of Agricultural Statistics* 68(3) 2014 365-375 Available: https://www.researchgate.net/publication/269710782_Price_Volatility_in_Agricultural_Commodity_Futures_-_An_Application_of_GARCH_Model (Accessed: 20th December 2019).
12. Tulsi Lingareddy (2008). 'Expert Committee on Commodity Futures: Agreements and Disagreements' *Economic & Political Weekly* August 23, 2008: 35-42
13. Tulsi Lingareddy (2015). 'Commodity Futures Trading at the Crossroads' *Economic & Political Weekly* June 13, 2015: 113-116.
14. Vijayakumar N, Parvadavardini S & Dharani M (2013). 'Relationship between Futures and Spot Market for Selected Spices in India' *Prajnan*, Vol. XLI, No. 3, 2012-13 NIBM, Pune: 219-232. Available: https://www.researchgate.net/publication/304797012_Relationship_between_Futures_and_Spot_Market_for_Selected_Spices_in_India (Accessed on 20th December 2019).

15. Zelda A. Efe-Omojevwe (2013) ‘Study of the Efficiencies of Maize and Wheat Futures Markets in India’ *OSR Journal of Agriculture and Veterinary Science* (. Volume 2, Issue 4 (Mar. - Apr. 2013): 09-14 Available: https://www.researchgate.net/publication/314401436_A_Study_of_the_Efficiencies_of_Maize_and_Wheat_Futures_Markets_in_India (accessed on 20th December 2019)

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