# COMMODITY FUTURES AS A HEDGING TOOL: A STUDY WITH SPECIAL REFERENCE TO SELECTED CROPS IN KERALA

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**UNDER THE FACULTY OF COMMERCE**


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# DECLARATION

I hereby declare that this thesis entitled **COMMODITY FUTURES AS A HEDGING TOOL: A STUDY WITH SPECIAL REFERENCE TO SELECTED CROPS IN KERALA** submitted to the University of Calicut, for the award of Degree of Doctor of Philosophy under the Faculty of Commerce, is an independent work done by me under the supervision and guidance of Dr. K. P. MURALEEDHARAN, Professor, Department of Commerce and Management Studies, University of Calicut.

I also declare that this thesis contains no material which has been accepted for the award of any other degree or diploma of any University or Institution and to the best of my knowledge and belief, it contains no material previously published by any other person, except where due references are made in the text of the thesis.

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## CERTIFICATE

This is to certify that the work reported in this Thesis entitled **COMMODITY FUTURES AS A HEDGING TOOL: A STUDY WITH SPECIAL REFERENCE TO SELECTED CROPS IN KERALA** that is being submitted by **Sri. BABY M.K.** for the award of the Degree of Doctor of Philosophy, to the University of Calicut, is based on the bonafide research work carried out by him under my supervision and guidance in the Department of Commerce and Management Studies, University of Calicut. The results embodied in this Thesis have not been included in any other Thesis submitted previously for the award of any degree or diploma of any other University or Institution.

**Dr. K. P. MURALEEDHARAN**
(Supervising Teacher)

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*A True Friend and Philosopher*

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# LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| ACE | : | Ahmadabad Commodity Exchange |
| ADF | : | Augmented Dickey-Fuller Tests |
| APMC | : | Agricultural Produce Market Committees |
| ARCH | : | Auto Regressive Conditional Heteroskedasticity |
| BSE | : | Bombay Stock Exchange |
| CAPM | : | Capital Asset Pricing Model |
| CBOT | : | Chicago Board of Trade |
| CCC-M GARCH | : | Constant Conditional Correlation – Multi Variate GARCH. |
| CV | : | Cash Price Volubility |
| FCOJ | : | Frozen Concentrated Orange Juice |
| FMC | : | Forward Market Commission |
| FV | : | Futures Price Volatility |
| GARCH | : | Generalised Auto Regressive Heteroskedasticity |
| GDP | : | Gross Domestic Product |
| GNMA | : | Govt. National Mortgage Association |
| ICX | : | Indian Commodity Exchange Ltd |
| ISO | : | Indian Statistical Organization |
| MSP | : | Minimum Support Price |
| M-T-M | : | Mark to Market |
| MCX | : | Multi-Commodity Exchange of India |
| NBOT | : | National Board of Trade |
| NCDEX | : | National Commodity and Deviation Exchange |
| NMCE | : | National Multi-commodity Exchange |
| NSE | : | National Stock Exchange |
| OI | : | Open Interest |

| | | |
|---|---|---|
| OLS | : | Ordinary Least Squares |
| OTC | : | Over the Counter |
| SEBI | : | Securities & Exchange Board of India |
| SIH | : | Information Arrival Hypothesis |
| TV | : | Trade Volume |
| UOI | : | Unexpected Open Interest |
| UTV | : | Unexpected Trade Volume |
| VAR | : | Value at Risk |
| VECM | : | Vector Error Correction Model |
| WPI | : | Wholesale Price India |
| WTO | : | World Trade Organization |

# CHAPTER I
# INTRODUCTION

## 1.1 INTRODUCTION

India is predominantly an agrarian economy with very high population dependence on agriculture and allied activities. Though the contribution of agriculture to the overall Gross Domestic Product (GDP) of the country has fallen from 41.7 percent in 1970-71 to 13.7 percent in 2012-13, agriculture still forms the backbone of India's economic development. Roughly two-thirds of the rural population is either self-employed in agriculture or are agricultural labourers. This creates a situation, where a large number of households have too small an income to sustain their lives. Hence even an eight or nine percent rate of growth in overall GDP may not deliver much in terms of poverty reduction unless agricultural growth accelerates. Further, "growth with inclusiveness" can be achieved only when agricultural growth accelerates and is widely shared amongst people of the country.

Poor returns from cultivation and absence of non-farm opportunities are indicative of the larger socio-economic malaise in rural India. This is accentuated by the multiple risks that the farmer faces - yield, price, input, technology and credit among others. The most tragic face of India's agrarian crisis can be seen in the increasing number of farmer suicides.

### 1.1.1 Minimum Support Prices and Regulated Markets

Agricultural commodity prices in India are primarily determined by domestic demand and supply factors, influenced by domestic price policy. For decades, the central and state governments have been intervening at every stage of marketing of major agricultural commodities. Minimum support

prices (MSP) have been a cornerstone of the agricultural policy since 1965. The price support system was initiated by the government to provide protection to agricultural producers against any sharp drop in farm prices. If there is a good harvest and market prices tend to dip, the government guarantees a minimum support price or floor price to farmers which covers not only the cost of production but also ensures a reasonable profit margin for producers.

In order to achieve an efficient system of buying and selling of agricultural commodities, most of the state governments and union territories have enacted several legislations to provide for the regulation of the agricultural produce markets. The basic objective in the setting up of a network of Agricultural Produce Market Committees (APMCs) has been to ensure reasonable gains to the farmers by creating a market environment where there is fair play of supply and demand forces. The APMCs also aim at regulating market practices and attaining transparency in transactions. While there were only 286 regulated markets in India at the end of 1950, their number increased to 7157 by 2010.

### 1.1.2 Globalization and the Agrarian Crisis:

As economies and markets around the world opened up amid rapid globalization, the phenomenon has brought in huge opportunities and challenges to all the sectors including agriculture. The 'liberalized' India has emerged as a major economic power in the world, with GDP growing at impressive levels and the poverty ratio coming down significantly. But it looks paradoxical that the Indian country side, where the large majority of its people reside, is in the grip of a severe agrarian crisis.

After initiating economic liberalization policies in 1991, the central and state governments in India have been gradually withdrawing from the

marketing of agricultural products. Withdrawal of government intervention has been accelerated with the implementation of the Agreement on Agriculture under the World Trade Organization (WTO) in 1995. Thus today, prices of agricultural commodities in the country are determined increasingly by market forces of demand and supply. In an open economy long run domestic prices will be affected by trends in international prices, although domestic production costs would still be the dominant determinant in a large economy like India. Since world prices fluctuate considerably around their long-run trends, it would be necessary to ensure a mechanism which reduces, if not prevents, the influence of international prices on domestic prices.

Traditional system of price stability through restrictions on international trade is against the spirit of economic liberalization which the country has embarked upon. Further, the Minimum Support Price (MSP) system has increased governments' food subsidy burden and hence is unviable. It is in this context that derivative trading in agricultural commodities is proposed as an alternative mechanism for price risk management. Futures trading can significantly reduce the risk of price fluctuations and pave the way for more efficient price discovery by allowing more agents with relevant information to participate in the process of price formation.

## 1.2 COMMODITY FUTURES MARKET IN INDIA

'Futures' are the most popular among the different types of derivative instruments, others being forwards, options and swaps. The term 'derivative' indicates that it has no independent value and that its value is derived from the value of some underlying asset. The underlying asset may be either a financial instrument (e.g. Share, bond, stock index etc) or a commodity (e.g. precious metal, energy, agricultural commodity etc). Thus derivative

instruments are broadly classified into two as financial derivatives and commodity derivatives.

Futures contracts are agreements to purchase or sell a given quantity of a commodity at a predetermined price with the settlement expected to take place at a future date. They are standardised in terms of quality and quantity of the commodity and place and date of delivery. Futures contracts are invariably traded through formal exchanges and are generally closed out before delivery. Closing out refers to a practice of buying two identical contracts (one to purchase the underlying commodity and the other to sell) at two different points of time, with each canceling the other out.

Historically, organised trading in commodity futures began in the United States of American in the middle of the 19$^{th}$ century with "maize contracts" at Chicago Board of Trade (CBOT). It was followed by similar initiatives in other centers like Kansas, Minneapolis and New York. Apart from US and UK, India is the only country that has had an active futures market over a long period of time.

The first commodity exchange in India was set up by Bombay Cotton Trade Association in 1875. Subsequently many exchanges came up in different parts of the country for futures trading in various commodities. By the end of 1930s futures trading was very active in a number of commodities such as cotton, jute, wheat, rice, sugar and gold in India. But in 1939 the government banned futures trading in several commodities because of the outbreak of the World War II. After independence the government enacted the Forward Contracts (Regulation) Act, 1952 and set up the Forward Markets Commission (FMC) in 1953. Futures trading which was resumed in 1953 was again banned in the 1960s. Later, on the recommendations of different expert committees such as the Khusro Committee (1980) and the Kabra

Committee (1993) and in tune with the spirit of economic liberalization of 1990s, futures trading was reintroduced in the country.

The beginning of the 21st century witnessed the setting up of national level electronic commodity exchanges in India. Thus the National Multi Commodity Exchange, Ahamedabad (2002), the Multi Commodity Exchange, Mumbai (2003) and the National Commodity and Derivative Exchange, Mumbai (2003) started functioning, offering national level, screen-based platform to trade in a number of agricultural and non-agricultural commodities. Two more national level exchanges namely the Indian Commodity Exchange, Gurgoan (2009) and the Ahamedabad Commodity Exchange (2010) were added later. Thus as on today, we have 21 exchanges of which five are national level multi-commodity exchange and 16 others are regional or commodity-specific exchanges. There has been a tremendous growth in the turnover of the exchanges too. The collective turnover of all exchanges in India which stood at 665.3 billion rupees in 2002-03 rose to 1, 81,261.04 billion rupees in 2011-12.

### 1.2.1 Functions of Futures Markets

A well developed futures market is of great significance to the economy and can be beneficial to different stakeholders in commodity market. Some of the important roles the futures market play are briefly stated below.

- Since all the price sensitive information available at a particular point of time are discounted, the futures prices tend to be the best estimates of spot prices in future.
- Futures markets provide efficient price signals which enable the producers to plan their production strategy so as to avoid the occurrences of glut or scarcity.

- Futures markets keep a stabilizing influence on spot prices by reducing the amplitude of short term fluctuations.
- Futures provide a very effective hedging option against undesirable price variations of the physical commodities.

### 1.2.2 Commodity Futures as Hedging Tool

The primary benefit of commodity futures market is that they provide hedging against price risk. Hedging is the practice of offsetting the price risk in a cash market by taking an opposite position in the futures market. By taking a position in the futures market, which is opposite to the position held in the spot market, the producer can offset the losses in the latter with the gains in the former.

## 1.3 SIGNIFICANCE OF THE STUDY

Kerala is known for its high literacy rate and better living standards when compared to the national average. A characteristic feature of Kerala's economic development has been the shift in focus from primary sector to the tertiary sector. A unique feature of Kerala's agricultural development has been the gradual shift from food crops to commercial crops. Thus plantation crops such as rubber, cardamom, tea, coffee and pepper assume great significance in Kerala's economy.

During the last few decades the plantation sector in the state has been passing through severe crisis on account of wide spread crop failures, higher input costs and labour unrests. Wide fluctuations in the prices of crops have been aggravating the problem of agricultural crisis which resulted in wide spread farmer suicides in the state. Commodity futures trading has been projected as an effective tool to minimise price risk through hedging. Further, futures trading which discounts all the available information on the economy

and the commodity traded is expected to reduce cash price volatility and achieve price stabilization.

In this situation a detailed study is highly imperative to examine the hedging effectiveness of agricultural commodity futures. To the best of our knowledge, no detailed study has so far been made into the hedging efficiency of plantation crops in the country and the influence of futures trading on spot price volatility. The present study is meant to fill this research gap. This study assumes special significance as it examines the differences in the level of awareness, if any, of speculators and hedges, the two major classes of players in the derivative market, on commodity futures and its trading mechanism. The study also reveals the perceptual differences between these two classes (hedges and speculators) which might exert great influence on their trading behavior in the derivative market.

## 1.4 RESEARCH PROBLEM

The commodity futures market in India which was in a state of hibernation for decades on account of ban and restrictions has been growing steadily since the dawn of the present century. There has also been an unresolved debate as to the desirability of futures trading in the country. Critics have been alleging that futures trading leads to higher volatility in the spot prices in the physical market due to the involvement of speculators. The hedging efficiency of derivatives has also been questioned.

Thus the problem under study is to examine the impact of futures trading on cash price volatility and the hedging effectiveness of futures contracts in reducing the risk on account of unexpected price variations.

## 1.5 SCOPE OF THE STUDY

The scope of the present study is confined to ascertaining optimal hedge ratios and hedging effectiveness of three plantation crops namely rubber, pepper and cardamom. The study also examines the impact of futures trading on the spot price volatility of the selected crops. The present study is also an attempt to make an in-depth analysis of the profile, level of awareness and perceptual differences between speculators and hedgers among the players in the commodity futures market in Kerala.

## 1.6 SEELCTION OF COMMODITIES

As stated elsewhere in this study, agriculture is the backbone for the survival of any community. India accounts for only about 2.4 percent of the world's geographical area but has to support about 17 percent of the world's human population. Agriculture is an important sector of the Indian economy, accounting for about 14 percent of the nation's GDP, about 11 percent of its exports and more than two third of the population still relies on agriculture as its principal source of income.

As in the case elsewhere, the people of Kerala also had been depending on agriculture for their livelihood and Kerala continues to be a predominantly agricultural state. Unlike the other regions of India, Kerala is characterised by extreme diversity in its physical resources and agro-climatic endowments. In earlier periods the choice of the cropping pattern was guided by agronomic considerations and consumption needs of farmers but now the market forces decide it. The most notable feature of Kerala's agricultural development is the emergence of cash crops as a dominant sector since the beginning of eighties.

Cash crops cultivated in Kerala fall mainly into three categories namely plantation crops (e.g., rubber, tea, coffee and cardamom), garden crops (e.g., coconut and areca nut) and mixed crops (e.g., pepper, cocoa and

vanilla). The term 'plantation crops' refers to commercial crops which are cultivated on an extensive scale in contiguous area. Kerala is the third major plantation crops producing state, after Tamil Nadu and Karnataka and accounts for 25.5 percent of the total plantation crops production in the country. With regard to the economic importance of the crop and the popularity in the futures market, three commodities namely rubber, pepper and cardamom are selected for the present study. A brief explanation of the importance of those commodities is furnished below.

### 1.6.1 Rubber

Natural Rubber, which belongs to *Hevea* family, occupies a dominant position among the plantation crops and is an important source of raw material with wide industrial applications. India is the fourth largest producer of natural rubber after Thailand, Indonesia and Malaysia. The total production of natural rubber in India in 2011-2 was 9,03,700 tones of which 89 percent was Kerala's contribution. Similarly the total area under rubber cultivation in the country was 7,11,560 hectares in 2010-11 and Kerala accounted for 76 percent of it with 5,34,228 hectares of rubber plantations. Further, in Kerala more than 9 lakh rubber growers are engaged directly in the production of Natural rubber. Most of them are small growers having less than one hectare of cultivation. Though rubber cultivation is carried out throughout the state of Kerala, the districts of Kottayam, Pathanamthitta, Idukki and the Eastern sides of Trivandrum are more famous for rubber plantations.

RSS (Ribbed Smoked Sheets) account for 72 percent of the production of natural rubber and tyre industry consumes 52 percent of the rubber produced in the country. Tyre is the major form in which rubber is exported from India. Kottayam, Kochi, Kozhikode and Kannur in Kerala are the major primary markets for natural rubber in India.

### 1.6.2 Pepper

Pepper, which is botanically known as *Piper nigrum* is considered the 'King of Spices'. It is one of the oldest and most popular spices in the world. It is a perennial, climbing vine, indigenous to the Malabar Coast of India. Pepper is basically a mixed crop grown in garden lands consisting of coconut and/or other tree crops such as areca nut. India is the largest pepper producer in the world with an annual production of around 50,000 tones. The crop is grown in about 2,46,000 hectares in India. Kerala along with Karnataka accounts for a major portion (92%) of production of black pepper in the country.

The black pepper growing areas in the West Coast of India include (1) coastal areas where pepper is grown in every homestead or plot of land, (2) midlands where pepper is cultivated on a plantation scale and (3) hills at an elevation of 800 – 1500 m above sea level, where the crop is mostly grown on shade trees in coffee, cardamom and tea plantations. Over 75 cultivars of black pepper are being cultivated in India. *Karimunda* is the most popular of all cultivars in Kerala, others being *Kottanadan, Nayarkodi, Aimpiriyan*, *Neelamundi, Kuthiravally and Kalluvally*. In Kerala Idukki and Wayanad are the major pepper producing districts. A major problem confronted by pepper cultivators in India has been the steady decline in pepper prices since 1990s.

### 1.6.3 Cardamom

Cardamom, known as the 'Queen of Spices' is one of the most highly priced and exotic spices in the world. Small cardamom (*Elettaria cardamomum*), the most important of the different varieties, occupies a unique position in the global spice trade. It is no exaggeration that the trade of pepper and the aroma of cardamom had a decisive role in the search for a short 'spice route' to India, and thereby far reaching consequences not only in

the commercial relations with several foreign countries but also in redefining the socio-political destiny of the country which culminated in the colonization of India for decades.

The world production of cardamom is estimated to be around 35,000 tones. India with an annual production of 9000-12000 tones is the second largest producer of cardamom after Guatemala. Among the Indian states, Kerala has a dominant role as it accounts for 59 percent of the cultivated area and 78 percent of the total production in cardamom. Idukki district in Kerala accounts for 79 percent of the cardamom area and 90 percent of the total production.

Since spices, plantation crops and coconut together account for three-fifth of the cropped area and approximately four-fifth of the agricultural output in the state, the vagaries in international market conditions affect the prospects of Kerala farmers severely. Of all the crops grown in Kerala, rubber, pepper and cardamom have the most active futures market and hence are selected for the present study.

## 1.7 OBJECTIVES

The main objectives of the present study are:

1. To assess the growth and development of commodity futures market in India.
2. To examine the impact of futures trading on the cash price volatility of agricultural commodities.
3. To analyse the hedging efficiency of selected agricultural commodities.
4. To examine whether there is any difference between constant and time – varying hedge ratios and hedging effectiveness

5. To find out the difference in the level of awareness of hedgers and speculators in the futures market in Kerala with regard to futures contracts and their trading mechanism.
6. To analyze the trading experience of hedgers and speculators in the commodity futures market in Kerala.
7. To study the perception of investors in respect of commodity futures.

## 1.8 HYPOTHESES

Based on the objectives set, the following hypotheses have been formulated and tested.

H1. Variations in the volume of futures trading do not affect spot price volatility of agricultural commodities.

H2. Variations in the 'Open Interests' of futures contracts do not affect spot price volatility of agricultural commodities.

H3. There is no significant difference between constant and time – varying hedge ratios of agricultural futures contracts.

H4. There is no significant difference between constant hedging effectiveness and average dynamic hedging effectiveness of agricultural commodity futures contracts.

H5. There is no significant difference in the trading experience of speculators and hedgers in the commodity futures market in Kerala.

H6. Speculators and hedgers in Kerala do not differ in their level of awareness with regard to commodity futures and its trading mechanism.

H7. There is no significant difference between hedgers' and speculators' perception of commodity futures as an investment option.

## 1.9 METHODOLOGY

This study is designed as a descriptive one based on both secondary and primary data,

### 1.9.1 Secondary Data

The study of the impact of futures trading on price volatility of base commodities and the calculation of optimum hedge ratios and hedging effectiveness are done on the basis of secondary data obtained from the official websites of the relevant commodity exchanges. Secondary data used include the daily closing spot prices, daily closing futures prices, daily open interests and daily trading volumes in respect of natural rubber, pepper and cardamom gathered from the official websites of NMCE, NCDEX and MCX respectively. Though different futures contracts of a commodity are traded simultaneously, the data in respect of near month contracts alone are considered. The details of secondary data used are shown below.

Table 1.1

**Description of secondary data used**

| Commodity | Source of data | Description of Data | Period of data |
|---|---|---|---|
| Rubber | www.nmce. com | Daily closing spot price<br>Daily closing futures prices of near month contract<br>Daily open interest of near month contract<br>Daily trade volume of near month contract | 15March 2003 to 7 may 2008<br>&<br>4 Dec 2008 to 31 July 2011 |
| Pepper | www.ncdex .com | Daily closing spot price<br>Daily closing futures prices of near month contract<br>Daily open interest of near month contract<br>Daily trade volume of near month contract | 1 Jan 2005 to 31 Dec. 2011 |
| Cardamom | www.mcxindia. Com | Daily closing spot price<br>Daily closing futures price of near month contract<br>Daily open interest of near month contract<br>Daily trade volume of near month contract | 23 Feb. 2006 to 31 Dec. 2011 |

Data have also been gathered from the published sources such as quarterly and annual reports of FMC, ISO, SEBI, NSE, BSE and the annual reports of the Ministry of Food and Consumer Affairs, Government of India.

### 1.9.2 Primary Data

This study mainly used primary data for drawing inferences on the trading experience, level of awareness and the perception of investors. The population of the study is the investors in commodity futures in the state of

Kerala. Primary data was collected from 150 sample respondents from selected districts of Kerala. The required data was gathered through undisguised direct personal interview using structured and pre-tested schedule.

### 1.9.3 Sample Design

As the population is quite large and spread through out the state of Kerala, it is not possible to conduct a census survey. Hence a sample study was conducted. The method of sampling used in this study is Proportionate Stratified Random Sampling. At first, the researcher had discussions with the state level heads of the three multi-commodity exchanges namely NMCE, NCDEX and MCX and the commodity broking firms who have active presence in the state of Kerala. From these discussions the major centers where futures trading in rubber, pepper and cardamom are active in Kerala were identified. Futures trading in the selected agricultural commodities was found to be active is South Eastern region of the 'High range' consisting of the districts of Kottayam and Idukki, in Ernakulam in Central Kerala and in the North Eastern region of the state which includes the districts of Kozhikode, Malappuram and Wynad. Then the scholar visited the branches of all commodity broking firms in the selected districts from where the lists of their clients were obtained. These lists of clients had to be edited for duplications as the same investor figured in the clients' lists of different brokers in the same region. Thus a list of 1565 investors consisting of 673 investors from South Eastern region, 325 from the Central region and 567 from the North Eastern region was finalized. From these a total of 165 respondents were selected into the sample as 70 from the South Eastern region, 35 from the Central region and 60 from the North Eastern region being approximately 10 percent of the total population. Data were collected from these respondents. Out of the collected schedules 15 were excluded

being incomplete or defective and only 150 good schedules are used in the study.

### 1.9.4 Tools of Data collection

A structured pre tested schedule was used for collecting data from the informants. A detailed schedule covering all aspects of the study was prepared in consultation with experts in the field and officials of the commodity exchanges and broking firms. The draft schedule was pre tested by way of conducting a pilot study among 30 selected investors in the commodity futures market. After the pre test the schedule was modified by adding certain relevant questions and deleting some unwanted questions. The modified schedule contains 33 questions divided into four groups.

### 1.9.5 Variables used in the study

The different variables used in the study can be grouped into two as 'background variables' and 'study variables'. The background variables are the demographic variables which highlight the profile of the sample respondents such as gender, age, education, occupation, income, domicile, marital status and family size.

The 'study variables' used in the study are listed below in table 1:2.

Table 1:2

**Variables used in the study**

| No | Variables used | Purpose |
|---|---|---|
| 1. | Pattern of Investment | To analyse the investment pattern of hedgers and speculators. |
| 2. | Investment Considerations | To study the prominent considerations of hedgers and speculators in making investment. |
| 3. | Risk tolerance | To examine the risk tolerance level of hedgers and speculators. |

| No | Variables used | Purpose |
|---|---|---|
| 4. | Investment experience | To study the experience of hedgers and speculators in investing in securities. |
| 5. | Awareness level | To analyse the awareness level of hedgers and speculators about futures contracts and their trading mechanism. |
| 6. | Information source | To study the information source of hedgers and speculators about commodity futures |
| 7. | Commodity groups | To identify the preference of hedgers and speculators in selecting the type of commodities to invest in. |
| 8. | Net trading result | To analyse the profit or loss from investing in commodity futures. |
| 9. | Perception | To analyse the hedgers and speculators perception with regard to return, risk, liquidity and safety of investing in commodity futures. |

### 1.9.6 Scaling Technique

Some of the information required for the study are qualitative in nature. In order to quantify such information scaling technique was used. Respondents' awareness of commodity futures and its trading mechanism have been measured using a continuous order scale ranging from 1 to 5. For the measurement of perception a five-point Likert Scale with neutrality at the centre has been used. For measuring the investment pattern Constant sum scale is used. Informants were asked to distribute a maximum of 10 points to several options given. On the basis of the mean points obtained for each option, priorities were identified. The mean scores have been converted into percentages for convenience

### 1.9.7 Data summarizations and Analysis

Primary data collected from the sample respondents are classified according to their prominent trading motive and thus two classes namely speculators and hedgers are obtained. The focus of the study is to examine whether speculators and hedgers differ in their level of awareness, perception trading pattern etc.

### 1.9.8 Data analysis

A detailed explanation of the tools and methods used for the analysis of data is furnished below.

**1) Measuring Awareness Level.**

The researcher has developed a tool for the measurement of the respondents' level of awareness on commodity futures. The tool comprises of measuring the awareness of eight different aspects relating is commodity futures and its trading practices on a continuous order scale ranging from 1 to 5. The different aspects in which the level of awareness is measured are: (1) The trading platform (2) Margin requirements (3) The market Regulator (4) Marking to Market (5) Backwardation/ contango (6) Hedging (7) Basis and (8) Base commodity.

The reliability of the tool has been tested with the help of Cronbach's Alpha which is 0.863. The correlation coefficients (r) of individual awareness score to the aggregate average have also been found to be ranging between 0.724 and 0.807 except for the first item (i.e., trading platform) the correlation coefficient (r) of which is 0.577. In spite of the low 'r', the question on trading platform is retained in the tool as it, in the opinion of experts, is an essential component of the overall awareness on the concept of futures.

**ii) Optimal Hedge ratio and hedging effectiveness.**

First, the spot price and futures price data are subjected to a logarithmic transformation. Then the stationarity of the 'log series' is evaluated using the Augmented Dickey-Fuller (ADF) test. The ADF test consists of estimating the following regression.

$$\Delta Yt = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta y_{t-1} + \varepsilon t$$

Where $\varepsilon t$ is a pure white noise error term and where $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$, $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$ etc.

Next we examine whether the 'log spot' and 'log futures' series are co integrated using Johansen Co integration Tests (both Eigen value and Trace Statistic). Where the log series are found to be first difference stationary and are co integrated, we use Vector Error Correction Model (VECM) to estimate the constant hedge ratio. The parameters of VECM are estimated and the residuals obtained are used to calculate Optimal Hedge Ratio and Hedging Effectiveness.

$$\text{The Optimal Hedge Ratio (H)} = \frac{\sigma_{sf}}{\sigma_f}$$

Where:

$\sigma_{sf}$ = Cov. ($\varepsilon_{st,}$ $\varepsilon_{ft}$)

$\sigma_s$ = Variance ($\varepsilon_{st}$)

$\sigma_f$ = Variance ($\varepsilon_{ft}$)

Hedging Effectiveness is calculated as:

$$E = \frac{\text{Var (u)} - \text{Var (H)}}{\text{Var (u)}}$$

Where,

Var (u) = $\sigma_s^2$ (i.e, Variance of unhedged portfolio)

Var (H) = $\sigma_s^2 + H_2 \sigma_f^2 - 2H \sigma_{sf}$ (i.e., variance of hedged portfolio)

H = Hedge Ratio, $\sigma_s$ and $\sigma_f$ are the standard deviations of spot and future returns and $\sigma_{sf}$ is the covariance.

The residuals obtained from VECM are tested for ARCH effect. Since ARCH effect is present in the residuals, the time-varying hedge ratios are also calculated using constant conditional correlation-multivariate GARCH (CCC- M GRACH) model.

Errors from VECM are obtained and these errors are modeled as univariate GARCH. Then covariance is calculated as.

$$h_{ss,t} = \omega_s + \alpha_{s,1} \varepsilon^2_{s,t-1} + \beta_{s,1} h_{ss,t-1}$$
$$h_{ff,t} = \omega_f + \alpha_{f,1} \varepsilon^2_{f,t-1} + \beta_{f,1} h_{ff,t-1}$$
$$h_{sf,t} = \rho(h_{ss,t} \times h_{ff.t})^{1/2}$$

Where, $h_{ss,t}$ is the conditional spot variance at time t, $h_{ff,t}$ is conditional futures variance, $h_{sf,t}$ is covariance and $\rho$ is the constant conditional correlation.

$$\text{Average Time – Varying Hedge Ratio } (H_t) = \frac{h_{sf,t}}{h_{ff,t}}$$

(Detailed explanation of the methodology is furnished in Chapter 5).

**(3) Measuring Volatility**: Data of daily closing prices, futures settlement prices, total futures Trading Volume (TV) and total Open Interests (OI) are used for analysing the impact of future trading on spot price volatility. Cash price volatility is first modeled as a GARCH (1, 1) process. Total volumes as

well as open interests of futures contracts are decomposed into expected and unexpected components by using 21-day moving averages. This study examines the lead-lag relationship between the unexpected component of the futures trading (Volume and Open Interest) and cash price volatility using the Granger Causality Test and Forecast Error Variance Decompositions.

To test Granger Causality running between X and Y, the following specification is used:

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-1} + \sum_{j=1}^{n} \beta_j Y_{t-j} + \varepsilon_{1t}$$

$$X_t = \sum_{i=1}^{n} \lambda_i Y_{t-1} + \sum_{j=1}^{n} \beta_j X_{t-j} + \varepsilon_{2t}$$

Where $\varepsilon_{1t}$ and $\varepsilon_{2t}$ are white noise residuals.

Then the reliability of the causality results based on bivariate analysis is checked using Forecast Error Variance Decompositions based on Trivariate analysis, which includes a third variable namely Futures Price Volatility (FV).

A $p^{th}$ order VAR in three variables is given by

$$\gamma_t = \mu + \pi_1 \gamma_{t-1} + \pi_2 \gamma_{t-2} + ..... + \pi_p \gamma_{t-p} + \varepsilon_t$$

where $\gamma_{t-1}, \gamma_{t-2}$ ..... $\gamma_{t-p}$ are vectors and $\pi_1, \pi_2, ..... \pi_p$ are metrices.

(For detailed explanation of the methodology please refer Chapter 4).

## 1.10 PERIOD OF THE STUDY

This study covers a period of seven years from 2003-04 to 2010-11 in the case of rubber, seven years from 1-01-2005 to 31-12-2011 in the case of pepper and six years from 23-02-2006 to 31 -12-2011 in the case of cardamom depending on the commencement of futures trading in the respective commodity in national level exchanges.

Primary data were collected from the month of May 2012 to October 2012.

## 1.11 LIMITATIONS OF THE STUDY

The study has the following limitations

(1) Most of the information supplied by the informants are from their memory by 'recall' method. Hence the data are subject to recall errors. However, the researcher has made sincere efforts to minimise such recall errors by cross-checking the information given by informants by asking questions in different ways.

(2) Due to cost and time constraints, the study had to rely on sampling technique for data collection. However, the researcher has been very careful to ensure the representativeness of the sample by way of adopting Proportionate Stratified Random sampling.

(3) The study made use of time series data of price and quantities obtained from the websites of relevant commodity exchanges. Hence, all the limitations of the time series data on account of economic, political and climatic factors are applicable to the data used.

(4) The respondents' level of awareness of commodity futures has been measured using an "awareness tool" developed by the researcher. In the absence of relevant theoretical support equal weightage has been given to all the eight items forming part of the tool. This is a limitation of the tool and hence of the study.

## 1.12 CHAPTERISATION

This study has been structured in the following manner.

**Chapter 1: Introduction**

Chapter 1 deals with the agrarian crisis in the post globalization era in India and the emergence of commodity futures as a tool for hedging against price risk. It also covers the research problem, scope, objectives, significance of the study, methodology and limitations of the study.

**Chapter 2: Review of Literature**

Second chapter deals with a review of literature on the role of commodity futures market, the performance of Indian commodity futures market, volatility, the role of futures in hedging and the role of futures in price discovery.

**Chapter 3: Commodity Futures: A Theoretical Overview and the Indian Scenario**

This chapter is devoted to give a theoretical overview of commodity futures in the Indian context. The chapter is divided into two sections: Section 1 furnishes a theoretical overview of commodity futures and their functions. Section 2 discusses the Indian scenario. It discusses the growth and development of the futures market in India highlighting the present trends.

**Chapter 4: Futures Trading and Price Volatility of Base Commodities**

Chapter 4 deals with the concept of volatility and examines the impact of futures trading on the price volatility of underlying assets with the help of Granger Causality Test and Error Variance Decomposition.

**Chapter 5 : Commodity Future as Hedging Tool**

Fifth chapter discusses the role of commodity futures in hedging against unexpected price variations of base commodities and presents the optimal hedge ratio and hedging effectiveness of rubber, pepper and cardamom futures.

**Chapter 6: Investor Awareness and Perception of Commodity Futures in Kerala**

Chapter six consists of the analysis and interpretation of the investors' awareness of futures contracts and their trading mechanism. Further, the investors' perception of risk, return, liquidity and safety of futures contracts is also analysed and interpreted.

**Chapter 7: Summary, Findings, Suggestions and Conclusions** Chapter 7 deals with the summary of the present study, major findings, the researcher's suggestions and conclusion.

# CHAPTER 2
# REVIEW OF LITERATURE

Commodity derivative markets are highly dynamic. Globally, futures markets have experienced tremendous growth over the last three decades. 'Pit-trading' has been replaced by screen-based electronic trading, new contracts are being regularly introduced and new trading rules and regulations formulated. Regulatory mechanism has been tightened and flexibility ensured. Hence, the literature on the topic is also dynamic, as new questions are continually proposed and investigated, and new research techniques are applied to traditional questions.

This chapter contains a review of the available literature on commodity futures markets. It is classified and presented under six heads. In the first part, the role of commodity futures markets is reviewed. In the second part of the literature survey, studies on the performance of the Indian Commodity futures markets are highlighted. The third part examines the impact of commodity futures on price volatility of the base commodities. Fourth part contains studies pertaining to the role of futures in hedging against losses from undesirable price movements. Fifth part of the literature survey summarizes the studies on commodity futures and price discovery. Various other studies on the topic that are, in some way or other, related to the problem under study are presented in the last part of the literature review.

## 2.1 Studies on the Role of Commodity Futures Markets

In the wake of globalisation and surge in the global uncertainties, financial organisations around the world are devising methods and instruments to contain the price risk that these uncertainties bring. Commodity derivatives are such instruments that have been devised to

achieve price risk management by basing the value of a security on the value of an underlying commodity. In the literature, several studies attempted to evaluate the role of futures both as an investment option and as a mechanism for price risk management.

**Working (1952)** who studied the price-support programs for storable crops in the United States has come to the conclusion that if a price-support program uses a support level which tends to produce an "unnatural" degree of price stability, it must tend to result in the accumulation of very large stocks, which have to be carried at heavy cost to the government.

**Ross (1975)** on the basis of a study of two groups of customers of a large commodity-trading house concluded that traders of commodity futures contracts, as a whole, lose money. The overall loss in the future market should be expected because of the nature of the market - a zero-sum game before commissions - but a losing game after paying them. Many traders are attracted to the market through the exuberance of an acquaintance who recently earned a profit; further, many trade only for a short time.

**Bodie and Rosansky (1980)** found that the mean rate of return on a well diversified portfolio of commodity futures contracts over the 27- years period from 1950 to 1976 was well in excess of the average risk-free rate. Moreover, the futures portfolio had a more positively skewed return distribution than the stock portfolio and served as a far better hedge against inflation.

**Fortenbery and Hauser (1990)** considered the investment benefits from trading live cattle, hog, corn and soybean futures contracts under the assumption that the investor's risk/return evaluation is relative to a highly diversified stock portfolio. A mean-variance approach was used to find the "optimal mix" of investment for the initial stock portfolio and for portfolios

which may include both stocks and futures. The addition of futures contracts to the portfolio rarely increases the portfolio return. However, investment benefits from agricultural futures are found in the form of a reduction in the portfolio's non systematic risk.

**Sahadevan (2002)** opines that commodity derivatives have a crucial role to play in managing price risk especially in agriculture dominated economies. However, as long as prices of many commodities are restrained to a certain extent by government intervention in production, supply and distribution, forward and futures markets for hedging price risk in those commodities have only limited practical relevance.

**Jain and Surabha (2005)** in their study observe that commodity markets are experiencing exponential growth across the globe. A positive growth rate and a rebound in global economy are driving this expansion. However, nowhere in the world have exchanges devised ways to bring on farmers on their platforms and use technology for their progress.

**Erb and Harvey (2006)** through their study aim at exploring the strategic and tactical opportunities that commodity futures present to investors. A commodity futures portfolio can have equity-like returns if it can achieve a high enough diversification return. The diversification return is a reasonably reliable source of return because a commodity futures portfolio can have equity-like returns by skewing portfolio exposures toward commodity futures that are likely to have positive role on spot returns in the future.

**Benavides and Snowden (2006)** state that administered commodity price schemes in developing countries have proved ineffective in raising farmers' incomes and hence, price stabilisation through futures markets is increasingly advocated as the alternative policy objective.

**Lingareddy (2008)** observes that futures trade in agricultural commodities in the modern exchange era has, so far, proven beneficial only in the case of a few commodities/contracts that fulfill the basic criteria of selection for futures trading accompanied by stringent and timely regulatory actions, while it has had an adverse impact on other cases.

**Jairath (2009)** empirically demonstrated that there exists opportunity for each stake-holder of futures trading. Farmers, quite often are faced with a risk of what to grow and when to sell. The futures trading offer solutions for such issues both at pre-harvest model and post-harvest model. There is huge opportunity for Indian growers-producers to take advantage of the futures trading. The data on hedger-ratio of select agricultural commodities contracts of NCDEX showed a good participation by hedgers. However, it is not clear from the data as to how many of these hedgers are the farmers.

**Sam (2010)** applying the concept of Value at Risk (VaR) assessed extreme market risk on investment in three actively traded agricultural commodity futures viz. corn, soybeans and wheat. As futures contract is a zero-sum game, the VaR for both short and long sides of the market was computed. It was found that wheat futures are riskier than the other two over both the periods considered (2000-'06 and 2006 - '08) and that all three commodities have experienced a sharp increase in market risk over the 2006-'08 period, with VaR estimates 10-43% higher than the long-run estimates.

## 2.2 Studies on the performance of Indian Commodity Futures Market

Commodity derivatives trading in India, not with standing its long and tumultuous history, with globalisation and measures of liberalisation, has witnessed a massive resurgence, turning it one of the most rapidly growing areas in the financial sector today. Yet only very few attempts have been

made to critically evaluate the performance of commodity futures markets in India.

**Naik and Jain (2001)** in their study attempted to test the efficiency and unbiasedness of Indian commodity futures markets. The results indicate that the performance of the Indian commodity futures markets is varied across the commodity exchanges. In most futures market, efficiency and unbiasedness varied during the maturity and also months prior to maturity. Most of the markets studies show efficiency in forward pricing in the months prior to the maturity. But their forward pricing ability is weak in the maturity month, which may be due to low volume of trading in the maturity month as inefficiency is more common in thin markets.

In a later study, **Naik and Jain (2002)** assessed the performance of selected Indian Agricultural Commodity Futures Markets in terms of risk management and price discovery functions. They conclude that the performance of Indian commodity futures markets varies across commodities, exchanges and contracts. Barring a few, they are still not congenial markets for hedgers. The markets are deficient in several aspects which discourage market players from trading in these markets.

**Ahuja (2006)** observes that the commodities derivatives market in India has made enormous progress in terms of technology, transparency and trading activity. Interestingly, this has happened only after the government protection was removed from a number of commodities, and market forces were allowed to play their role. He opines that this should act as a major lesson for the policy makers in developing countries, that pricing and price risk management should be left to the market forces rather than trying to achieve these through administered price mechanisms.

**Lokare (2007)** endeavored to test the efficacy and performance of Indian commodity derivatives in steering the price risk management. The critical analysis of performance divulges that these markets, although are yet to achieve minimum critical liquidity, almost all the commodities throw an evidence of co-integration in both spot and futures prices, presaging that these markets are marching in the right direction of achieving improved operational efficiency.

**Dummu (2009)** studied the working of the National Board of Trade (NBoT), Indore. He finds that open interest in NBoT displays the typical pattern of mature exchanges - of rising steadily as the contract moves towards expiry but peaking and falling rapidly in the time just before maturity. Like commodity exchanges in developed countries, the NBoT offers opportunities to short and long hedgers to construct risk less profit-earning trading strategies.

**Lakshmi (2009)** probed into the rational behind the suspension of sugar futures and stated that there is no evidence to conclude that a price rise in commodities is done to speculation in futures trade and futures prices drive the spot prices. The author is of the opinion that suspension of futures trade amounts to reduction in transparency and creates artificial hindrance for the free flow of information among the players about the estimated fundamental factors such as demand and supply conditions, government policies, weather forecasts etc.

**Ghosh (2009)** studied the Indian futures markets for a number agricultural commodity like wheat, potato, sugar, pepper, gur and mustard. He finds that the strong relationship between the spot and futures prices required for the efficient functioning of futures market has not yet developed for many commodities. This, according to him, is due to lack of hedging and

adequate participation of farmers, unnecessary regulations, infirmities in the spot markets and absence of free playing of the markets.

In a recent study, **Biswas and Rajib (2011)** examined the price volume relationships in Indian commodity futures market. The two competing models in price volume relationship viz. "Mixture of Distribution Hypothesis", suggesting a contemporaneous relationship and "Sequential Information Arrival Hypothesis" (SIH), suggesting a positive inter temporal causal relationship were tested using correlation coefficient and Granger causality test with Vector Auto regressive methodology. They conclude that though there exists contemporaneous correlation between volume and price change in some of the cases, in general, on the basis of the presence of Granger Causality, SIH is supported.

## 2.3. Studies on Volatility

The effect of the existence of commodity futures trading upon spot prices has long been discussed. Farmers, regulatory agencies and the media maintain that a futures market offers individual traders wide opportunities to speculate, leading to unjustified price levels and unnecessary price volatility. Most economists, however, have argued that speculation results in a better allocation of commodities over time and reduces the frequency and amplitude of price fluctuations. Several empirical studies have been conducted to test the effect of the presence of a futures market on price variability.

**Venkataramanan (1971)** questions the restrictive role the government has been playing in the futures markets. In his opinion it can be empirically shown that since speculators make profits by buying when prices are low and selling when prices are high, they reduce price variations through advance anticipatory actions.

**Kawai (1982)** examines the effect of the presence of a commodity futures market upon the price formation process in a 'Stochastic rational expectations' framework. According to him, the existence of futures trading does not affect the degree of short-term spot price fluctuations. However, if the commodity market disturbance that originates from Stochastic consumption demand is serially dependent, then the long-term price variation is smaller with a futures market than without it.

**Turnovsky and Campwell (1995)** state that since futures markets reduce price risk of holding inventories, larger inventories are held and prices tend to stabilize as a consequence.

**Netz (1995)** opines that when a futures market is introduced, the volume of storage should become more sensitive to changes in the return to storage. The increase in storage sensitivity means that storage will absorb a larger portion of demand and supply shocks than it did previously, reducing spot price volatility. Data from the Chicago Board of Trade support the hypotheses of increased storage sensitivity and reduced spot price volatility.

**Santos (2002)** explored into the role the advent of futures trading that may have had on sport price volatility in the United States. He examined the volatility of wheat and corn spot prices and concluded that the evolution of futures markets is the principal proximate reason why commodity sport price volatility diminished in the 1870s.

**Ranjan (2005)** conducted a case study on Soya oil which reveals that futures trading did not have a positive impact on daily price volatility. The results of regression analysis suggest that only about 25 percent variation in sport prices of Soya oil is explained by variations in futures prices. Over a long period of time, the 'basis' has declined, suggesting thereby that the spot prices move closer to the futures prices of Soya oil.

**Sabnavis and Jain (2007)** in their discussion paper tried to provide detailed clarification with both facts and global parallels to ten misconceptions about the commodity futures market in India. According to them higher prices in the cash markets have been caused by economic fundamentals and there is evidence to show that price volatility has come down in the post futures trading era.

In striking contrast with the studies reported above, certain others indicate increased spot price volatility subsequent to the introduction of futures trading.

**Figlewski (1981)** made an attempt to analyze the impact of introducing futures trading in Government National Mortgage Association (GNMA) pass-through certificates on price volatility in the cash market for these securities in the US. With the help of regression analysis came to the conclusion that futures trading in GNMA securities has led to increased price volatility in the GNMA cash market.

**Newbery (1990)** observes that futures markets with their hedging potentials can reduce the risk substantially. Risk reduction encourages producers to undertake more risky investment projects, and risky investment destabilizes spot prices, thus resulting in increased volatility.

**Yang et al. (2005)** in their research examined the lead-lag relationship between futures trading activity (volume and open interest) and cash price volatility for major agricultural commodities. Granger causality tests and generalised forecast error variance decompositions show that an unexpected increase in futures trading volume unidirectionally causes an increase in cash price volatility for most commodities. Their findings are generally consistent with the destabilizing effect of futures trading on agricultural commodities

markets and may, at least partly, explain why the criticisms of futures markets have been historically most virulent for agricultural commodities.

Earlier, **Chari et al. (1990)** showed that even if there is no production uncertainty, the commodity is nonstorable, and all participants have the same information, the introduction of futures market can increase the variance of spot prices. The study concluded that the connection between the variance of prices and welfare is tenuous and introduction of futures trading can increase the variance of prices as well as welfare.

**Nath and Lingareddy (2006)** examined the impact of futures trading in three important commodities which were banned by the government from trading in the futures market. Hodrick-Prescott Filter was used to differentiate the general trend from season/cyclical fluctuations in prices. Their study shows that in India future trading in selected commodities has apparently led to increase in prices of commodities like urad and futures have increased the volatilities in the spot market for some of the commodities.

**Nath and Lingareddy (2008)** attempted to explore the effect of the introduction of futures trading in sport prices of pulses. They observed that volatility in the prices of urad as well as pulses was higher during the period of futures trading than in the period prior to its introduction as well as after the ban of futures contracts. Although there was a mild spillover of volatilities from urad to food grains, the flow did not seem to extend to all commodities. Hence the proposition of futures trading contributing to an increase in inflation (WPI) appears to have no merit.

There are a few studies which try to explain the volatility of futures prices over the life of a contract.

According to **Koekebakker (2004)** agricultural futures price movements have fat-tailed distributions and exhibit sudden and unexpected

price jumps. He has also empirically shown that volatility of futures prices is time-dependent both as a function of calendar-time (seasonal effect) and time-to-maturity (maturity effect).

**Jin and Frechette (2004)** in their study tested whether the volatility of agricultural futures prices exhibits fractional integration. For the study, volatility series were constructed for fourteen agricultural futures price series with over 5300 observations per series. The volatility series exhibit strong long-term dependence, which is an indicator of factional integration. Long-term dependence is a special form of non-linear dynamics that describes the correlation structure of a time series at long lags. Hence they suggest that in modeling agricultural futures price volatility, a factional integration model, FIGARCH ( 1,d,1) can perform significantly better than a traditional volatility model, GARCH (1,1).

**Power and Turvey (2011)** address the question of what explains long memory in commodity futures price volatility. The results confirm previous findings of long memory, but suggest that in the case of agricultural commodity futures, long memory is fractional only for one out of ten contracts. For all others, the appearance of long memory is consistent with the true data generating process belonging to a class of stochastic long-memory models such as Stochastic Permanent Break models or Stochastic Unit Root models.

Certain other studies focus on the volatility pattern of futures prices over the life time of a contract. These studies address the question namely whether the futures price variability increases or decreases as the maturity date of the futures contract approaches.

**Samuelson (1965)** put forward the hypothesis of a negative relationship existing between the time to maturity and futures price volatility.

According to him if a piece of information is released when there is a long time to maturity it will have little effect on futures prices; on the other hand, if the same information is released just before maturity, it will have a larger effect.

**Anderson and Danthine (1983)** examine the time series volatilities in futures prices and make an attempt to clarify the Samuelson hypothesis in a rational expectations model of a futures market with diverse information. According to them the behavior of futures prices in the days close to expiration of the contract depends upon the amount of uncertainty that has been resolved. If a great deal of uncertainty remains unresolved as maturity approaches, then the pattern of time series volatilities will increase; on the other hand, if much underlying uncertainty has been resolved, then futures prices will tend to stabilize before maturity. They examine this issue in a three – trade – date rational expectations model with diverse information in which the separate pieces of information are aggregated into fully revealing prices.

**Black and Tonks (2000)** examine the pattern of volatility over time of a series of commodity futures prices, and focus on the future price variability as the maturity date of the futures contract approaches. Having made an attempt to distinguish between the amount of uncertainty and the informational efficiency in a market, they establish that the volatility of futures price as maturity approaches depends on not only the quantity of uncertainty that may be potentially resolved, but also on the informational efficiency of the futures market, which enables the resolution of the uncertainty to be incorporated into prices.

**Crain and Lee (1996)** while exploring the impact of government farm programs on the spot and futures price volatility empirically prove that the volatility is transferred from the futures market to the spot market. Volatility in the spot market today is significantly related to past volatility in the futures

market up to at least 10 days ago, although more recent past volatility shows greater impact. The spot volatility also Granger – causes the futures volatility but only up to lag 3 or 4. The impact of futures on spot is bigger and more persistent than the impact of spot on futures.

## 2.4 Studies on the role of Futures in hedging

Hedging is the practice of off-setting the price risk inherent in any cash market position by taking an equal but opposite position in the futures market. This technique is highly useful in case of any long-term requirement for which the prices have to be confirmed to quote a sale price but avoids buying the physical commodity immediately to prevent blocking of funds and incurring large holding costs (Tomek and Peterson, 2001).

Empirical research has mostly concentrated on identifying the optimal hedge and determining the hedging effectiveness, i.e., the percentage reduction in the variability of unhedged position

**Working (1949)** formulated a generalized model of cash-futures price relationships where inter temporal price relationships, or spot- futures and nearby- distant price differences, both positive and negative, are viewed as prices of storage. According to him, these price spreads provide incentives or disincentives to store and hedge

**McKinnon (1967)** shows that even with a fixed futures price, an optimum hedge exists for given variances of cash price and of production, and some non optimum hedges can be destabilizing. The goodness of a hedge also depends upon the relationship between the prices at which cash sales are made and at which the hedge is lifted.

**Murphy (1987)** used spectral analysis to investigate the risk and return seasonality of agricultural futures contracts. This study finds that the

contribution of agricultural futures to the risk of investment portfolios does not vary seasonally. It also shows that seasonal changes in the variance are uncorrelated with the return on the market portfolio and hence, seasonal differences in agricultural futures variances can be disregarded by diversified speculators. This finding implies that agricultural producers and traders may, even in months of high price volatility, freely construct seasonal hedges of their spot price risk in the futures market without lowering their expected return.

According to **Pennings and Leuthold (1999)** hedging effectiveness is related to trading volume and this relationship is more prominent when the hedging effectiveness takes market depth risk into account. Having evaluated the hedging effectiveness by taking into account basis risk and market depth risk and analyzing the overall risk reduction capacity of the derivative contract, they conclude that hedging effectiveness is an important determinant in explaining the derivatives' contract volume.

**Surabha (2005)** remarks that derivatives are effective instruments to hedge the risk of owning things that are subject to unexpected price fluctuations, eg. foreign currencies, commodities, stocks and government bonds. One key purpose for the existence of futures and other derivatives is to modify risk exposures.

**Ramakrishna and Jayasheela (2009)** examine the hedging effectiveness of Nifty Futures using the Ordinary Least Squares (OLS) technique. Empirical results show that the volatility of the Nifty spot index has been reduced after the introduction of the futures trading, though the percent reduction of volatility is small.

**Graf (1953)** opines that hedging does not provide complete protection to the individual traders. Although at time hedges are very effective, at other

times they are not. During the period of his study, on the average, long basis hedgers lost more by hedging than if they had not hedged.

**Lence (1995)** in his study compared risk-minimising and utility-maximising hedge ratios for a Midwest grain producer, when the assumptions that guarantee their equivalence are relaxed. The utility-maximising optimal hedge was found to deviate substantially from the risk-minimizing hedge and was highly sensitive to borrowing, lending and investing costs and to transaction costs. In realistic scenarios, he found the optimal hedge to be zero, and demonstrated that the economic value of more precise estimation of risk-minimising hedge ratios is quite small.

**Lence (1996)** continued to work on hedging effectiveness. Expanding the analysis to include stochastic production, large differences between the risk-minimising and utility-maximising hedge ratios were again found. With stochastic production and alternative investments, brokerage fees assume added importance and drive hedge ratios to zero.

**Iyer and Pillai (2010)** in their study on the role of futures market in price discovery found that in the case of commodities like chickpeas, nickel and rubber, the convergence of price worsens during the expiration week indicating the non-usability of futures contracts for hedging.

In addition to the studies which either support or object hedging effectiveness, there are a number of others which attempt to explain other related aspects like hedging behavior and cross-hedging.

Thus **Ho (1984)** utilizes a continuous time investment and consumption model to analyse the optimal behavior for the farmers' use of futures in hedging when he must contend with both price and output uncertainties. His major findings are:

(i) Futures trading offer perfect hedging opportunities for farmer only when there is no output uncertainty or when output and price are perfectly correlated.

(ii) The hedge ratio, in general, is less than unity and falls with the longer the time to harvest. This is because when price and output are negatively correlated, the income uncertainty is reduced and the farmer would hedge only a portion of his anticipated output.

**Bond and Thompson (1985)** have demonstrated that the decision makers' attitude toward risk may be a relevant determinant of the size of the optimal hedge ratio. According to them it can be misleading to suggest that the optimal hedging ratio is generally independent of risk aversion even when cash and futures positions are simultaneously determined. Their conclusion depends on the existence of either nonlinear transaction or storage costs or binding optimization constraints due to budgetary or other resource limitations.

**Kamara and Siegel (1987)** have derived the optimal hedging strategies in futures markets allowing delivery of more than one quality of underlying asset. The study demonstrates that hedging the delivery risk improves the hedge performance significantly even in a market where the delivery uncertainty (regarding the quality delivered) is relatively small.

**Thompson and Bond (1987)** in their study extended the analysis of optimal hedging decisions to account for the exchange rate uncertainties faced by off shore traders dealing on U.S. futures exchanges. The theoretical derivations indicate that exchange rate risk may affect commodity hedging decisions in situations where exchange rates and commodity prices are perceived to interact with one another over time.

**Miller (1985)** found modest support for simple and multiple cross hedges when he examined the value of cross-hedging for products not traded on exchanges.

**Grant and Eaker (1989)** investigated cross-hedging for commodities with and without contracts, and with multiple futures, and found no evidence of the value of cross-hedging beyond naive hedging.

**Martinez and Zering (1992)** conclude that revising a hedge in a dynamically optimal way may increase profits with little change in uncertainty over that of a fixed hedge. However, it appears that the increase in returns is too small to justify application of the more sophisticated dynamic hedging model.

**Sephton (1993**) demonstrates that the traditional method of calculating the optimal hedge ratio is deficient, primarily because it does not account for temporal evolution in the process generating asset price. He empirically establishes that hedge ratios calculated from the multivariate GARCH model led to a lower conditional variance of market returns than those based on the traditional method.

**Lapan and Moschini (1994)** considered the hedging problem of a firm that has three sources of risk: price, basis and yield uncertainty. The study makes clear that the optimal hedge under yield uncertainty depends on the conditional forecast of the harvest price. Further, the optimal hedge is inherently time-varying because conditional forecasts will be revised as harvest approaches.

**Vukina et al. (1996)** conducted an investigation into the use of Chicago Board of Trade Yield Futures to manage price and yield risks which shows that a risk-minimising firm can reduce its variance of profit by hedging in both markets compared to hedging in price futures only.

**Collins (1997)** in his study argued that hedging is motivated by avoidance of financial failure rather than by reducing income variability. Because hedging is costly, producers will not hedge unless the initial equity of the firm, plus revenue from the sale of the product at a low price, is insufficient to meet total financial obligations. Arias et al. (2000) who examined hedging under non-linear borrowing costs, progressive tax rates and liquidity constraints also supported Collins' findings. They opine that in plausible scenarios, farmers hedge little or not at all.

**Pennings and Leuthold (2000)** found that risk perceptions and attitudes affect hedging along with such factors as debt-to-asset ratios, market orientation and entrepreneurial behavior, but not in a homogenous manner.

**de Roon et al. (2000)** assessed the effect of hedging pressure (i.e. the net position of hedgers) on futures risk premium for 20 futures markets. Their finding, that both own-hedging pressure and cross-hedging pressure from within a future's own group are important in explaining returns, is consistent with a risk premium.

**Pennings and Garcia (2004)** with a sample of small and medium-sized hog producers, wholesalers and processors encountered heterogeneity in hedging behavior related to risk exposure, firm size, financial leverage, risk attitude and risk perceptions, and the level of education.

**Easwaran and Ramasundaram (2008)** conducted a study on price discovery in a sample of four agricultural commodities traded in futures exchanges. The study shows that the futures markets in those commodities are not efficient, which implies that the futures exchanges fail to provide an efficient hedge against the risk emerging from volatile prices of those commodities.

## 2.5 Studies on Futures and Price Discovery

Price discovery is the process of determining the price of a commodity, based on supply and demand factors. The view that futures contrast prices for agricultural commodities are rationally held expectations of subsequent cash prices has been widely accepted since Holbrook working first explained commodity market inter temporal price behaviour in 1958.

The role of futures prices as predictors of future spot prices was first rigorously analyzed by **Samulelson(1965).** He showed that under certain assumptions the sequence of futures prices for a given contact follows a martingale; in other words, today's futures prices are the best unbiased predictor of tomorrow's futures prices. Further, since by arbitrage futures prices and spot prices are equalized at maturity, futures prices are also unbiased predictors of future spot prices.

**Ehrich (1969)** observed that cash prices of feeder cattle are tied by economic forces to process of futures contrasts. But unlike the case of storable commodities, where cash-futures spreads signal adjustments in quantity stored, it is not expected that quantities placed on feed will adjust to cash- futures price spreads for beef cattle.

**Kofi (1973)** has demonstrated that futures market perform their forward pricing function very well and that the correlation coefficient, the performance test statistic, measures well the degree top which the spot price is predictable months in advance for a particular commodity. He showed that the predictive reliability of a futures market improves as more accurate information on supply and demand becomes available.

**Just and Rausser (1981)** compared the accuracy of major commercial price forecasts for a number of agricultural commodities. The price forecasting information in futures price is evaluated by comparison. The

results among commercial forecasts are mixed, but futures prices perform relatively better on average, although not universally so.

**Garbade and Silber (1983)** developed an equilibrium model of simultaneous price dynamics to categories the transmission of information between cash and futures markets. Examining the relationship between daily cast and futures price for four storable commodities, they conclude that futures markets generally dominate cash markets in registering and transmitting information.

**Koontz et. al. (1990)** extended the analysis in the live cattle market to allow spatial as well as temporal interaction between futures and cash markets, and found a high degree of interaction between the cash and futures, with the futures, tending to dominate in the pricing process.

**Schroeder and Goodwin (1991**) studied the pricing mechanism for live hogs. Based on Granger Causality, they found that information is discovered first in the futures markets and then transferred to cash markets.

**Karbuz and Jumah (1995)** use the concept of co integration to examine the long run relationship between futures and spot prices of cocoa and coffee on the New York and London Fox. The study is also an attempt to analyze price trends of related commodities on the same and different commodity exchanges. Their empirical results show that in general, the prices of these commodities tend to move together in the long run. The study also proves that empirical evidence can be used to support the assumption that commodity prices are perfectly arbitraged in international markets over a long period of time.

**Fortenbery and Zapata (1997)** have confirmed that futures markets play the dominant role in the price discovery process for storable and non-storable commodities. However, they cautioned that insufficient volume and

institutional constraints can hinder the development of long-run linkages between cash and futures prices.

**Silvapulle and Moosa (1999)** examine the relationship between the spot and futures prices of WTI crude oil using a sample of daily data. Linear causality testing reveals that futures prices lead spot prices, but non linear causality testing reveals a bidirectional effect. These results suggest that both spot and futures markets react simultaneously to new information.

**Singh and Shanmugam (2007)** looked into the mechanism of movement of spot and futures prices for various cereals, pulses, oil seeds and major cash crops in the Indian agriculture. The co integration test was used to find out whether there exists a long run relationship between spot and futures prices of various contract months for these crops. It was found that short run changes in the futures price series have a positive impact on the short run changes in the spot prices.

**Zapta et al. (2005)** examined the relationship between Sugar Futures prices traded in the New York and the world cash prices for exported sugar. The study found that sugar futures market leads the cash market in price discovery. They also found unidirectional causality from changes in futures to changes to spot prices.

**Karnade (2006)** analyzed the linkage between Indian caster seed futures and spot markets using co integration analysis. The study found that futures markets in Mumbai and Ahmadabad are co integrated indicating that price linkage between futures markets in Mumbai and Ahmadabad has strengthened overtime. Overall, there was unidirectional causality from futures to spot market.

**Elumalai et. al. (2009)** attempted to asses the futures and spot price linkages for three actively traded agricultural commodity by using Johnson

Co integration Analysis and Vector Error Correction Model. On price discovery, the significant coefficient of at least one error correction term confirmed the presence of co integration between futures and spot prices of the commodities studied. When the co integrating relationship was disturbed, it was the spot price which tends to make adjustments towards long run equilibrium. That is, when the spot price was too high, it immediately falls back toward future prices. The coefficient of the logged futures price in the spot price model was positive and significant indicating information flows from futures to spot market.

**Iyer and Pillai (2010)** examined whether futures markets play dominant role in the price discovery process with the help of a two-regime threshold vector auto regression (TVAR) for six commodities. They find evidence for price discovery process happening in the futures market in the five out of six commodities.

Certain other studies, though few in number, disprove the price discovery role of futures contracts.

**Leuthold (1974)** in his study tried to examine the forward pricing function of one of the original and most successful futures contracts where no storable inventory is involved, live beef cattle. With the help of regression analysis and a 'mean square error coefficient' he establishes that for distant futures the cash price is a more accurate indicator of future cash price conditions than is the futures price. Also, the cash price is more stable than the futures price for distant contracts.

**Martin and Garcia (1981)** studied the forecasting performance of live cattle and hog futures by regressing cash prices on lagged observations of futures prices for relevant contract months. Their analysis shows that the live cattle market has not performed the forecasting function well. Cattle futures

appear to add little forecasting information beyond that available in lagged cash prices.

**Pradhan and Bhat (2006)** examined the price discovery and casualty between stock index and it futures in India also had similar results. They studied price discovery and casual nexus between S&P CNX Nifty and Nifty futures for near- month, mid-month and far-month contracts separately. They used Johnson's co integration test and the Vector Error correction Model for the study. The analysis reveals that spot leads futures and the spot market transfers the information to the futures market.

**Gross (1981)** indicted that futures prices for discontinuous inventory and non-inventory commodities are not unbiased predictions, whereas continuous inventory commodities often fail to reject the unbiasedness hypothesis, suggesting that they are better forecasts; the absence of inventories may lead to gaps in the flow of information or increase errors in expectations because of the lack of close ties between cash and futures prices.

**Gracia et. al (1988)** found that livestock markets do not perform as well as those for lack of storability and the potential for supply responses within the year. Forecasting ability of futures price is affected by the time to maturity. At longer forecast horizons, forecasting performance declines, which is reasonable as more unexpected information enters the market making forecasts less precise.

**Easwaram and Ramasundaram (2008)** who looked into price discovery in a sample of four agricultural commodities traded in futures exchanges state that it is quite obvious that price discovery does not occur in agricultural commodity futures market. The Bartlett's test statistics was found to be insignificant, signifying that these futures markets are not at all aligned with their respective spot markets.

**Mc Kenzie and Holt (2002)** tested market efficiency and unbiasedness in four agricultural commodity futures markets- live cattle, hogs, corn and soybean meal- using co integration and error correction models with GQARCH-in-mean processes. Results indicate that each market is unbiased in the long run, although cattle, hogs and corn futures markets exhibit short-run inefficiencies and pricing biases.

In India, **Ghosh and Rachuri (2011)** made an attempt to analyze the efficacy of refined soya marketing price discovery. The analysis shows that futures markets dominated price making prior to April 2008. However after April 2008 the spot market has dominated the futures markets, the reason being that it is the global prices that dominate the edible oils complex scenario in India.

**Ali and Gupta (2011)** exported the efficiency of the futures markets for 12 agricultural commodities traded at NCDEX by using Johnson's co integration analysis and Granger Causality tests. Results show that co integration exists significantly in futures and spot prices for all the selected commodities expert for wheat and rice. This suggests that there is a long-term relationship between futures and spot prices for most of the agricultural commodities. The analysis of short tem relationship by causality test indicates that futures markets have stronger ability to predict subsequent spot prices for chickpea, Castor seed, soybean and Sugar as compared to maize and pepper, where bi- directional relationships exist in the short run.

## 2.6 Other Studies on Commodity Futures

Dusak (1973) analyzed the determinants of futures prices in the context of CAPM. In this framework, returns on futures market assets are governed by these assets' contribution to the risk of a large and well-diversified portfolio.

**Ward and Dasse (1977)** used an estimate of the basis model for Frozen Concentrated Orange Juice (FCOJ) to test the theory of storage and to illustrate anticipatory aspects of the basis not included in storage theory. A futures basis should reflect the marginal cost of physical product plus a risk premium less a convenience yield. However, unique market characteristics may lead to basis bias not explained by the storage theory.

**Dewbre (1981)** studied the direction and magnitude of changes in cash and futures prices occurring in response to changes in economic information. He found that given changes in economic information about the future simply need not produce equivalent changes in both cash and futures prices and, in fact, would be expected to do so only rarely. Clearly, the relative impact that a change in information about the future has san cash and futures prices will depend on the time horizon of the information (discounting), the nature of change (whether it is a change in a component of future demand or future supply, and upon the relative elasticity of current versus future period supply and demand. Further, even the direction of change i8n cash prices may differ from that for futures prices.

**Gray (1984**) made an attempt to highlight the role of expectations in the analysis of supply and interest rate shocks. Shocks which are expected to be permanent generally will create larger movements in spot and futures prices than shocks which are regarded as transitory. The result demonstrates the potential importance of capturing expectations effect in empirical studies of futures market behavior.

**Hazuka (1984)** tested a consumption-oriented CAPM for several commodities that were classified according to storage characteristics. Only futures contracts with one month to maturity were used. Hazuka found that the risk premium involved in the futures contracts were, significantly different

from zero, although the estimates of the coefficient in the model were different from their theoretical values.

**Nelson (1985)** observed that empirically significant differences between forward and futures contracts evidence their imperfect substitutability as pre harvest market instruments. Certain combinations of market conditions make the two types of contracts complementary rather than interchangeable. Forwards and futures differ conceptually because of lumpiness, marking-to-market and basis. Of these differences 'basis' constitute the most important factor.

**Jagannathan (1985)** in his study analysed the determinants of risk premium to determine whether two-month returns to futures speculations for three commodities (Corn, Wheat and Soybeans) for 1960- 78 period were consistent with consumption- beta model of risk premium. This model requires that the relative return to two different assets more proportionately to the relative conditional co variances of the return to each asset and the rate of change of consumption. He modeled the time-varying conditional covariance between the rate of change of consumption and the real return to forward speculations by projecting the observed covariance on a set of variables that included U.S. industrial production growth and the U.S. terms of trade. He found that, on the whole, the evidence suggested that this model does not provide an adequate description of returns to futures speculation.

**Wright and Williams (1989)** suggested that the appearance of convenience yield may be due to aggregation of data or mis measurement. Backwardation in price spreads may arise because stock and price data are averaged across locations and grades, including those markets experiencing temporary stock-outs with results then attributed to all locations. When these are stock-outs, nearby forward or spot prices are not constrained by possible arbitrage.

**Kaminsky and Kumar (1990)** undertook an econometric investigation into the efficiency of commodity futures markets. The study suggests that for certain commodities expected excess returns to futures speculation are non zero indicating market inefficiency. But they opine that these results do not necessarily imply that agents do not act rationally.

**Lapen et al. (1991)** observed that when futures and option prices are unbiased, optimal hedging requires only futures (options are redundant). Options are used together with futures as speculative tools which market prices are perceived as biased.

**Nijman and Beetsma (1991)** tested the empirical implications for the marginal process of prices of sugar futures of a simple pricing model. A significant impact of the conditional variance on the change in futures prices was obtained in monthly as well as daily GARCH-M models. The results suggest that the risk premier depend on the time varying volatility.

**Naik and Leuthold (1991),** with the help of a general inter temporal model, decomposed corn basis into a risk premium a speculative components and a maturity basis apart form storage costs.

**Lence et al. (1992)** show that a firm will increase production under a higher futures-cash marketing margin and under a less volatile relationship between cash and futures prices. Their analysis highlights the relevance of futures markets in directing marketing firms' resource allocations. Futures prices and their relationship with cash prices seem to be important factor affecting processing decisions. Their analysis implies that risk measures focusing on the variability of cash prices may be misleading because, in the presence of futures markets, a firms risk is only that which cannot be eliminated through hedging.

**Bailey and Chan (1993)** provide evidence that the spread between commodity spot and futures prices (the basis) reflects the macro economic risks common to all asset markets. The basis of many commodities is corrected with the stock index, dividend yield to and corporate bond quality spread. Explanatory power is related to exposure to macro economic fluctuations. About 40 percent of the variation in the basis of a portfolio of commodities with high business cycle sensitivity is explained by the stock and bond yields. Further diagnostics indicate that these associations are largely due to the presence of risk premiums, rather than spot price forecasts, in the basis.

**Tomek (1993)** suggested that basis has become more volatile and difficult to predict, thereby increasing basis risk mainly due to the changing nature of cash markets, higher level of vertical integration, and more direct sales or contracting to processors.

**Liu et al (1994)** addressed the forecast ability of the nearby cattle basis, which they modeled as a function of delivery costs and expected changes in cash prices. They concluded that short term dynamics (i.e. the lagged basis) are as important as fundamental variable in predicting nearly basis.

**Benirschka and Binkley (1995)** demonstrated that backwardation in prices may occur at a central consumption market, but not at distant production points where storage occurs. Commodity prices decline with distance to market because of increased costs of transportation reducing the opportunity cost of holding commodity stocks. Hence, distant locations have a comparative advantage in holding stocks, so stock levels and storage capacity increase with distance to the central market. Backwardations not observed at the points of storage when inter temporal prices are properly viewed and measured.

**Irwin et al. (1996)** examine whether mean reversion is present in corn, soybean, wheat live hog and live cattle futures prices. Consistent with earlier studies, asymptotic regression results provide substantial evidence of mean reversion in commodity futures pried movements. In sharp contrast, the Monte Carlo regression analysis does not provide support for the existence of mean reversion in commodity futures prices. A clear implications is that the a asymptotic regression results are misleading. The reason is that the small sample distributions of test statistics are not well approximated by assumed asymptotic distributions.

**Brennan et al. (1997)** applied a mathematical programming model to the wheat marketing system of Western Australia and found that if inter temporal prices are properly measured at the local level, stocks are not held at a monetary loss, and the apparent loss is an illusion caused by spatial aggregation.

**Jiang and Haryenga (1997)** using data for corn and soybeans identified seasonal patterns as important in deciding the basis along with storage costs, production levels and transportation rates.

**Chatrath et al. (2001)** conducted a battery of tests for the presence of low-dimensional chaotic structure in the gold and silver futures prices using twenty years of data. While they observe strong evidence for non linear dependence in the data, the evidence is not consistent with chaos; rather, their results indicate that ARCH – type processes explain the non linearities in the data.

**Mc Kaenzie and Holt (2002)** tested market efficiency and unbiasedness in four agricultural commodity futures markets- live cattle, hogs, corn and soybean meal-using co integration and error correction models with GQARCH-in mean processes. Results indicate that each market is

unbiased in the long run, although cattle, hogs and corn futures markets exhibit short-run inefficiencies and pricing biases.

**Sorenson (2002)** modeled the seasonality in corn, soybean and wheat futures prices and provided empirical evidence on the theory of storage, finding a strong negative relationship between stocks and convenience yields.

**Singh et al. (2005)** made an attempt to look into the mechanism of movement of spot and futures prices for two important food crops in Indian agriculture. The Augmented Dickey Fuller (ADF) test was used for both the crops to check the stationary of the time series data. Most of the series have been observed to follow the stationary pattern at first difference. With the help of co-integration test, it has been observed that the futures contrast behaves in an expected manner and there exists a mechanism for long-run equilibrium in the maize as well as wheat crops. This phenomenon of price convergence clearly shows that the farmers are mitigating the price risk as spot and futures prices coverage.

**Pavastar (2005)** favours the idea of granting intellectual property rights (IPR) for a contract design in a specified commodity. According to him in the absence of IPR not only does liquidity tend to become fractured but research and developments of new commodity products may come to a halt for fear that others would copy the products of successful exchanges without any costs.

**Koshie (2005)** opines that the commodity exchanges have to grow in large volumes to sustain themselves. In order to achieve this objective, there is a need for larger participation of the concerned players as well as introduction of futures in more commodities by the exchanges. For this to happen there is the need to spread awareness about the commodity exchanges and benefits that are available.

**Pavaskar (2005)** observed that perils of dematerialization of commodity futures deliveries far outweigh their apparent benefits. In his opinion its introduction in India must await until a revolution in our agricultural economy to usher in uniform standards in crop varieties and their production, packing or bailing and their storage and above all, in the trading practice in physical market.

**Battacharya (2007)** opines that it is not unlikely that the futures will remain largely a domain of speculates; a category without whose presence the futures market cannot operate. Even higher margin requirements may not prove enough to deter speculative deals. The huge size of the black economy finances and the ease with which it can play in the futures markets are considered to be the major factors behind the rapid growth of the futures trade.

**Sahoo and Kumar (2009)** examined the issues of efficiency and futures trading leading to inflation by using Granger Causality frame work. Results show that, out of five commodities studied, only in the case of crude, causality runs from volume to spot price. Hence there is no sufficient evidence to support that futures market leads to higher inflation.

**Anderson (2010)** has introduced a board framework for the construction of Markov models for the pricing and risk management of commodity derivatives. He takes the 'term structure' of futures prices as exogenously given, and explicitly model a number of empirical effects associated with commodity price behavior, including stochastic volatility, jumps and spikes. He believes that the risk-neutral dynamics of most traded commodities markets can be captured accurately by specific subsets of his general model universe.

**Luo et al. (2011)** with the help of experimental data found that compared to situations in futures market that implemented uniform margin

system, open position and futures, turnover are both significantly higher in futures markets that implement differentiated margin system. On the other hand, the differentiated margin system has no effects on hedgers' futures turnover, but significantly reduced speculator's futures turnover. Thus differentiated margin system is beneficial to effectively restrict both speculators and hedgers' speculating behavior.

**CONCLUSION**

From the review of literature it can be observed that though a large number of studies on commodity futures are available, most of them are conducted outside Indian market conditions. Variations exist in the depth and coverage of these studies. Some of the studies have addressed vital problems in the area while the problems addressed by certain other studies are very generic and shallow. The studies reviewed differ in terms of the methodology adopted also. Some researchers have used advanced and sophisticated econometric models to examine the problems while certain other researchers have used only simple descriptive statistics.

Though the issue of the role of futures in hedging against price risk has been addressed by certain studies, none of them attempted to calculate the optimal hedge ratios and hedging efficiency of plantation crops such as rubber, pepper and cardamom. Similarly, in spite of the apprehensions on futures trading leading to increased price volatility, no systematic attempt has so far been made to study systematically the impact of futures trading on the price volatility of plantation crops like rubber, pepper and cardamom which form the backbone of Kerala's agriculture.

Further, the issues of investors' perception and level of awareness on commodity futures in Kerala have not been addressed properly. Hence there is a research gap and the present study is meant to fill this gap.

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# CHAPTER 3

# COMMODITY FUTURES: A THEORETICAL OVERVIEW AND THE INDIAN SCENARIO

This chapter is devoted to give a theoretical overview of commodity futures and the historic evolution and present status of commodity derivatives in India. The chapter is organised into two sections. In the first section, an attempt is made to furnish a detailed overview of commodity derivatives, their origin, meaning and functions to give an idea on volatility and hedging discussed in the subsequent chapters. The second part contains a discussion of the history as well as the present status of the commodity derivatives market in India.

## SECTION- I

## COMMODITY FUTURES: AN OVERVIEW

Commodity futures are hardly new and the operations of many derivative markets go back to more than a century. However, the recent spurt in their operations, along with advances in technology, has made it clear that futures markets could make a substantial contribution in improving the welfare of people in both developing and developed countries.

Instability of commodity prices has always been a major concern of both farmers and consumers in an agriculture-dominated country like India. Farmers' direct exposure to price fluctuations makes it too risky for many farmers to invest in other wise profitable activities[1]. There are various ways to handle this problem and commodity exchanges are one such device. Commodity exchanges enable different players in the farm sector- producers,

processors, traders and consumers- to manage their activities in a better way in an environment of unstable prices. In a restricted sense, commodity exchanges may be defined as centers where trade in derivatives is organised.

### 3.1 Derivatives-Meaning

The term "derivatives" indicates that it has no independent value, i.e., its value is entirely derived from the value of the underlying asset. The underlying asset can be securities, commodities, livestock or anything else. In Chemistry a derivative is 'a substance related structurally to another substance and theoretically derivable from it'. Derivatives in finance work on the same principle. They are financial instruments whose promised pay offs are derived from the value of something else, generally called the underlying.[2]

The Securities Contracts (Regulation) Act, 1956 defines 'derivatives' as under:

"Derivatives include

1. Security derived from a debt instrument, share, loan whether secured or unsecured, risk instrument or contract for differences or any other form of security.

2. "A contract which derives its value from the prices or index of prices of underlying securities".

Derivative contracts are primarily of two kinds- Contracts that are traded on the exchanges and contracts that are traded outside the exchanges. Contracts traded on the exchanges are called 'Exchange-traded derivatives', while those traded outside the exchanges are called "over-the-counter" (OTC) derivatives.

## 3.2 Features of a Derivative

Though the features of different types of derivatives might differ according to their nature, the following can be pointed out as the basic features of a derivative.

- ❖ A derivative instrument relates to a future contract between two parties.
- ❖ Its value is derived from the value of some underlying asset such as agricultural commodities, metals, energy or a financial asset.
- ❖ The counter parties have specified obligations under the derivative contract, which obviously, would differ according to the type of the instrument.
- ❖ Derivative contracts can be undertaken either directly between two parties or through an exchange.
- ❖ In derivative trading, the taking or making of delivery of underlying assets is generally not involved; rather transactions are mostly settled by off setting positions in the derivatives themselves.
- ❖ It is easier to take a position (short or long) in derivatives when compared to other assets or securities.
- ❖ Derivatives are mostly secondary market instruments and have little usefulness in mobilizing fresh capital by the corporate world.

## 3.3 Financial and Commodity Derivatives

On the basis of the underlying, derivatives can be broadly divided into two categories viz.,

1. Financial Derivatives; and
2. Commodity Derivatives

This classification essentially, is with reference to the type of the underlying asset from which the derivative derives its value.

## 3.4. Financial Derivatives

A 'financial derivative' is a financial instrument whose value is derived from the value of an underlying financial asset such as bond, Treasury bill, stock, or such other instruments. There are a number of financial derivatives which are extensively traded in the financial markets all over the world. The important among them are:

### 3.4.1 Forward Contracts

A forward contract is a simple bipartite contract, which is to be performed mutually by the contracting parties, in future, at the terms decided upon, on the contract date. In other words, a forward contract is an agreement to buy or sell an asset on a specified future date for a specified price. One of the parties to a forward contract assumes a 'long position' and agrees to buy the underlying asset on a specified future date for a certain specified price, while the other party assumes a 'short position' and agrees to sell the asset on the same date for the same price. Each forward contract is unique in terms of contract size, expiration (maturity) date, the asset type etc. They are bilateral contracts which lack liquidity and are exposed to counter party risk.

### 3.4.2 Futures Contracts

Like a forward contract, a futures contract also is an agreement between two parties to buy or sell a specified quantity of an asset at a specified price and at a specified time and place. They are normally traded on an exchange which sets certain standardized norms for trading in the futures contracts. Futures contracts have the following features in brief:-

- A futures contract has certain standardized specifications in respect of the quantity and quality of the asset, date and month of delivery, units of price quotation and location of settlement.
- Here, the exchange acts as an intermediary and gives guarantee for the performance of the parties to each transaction.
- When a person enters into a contract he is required to deposit a certain amount with the broker, which is called ‘margin’.
- The futures price are expressed in currency units with a minimum price movement called a “tick size”.
- Most of the futures are settled in cash by the short or long making cash payment on the difference between the futures price at which the contract was entered and the cash price at the expiration date.

**Table 3.1**

**Differences between Forward and Futures Contracts**

| Feature | Forward Contracts | Futures Contracts |
|---|---|---|
| Operational Mechanism | Traded directly between contracting parties (not traded on exchanges) | Traded on the exchanges |
| Contract specifications | Differ from trade to trade | Contracts are standardized |
| Counter party risk | Exists. But, sometimes jettisoned to a guarantor | Exists. But assumed by the cleaning agency which becomes the counterparty to all trades or unconditional guarantees their settlement |
| Liquidation profile | Low, as contracts are tailor-made contracts catering to the needs of the parties involved. Further, they are not easily accessible to other market participants | High, as contracts are standardized, exchange- traded contracts. |
| Price Discovery | Not efficient as markets are scattered | Efficient, as markets are centralized and all buyers and sellers come to a common platform to discover the price through a common order book |
| Quality of information and its dissemination | Quality of information may be poor. Speed of information dissemination is low | As futures are traded on a nation wide basis, every bit of decision-related information gets disseminated very fast. |

Source: Manish Bansal and Navneet Bansal, "Derivatives and Financial Innovations", pp.22-23.

### 3.4.3 Option Contracts

Option may be defined as a contract between two parties whereby one party obtain the right without any obligation, to buy or sell a particular asset at the specified price, on or before a specified date. In other words, an option is a right given by the option writer/seller to the option buyer/holder to buy or sell an underlying asset at a predetermined price, within or at the end of a specified period. The option buyer, who is also called long on option, has the right but no obligation. On the other hand, the option writer/seller, who is also called the short on option, has an obligation but no right, with regard to buying or selling of the underlying asset. Options are categorized as 'calls' and 'puts'. An option which gives the buyer a right to buy the underlying asset, is called a call option; while an option which gives the buyer a right to sell the underlying asset is called a put option. Further, options can be American or European. American options can be exercised at any time up to the expiration date. European options can be exercised only at the expiration date.

### 3.4.4 Swap Contracts

A swap is an agreement between two parties to exchange cash flows in future. The agreement defines the dates when the cash flows are to be paid and the way in which they are to be calculated. In the simplest swap, one party promises to pay cash flows corresponding to the interest payments of fixed rate debt on a given amount to a party that promises to pay cash flows corresponding to the payments of floating-rate debt on the same principal amount. The cash flows that are swapped may be determined on the basis of interest rates, exchange rates or other market variables. A swap is not a funding instrument, but rather a device to obtain the desired form of financing (say, in US dollars or at fixed rate of interest) indirectly which otherwise, might be inaccessible or too expensive.

## 3.5 Commodity Derivatives

Commodity derivatives are conceptually similar to financial derivatives and differ from the latter only in respect of the underlying asset. Though different types of commodity derivatives such as forwards, futures and options are available, in India trading in futures alone is permitted through the exchanges. Further, the focus of the present study is on commodity futures. Hence, a brief explanation of the same is furnished here.

Commodity futures contract is an improved variant of forward contracts. It is an agreement to purchase or sell a given quantity of a commodity at a predetermined price, with settlement expected to take place at a future date. The commodity futures contracts in India as defined by the Forward Markets Commission have the following the following features:

1. Trading in futures is necessarily organised under the auspices of a recognised association so that such trading is confined to and conducted through members of the association in accordance with the procedure laid down in the rules and bye-laws of the association.
2. It is invariably entered into for a standard variety known as the 'basis variety' with permission to deliver other identified varieties known as 'tenderable varieties'.
3. The units of price quotation and trading are fixed in these contracts, parties to the contracts not being capable of altering these units.
4. The delivery periods are specified.
5. The seller in a futures market has the choice to decide whether to deliver goods against outstanding contracts.
6. In futures, transactions are mostly squared up before the due date of the contract and contracts are settled by the payment of differences of price without any physical delivery of goods taking place.

## 3.6 Commodities suitable for Futures Trading

All commodities are not suitable for future trading. To be suitable for trading in the future market, it should possess the following features:

1. The commodity should have suitable demand and supply conditions. A broad cash market is important as large supply of the commodity will make it difficult to establish dominance in the market place and a broad cash market will tend to provide for a continuous meeting of supply and demand forces.

2. Prices should be volatile to necessitate hedging through futures trading. The attribute of fluctuating price is of great importance, since firms will not feel the need to insure themselves against price risk if price changes are small.

3. The commodity should be free from substantial control from government regulations which impose restrictions on supply, distribution and prices.

4. The commodity should be homogenous or at least, it must be possible to specify a standard grade and to measure deviations from that grade.

5. The commodity should be storable, or else, arbitrage would not be possible and there would be no relationship between spot and futures markets.

However, most of the exotic commodity derivatives contracts (eg. weather indices and carbon credits) developed in the recent past do not satisfy these requirements but have proved to be successful as financial instruments. Hence the emphasis on commodity attributes has been relaxed considerably.

## 3.7 Role of Futures Markets

The development and sustenance of competitiveness of our industry and trade critically depend on their ability to make accurate price forecasts and transfer the risks related to movement in prices of input/outputs. The efficient price forecasts help the trade and industry to plan their inventory production and commitments for sale at a future date. Availability of an efficient formal mechanism to transfer price risk reduces price uncertainty and hence they can concentrate on their core activity, namely, trading or manufacturing. Here lies the significance of a developed futures market.

- An efficient futures market seeks to create an efficient forecast of price, which takes into account all the price-sensitive information about the commodity that is available at a particular point of time.
- Futures provide a very effective hedging option.
- It is a smart investment choice.
- The futures market provides efficient price signals which enable the producers to plan their production strategy and the occurrences of glut or scarcity can be avoided.
- A major factor contributing to inefficiencies in trade and industry is the rigidities involved in dealing with the physical commodity and the absence of a system for establishing and enforcing standards in respect of quality, grades and certification. The 'Warehouse Receipt System" evolved along with futures markets can remove these hurdles effectively.

### 3.7.1 Price Risk Management through Hedging

Price risk management refers to minimising the risk of price volatility involved in commodity trading. Through futures contracts, the risk may be

shifted to speculators or traders who are willing to assume the risk. A hedger would try to minimise risk by taking opposite positions in the futures and cash markets.

The protective feature of hedging is based on the assumption that trends in cash and futures prices are sufficiently similar, so that losses incurred in the purchase or sale of cash commodities can be offset by gains from opposite transactions in the futures markets.

Hedge may be either 'long' or 'short'. Long hedge' is a transaction where a position in the cash market is hedged by going long in the futures market. 'Short hedge', on the other hand, is the hedge that is accomplished by going short in the futures market. When futures contract on an asset (say, for eg. jet fuel) is not available, market participants generally look forward to another asset (say, crude oil) that is closely associated with their underlying and traded in the futures market. They may trade in the futures of such an asset in order to minimise the loss from dealing in the commodity of their interest. This is called "Cross hedge".

### 3.7.2 Price Discovery

Price discovery refers to the process of determining the price level of a commodity based on demand and supply factors. Every trader in a commodity exchange has specific market information like demand, supply and inflation rates. When trade between buyers and sellers are executed, the market price of a commodity is discovered. Futures markets are expected to generate prices that express the markets view of subsequent cash prices and transmit that information quickly to the marketing system.[3] According to Powers and Vogel, "Futures markets provide a mechanism, by which diverse and scattered opinions of the futures are coalesced into one readily discernible number which provides a consensus of knowledgeable thinking.[4] Thus,

futures prices provide an expression to consensus of today's expectations about a specified future time. Further, price discovery function of the futures market also leads to the inter-temporal inventory allocation function. In other words, the traders can compare the spot and futures prices and will be able to decide the optimum allocation of the quantity of underlying asset between the immediate sale and future sale.

### 3.7.3 Liquidity

Futures contracts can easily be converted into cash, i.e., they are liquid. By buying or selling the contract in order to make profits, speculators provide the capital required for ensuring liquidity in the market.

### 3.7.4 Price Stabilization (Reducing Volatility)

Another important function of the futures market is to keep a stabilizing influence on spot prices by reducing the amplitude of short term fluctuations. In other words, futures market reduces both the heights of the peaks and the depth of the troughs. The major causative factors responsible for such price stabilizing influence are speculation, price discovery, tendency to panic etc.

### 3.7.5 Bringing Transparency and Controlling Black Marketing

Futures markets allow speculative trade in a more controlled environment where monitoring and surveillance of the participants is possible. Hence, futures ensure transparency. The transparency benefits the farmers as well, by spreading awareness about prices in the open market.

## 3.8 Pricing of Futures

'Cash' and 'futures' prices usually have a well-defined relationship to each other. There are a number of theories which try to explain the

relationship between spot and futures prices. The most important among such theories are 'the cost-of-carry approach' and 'the expectations approach'.

### 3.8.1 The Cost-of-Carry Approach

According to Keynes and Hicks, "Futures prices essentially reflect the carrying cost of the underlying assets. In other words, the inter-relationship between spot and futures prices reflects the carrying cost, i.e., the amount to be spent for storing the asset from the present time to the futures maturity date. Carrying cost would include the expenses on transportation, storage, insurance and financing.

In certain cases, there might be a possibility of earning a yield on storing the underlying asset. Such yield is known as "convenience yield" from holding stock. For instance, in case of wheat, there might arise some extra gain due to low production of wheat on account of bad weather in future. Thus up to a certain level, stock holding has a yield in the event of a stock-out or unanticipated demand. This may be termed as a negative carrying cost. Hence, the net carrying cost is the excess of gross carrying cost over convenience yield.

### 3.8.2 The Expectation Approach

The proponents of this approach argue that the futures price is the market expectation of the spot price at a future date. Many traders, especially those using futures market to hedge, would like to study how today's futures prices are related to market expectations about futures prices. Any major deviation of the futures prices from the expected price will be corrected by speculative activity. This approach is also known as "hypothesis of unbiased futures pricing" because it regards the futures price as an unbiased predictor of the future spot price and expects that, on an average, the futures price will forecast the future spot price correctly.

## SECTION II

## FUTURES TRADING: THE INDIAN SCENARIO

The process of economic liberalization was initiated in the early 1990s in India. As in most other countries, policy makers, practitioners and academics responded to the opening up of the economy and to the growth of financial markets worldwide, by advocating wide-ranging reforms. International trade and investment were opened up, a process of deregulation and privatization initiated and the tax regime reviewed.[6] The revival of India's organized futures industry in 2003 was part of this initiative in the financial sector.

### 3.9 History of Futures Trading

It is widely believed that derivative trading in rice, in its rudimentary from, existed around 4000 B.C. in ancient China. Basically commodity derivative trading has evolved from the need to ensure continuous supply of seasonal agricultural crops. The origin of commodity derivative markets dates as far as back to the 17th century, when they were informally established in Amsterdam and involved in trade in "tulips".[7] Almost during the same time, 'Dojima Rice Exchange' was established in Osaka, Japan. Historically, the concept of organized trading in commodity futures began in the United States of America in the middle of the 19th century with 'maize contracts' at the Chicago Board of Trade (CBOT). It was followed by similar trading in other centers like Kansas, Minneapolis, and New York. Apart from US and UK, India is the only country that had an active futures market over a long period of time.

### 3.9.1 Futures Trading in India

It is believed that commodity derivatives have existed in India for thousands of years. Kautilya's 'Arthashastra' alludes to market operations similar to modern futures markets.[8] The first commodity exchange in India was set up by Bombay Cotton Trade Association and formal organized futures trading started in cotton in 1875. Subsequently, many exchanges came up in different parts of the country for futures trade in various commodities. The Gujarati Vyapari Mandali came into existence in 1900 which undertook futures trade in oilseeds for the first time in the country. The Calcutta Hessian Exchange and the East India Jute Association were set up in 1919 and 1927 respectively for futures trade in raw jute. Between 1920s and 1930s futures trading was conducted in a number of commodities such as cotton, raw jute, jute goods, castor seed, wheat, rice, sugar, gold and silver.

In 1939, the government banned futures trading in several commodities because of the outbreak of the World War II. After independence the government enacted the Forward Contracts (Regulation) Act, 1952 and set up the Forward Markets Commission (FMC) in 1953. The futures trading which resumed in 1953 was again banned in the 1960s except for pepper, turmeric, caster seed and linseed. Futures trading in caster seed and linseed was suspended in 1977. The Khusro Committee (1980) recommendations helped to start futures trading in potato and gur in the early 1980s and resume caster seed futures in 1985.

As part of economic liberalization of 1990s an expert committee on forward markets under the chairmanship of K.N. Kabra was appointed by the Government of India in 1993. The committee in its report submitted in 1994 recommended the reintroduction of futures which were banned in 1960s and also to widen its coverage to many more agricultural commodities and silver.

Accordingly futures trading for 16 commodities and their by products and international futures trading for pepper and caster oil were permitted. However, the Kabra Committee unanimously opined against granting permission to futures in wheat, pulses, non basmati rice, tea, coffee, dry chillies, maize, vanaspati and sugar.

There were a number of other expert committees, including the Shroff Committee and the Dantwalla Committee, which laid the foundation for the revival of futures trading in India. Many reports, notably a UNCTAD and World Bank Joint Mission Report- India: Managing Price Risk in India's Liberalised Agriculture: Can Futures Market Help? (1996), advocated the repeal of the notification prohibiting forward trade.

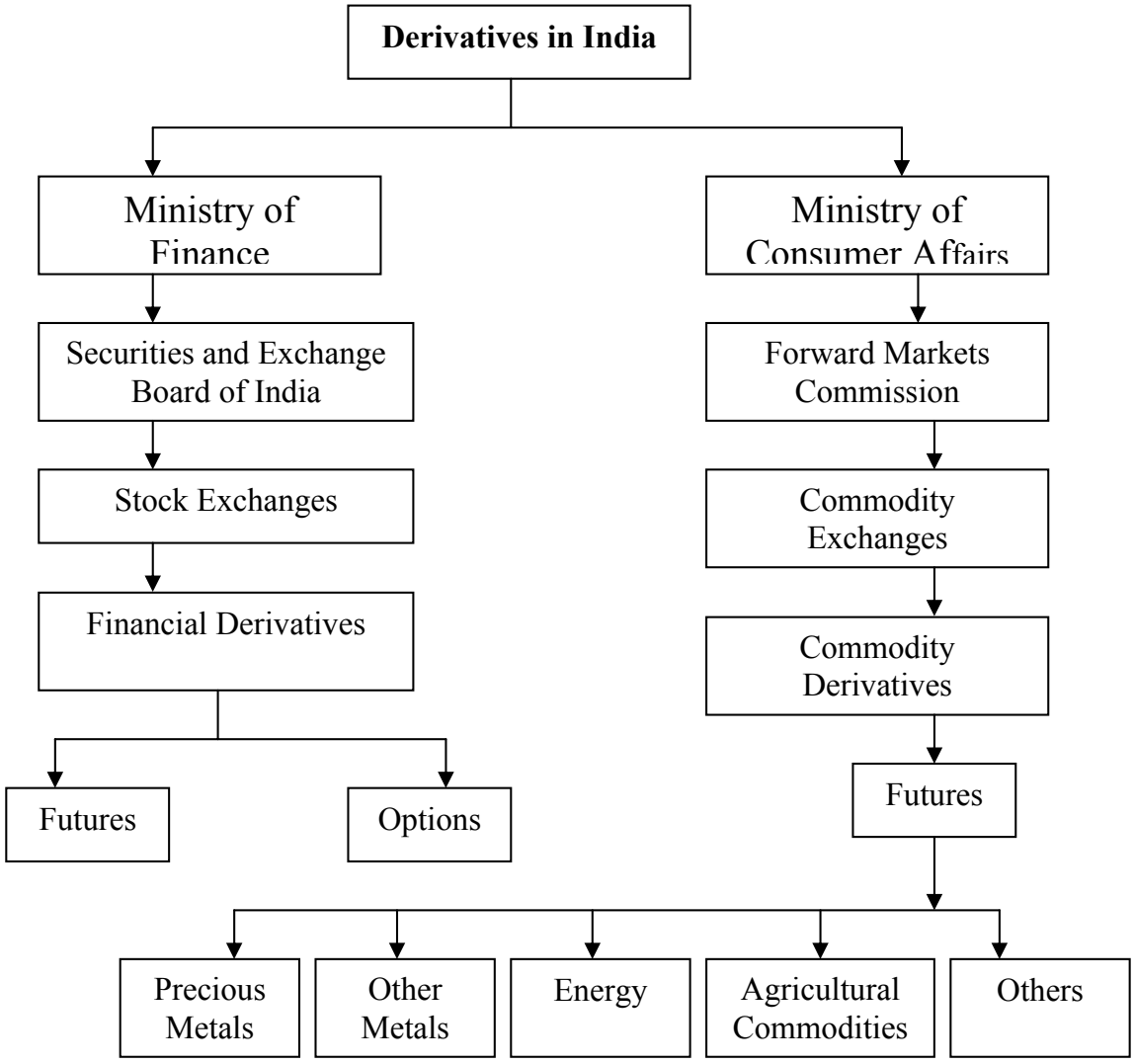
### 3.10 Structure of Derivative Markets in India

Derivative markets in India can be broadly divided into two segments viz.,

1. Financial Derivatives and
2. Commodity Derivatives

Two separate regulators set up under different Acts of Parliament govern financial and commodity derivatives markets in India. They are also under the control of different ministries (see Figure 3: 1)

**Fig 3:1 Organizational Structure of Derivatives in India**




## 3.11 Organisational Set-up of Commodity Exchanges

In the Indian context, the scope of commodity exchanges has been limited to futures trading. They are associations of members which provide all organisational support for carrying out futures trading in a formal environment. These exchanges are managed by a "board of directors" which is composed primarily of the members of the association. There are also representatives of the government, and general public nominated by the FMC.

Majority of the members of the Board are chosen from among the members of the association who have trading and business interest in the exchange. The Board appoints a chief executive officer, who with his team assists the Board in day-to-day administration of the exchange. There are different classes of members who capitalize the exchange by way of participation in the form of equity, admission fee, security deposits, registration fee etc. They are classified as ordinary members, trading members, trading-cum-cleaning members, institutional clearing members and designated clearing bank. The membership requirements for and the composition of members, however, vary from one exchange to another.

### 3.11.1 Margin Money

Margins are good faith deposits kept with a clearing house usually in the form of cash. The aim of margin money is to minimise the risk of default by either counter party. Though exchanges might collect different types of margins from the market participants (eg. special margin, volatility margin, delivery margin etc), initial margin and mark-to-market margins are more important.

Initial Margin is the amount to be deposited by the market participant in his margin account with clearing house before he can place order to buy or sell a futures contract. This must be maintained throughout the time his position is open and is returnable at delivery, exercise, expiry or closing out.

Mark-to-Market Margins (MTM) are payable based on closing prices at the end of each trading day. These margins will be paid by the buyer if the price declines and by the seller if the price rises. This margin is worked out on difference between the day's closing rate and the previous day's clearing rate. The exchange collects these margins from buyers if the prices decline and pays to the sellers and vice versa. Collecting MTM margins on a daily

basis reduces the possibility of accumulation of loss, particularly when futures price moves only in one direction.

### 3.12 Regulation of Futures Trading in India

At present there is a three tier system for the regulation of futures trading in the country viz., Government of India, Forward Markets Commission (FMC) and Commodity Exchanges Regulation to ensure fairness and transparency in trading, clearing, settlement and management of the exchange so as to protect and promote the interests of all stake holders. With a view to provide regulatory oversight, the FMC prescribes the following regulatory measures:

1. Limit on net open position of an individual operator and at member level to prevent excessive speculation.
2. Circuit-filters to allow cooling of market in the event of abrupt upswing or downswing in prices.
3. Imposition of margins to prevent default by the parties.
4. Insisting on physical delivery of contracts and imposing penalty for defaults.
5. Daily marking-to-market of the contracts.

### 3.13 Commodity Futures in India: Growth and Development

Though organised commodity futures trading existed in India since 1875, the commodity derivatives were in a state of hibernation until the dawn of the present century owing to a number of government restrictions. Significant developments in commodity futures market occured in 2003-04, when the government issued notification on 01.04.2003 stating that "futures trading can be conducted in any commodity subject to the approval/recognition of the Government of India".

In order to set up proper markets, the Government of India on the recommendation of the Forward Market Commission granted recognition to three national level commodity exchanges. The National Multi Commodity Exchange Ahmadabad (NMCE) was the first exchange to be granted permanent recognition by the Government, where futures trading started in November 2002. The Multi Commodity Exchange, Mumbai (MCX) was established in November 2003 and the National Commodity and Derivative Exchange, Mumbai (NCDEX) commenced operations in December 2003. Two more nation wide exchanges, the Indian Commodity Exchange Ltd. Gurgaon (ICEX) and the Ahmadabad Commodity Exchange (ACE) were also granted recognition later. Thus today we have 21 exchanges of which five exchanges are national level multi commodity exchanges and 16 others are regional or commodity- specific exchanges.

TABLE 3.2

**Turnover of the Indian Commodity Derivative Exchanges**

| Year | Turnover (in Rs. Billion) | Growth (Per cent) |
|---|---|---|
| 2002-03 | 665.30 | -- |
| 2003-04 | 1,293.64 | 94.44 |
| 2004-05 | 5,717.59 | 341.98 |
| 2005-06 | 21,551.22 | 276.98 |
| 2006-07 | 36,769.27 | 70.61 |
| 2007-08 | 40,659.89 | 10.58 |
| 2008-09 | 52,489.56 | 29.09 |
| 2009-10 | 77,647.54 | 47.93 |
| 2010-11 | 119,489.42 | 53.89 |
| 2011-12 | 1,81,261.04 | 51.70 |

Source: Annual Reports, Ministry of Food and Consumer Affairs, Delhi.

Volumes on the exchanges have picked momentum rather quickly (Table 3.1) and almost tripled consistently for two years in 2004-05 and

2005-06. Although the growth persisted in the subsequent years, the rate fell down to 70.61% in 2006-07 and to a modest 10.58% in 2007-08. Since then, the rate of growth moved upwards and remained around 50% in the last three financial years.

### 3.13.1 Futures Turnover in Relation to Gross Domestic Product (GDP)

TABLE 3.3

**Comparison of Turnover of Commodity Derivative Exchanges with India's GDP**

**(Rs. Billion)**

| Year | GDP (at constant prices Base Year: 2004-05) | Commodity Derivative Exchanges | |
|---|---|---|---|
| | | Turnover (Value) | Turnover as % of GDP |
| 2004-05 | 29714.64 | 5,717.59 | 19.24 |
| 2005-06 | 32,530.73 | 21,551.22 | 66.25 |
| 2006-07 | 35,643.64 | 36,769.27 | 103.13 |
| 2007-08 | 38,966.36 | 40,659.89 | 104.35 |
| 2008-09 | 41,589.76 | 52,489.56 | 126.22 |
| 2009-10 | 45,076.37 | 77,647.54 | 172.26 |
| 2010-11 | 48,859.54 | 1,19,489.42 | 244.56 |
| 2011-12 | 52,025.15 | 1,81,261.04 | 348.41 |

Source: ISO and FMC.

A comparison of the turnover of commodity exchanges with the country's GDP will give us further insight into the tremendous growth in the volume of futures trading subsequent to the setting up of the nation wide electronic exchanges in 2003. The collective turnover of all exchanges which stood at 19.24% of the GDP in 2004-05, surpassed the country's Gross Domestic Product in 2006-07 (103.13%). The total turnover of all exchanges together in 2011-12 was 1,81,261.04 billion rupees while the country's GDP was only 52,025.15 billion rupees at constant prices (base year 2004-05) Thus

the total turnover of the commodity exchanges in the year was 348.41% of the GDP.

### 3.13.2 Turnover of Commodity Futures and Securities: A Comparison

TABLE 3.4

**Comparison of the Turnover of Commodity Derivatives with BSE and NSE**

**(Rupees Billion)**

| Year | Turnover* of Stock Exchanges | | | Turnover of Commodity Exchanges | Turnover as % of BSE & NSE |
|---|---|---|---|---|---|
| | BSE | NSE | Total | | |
| 2008-09 | 11000.74 | 27520.23 | 38520.97 | 52489.56 | 136.26 |
| 2009-10 | 11788.09 | 37545.24 | 49333.33 | 77647.54 | 157.39 |
| 2010-11 | 11034.67 | 35774.12 | 46808.79 | 119489.42 | 255.27 |
| 2011-12 | 6670.22 | 28108.92 | 34779.14 | 181261.04 | 521.18 |

. *Turnover of the stock exchanges include only that of the cash segment

Source: NSE, BSE, SEBI* and FMC excluding futures and options.

Table 3.3 furnishes a comparison of the turnover of commodity exchanges with that of Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). In 2008-09 the turnover of all the commodity exchanges in India was 52,489 billion rupees while it was 11000.74 billion rupees in BSE and 27520.97 billion rupees in NSE. The turnover of commodity exchanges which was 136.26% of the turnover of BSE and NSE together in 2008-09 rose to 521.18% in 2011-12. The growth of commodity futures trading shall be all the more amazing when we consider the fact that the Bombay Stock Exchange (BSE) was established in 1875 and the National Stock Exchange (NSE) commenced operations in 1994. While the modern commodity exchanges in India are hardly a decade old.

TABLE 3.5

**Turnover of Stock Exchanges and Commodity Derivative Exchanges in India**

**(Rs. Billion)**

| Year | Stock Exchanges | | Commodity Derivative Exchanges |
|---|---|---|---|
| | Cash Segment Turnover | Derivative Segment Turnover | |
| 2005-06 | 23,856.30 | 48,241.74 | 21,551.22 |
| 2006-07 | 29,014.70 | 73,586.42 | 36,769.27 |
| 2007-08 | 50,986.84 | 1,30,094.78 | 40,659.89 |
| 2008-09 | 38,487.71 | 1,10,104.83 | 52,489.56 |
| 2009-10 | 55,064.34 | 1,76,636.64 | 77,647.54 |
| 2010-11 | 46,660.56 | 2,92,482.21 | 1,19,489.42 |

Source: Reports of NSE, BSE, SEBI and FMC.

Table 3.4 shows the turnover of Indian Commodity derivative exchanges in comparison with the turnover of stock exchanges in India indicating their collective turnover in both cash and derivative segments. While the turnover of commodity derivative exchanges which was less than the turn over in the cash segment of the stock exchanges in the country marched ahead to surpass the latter in 2006-07 and was 256% of the stock exchanges' volume in the cash segment in 2010-11. But the volumes of commodity exchanges have been varying between 40% and 50% of the stock exchanges turnover in the derivative segment except in 2007-08 when it was only 31% of the latter.

### 3.13.3 Commodity Futures – Exchange-wise Turnover

TABLE 3.6

**Turnover of Different Commodity Derivatives Exchanges in India**

**(Rs. Billion)**

| Commodity Exchange | Years | | | | |
|---|---|---|---|---|---|
| | 2006 | 2007 | 2008 | 2009 | 2010 |
| MCX | 20256.63 | 27304.15 | 42846.53 | 59566.56 | 78954.04 |
| NCDEX | 12433.27 | 7749.65 | 6280.74 | 8057.2 | 9732.17 |
| NMCE | 1114.62 | 250.56 | 372.72 | 1959.07 | 1807.38 |
| Other Exchanges | 1040.33 | 1240.51 | 838.85 | 1321.73 | 4453.66 |
| Total | 34844.85 | 36544.87 | 50338.84 | 70904.56 | 94947.25 |

Source: Reports of FMC

Another striking feature of the commodity futures market in India has been a shift in favour of the nation wide exchanges. In the year 2006 the volume of regional exchanges was 1040.33 billion rupees against the total futures turnover of 34844.85 billion rupees. The share of commodity specific exchanges rose to 1321.73 billion in 2009 while the total turnover of all exchanges stood at 70,904.56 billion rupees. In the next year the share of others showed a substantial increase (4453.66 billion rupees), but it might be because the figure included the turnover of the two newly established multi commodity exchanges (ICEX and ACE) also.

This shift in favour of the multi commodity exchanges and the declining role of regional/commodity specific exchanges shall be quite evident from Table 3.6.

TABLE 3.7

**Market share of commodity exchanges (2011-12)**

| Name of Exchange | Market share (%) |
|---|---|
| MCX | 86.0 |
| NCDEX | 10.0 |
| NMCE | 1.5 |
| ICEX | 1.4 |
| ACE | 0.8 |
| Others | 0.3 |
| Total | 100.0 |

Source: Reports of FMC

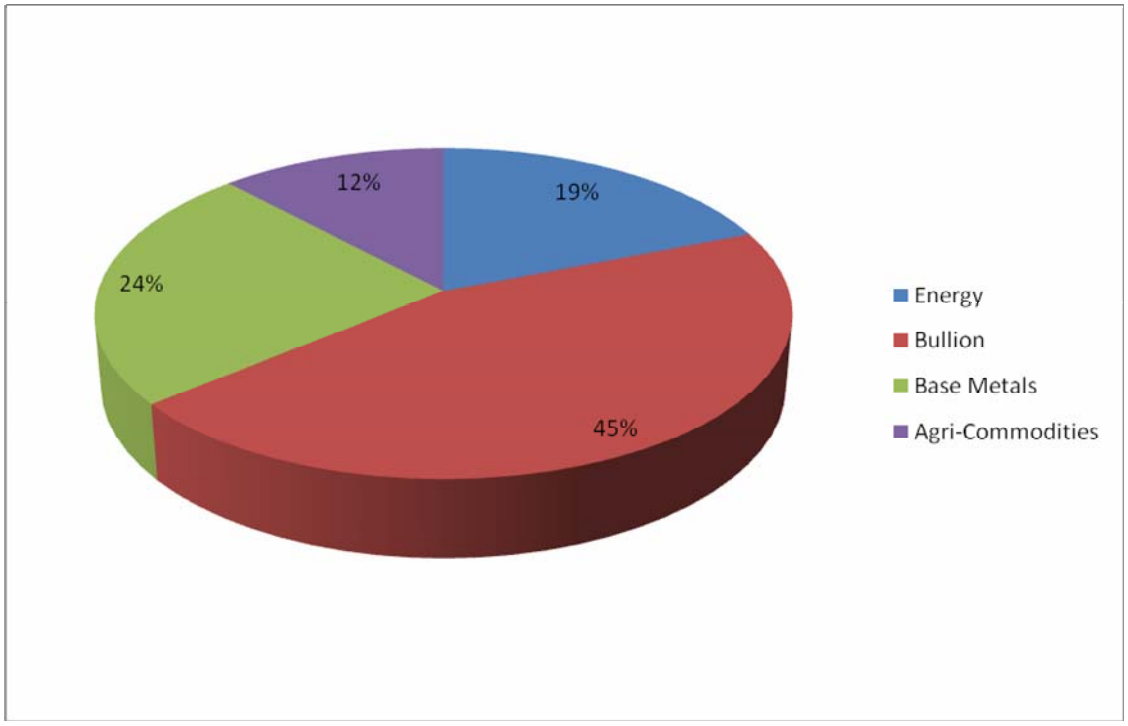
The Multi Commodity Exchange (MCX) alone accounted for 86% of the total turn over during the year 2011-12 followed by NCDEX (10%) and NMCE (1.5%). The share of 16 regional/commodity specific exchanges was a meager 0.3% of the total volume.

### 3.13.4 Share of Commodity Groups in Trade Volume

Another trend which is observable is the change in the share of commodity groups in trade volumes over the years. The share of agri-commodities to the total traded volume was 68.18% in 2004-05. In 2005-06 it declined to 55.31% and in the subsequent year fell further to be 3.82% of the total. In 2010-11 the share agricultural commodities to the total turnover of derivative exchanges was only 12%.

**Figure 3.2**

**Share of Commodity Groups in Trade Volume (2010-11)**




Source: Analytique, Bombay, Chamber of Commerce.

The total share of bullion and other metals which was 31.47% of the total in 2004-05 rose to 36.15% in 2005-06, 57.9% in 2006-07 and 64.55% in 2007-08. In 2010-11 bullions and other metals constituted 69% of the total turnover.

## CONCLUSION

The evolution of commodity futures has a long history spread over several centuries and the practice of trading in commodity derivatives prevailed in different parts of the world from time immemorial. Organised trading in commodity futures began in America in the middle of the 19$^{th}$ century. Almost at the same time the first commodity exchange in India was setup by the Bombay Cotton Trade Association. This was followed by similar initiatives in different parts of the country. But the history of futures trading in

India was marked by frequent bans and restrictions on account of the apprehension that futures trading in commodities would lead to price instability and inflation.

The Indian commodity futures market which was in a state of hibernation for decades was given a fresh life with the setting up of national level multi – commodity exchanges as part of India's liberalization process in the 1990s. Since then the commodity derivatives market in India has been growing in leaps and bounds.

The present study highlights certain striking features of the commodity futures market in India. During the last decade the role of regional and commodity specific exchanges have declined while the national multi commodity exchanges have grown considerably in terms of volume and turnover. Though futures contracts were originally introduced as a tool for hedging in agricultural commodities, the share of agricultural products in the total trade volume of commodity exchanges has been steadily declining. Bullion, base metals and energy are fast emerging as investors' preferred choices.

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# CHAPTER 4

# FUTURES TRADING AND PRICE VOLATILITY OF BASE COMMODITIES

## 4.1. Introduction

Ever since agricultural markets have existed, agricultural prices have always been volatile. Price fluctuations are a common feature of a well-functioning agricultural product market. But when these become large and unexpected, they can have negative impact on the food security of consumers, living conditions of farmers and the overall welfare of a country.

One of the major arguments advanced against liberalisation of agricultural trade is that it would lead to transmission of international price volatility into domestic markets also. Unstable prices along with wide spread crop failures due to changing climatic conditions has been a major reason for the crisis in the agricultural sector that has led to a large number of farmer suicides in the recent past in different parts of the country. Small farmers in countries like India, with low propensity to save cannot cope with the revenue variability resulting from fluctuations in output prices.

## 4.2. Volatility – Meaning

Asset price volatility is one of the most puzzling phenomena confronting financial economists, yet understanding volatility remains one of our most stubborn challenges. In a purely descriptive sense, 'volatility' refers to variations in economic variables over time. It is the relative rate at which the price of an asset (commodity) moves up and down. Price volatility refers to the tendency to rise and fall in price of an asset over a period of time.

Volatility depends upon the range between high and low prices of an asset, and on the number of price changes it undergoes.

Volatility indicates how much and how quickly a value (for example, the price of a commodity) changes over time. While this concept may seem obvious, a precise definition of volatility is elusive and measurement prone to subjectivity. Volatility is determined by the speed, magnitude and change in direction of the rate of variation in prices. From a statistical standpoint, the greater the magnitude of its rate of change (up or down), the greater the speed of such change and the more changes there are in opposite directions, the more volatile a price will be. In other words, wide price movements over a short period of time typify the term 'high volatility'.

### 4.2.1. Historical and Implicit Volatility

Two kinds of volatility are found in the literature: an historical (realised) volatility and an implicit future volatility. The historical volatility is based on observed (realised) price movements of an asset over an historical period. It represents past price movements and reflects the resolution of supply and demand factors. In other words, it reveals how volatile a price has been in the past.

Implicit volatility is the market's view on how volatile a price will be in the future. It represents the market's expectation of how much the price of a commodity is likely to move and tends to be more responsive to current market conditions. Though implicit volatility is of greater significance in the formulation of policies, in our study we use the term 'volatility' to refer to the realised instability of agricultural prices in the past.

## 4.3. Agricultural Prices and Volatility

Most agricultural commodity markets are characterised by a high degree of volatility. Traditionally, volatility in agricultural prices has been attributed to three major market fundamentals.

- Agricultural output varies considerably from period to period as a result of unforeseeable and unpreventable exogenous shocks such as weather and pests.

- Price and income elasticities of agricultural commodities are inherently low. Demand elasticities are relatively small with respect to price and income especially in the case of food crops. Supply elasticities are also low, at least in the short run. In order to get supply and demand back into balance after a supply shock, prices, therefore, have to vary rather strongly, especially if stocks are low.

- The nature of planning process, where production decisions for most farm products are made much in advance of the time the product is marketed, is another striking feature of agriculture. Since production takes considerable time in agriculture, supply cannot respond much to price changes in the short-run, though it can do so much more once the production cycle is completed. The resulting lagged supply response to price changes can cause cyclical adjustments that add an extra degree of variability to the markets concerned.

Agricultural commodity prices might also be affected by a number of other exogenous factors. The more important among them are briefly listed below.

(1) Inflation: Commodities currently represent financial assets in investors' portfolio, which implies that incentives to acquire them as stores of wealth grow with the level of prices, that is, inflation.

(2) Stock levels: Several studies have shown that inventories have a direct link on volatility. As commodity stocks falls, it is expected that price volatility will increase. Stocks can absorb the shocks in demand and supply.

(3) Yield: The yield of a given crop can drive the price for a given commodity either up or down. A particularly large yield (relative to expectations) may drive prices down and vice versa.

(4) Income growth: Accelerations or decelerations in world growth rates may cause variations in the demand for food, and therefore, give rise to higher or lower volatility levels.

(5) Exchange rate: The exchange rate has an important impact on asset prices. Thus, volatility in the value of U.S. dollars may entail short-run gains or losses in the profitability of assets denominated in US dollars, which may prompt the investors to modify their positions in the short-run, thus resulting in overall market volatility. Further, the prices that producers receive once they are deflated into the currency of domestic countries may have great impact on the prices at which they are prepared to sell.

(6) Interest rate: Interest rate is an important macroeconomic factor that can have a direct effect on the price of commodities because it represents a cost to stock holding.

(7) Transmission across prices: A positive transmission of price volatility is expected across commodities. Similarly international volatility gets transmitted into domestic prices.

(8) Export concentration: A few exporting countries can expose international markets to variability in their exportable supplies. This variability might stem from weather shocks and domestic events such as policy changes.

(9) Oil price volatility: Perhaps, one of the biggest shifts in agricultural production in the recent past is the move towards biofuels. Thus there is transmission between crude oil and sugar prices. There is further a strong link between input cost and output prices. Fertilizer prices, mechanized agricultural and freight costs are all dependent on oil prices. Hence, oil price volatility is bound to spill over into other commodity prices.

(10) Financialisation of commodity markets: Financialisation of commodity trading indicates the increasing role of financial motives, financial markets and financial actors in the operation of commodity markets. The impact of increased financialisation and the role of speculators on price volatility are ambiguous and are currently under debate.

### 4.3.1. Impact of Agricultural Price Volatility

Not all price variations are problematic and agricultural prices in particular are subject to certain degree of cyclical and seasonal volatility. But variations in prices become problematic when they are large and cannot be anticipated and, as a result, create levels of uncertainty for producers, traders, consumers and governments. Such uncertainty can lead to sub-optimal decisions.

**4.3.1.1. On producers**: Price volatility is, perhaps, the most pressing issue facing producers of primary commodities. Producers are concerned about low prices, which may threaten their living standards and their ability to provide for their families. Since price volatility makes it difficult to obtain a reasonable price every year, farmers struggle to plan their economic activities.

Farmers invest without knowing whether even their production cost will be covered. This results in increasing indebtedness, which further limits their ability to access credit and make investments. The instability further means that prices cannot serve as signals for farmers to make decisions on what to plant and when.

**4.3.1.2. On Processors / Traders**: The immediate consequence of price instability is a lower profit margin for processing firms. It is rarely possible to pass on the totality of commodity price increases to the finished products, as this would scare off customers. The steady rise in commodity prices in recent years has significantly reduced margins of small processing units threatening their survival.

**4.3.1.3. On Consumers:** At the consumer level, volatility translates to large price fluctuations that reduce their purchasing power[1]. Consumers wish to maximise their welfare and the utility they derive from the consumption of a unit of agricultural product subject to their budget constraint. Since they are price-takers, they often adjust their demand as the prices of basic commodities change. When the prices of commodities increase, consumers tend to adjust their consumption expenditure, because high prices diminish their purchasing power.

**4.3.1.4. On the Economy**: Many countries in the world specialize in the export of just a few primary products and / or depend heavily on agricultural commodities. These countries are usually exposed to substantial commodity price volatility and suffer a high degree of macroeconomic instability, which in turn, might have negative implications for their GDP and growth rates.[2]

### 4.3.2. Futures Trading and Spot Price Volatility

The effect of futures trading on cash price volatility has been a topic of discussion for many years. Earlier empirical studies found that the

introduction of commodity futures trading generally reduced or at least did not increase the spot price volatility of the base commodities[3]. Many of the later studies which account for the time-varying patterns of price volatility also confirmed this conclusion[4, 5]. Futures trading tends to achieve a rationale for price discovery and information dissemination on real-time basis. This, in turn, is expected to reduce the seasonal variations in prices, which are attributed mainly to the pattern of production and marketing of agricultural commodities.

### 4.4.1 Futures trading, storage and price volatility

For many commodities, storage exists as a way to smoothen consumption and production. Storage strengthens demand in times of abundance and supply in times of scarcity, thus reducing price swings. But producers and traders are reluctant to maintain stocks as the future prices are unknown[6]. It is argued that futures encourage storage, either by reducing the risk storers face or by providing agents with more information regarding actual return to storage[7]. This in turn, will dampen cash price swings, and reduce spot price volatility.

### 4.4.2 Financialisation of Commodity Markets and Cash Price Volatility:

Financial market players and financial motives have systematically transformed physical commodity market into financial markets. Investors have been engaging in commodities trading for the purpose of portfolio diversification ever since it became evident that commodity futures contracts fetch the same average returns as investments in equities. Further, over the business cycle their returns were negatively correlated with those on equities and bonds[8]. This financialisation of commodity markets is likely to distort the price discovery mechanism and prices tend to move away from levels justified by the fundamentals for longer periods of time.

A futures market could induce a significant amount of new hedge trading without attracting enough speculation to permit an effective risk transfer. The hedging pressure in futures can then spill over into the cash market where dealers and other market makers end up bearing risk transferred through both the cash and futures market.

Futures trading might increase spot price volatility if investors in futures market do not have good information as participants in the cash market. Even if the futures price accurately reflects the information available to players in that market the cash market prices would move away from their most appropriate values, when the futures market players have only inaccurate or outdated information. This situation will present profit opportunities to the better informed cash market participants, whose trading will act to stabilise futures prices while allowing greater volatility in cash prices.

### 4.5. Measuring Volatility

Though volatility of a time series appears to be an obvious concept, there is no consensus as to what constitutes the correct method of its measurement. For example if a price series has a mean, then volatility may be interpreted as its tendency to have values varying from this mean. Alternatively, volatility can be interpreted as a series' tendency to have large variations in its value from period to period. Volatility is also explained in terms of the degree of forecast error. Thus, a series may have large period-to-period changes or larger variations away from its mean, but if the conditional mean of the series is able to explain most of the variance, then it cannot be considered volatile. The different approaches to the measurement of price volatility are briefly explained below.

### 4.5.1. Standard Deviation and Coefficient of Variation

The naive approach involves treating all price movements as indicative of instability by calculating the unconditional standard deviation of the price index or its coefficient of variation[9]. The most striking advantage of this approach is its simplicity. A better and useful variant of this approach of measuring instability is using the ratio method[10]. In this method, variability of the series is calculated by measuring the standard deviation of log ($P_t/P_{t-1}$) over a period, where '$P_t$' is the price in period't' and $P_{t-1}$ is the price in period t-1. This method does not account for predictable components like trends in the price evolution process. In other words, this approach treats all price movement as unpredictable, implying that past realisations of price and volatility have no influence on the current and future realisations[11]. Thus standard deviation as a method of measuring instability is likely to overstate volatility.

### 4.5.2 Autoregressive Models:

Autoregressive models, such as the Autoregressive Integrated Moving Average (ARIMA) model are used to distinguish between predictable and unpredictable components of the price process. To obtain the unpredictable components of the price process, Dehn (2000) suggested removing the predictable components of the price series (e.g.: seasons, trends, inflation etc) in an ARIMA model and using the standard error of the regression as a measure of volatility that accounts for the unpredictable components of the price process[12].

However, the autoregressive models suffer from certain limitations. Some issues which are integral to the concept of volatility such as whether the impact of a price shock is permanent or is only transitory and the instances of volatility spillover from one market to another cannot be satisfactorily

addressed through the ARIMA model. Further the ARIMA model treats volatility as time-invariant.

### 4.5.3. ARCH-GARCH Models

One approach that distinguishes between unpredictable and predictable components of the price process and at the same time allows for variance of the unpredictable component is the family of autoregressive conditional heteroskedasticity (ARCH) models[13]. The ARCH models are mean zero, serially uncorrelated processes with non-constant variances conditional on the past, but with constant unconditional variances.

In an ARCH model the conditional error variance of the time series is represented by an autoregressive (AR) process, with conditional variance equal to a linear function of past squared errors[14]. Consider an AR (I) process,

$$Y_t = \alpha + \beta Y_{t-1} + \varepsilon_t$$

In the absence of conditional hereoskedasticity, the $\{\varepsilon_t\}$ sequence has a mean of zero and a constant variance, and all autocorrelations between $\varepsilon_t$ and $\varepsilon_{t-1}$ are zero. Assuming that the conditional normally distributed errors sequence $\{\varepsilon_t\}$ has zero mean and conditional variance of $h_t$, the ARCH ($\rho$) representation is

$$h_t = \alpha_0 + \sum_{i=1}^{\upsilon} \alpha_i \varepsilon_{t-1}^2$$

Where p is the order of ARCH process and $\alpha_i$ is a vector of unknown parameters.

Bollerslav[15] generalised the ARCH model by allowing the conditional variance of the error process to be an ARIMA process. The resulting model is known as the generalised autoregressive conditional heteroskedasticity

(GARCH) model. In the case of a GARCH model, the conditional variance depends not only on the past values of the time series but also on a moving average of the past conditional variance. According to Bollerslev, GARCH allows for a more parsimonious representation of the data.

### 4.6. Data and Methodology

Most of the earlier works on the impact of futures trading on cash price volatility (e.g., Kamara[16], Singh[17], and Nath and Lingareddy[18]) focus on the paradigm of introducing futures trading. Thus they compare cash market volatility before and after the introduction of futures trading.

Following the studies of Figlewski[19] Chen, Cuny and Haugen[20], Adrangi and Chatrath[21] Gulen and Mayhew[22] and Yang *et al*.[23] the scholar prefer to approach the issue in a different way. In this study the scholar would like to examine the question "how does the futures trading activity affect spot price volatility?" As Stein[24] observes the impact of more or less speculation from established futures trading on cash market volatility is far more relevant to the real world than to the introduction of a futures market. Trading activity in the futures market is commonly measured by daily trading volume or open interest.

#### 4.6.1. Data used

The data for the analysis consist of daily cash closing prices, daily futures settlement prices, total futures trading volume (TV) and total futures open interest (OI) for rubber, pepper and cardamom obtained from the relevant commodity exchange. Though different futures contracts of a commodity are usually traded simultaneously, daily volume, open interest and closing price of the 'near month' contract alone are considered. Near month contract is preferred over others, because it is most actively traded. Further,

the use of near month contract helps to avoid the 'expiration effect' from which the 'current month' contracts usually suffer.

The details of the data used are shown below:

**Table 4.1. Description of Data**

| Commodity | Futures Exchange | Period of Data |
|---|---|---|
| Rubber | NMCE | 15 March 2003 to 7 May 2008 & 4 December 2008 to 31 July 2012 |
| Pepper | NCDEX | 1 January 2005 to 31 December 2011 |
| Cardamom | MCX | 23 February 2006 to 31 December 2011 |

The data for the study are obtained from the websites of the respective commodity exchange where each commodity is most actively traded in India. Since futures trading in rubber was suspended for nearly seven months from May to November 2008, there is a structural break in the data series and hence the period under study is divided into two sub periods as shown in Table 4.1 above.

### 4.6.2. Methodology

Cash price volatility is modeled as a GARCH (1,1) process which addresses the time-varying pattern of commodity spot price volatility (Antoniou and Foster[25], Gulen and Mayhew[26], and Yang *et al*.[27]). Total volumes as well as open interests of the futures contracts are decomposed into expected and unexpected components[28]as only the unexpected components of futures trading activity are relevant to the study. The expected component is excluded as the information embedded in it should already be reflected in the cash price. This study uses 21-day moving averages of volume and open interest as the expected component and the difference between actual volume

(or open interest) and the expected component as the unexpected component[29].

However, if the effect of an economic shock on the spot market is highly persistent, expectations formed on the 21-day moving average may not be able to 'whiten' the unexpected component and a large number of trading days (longer than 21 trading days) would be required for full incorporation of the information from an economic shock into these series.

This study examines the lead-lag relationship between the unexpected component of the futures trading activity (volume and open interest) and cash price volatility using (i) the Granger causality test and (ii) Forecast error variance decompositions.

To test Granger causality running between X and Y, the following specification is used

$$Y_t = \sum_{i=1}^{n} \alpha_i X_{t-1} + \sum_{j=1}^{n} \beta_j Y_{t-j} + \varepsilon_{1t} \qquad \text{... (1)}$$

$$X_t = \sum_{i=1}^{n} \lambda_i Y_{t-1} + \sum_{j=1}^{n} \beta_j X_{t-j} + \varepsilon_{2t} \qquad \text{... (2)}$$

where $\varepsilon_{1t}$ and $\varepsilon_{2t}$ are white noise residuals.

It may be misleading to rely on the statistical significance of economic variables as determined by the Granger causality tests[30, 31]. Hence forecast error variance decomposition is also used to model the relationship between the variables under study, as it allows for economic significance of the selected variables and provide some insights such as the strength of a causal relationship which Granger cannot reveal[32].

## 4.7. Results and Discussion

### I. Impact of Rubber Futures Trading on Rubber Cash Price Volatility

As mentioned earlier as futures trading in natural rubber was suspended from May to December in 2008, there is a structural break in the time series data of rubber and hence the period under study is divided into two sub-periods.

### (A) First sub-period (15 March 2003 to 7 May 2008)

The spot price and futures price series are tested for ARCH effect using the following GARCH (1,1) model.

$$\sigma_t^2 = \alpha_0 + \alpha_1 U_{t-1} + \phi_1 \sigma_{t-1}^2$$

The results obtained are reported below:

**Table 4.2 – Testing Rubber Futures for ARCH effect (Sub-period 1)**

| Variable | Coefficient | Std. Error | Z-Statistic | P-Value |
|---|---|---|---|---|
| C | 5.692544 | 2.204294 | 2.582479 | 0.0098 |
| Variance Equation | | | | |
| C | 230.8995 | 27.09707 | 8.521189 | 0.0000 |
| RESID (-1)^2 | 0.109747 | 0.008086 | 13.57198 | 0.0000** |
| GARCH (-1) | 0.883009 | 0.007226 | 122.2033 | 0.0000** |

** Significance at 1% level.

**Table 4.3 – Testing Spot Rubber for ARCH effect (Sub-period 1)**

| Variable | Coefficient | Std. Error | Z-Statistic | P-Value |
|---|---|---|---|---|
| C | 5.782479 | 1.922123 | 3.008382 | 0.0026 |
| Variance Equation | | | | |
| C | 109.9081 | 17.15362 | 6.407282 | 0.0000 |
| RESID (-1)^2 | 0.094891 | 0.007092 | 13.38010 | 0.0000** |
| GARCH (-1) | 0.899832 | 0.006230 | 144.4321 | 0.0000** |

** Significance at 1% level.

The results show that there is significant ARCH effect in both the spot and futures series. The following graphs also confirm the ARCH effect in these series.

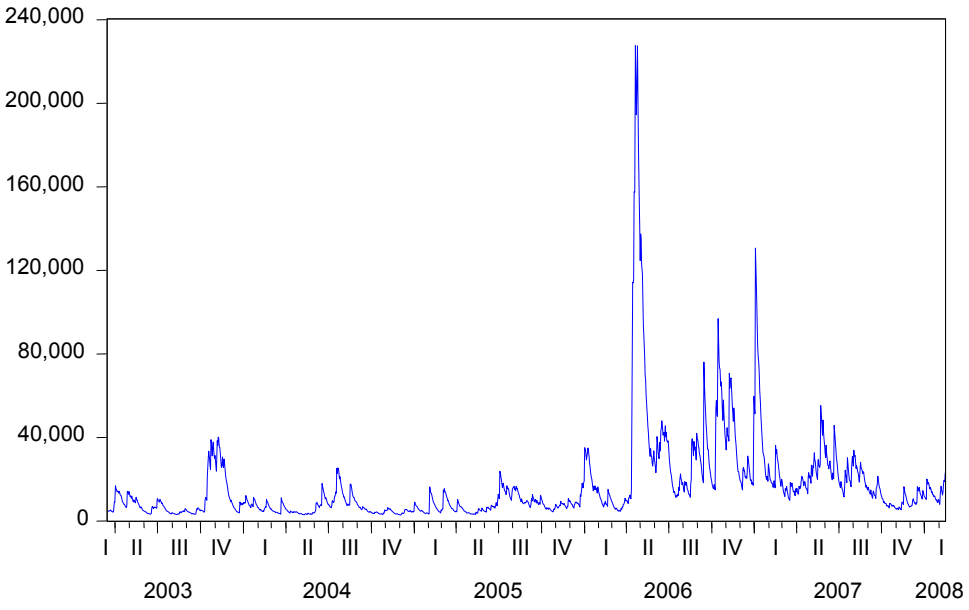


**Fig. 4.1. ARCH effect in Rubber Futures (sub period 1)**

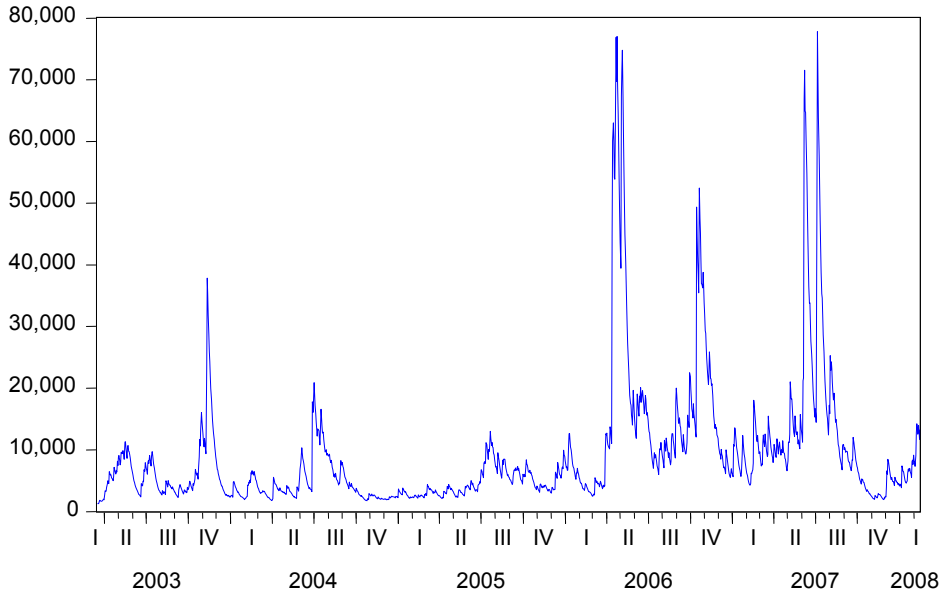


**Fig. 4.2. ARCH effect in Spot Rubber (sub period 1)**

As stated in the methodology 'Trade Volume' and 'Open Interest' are taken as the indicators of the futures trading activity. 21-day moving averages of both volume and open interest are calculated and the difference between the original data and these moving averages are taken as the unexpected component of volume and open interest and are denoted as UTV (Unexpected Trade Volume) and UOI (Unexpected Open Interest) respectively. The graphs of these unexpected components are presented below.

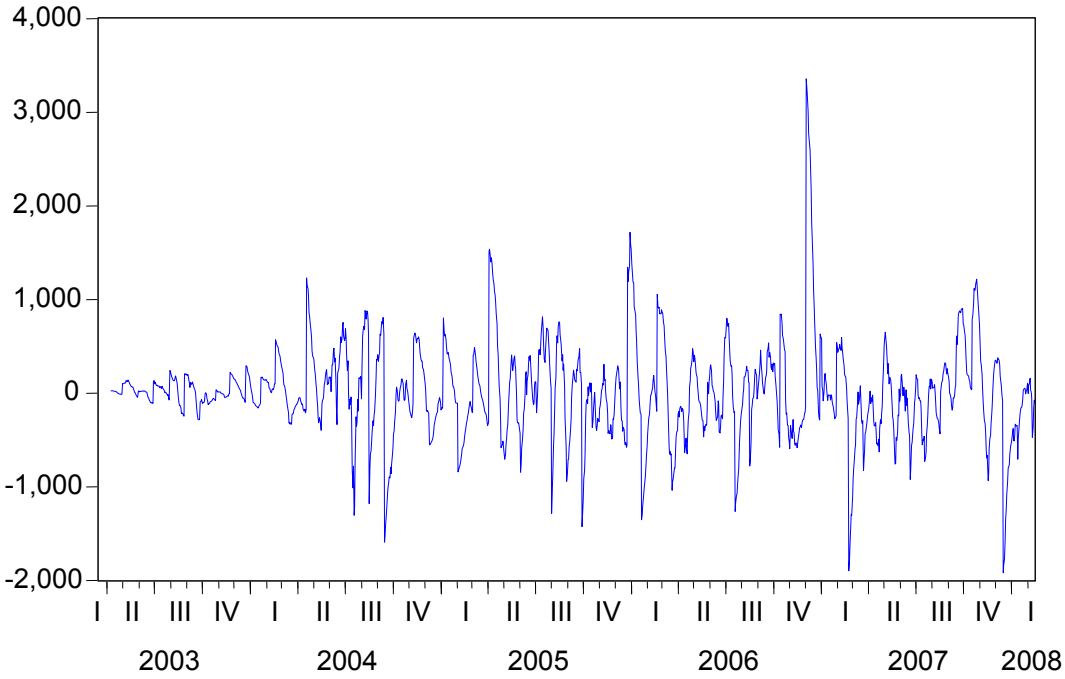


**Fig. 4.3. Unexpected Components of Open Interest (Rubber Period 1)**

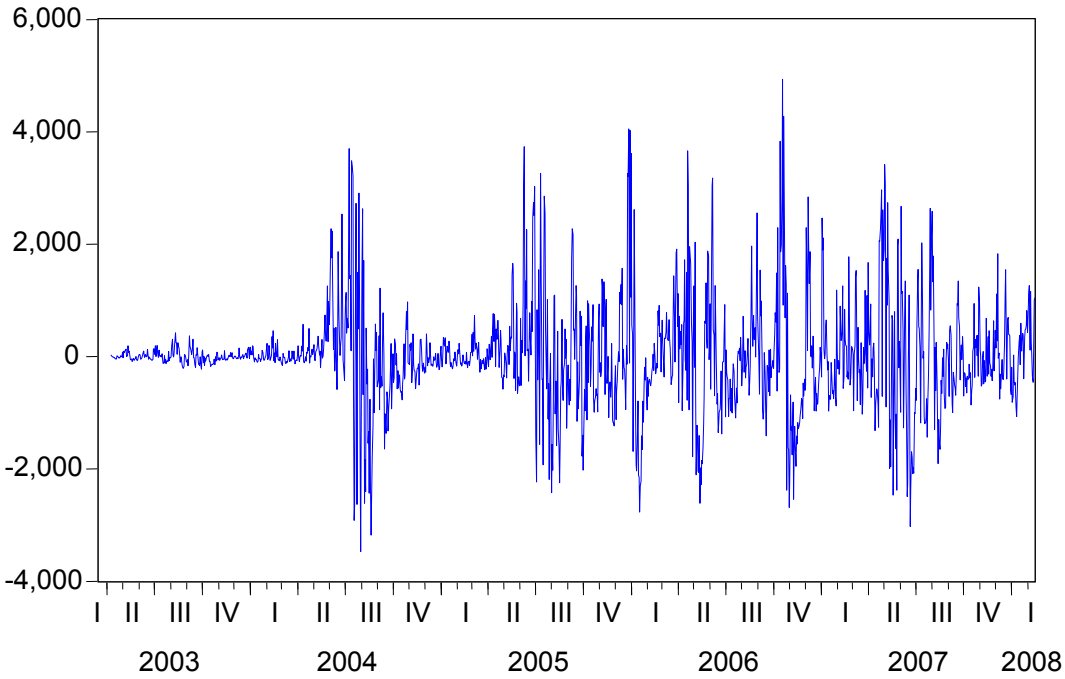


**Fig. 4.4. Unexpected Component of Trade Volume (Rubber Period 1)**

Since we cannot use non-stationary variables for testing Granger causality or for VAR modeling, the stationarity of all the four series is tested using Augmented Dickey-Fuller (ADF) test. The results are summarised below.

**Table 4.4. Unit root tests of Rubber (Period 1)**

| Variable | Test statistic | P-value |
|---|---|---|
| Futures (GARCH) | -6.715983 | 0.0000 |
| Spot (GARCH) | -6.267119 | 0.0000 |
| UOI | -10.33324 | 0.0000 |
| UTV | -11.90399 | 0.0000 |

The null hypothesis of a 'unit root' is rejected and all the four series under study are found to be stationary.

Next, pair wise Granger causality test was performed on Unexpected Trade Volume (UTV) and Spot (GARCH) series and Unexpected Open Interest (UOI) and Spot (GARCH) series using the following pairs of equations.

$$CV_t = \sum_{i=1}^{n} \alpha_1 \, UOI_{t-1} + \sum_{j=1}^{n} \beta_j \, CV_{t-j} + \varepsilon_{1t}$$

$$UOI_t = \sum_{i=1}^{n} \lambda_i \, CV_{t-1} + \sum_{j=1}^{n} \delta \, UOI_{t-j} + \varepsilon_{2t}$$

and

$$CV_t = \sum_{i=1}^{n} \alpha_1 \, UTV_{t-1} + \sum_{j=1}^{n} \beta_j \, CV_{t-j} + \varepsilon_{1t}$$

$$UTV_t = \sum_{i=1}^{n} \lambda_i \, CV_{t-1} + \sum_{j=1}^{n} \delta \, UTV_{t-j} + \varepsilon_{2t}$$

Where CV is the cash volatility represented by the spot (GARCH) series.

The optimum lag length has been selected using information criterion.

The results of Granger causality tests are reported below.

**Table 4.5. Pair-wise Granger Causality between Unexpected Volume and Cash Price Volatility (Rubber Period 1)**

| Null Hypothesis | Observations | F-Statistics | P-Value |
|---|---|---|---|
| UTV does not Granger cause CV | 1511 | 10.0384 | 2.E-16 |
| CV does not Granger cause UTV | | 4.00329 | 2.E-05 |

Since the p-value is less than 0.05 both the null hypothesis are rejected and hence it is inferred that a bi-directional causality running between unexpected trade volume and cash price volatility exist in the case of rubber in sub-period 1.

**Table 4.6. Pair-wise Granger Causality between Unexpected Open Interest and Cash Price Volatility (Rubber Period 1)**

| Null Hypothesis | Observations | F-Statistics | P-Value |
|---|---|---|---|
| UOI does not Granger cause CV | 1514 | 1.71832 | 0.1006 |
| CV does not Granger cause UOI | | 0.32994 | 0.9406 |

Table 4.6 above shows that both the null hypotheses are accepted and thus neither open interest Granger causes cash price volatility nor cash price volatility causes fluctuations in open interest.

Next to check the reliability of the causality results based on bivariate analysis, forecast error variance decompositions based on trivariate analysis are conducted, which includes a third variable, futures price volatility (FV).

A $p^{th}$ order VAR in three variables is given by

$$\gamma_t = \mu + \pi_1 \gamma_{t-1} + \pi_2 \gamma_{t-2} + ..... + \pi_p \gamma_{t-p} + \varepsilon_t$$

Where $\gamma_{t-1}, \gamma_{t-2} ..... \gamma_{t-p}$ are vectors and $\pi_1, \pi_2, ..... \pi_p$ are metrices.

The results of two trivariate VAR models are reported below. One trivariate VAR model includes Cash Price Volatility (CV), futures price volatility (FV) and Unexpected Futures Trading Volume (UTV), while the other trivariate VAR model includes CV, FV and Unexpected Futures Open Interest (UOI). Here, for the sake of convenience, only the results on the 21st day after a one standard deviation shock to the relevant variable are reported.

**Table 4.7. Error Variance Decomposition VAR with CV, FV and UTV (Rubber Period 1)**

| Description | CV | FV | UTV |
|---|---|---|---|
| CV Explained by ..... | 75.22864 | 15.39239 | 9.37897 |
| FV Explained by..... | 23.0060 | 70.48990 | 6.50408 |
| UTV Explained by ..... | 1.746709 | 2.177456 | 96.07585 |

As evident from Table 4.7 cash price volatility is explained by Futures price and Unexpected Trade Volume to the extent of 15.39% and 9.38% respectively and Futures price Volatility is explained by CV and UTV to the extent of 23% and 6.5% respectively. But only around 2% of the variations in Unexpected Trade Volume is explained by CV (1.75%) and FV (2.18%).

**Table 4.8: Error Variance Decomposition VAR with CV, FV and UOI (Rubber Sub-period I)**

| Description | CV | FV | UOI |
|---|---|---|---|
| CV Explained by | 82.33484 | 16.96171 | 0.70345 |
| FV Explained by | 26.40468 | 73.25329 | 0.342024 |
| UOI Explained by | 3.014059 | 2.527651 | 94.45829 |

Table 4.8 shows that unexplained open Interest (UOI) explains only 0.7% of the cash price Volatility and 0.34% of the futures price volatility. Similarly unexpected open interest is explained by CV and FV only to the extent of 3% and 2.5%.

**(B) Second Sub Period (4 December 2008 to 31 July 2012**

First, the spot price and futures price series are tested for ARCH effect using GARCH (1,1) model. The following results are obtained.

**Table 4.9: Testing Rubber Futures for ARCH effect (Sub-period II)**

| Variable | Coefficient | St. Error | z-statistic | P-value |
|---|---|---|---|---|
| Variance Equation | | | | |
| C | 650.2122 | 168.6317 | 3.85813 | 0.0001 |
| RESID (-1)^2 | 0.104521 | 0.013407 | 7.796116 | 0.0000** |
| GARCH (-1) | 0.889936 | 0.012564 | 70.83486 | 0.000** |

** Significance at 1% level

**Table 4.10 Testing Spot Rubber for ARCH effect (Sub-period II)**

| Variable | Coefficient | St. Error | z-statistic | P-value |
|---|---|---|---|---|
| Variance Equation | | | | |
| C | 1307.868 | 145.6113 | 8.981773 | 0.0000 |
| RESID (-1)^2 | 0.254337 | 0.019935 | 12.75820 | 0.000** |
| GARCH (-1) | 0.730309 | 0.014341 | 50.92627 | 0.0000** |

** Significance at 1% level

The results show that there is significance ARCH effect in both spot and futures price series.

The following graphs also confirm the ARCH effect.

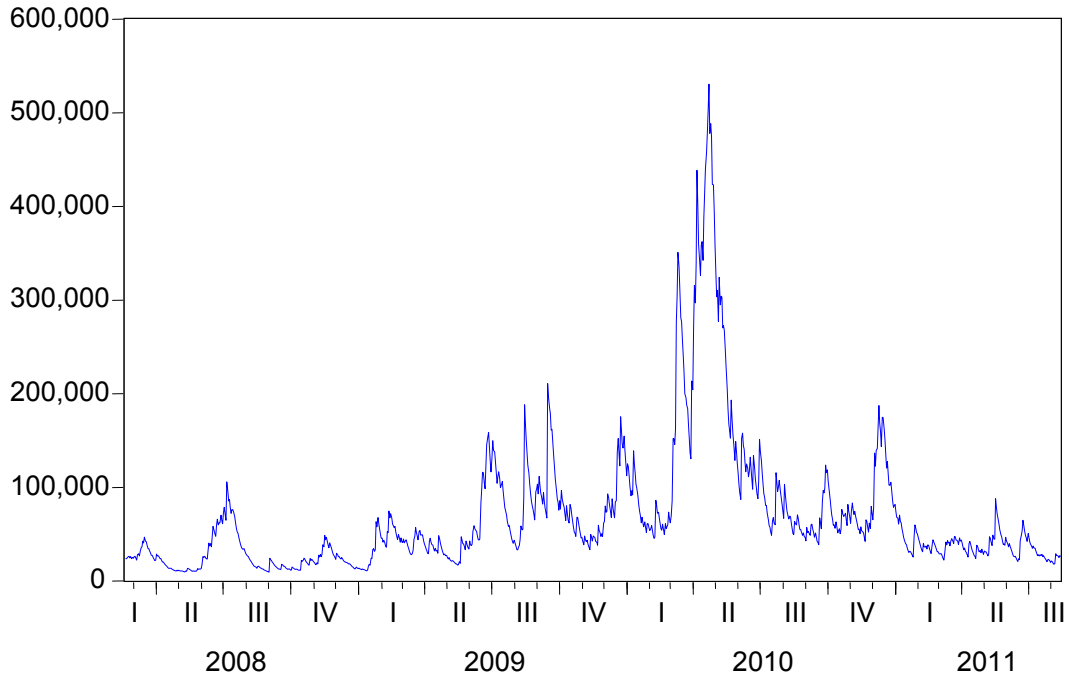


**Fig. 4.5 ARCH effect in Rubber Futures (Sub period II)**

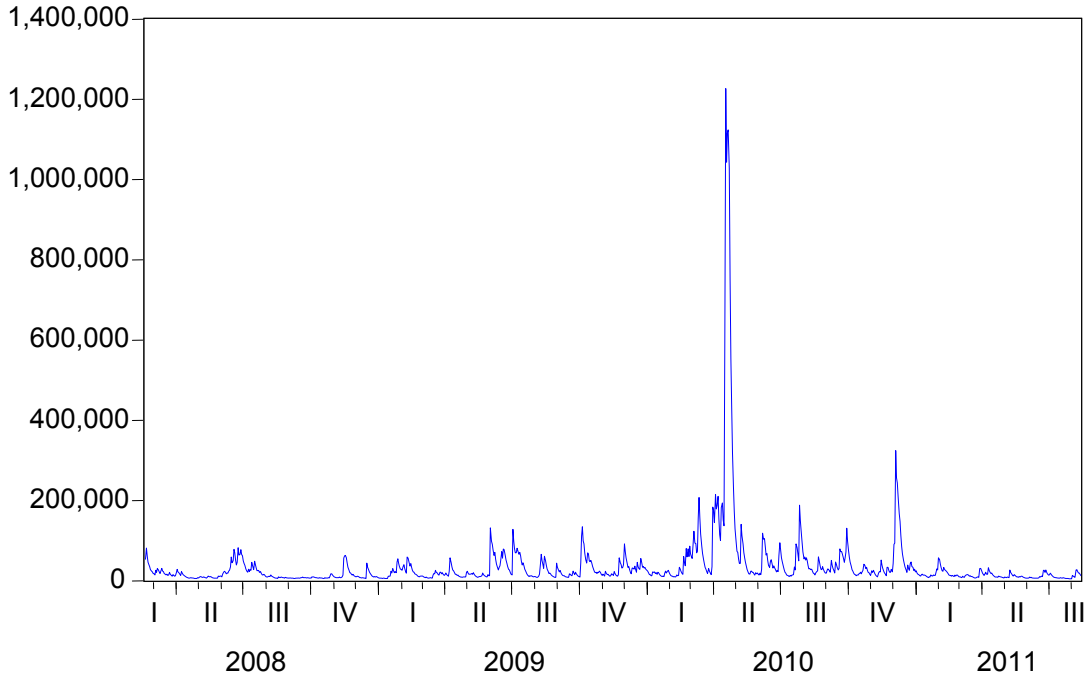


**Fig. 4.6 ARCH effect in Spot Rubber (Sub period II)**

As detailed in the methodology the unexpected components of trade volume and open interest are obtained by subtracting 21-day moving averages from the Original data. The graphs of Unexpected Trade Volume (UTV) and Unexpected Open Interest (UOI) are presented below

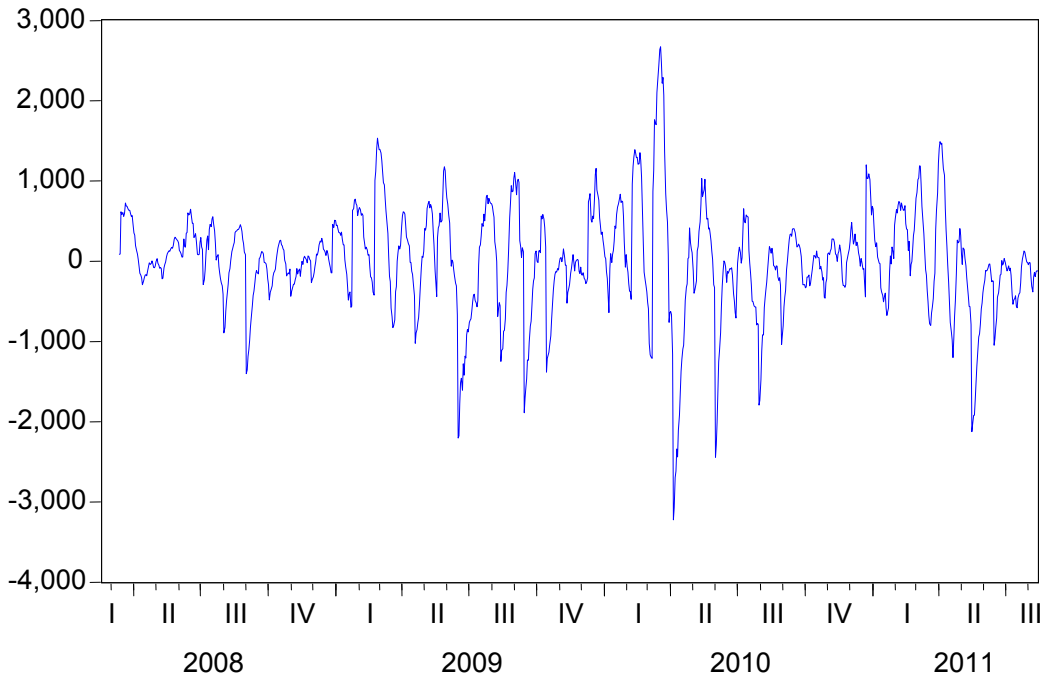


**Fig. 4.7 Unexpected component of Open Interest**
**(Rubber Sub –period II)**

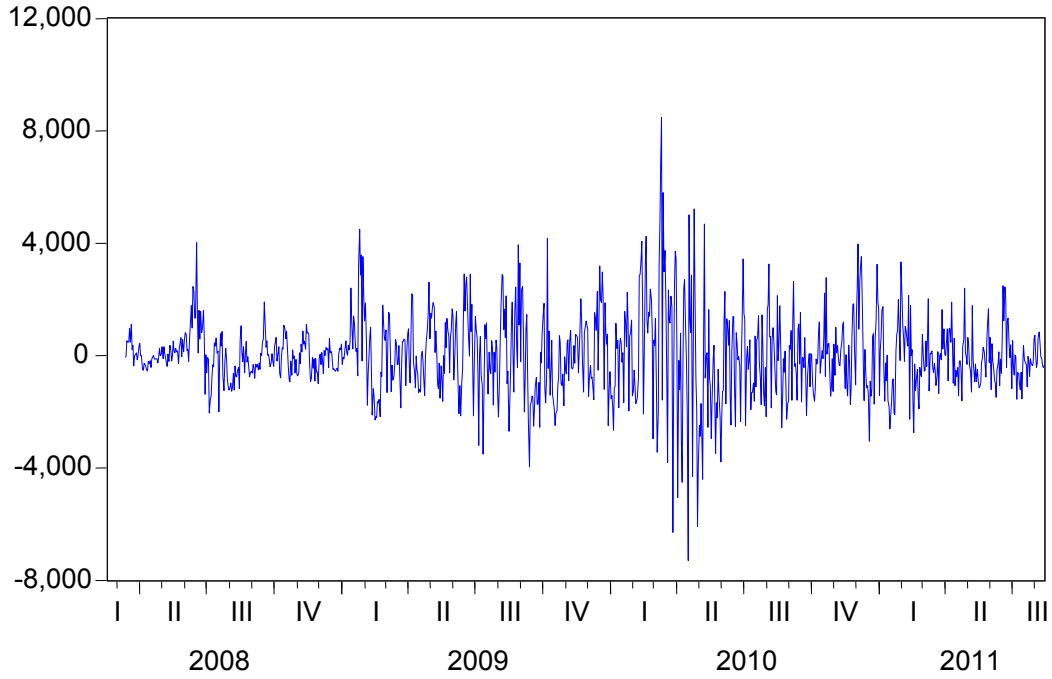


**Fig. 4.8 Unexpected Component of Trade Volume**
**(Rubber Sub-period II)**

The results of ADF test administered on all the four series to test their sationarity are reported below.

**Table 4.11 : Testing unit root with ADF for Rubber (Sub period II)**

| Variable | Test Statistic | p-Value |
|---|---|---|
| FV | -3.227616 | 0.0187 |
| CV | -7.161503 | 0.000 |
| UOI | -10.19807 | 0.0000 |
| UTV | -7.684687 | 0.000 |

The null hypothesis of the presence of a unit root is rejected in the case of all the four variables and the series are found to be stationary.

The results of Granger Causality tests performed on two pairs of "UTV and CV" and "UOI and CV" are as follows:

**Table 4.12 Pair-wise Granger Causality between Unexpected volume and Cash price Volatility (Rubber Sub –period II)**

| Null hypothesis | Observations | F-Statistics | P-value |
|---|---|---|---|
| UTV does not Granger cause CV | 1052 | 3.40782 | 7. E-07 |
| CV does not Granger Cause UTV | | 3.44706 | 5. E-07 |

Both the null hypotheses are rejected and the table shows that there is bi-directional causality between unexpected trade volume and cash price volatility for rubber in the second sub-period also.

**Table 4.13: Pair wise Granger Causality between unexpected open Interest and Cash Price Volatility (Rubber Period II)**

| Null Hypothesis | Observations | F-statistics | P-value |
|---|---|---|---|
| UOI dos not Granger Cause CV | 1054 | 3.97734 | 5E-08 |
| CV does not Granger Cause UOI | | 1.43575 | 0.1063 |

While the null hypothesis of "Unexpected Open Interest does not cause cash price Volatility" is rejected, the second null hypothesis namely "Cash Price Volatility does not Granger cause unexpected open Interest" is accepted. Hence uni-directional causality running from Open Interest to spot price volatility is observed.

The two trivariate VAR models of forecast error variance decompositions generated the following results on 21$^{st}$ day of a shock.

**Table 4.14: Error Variance Decomposition VAR with CV, FV and UTV (Rubber Sub-period II)**

| Description | CV | FV | UTV |
|---|---|---|---|
| CV Explained by | 67.88835 | 28.96627 | 3.145478 |
| FV Explained by | 12.01614 | 71.97420 | 16.00967 |
| UTV Explained by | 3.340063 | 4.287827 | 92.37211 |

From the results reported above it is clear that 3.15% of the cash price volatility is explained by unexpected trade volumes, while 3.34% of the variations in trade volumes is explained by cash price volatility. Thus the univariate causality indicated by Granger Causality test is supported by the trivariate VAR analysis also.

**Table 4.15: Error Variance Decomposition VAR with CV, FV and UOI (Rubber Sub period II)**

| Description | CV | FV | UOI |
|---|---|---|---|
| CV Explained by | 64.27825 | 27.52574 | 8.196005 |
| FV Explained by | 13.60446 | 82.62591 | 3.76935 |
| UOI Explained by | 5.158253 | 0.343373 | 94.49837 |

Table 4.15 shows that 8.20% of the cash price volatility is explained by the unexpected Open Interest. This is in conformity with the results of Granger Causality test. But trivariate VAR analysis shows that cash price volatility explains variations in UOI to the extent of 5.16% which is in contrast to the findings of causality test which accepted the null hypothesis of "CV does not Granger cause UOI".

## II Impact of Futures Trading on Pepper Cash Price Volatility

The spot price and futures price series are tested for ARCH effect using GARCH (1, 1) model and the following results are obtained.

**Table 4.16. Testing Pepper Futures for ARCH effect**

| Variable | Coefficient | Std. Error | Z. Statistic | p-value |
|---|---|---|---|---|
| Variance Equation | | | | |
| C | 68.18042 | 19.83666 | 3.437092 | 0.0006 |
| RESID (-1)^2 | 0.049194 | 0.005417 | 9.081096 | 0.0000** |
| GARCH (-1) | 0.953245 | 0.004856 | 196.3169 | 0.0000** |

** Significance at 1% level

**Table 4.17. Testing Spot Pepper for ARCH effect**

| Variable | Coefficient | Std. Error | Z. Statistic | p-value |
|---|---|---|---|---|
| Variance Equation | | | | |
| C | 34.54155 | 8.147609 | 4.239471 | 0.0000 |
| RESID (-1)^2 | 0.144491 | 0.006283 | 22.99640 | 0.0000** |
| GARCH (-1) | 0.886487 | 0.003961 | 223.8203 | 0.0000** |

** Significance at 1% level

The results reported above indicate that there is significant ARCH effect in both futures price and cash price series of pepper.

The following graphs also indicate the ARCH effect present in the series.

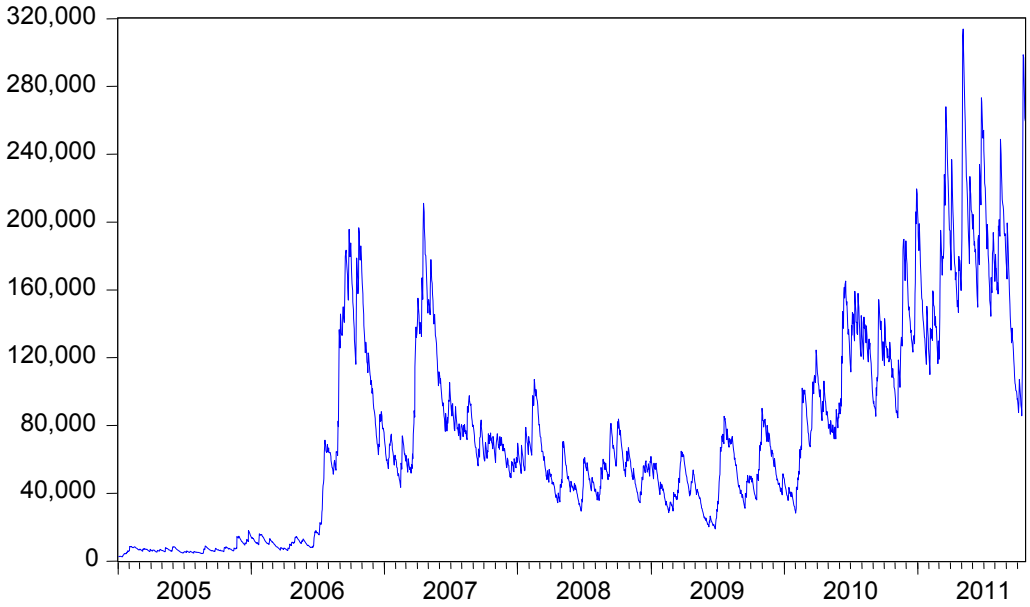


**Fig. 4.9. ARCH Effect in Pepper Futures**

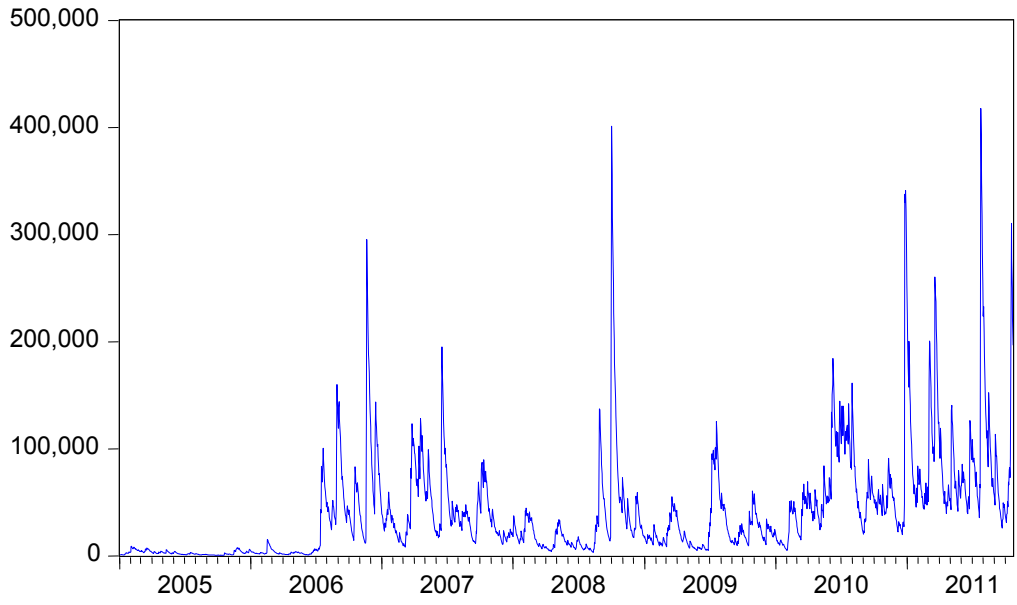


**Fig. 4.10. ARCH Effect in Spot Pepper**

As stated in the methodology the unexpected components of trade volume and open interest are obtained by eliminating 21 day moving averages

from the original data. The graphs of Unexpected Trade Volume (UTV) and Unexpected Open Interest (UOI) are presented below.

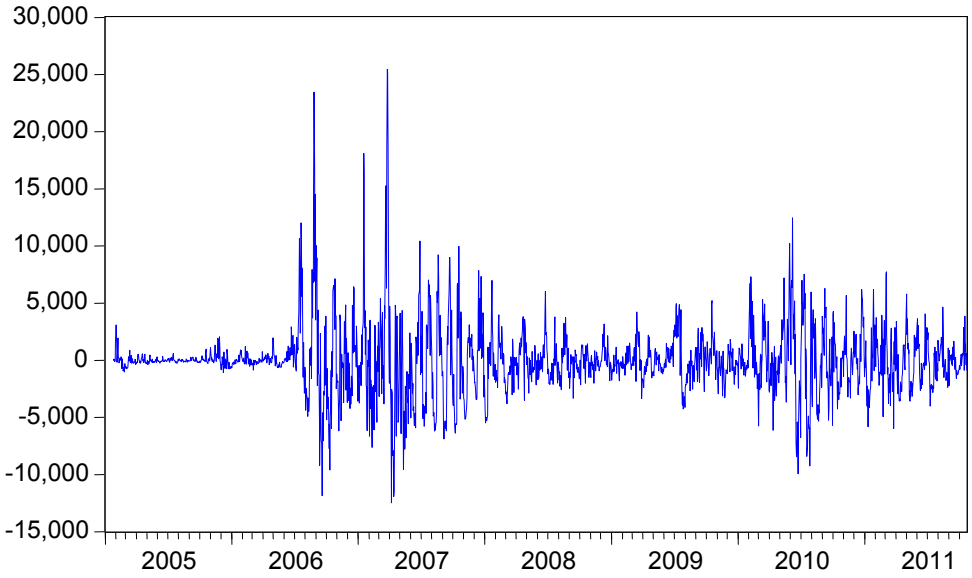


**Fig. 4.11. Unexpected Component of Trade Volume of Pepper**

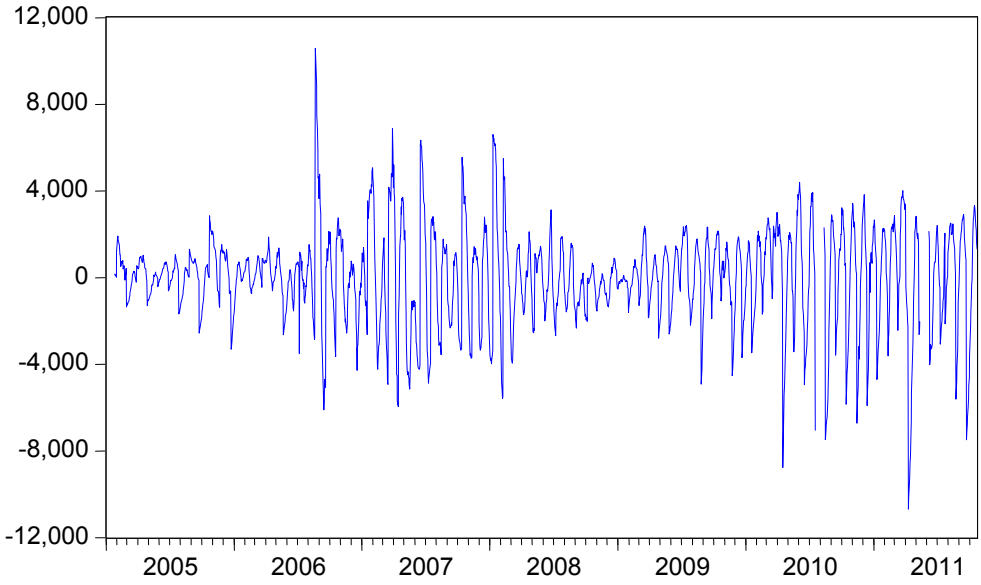


**Fig. 4.12. Unexpected Component of Open Interest of Pepper**

The stationarity of all the four pepper series are then tested using Augmented Dickey Fuller test. The results of ADF test are furnished below:

**Table 4.18**

**Testing Unit root with ADF for pepper series**

| Variable | Test statistic | p-value |
|---|---|---|
| FV | -4.253121 | 0.0037 |
| CV | -9.162409 | 0.0000 |
| UOI | -17.73105 | 0.0000 |
| UTV | -15.70184 | 0.0000 |

The null hypothesis that the series has a unit root is rejected in all the cases and the series are found to be stationary.

Next, pair wise Granger Causality tests are performed on "UTV and CV" and "UOI and CV". The following results are obtained.

**Table 4.19**

**Pair wise Granger Causality between unexpected volume and sport price Volatility for Pepper**

| Null hypothesis | Observations | F-statistic | p-value |
|---|---|---|---|
| UTV does not Granger cause CV | 2101 | 5.94101 | 6.E-09 |
| CV does not Granger Cause UTV | | 1.89857 | 0,0411 |

Both the hypothesis is rejected at 5% level and there is bidirectional causality between trade volume and cash price volatility in the case of pepper.

TABLE 4.20

**Pair-wise Granger Causality between Unexpected Open Interest and Cash Price Volatility for Pepper**

| Null hypothesis | Observations | F-statistic | p-value |
|---|---|---|---|
| UOI does not Granger cause CV | 2036 | 2.71432 | 0.0018 |
| CV does not Granger Cause UOI | | 1.24855 | 0.2490 |

While the null hypothesis of "Unexpected Open Interest does not Granger Cause Cash Price volatility is rejected, the other namely "Cash Price Volatility does not Granger Cause Unexpected Open Interest" is accepted. Thus there is a uni-directional causality running from open interest to cash price volatility in the case of pepper.

The two trivariate VAR models of forecast error variance decompositions generated the following result on the 21st day of a shock.

TABLE 4.21

**Error Variance Decomposition VAR Analysis with CV, FV and UTV (Pepper)**

| Description | CV | FV | UTV |
|---|---|---|---|
| CV Explained by | 82.15194 | 12.06946 | 5.778593 |
| FV Explained by | 7.001955 | 83.86060 | 9.137440 |
| UTV Explained by | 1.504776 | 2.930192 | 95.56503 |

From the table it is clear that 5.799 of the cash price volatility is explained by Unexpected Trade Volume while only 1.5% of the fluctuations

in Unexpected Trade Volume is explained by the spot price volatility. Hence the findings of pair-wise Granger causality (i.e. bi directional causality between volume and cash price volatility) is contradicted.

TABLE 4.22
**Error Variance Decomposition VAR Analysis with CV, FV and UOI (Pepper)**

| Description | CV | FV | UOI |
|---|---|---|---|
| CV Explained by | 66.15263 | 33.07717 | 0.770206 |
| FV Explained by | 0.209322 | 99.20303 | 0.587645 |
| UOI Explained by | 1.281430 | 3.431985 | 95.28659 |

As Table 4.22 shows only 0.77% of the cash price volatility is explained by Unexpected Open Interest. Similarly Open Interest explains only 1.28% of the cash price volatility.

The results of Granger Causality tests and Error Variance Decomposition seem to be contradicting in the case of pepper. While a bi – directional Granger causality running between cash price volatility and unexpected components of trade volume is indicated, cash price volatility seems to exercises only a nominal influence (1.5%) on the trade volume. Similarly, the uni – directional causality from unexpected open interest to cash price volatility is not indicated by error variance decomposition.

### III Impact of Futures trading on cash Price Volatility of Cardamom

First, the spot price and futures price series of Cardamom are tested for ARCH effect using GARCH (1,1) model. The results obtained are reported below:

TABLE 4.23

**Testing Cardamom Futures for ARCH effect**

| Variable | Coefficient | Std. Error | Z. Statistic | p-value |
|---|---|---|---|---|
| Variance Equation | | | | |
| C | 1.671755 | 0.201181 | 8.309697 | 0.0000 |
| RESID (-1)^2 | 0.107605 | 0.007649 | 14.06694 | 0.0000** |
| GARCH (-1) | 0.894959 | 0.005933 | 150.8352 | 0.0000** |

** Significance at 1% level

TABLE 4.24

**Testing Cardamom Cash Price series for ARCH effect**

| Variable | Coefficient | Std. Error | Z. Statistic | p-value |
|---|---|---|---|---|
| Variance Equation | | | | |
| C | 0.968614 | 0.033405 | 27.20031 | 0.0000 |
| RESID (-1)^2 | 0.097184 | 0.004278 | 22.71522 | 0.0000** |
| GARCH (-1) | 0.907996 | 0.002540 | 357.4751 | 0.0000** |

** Significance at 1% level

The results of GARCH (1,1) show that there is significant ARCH effect in both the cash price and futures price series of Cardamom. The presence of ARCH effect is indicated by the following graphs.

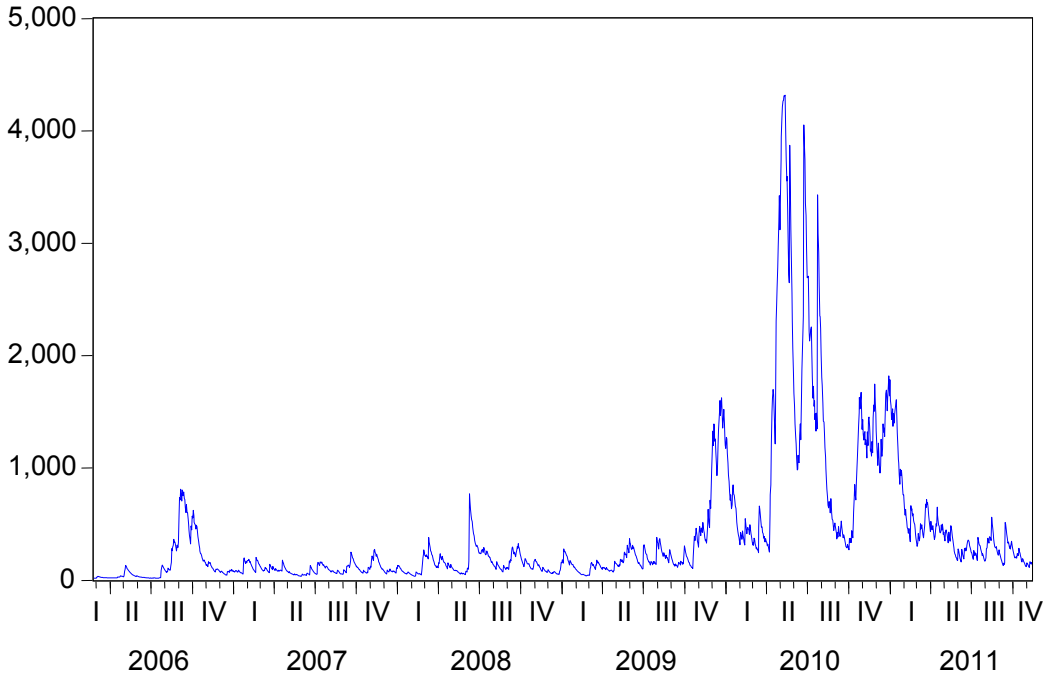


**Fig. 4.13. ARCH Effect in Cardamom Futures**

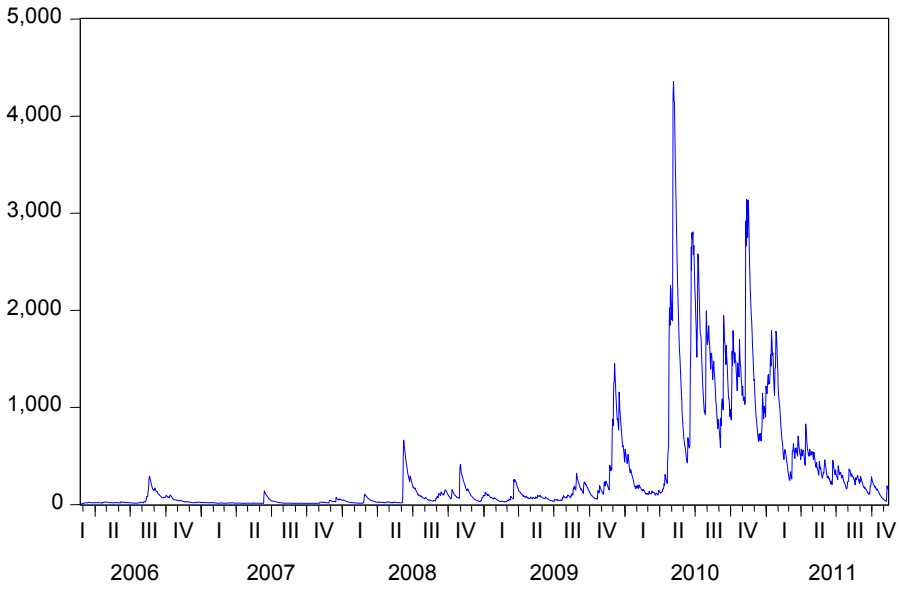


**Fig. 4.14. ARCH Effect in Cardamom Spot Prices**

As detailed in the methodology the unexpected components of trade volume and open interest are taken out on the basis of a 21- day moving

average. The graphs of Unexpected Trade Volume (UTV) and Unexpected Open Interest (UOI) are furnished below:

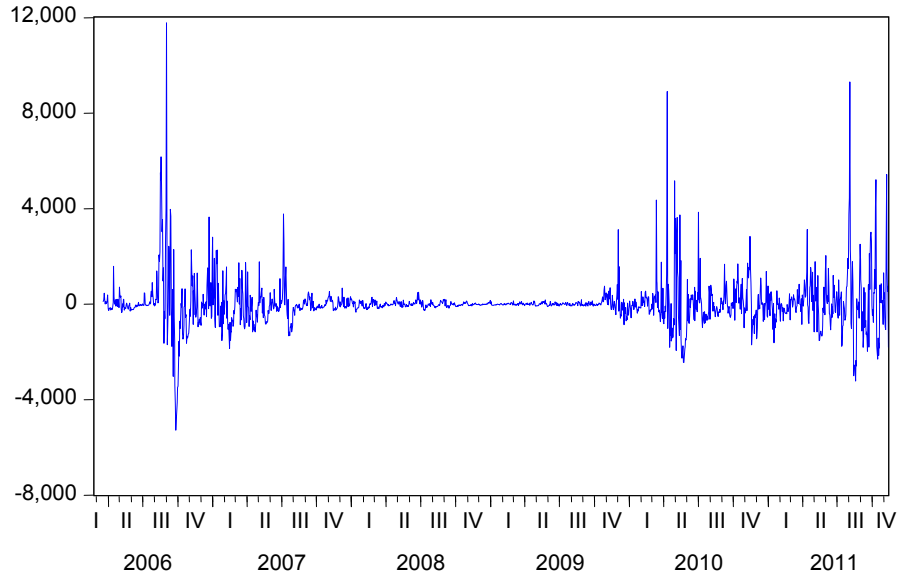


**Fig. 4.15. Unexpected Component of Trade Volume of Cardamom**

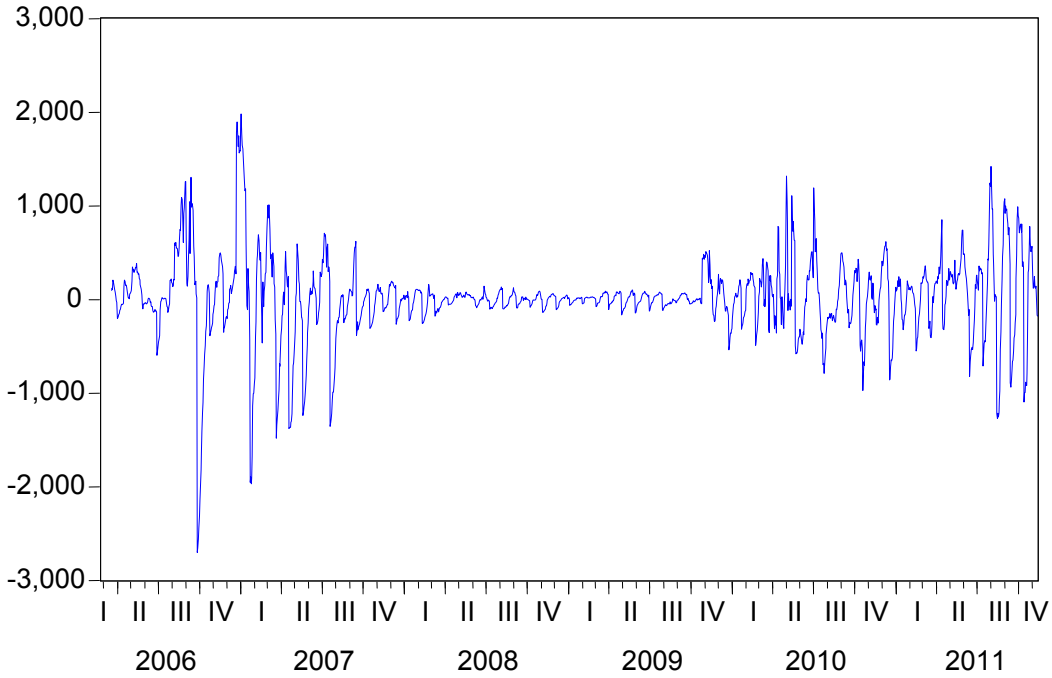


**Fig. 4.16. Unexpected Component of Open Interest of Cardamom**

The stationarity of all the four cardamom series are tested using Augmented Dickey Fuller (ADF) test. The following results are obtained.

TABLE 4.25

**Testing Unit root with ADF for cardamom series**

| Variable | Test statistic | p-value |
|---|---|---|
| FV | -3.852289 | 0.0025 |
| CV | -4.900801 | 0.0000 |
| UOI | -12.0634 | 0.0000 |
| UTV | -17.4853 | 0.0000 |

The null hypothesis that the series has a unit root is rejected in all the cases and the series are found to be stationary.

Next pair wise Granger Causality tests are performed on "UTV and CV" and UOI and CV". The following results are obtained.

TABLE 4.26

**Pair-wise Granger Causality between Unexpected Volume and Cash Price Volatility of Cardamom**

| Null hypothesis | Observations | F-statistic | p-value |
|---|---|---|---|
| UTV does not Granger cause CV | 1755 | 3.34538 | 8.E-06 |
| CV does not Granger Cause UOI | | 3.18663 | 2.E-05 |

Both the null hypotheses set are rejected at 5% and hence bi-directional causality between trade volume and cash price volatility is indicated.

TABLE 4.27

**Pair-wise Granger Causality between Unexpected Open Interest and Cash Price Volatility of Cardamom**

| Null hypothesis | Observations | F-statistic | p-value |
|---|---|---|---|
| UOI does not Granger cause CV | 1761 | 0.94186 | 0.4932 |
| CV does not Granger Cause UOI | | 2.69369 | 0.0028 |

While the null hypothesis of "Cash Price Volatility does not Granger cause Unexpected Open Interest" is rejected, the other namely Unexpected Open Interest does not Granger Cause spot price volatility is accepted. Thus the test results show a uni-directional causality running from cash price volatility to open interest.

Two trivariate VAR models of forecast error variance decompositions are then run and following results for the 21$^{st}$ day after the shock are obtained.

TABLE 4.28

**Error Variance Decompositions - VAR Analysis with CV, FV and UTV (Cardamom)**

| Description | CV | FV | UTV |
|---|---|---|---|
| CV Explained by | 63.96876 | 35.04992 | 0.981322 |
| FV Explained by | 5.125999 | 92.93263 | 1.931369 |
| UTV Explained by | 3.499959 | 0.921568 | 95.57847 |

The results of VAR model reported above show that while 3.5% of the unexpected trade volume is explained by cash price volatility only 0.98% of the cash price volatility is explained by the trade volume.

TABLE 4.29

**Error Variance Decomposition -VAR Analysis with CV, FV and UOI (Cardamom)**

| Description | CV | FV | UOI |
|---|---|---|---|
| CV Explained by | 62.60384 | 37.10079 | 0.295367 |
| FV Explained by | 4.452217 | 95.25767 | 0.290114 |
| UOI Explained by | 1.068345 | 3.025817 | 95.90584 |

Table 4.29 shows that only 1.07% of the unexpected open interest is explained by cash price volatility. Open interest explain only 0.3% of the cash price volatility.

Though in the case of cardamom, a bi – directional causality between unexpected trade volume and cash price volatility and a uni – directional causality from cash price volatility to open interest are indicated by pair wise Granger Causality tests, the Error variance Decomposition VAR analysis does not seem to support the findings of the former.

## CONCLUSION

The present study examined the lead–lag relationship between the unexpected components of futures trading activity (Trade Volume and Open Interest) and Cash price volatility which was modeled as a GARCH (1, 1) process. The results obtained from Granger Causality tests are presented in the following table.

TABLE 4:30

**Results of Granger Causality Tests – Summerised**

| Commodity | Variables Studied | Results |
|---|---|---|
| Rubber (Sub-Period - I ) | Unexpected Trade Volume (UTV) Cash Price Volatility (CV ) | Bi – directional Causality running between UTV and CV |
| | Unexpected Open Interest (UOI ) Cash Price Volatility ( CV ) | No Causality between UOI and CV |
| Rubber (Sub-Period - II ) | Unexpected Trade Volume (UTV) Cash Price Volatility (CV ) | Bi – directional Causality Running between UTV and CV |
| | Unexpected Open Interest (UOI ) Cash Price Volatility ( CV ) | Uni – directional Causality running from UOI to CV |
| Pepper | Unexpected Trade Volume (UTV) Cash Price Volatility (CV ) | Bi – directional Causality running Between UTV and CV |
| | Unexpected Open Interest (UOI ) Cash Price Volatility ( CV ) | Uni – directional Causality running from UOI to CV |
| Cardamom | Unexpected Trade Volume (UTV) Cash Price Volatility (CV ) | Bi – directional Causality running between UTV and CV |
| | Unexpected Open Interest (UOI ) Cash Price Volatility ( CV ) | Uni – directional Causality running from UOI to CV |

The results of Granger causality tests show that there is a bi – directional causality running between UTV and CV in the case of all the three commodities studied. But the results in respect of causality between UOI and CV are mixed. While UOI is found to Granger cause CV in the case of Rubber (Sub period II) and Pepper, a uni – directional causality running from CV to UOI is found in the case of Cardamom. In the case of rubber in sub period I, no causality is found to exist between UOI and CV.

The reliability of causality results based on bivariate analysis are checked by conducting Forecast Error Variance Decompositions based on trivariate analysis, which includes a third variable namely futures price volatility (FV).

In the case of Rubber ( sub period I ), cash price volatility is explained by Unexpected Trade Volume to the extent of 9.38% but only around 2% of the variations in Unexpected Trade Volume is explained by CV . Unexplained Open Interest (UOI) explains only 0.7% of the cash price Volatility. Similarly unexpected open interest is explained by CV only to the extent of 3%. In the case of Rubber (sub period II), 3.15% of the cash price volatility is explained by unexpected trade volumes; while 3.34% of the variations in trade volumes is explained by cash price volatility. Thus the univariate causality indicated by Granger Causality test is supported by the trivariate VAR analysis also.

The trivariate VaR analysis conducted in the case of Pepper revealed that 5.799% of the cash price volatility is explained by Unexpected Trade Volume while only 1.5% of the fluctuations in Unexpected Trade Volume are explained by the spot price volatility. Hence the findings of pair-wise Granger causality (i.e. bi directional causality between volume and cash price volatility) is contradicted. Similarly only 0.77% of the cash price volatility is explained by Unexpected Open Interest and Open Interest explains only 1.28% of the cash price volatility.

Error Variance Decomposition in the case of Cardamom shows that while 3.5% of the unexpected trade volume is explained by cash price volatility only 0.98% of the cash price volatility is explained by the trade volume .In the same way only 1.07% of the unexpected open interest is explained by cash price volatility and open interest explain only 0.3% of the cash price volatility.

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# CHAPTER 5
# COMMODITY FUTURES AS HEDGING TOOL

## 5.1 Introduction

Given the volatile financial and economic environment, financial risk has taken the centre stage in every sphere of economic activity. Volatility is an important conception in finance, which measures the state of instability of the return. In agriculture, volatility of commodity prices may cause significant economic losses to farmers if the risks are not properly managed.

Instability of commodity prices has always been a major concern for an agriculture-dominated country like India, where agriculture continues to be the main source of livelihood for more than 58% of the population. Agricultural producers and commodity traders have long been worried over the price risk to which they are exposed[1]. The 'price risk' refers to the probability of adverse movements in the prices of commodities. The fact that most crops are seasonal and would attract only lower prices during the harvest season, which makes agricultural activities all the more risky. Futures contracts were originally developed to deal with this problem and to offer a form of insurance against unfavorable price fluctuations on account of both market and non-market conditions.

## 5.2 Hedge: Meaning and Definition

The word 'hedge' means protection. It is defined as the strategy of agents willing to transfer risk among themselves, primarily hedgers and speculators. According to Webster's Dictionary to hedge is "to try to avoid or lesson loss by making counterbalancing bets, investments etc." In the

context of futures trading, a counterbalancing transaction involves a position in the futures market that is opposite to one's current position in the cash market. In other words, hedging relies on the combination of a position in the spot market with one in the futures market in order to form a portfolio that will reduce the fluctuation in price.

Since the cash market price and futures market price of a commodity tend to move up or down together, any loss or gain it in the cash market will be roughly offset or counterbalanced in the futures market.

### 5.2.1 Who do hedge?

Futures market participants fall into two general categories viz: hedgers and speculators. Hedgers in the commodity futures market include.

(1) Farmers who seek protection against declining prices for their crops;
(2) Traders who need protection against prices coming down between the time they purchase crops from farmers and the time it is sold;
(3) Manufactures who use agri-products as their raw material (e.g. A tyre company) require protection against increasing raw material costs:
(4) Exporters who have contracted for future delivery of commodities but have not yet purchased them need protection against prices going up in the meantime.
(5) Importers who want to take advantage of lower prices from commodities contracted for futures delivery but not yet received the same, also seek protection by hedging.

Since the number of individuals and firms seeking protection against declining prices at any given time is rarely the same as the number seeking protection against rising prices, other market participants called speculators are also required. Speculators facilitate hedging by providing market liquidity. Market liquidity refers to the ability to enter the exit the market

quickly, easily and efficiently. Speculators are attracted by the opportunity to make a profit if they prove to be correct in anticipating the direction and timing of the price movements.

### 5.2.2 Basis Risk

By hedging with futures buyers and sellers are eliminating future price level risk. Since cash and futures price movements are typically not perfectly correlated, there is bound to be variation in the spread between spot and futures prices. This is referred to as 'basis risk'. Basis risk is considerably less than price risk, but it can have a significant impact on the performance of the hedge. A stronger-than-expected basis will benefit a short hedger, while a weaker-than-expected basis works to the advantage of a long hedger.

### 5.2.3 Long Hedge

When a buyer of commodities wants to hedge his position, he would initially buy futures contracts for protecting himself against rising prices. As the date for the actual purchase of the physical commodity approaches, he would offset his futures position by selling back the futures contracts he has initially bought. This procedure is called a 'long hedge'. Long hedgers benefit from a weakening basis.

### 5.2.4 Short Hedge

A person who intends to sell some commodities at a certain point of time in future would seek a protection against falling prices. He can initially sell futures contracts and then buy them back at a date closer to the date of his actual sale of physical commodity. Short hedgers benefit from a strengthening basis.

## 5.3 Importance of Hedging

Hedging with futures offers the hedger an opportunity to establish an approximate price, months in advance of the actual sale or purchase and protects him from unfavorable price changes. This is possible because cash and futures price tend to move in the same direction and by similar amounts, so losses in one market can be offset with gains in the other. Although the futures hedger is unable to benefit from favorable price changes, he is protected from unfavorable market moves.

The protective feature of hedging is based on the assumption that trends in cash and futures prices are sufficiently similar, so that losses incurred in the purchase or sale of cash commodities can be offset by gains from opposite transactions in the futures market. When movements of cash and futures price are parallel, those who hedge the purchase of commodities in the spot market by offsetting sales of futures contracts will lose on the cash commodities as prices decline, but these losses, will be counterbalanced by gains on futures contracts. When cash prices advance, the reverse is true.

Thus hedging enables the farmers and traders to lock in a definite price for their commodities, months in advance of actual transaction, and provides confidence to proceed with their activities without any fear of loss on account of adverse price movements.

## 5.4 Optimal Hedge Ratio and Hedging Effectiveness

Collins (1997) indicated that most of the hedging literature focuses on how the market players can use this tool to offset their risks, and in turn optimize their price, income and profit objectives[2]. As such, several hedging strategy models have been studied throughout time, which fundamentally converge to decision models for the hedging effectiveness, considering most influencing factors as close as possible to the agents' realities.

The risk offsetting proportion or the hedge ratio is an outstanding reference in the literature. The hedge ratio is defined as the ratio of the size of position taken in the futures market to the size of the position in the spot market. If such a ratio minimizes the total risk (variance) of the portfolio, then it is said to be optimal.

One of the key theoretical issues in hedging is the determination of the optimal hedge ratio. The specification of this ratio depends on how the concept of "optimization" is defined. For example, the most widely used hedging strategy is based on the assumption that investors care only for the risk associated with hedging and that the variance of the underlying asset is the appropriate method of measuring risk. Thus the minimum variance (MV) hedge ratio is estimated by minimizing the variance of the hedged portfolio.

### 5.5 Classical Theory of Hedging (Naive hedging)

Traditional hedging theory emphasizes the risk avoidance potential that futures markets can provide. Hedgers believe that futures markets and spot markets are highly correlated and move in the same direction with similar magnitudes. Thus investment risk is eliminated if an equal contract value of the opposite sign is invested in the futures market for each unit of value held in the spot market. In this case, when the hedge ratio equals '1', the strategy is called naive hedging.

Working[3, 4] challenged the view of hedgers as simply being risk minimizers. He argued that hedgers may also function as speculators and are concerned with relative price changes of spot and futures markets. According to him, holders of long positions in the spot market will hedge if the basis (spot price minus futures price) is expected to fall and will not hedge if the basis is expected to rise.

## 5.6 Ordinary Least Square (OLS) Method

Since cash and futures price movements might not be perfectly correlated in real life, risk management would require determination of the 'optimal hedge ratio' (OHR) which is the optimal amount of futures bought or sold expressed as a proportion of the cash position. When basis risk is the only source of uncertainty, the OHR can be reduced to a simple ratio of the conditional covariance between cash and futures prices to the conditional variance of futures prices[5]. To estimate such a ratio, early works used the slope of an ordinary least squares regression of cash on futures prices.

Thus

$$\gamma_{st} = \alpha + \beta\gamma_{ft} + \varepsilon_t$$

Where $\gamma_{st}$ is commodity spot return and $\gamma_{ft}$ is the commodity futures return. The OLS estimator is

$$\hat{\beta} = \frac{\sigma_{sf}}{\sigma_f^2}$$

Where $\hat{\beta}$ is the optimal hedge ratio which will maximize the utility function of an investor who faces the mean variance expected utility function. This conventional hedging strategy assumes that the investor holds one unit in long position in the spot commodity market. To maximize his utility as well as minimize the variance of his long position, he holds $\hat{\beta}$ unit of spot position in the futures market.

## 5.7 Error Correction (ECM) Models

The use of regression for calculating the hedge ratio has been criticized on mainly two grounds. First, it is based on unconditional second moments, where as the covariance and variance should be conditional because hedging decision made by any trader is based on all the information available at that time. Second, the estimates based on OLS regression is time invariant, but the joint distribution of spot and futures prices may be time-variant.

Hence, vector autoregressive (VAR) models which take into account the dynamic properties and interactions of the time series data are widely used for the estimation of the OHR. VAR model is a general framework to describe the dynamic interrelationship between stationary 1(0) variables. A first order, p = 1, bivariate, k = 2 VAR is

$$\begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{pmatrix} \mu_1 \\ \mu_2 \end{pmatrix} + \begin{bmatrix} \pi_{11.1} & \pi_{12.1} \\ \pi_{21.1} & \pi_{22.1} \end{bmatrix} \begin{pmatrix} y_{1t-1} \\ y_{2t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix}$$

say $\quad y_t = \mu + \pi_1 y_{t-1} + \varepsilon_t \qquad (1)$

where $\mu' = (\mu_1, \mu_2)$ is the vector of constants usually known as drifts and $\varepsilon'_t = (\varepsilon_{1t}, \varepsilon_{2t})$ are innovations relative to the information set $y'_{t-1} = (y_{1t-1}, y_{2t-1})$. A $p^{th}$ order VAR in k variables is given by

$$y_t = \mu + \pi_1 y_{t-1} + \pi_2 y_{t-2} + ..... + \pi_p y_{t-p} + \varepsilon_t$$

If the variables are non stationary I(1) variables and are not co integrated, the interrelationship between them can be examined using a VAR framework in first differences of the variables; that is,

$\Delta y_{it} = y_{it} - y_{it-1}$ and $\Delta y_t \equiv (\Delta y_{1t}, \Delta y_{2t}, ....., \Delta y_{kt})$ and estimate

$$\Delta y_t = \mu^* + \pi_1^* \Delta y_{t-1} + \pi_2^* y_{t-2} + ..... + \pi_p^* \Delta y_{t-p} + \varepsilon_t^*. \qquad ..... (2)$$

One unsatisfactory feature of using the variables in first difference is that such a formulation provides no information on the relationship between the levels of the variables in the VAR. A satisfactory alternative arises when the variables in $y_t$ are co integrated. Hence a more promising way forward is to formulate models which capture short run responses and long run relationships as represented in the co integrating combinations. As a result of it, Engle and Granger (1987)[6], which is part of what is known as Granger Representation Theorem, is of relevance here. It states that if the k x 1 vector of variables $y_t$ is CI(1,1) then there exists a error correction representation of the general form:

$$\Delta y_t = \alpha z_{t=1} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + .... + \Gamma_{p-1} \Delta y_{t-(p-1)} + \varepsilon_t \qquad (3)$$

where $z_{t-1} = \beta' y_{t-1}$ are the r linear, co integrating combinations among the k variables, with $\beta$ the k x r matrix of r co integrating vectors.

The error terms in the equations, $\varepsilon_{St}$ and $\varepsilon_{Ft}$ are independently and identically distributed (i.i.d) random variables. The minimum variance hedge ratios are calculated as:

$$H = \frac{\sigma_{sf}}{\sigma_f}$$

Where,

$\sigma_S$ = Variance ($\varepsilon_{S,t}$)

$\sigma_f$ = Variance ($\varepsilon_{F,t}$) and

$\sigma_{sf}$ = Covariance ($\varepsilon_{s,t}, \varepsilon_{f,t}$)

## 5.8 The ARCH – GARCH Models

A time series is a sequentially ordered data set referred to a time frame. The main objective of a time series analysis is to find the characteristics of its data generating process in order to predict its future values (Gujarati, 2007)[7].

Agricultural prices and financial series are characterized by high volatility as well as small and large prediction errors. This behavior is a consequence of shifts in monetary and fiscal policies, exogenous demand and supply shocks, commodities' intrinsic properties and marketing conditions, and others[8].

It is widely known that volatility varies over time and tends to cluster in periods of large volatility and periods of tranquility. This phenomenon is called volatility clustering. An additional factor to consider is that volatility has shown to be auto correlated, which means that today's volatility depends on that of the past. Considering the fact that volatility is not directly observable the need of a good model to help estimate and forecast it is essential. Hence, modern techniques of estimating time-varying OHR are based on Engle's (1982) autoregressive conditional heteroscedasticity (ARCH) framework[9] or Bollerslev's (1986) generalized ARCH (GARCH) approach[10].

Engle (1982) studied the variance of the prediction errors in highly volatile time series, leading to autoregressive conditional heteroscedasticity (ARCH) models, on which the conditional variance is dependent of the series' past values and modeled through a quadratic form. For an ARCH (1) type model, the variance of '$\varepsilon_t$' will be dependent of a constant plus the term $\varepsilon_{t-1}$, which is the main characteristic of the ARCH models. Engle considered the error term '$\varepsilon_t$' as Gaussian white noise with zero mean and unit variance, independently and identically distributed variable. The ARCH models can be extended through the generalized autoregressive conditional heteroscedasticity (GARCH) approach, which increases the time series' informational set, yielding a more parsimonious formulation, compared with an AR or MA modeling (Bollerslev, 1986). Hence a GARCH (p, q) volatility model features less parameters than an ARCH (p).

Later studies[11] (Baba et. al 1990, Karolyi 1995, and Yang and Allen 2004) showed that a GARCH (1,1) model having fewer parametric restrictions is preferable for the specification of a financial series.

While applying the model in a real life situation several difficulties might appear which need to be properly addressed. Thus in order to make estimates possible, the number of parameters needs to be reduced without restricting the flexibility to capture the dynamics in the conditional covariance too much. Further, the conditions that make the covariance matrix 'positive definite' at every point in time (as required by definition) and the conditions for the week stationarity of the process are to be determined. Hence, a number of variations of the original GARCH have been proposed and tested by researchers. But empirical studies do not provide compelling evidence to prefer any particular model. Hence this study uses a Constant Conditional Correlation Multivariate GARCH (CCC-M GARCH) model for the estimation of time variant optimal hedge ratio.

## 5.9 Data and Methodology

The details of the data used and the methodology employed are briefly discussed below.

### 5.9.1 Data Used

The optimal hedge ratio and the hedging effectiveness of the agricultural futures under study are estimated with the help of secondary data on spot prices and futures prices of the respective commodity obtained from the relevant commodity exchange. Though different spot prices such as 'opening', 'low', 'high', 'closing' etc are available with the exchanges, the daily closing prices of the commodity under study are taken to represent the spot price. Similarly different futures contracts of a commodity are usually traded simultaneously. The daily closing prices of 'near month' contract

alone are used to represent the futures price. The rationale behind the use of 'near by' contract is that it is the most actively traded contract. A contract becomes nearby at the beginning of the previous contract's expiration month. The use of near month contract helps to avoid the often-noted 'expiration effect'.

For estimating the hedging effectiveness of rubber futures, we use the data for the period from 15 March, 2003 to 31 July, 2012, taken from the website of NMCE, where rubber futures are most actively traded in India. Since futures trading in rubber was suspended for nearly seven months from May to November 2008, there is a structural break in the time series, and hence the period under study is divided into two sub periods (15 March, 2003 to 7 May 2008 and 4 December, 2008 to 31 July, 2012) and the OHR and hedging effectiveness are calculated for both periods separately.

The calculation of the optimal hedge ratio of pepper futures in India is based on the spot and futures price data for the period from 1 Jan 2005 to 31 December 2011 obtained from the website of NCDEX, where pepper futures are most actively traded. For the estimation of the hedging efficiency of Cardamom futures, we rely on the data for the period from 23 February 2006 to 31 December 2011 taken from the official website of MCX.

### 5.9.2 Methodology

A logarithmic transformation has been made to every spot price and future price data, prior to conducting the empirical analysis and will be referred to as 'log spot' and 'log future' series throughout the remainder of this chapter.

First, the stationarity of the log series (log spot and log future) is evaluated using the Augmented Dickey – Fuller (ADF) test. The ADF test consists of estimating the following regression.

$$\Delta Yt = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta y_{t-1} + \varepsilon t$$

Where $\varepsilon t$ is a pure white noise error term and where $\Delta y_{t-1} = (y_{t-1} - y_{t-2})$, $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$ etc.

When the log series is found to be 1(1), the same test is performed on the differenced log series (d log spot and d log future) to determine whether the log series is first difference stationary. The hypothesis for the ADF test is $H_0$: The series contains a unit root (i.e., $\delta = 0$) against $H_1$: The series does not contain a unit root (i.e. $\delta < 0$). The optimal lag length is determined by using minimization of the Schwarz Bayesian Information Criterion (BIC) [EVIEWS automatically calculate the optimum lag length].

The second step in the empirical methodology is to determine whether the log spot and log future series are co integrated. Two series are said to be co integrated if they are tied together by a long run relationship. The log spot and log future series are co integrated if they are I(1) but a linear combination is I(0), denoted as CI(1,1). In the present study, co integration between log spot and log future series are tested using Johansen Co integration Tests (both Eigen Value and Trace Statistic).

Where the log spot and log future series are first difference stationary and are co integrated we use Vector Error Correction Model (VECM) to estimate the constant hedge ratio. The parameters of VEC Model are estimated and the residuals are obtained. These residuals are used to calculate hedge ratio and hedging effectiveness.

The two variables used in the analysis are returned on spot and future prices in equation (3). The optimum lag length is selected using Akaike and Schwarz information criteria.

The residuals ($\varepsilon t^y$ and $\varepsilon t^x$) obtained from the above VECM when applied to the 'spot returns' and 'future returns' series understudy are designated as $\varepsilon_{st}$ and $\varepsilon_{ft}$ respectively. The optimal hedge ratio is calculated by using the variances and co variances of these residuals.

$$\text{The Optimal Hedge Ratio (H)} = \frac{\sigma_{sf}}{\sigma_f}$$

Where:

$\sigma_{sf}$ = Cov. ($\varepsilon_{st,}$ $\varepsilon_{ft)}$

$\sigma_{s}$ = Variance ($\varepsilon_{st)}$

$\sigma_{f}$ = Variance ($\varepsilon_{ft)}$

Hedging Effectiveness is calculated as:

$$E = \frac{\text{Var (u)} - \text{Var (H)}}{\text{Var (u)}}$$

Where,

Var (u) = $\sigma_s^2$ (i.e, Variance of unhedged portfolio)

Var (H) = $\sigma_s^2 + H_2 \sigma_f^2 - 2H \sigma_{sf}$ (i.e., variance of hedged portfolio)

H = Hedge Ratio, $\sigma_s$ and $\sigma_f$ are the standard deviations of spot and future returns and $\sigma_{sf}$ is the covariance.

Next, we test the residuals from the VECM for ARCH effect and find that in every case both spot and futures residuals obtained from VECM exhibit ARCH effect. The ARCH effect present in residuals confirms the necessity of GARCH modeling to estimate conditional variance, covariance and time-varying hedge ratios. Hence, the time-varying hedge ratio is calculated using constant Conditional Correlation – Multivariate GARCH

(CCC-M GARCH) Model. The ARCH effect present in the time – series data implies that a hedge ratio shall not be optimal for every point of time; rather it would be varying from time to time. Hence the optimal hedge ratio shall be the average of the ratios computed for different points of time.

Errors from VEC Model are obtained and then each error is modeled as univariate GARCH model and covariance is calculated as follows:

$$h_{ss,t} = \omega_s + \alpha_{s,1}\, \varepsilon^2_{s,t-1} + \beta_{s,1}\, h_{ss,t-1}$$

$$h_{ff,t} = \omega_f + \alpha_{f,1}\, \varepsilon^2_{f,t-1} + \beta_{f,1}\, h_{ff,t-1}$$

$$h_{sf,t} = \rho(h_{ss,t} \times h_{ff.t})^{1/2}$$

Where, $h_{ss,t}$ is the conditional spot variance at time t, $h_{ff,t}$ is conditional futures variance, $h_{sf,t}$ is covariance and $\rho$ is the constant conditional correlation.

$$\text{Average Time – Varying Hedge Ratio } (H_t) = \frac{h_{sf,t}}{h_{ff,t}}$$

**5.10 Results and Discussion**

**I. Optimal Hedge Ratio (OHR) and Hedging Effectiveness of Rubber Futures**

As stated earlier, due to the suspension of futures trading in rubber from May to December 2008, there is a structural break in the time series data of rubber and hence the period under study is divided into two sub-periods.

***(A) First Sub-period (15 March 2003 to 7 May 2008)***

The spot price and future's price series have been subjected to a logarithmic transformation and the series obtained are designated as 'log spot' and 'log future' respectively. These series are tested for stationarity at levels

and first difference using Augmented Dickey-Fuller (ADF) test. The results are summarised below:

**Table 5.1 : Unit root tests of Rubber (Period-1)**

| Variables | Levels | First difference |
|---|---|---|
| log spot | -2.303326 (0.4313) | -35.67745 (0.0000)** |
| log future | -2.759981 (0.2126) | -39.59430 (0.0000)** |

Figures in () are p-values.

** indicates significance at 1% level.

Both 'log spot' and 'log future' series have a unit root but are stationary at first difference.

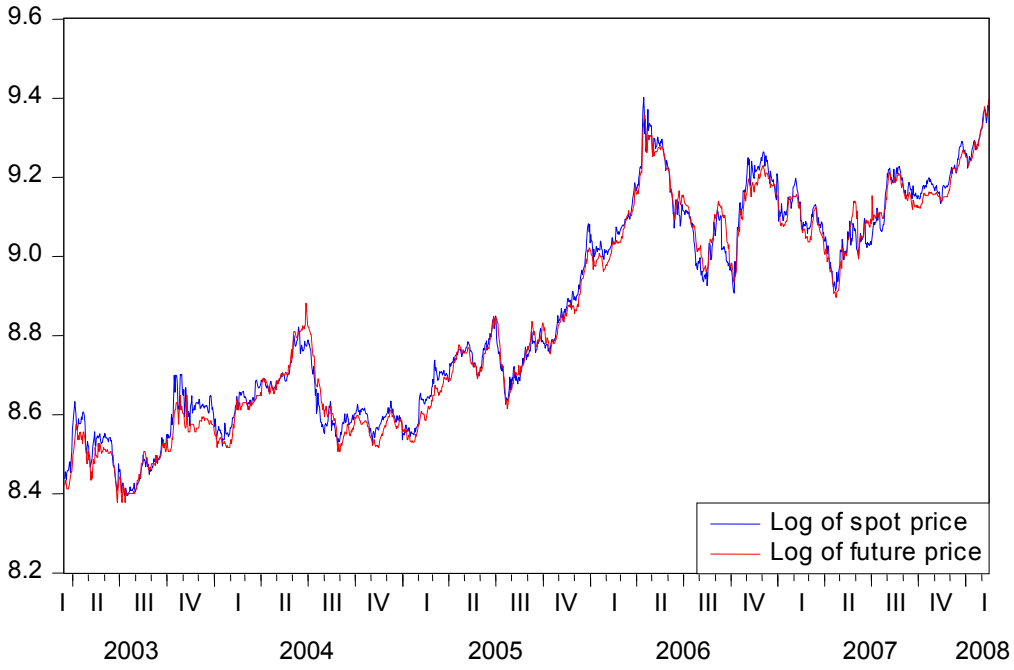



**Fig. 5.1. Graph of 'log spot' and 'log futures' of Rubber (Period 1)**

The graph indicates possible co integration between log spot and log futures.

**Table 5.2 : Testing Co integration between 'log spot' and 'log futures' (Rubber Period – 1) using Johansen Co integration Tests**

| Hypothesized No. of CE(s) | Eigen value | Trace Statistic | Max-Eigen Statistic |
|---|---|---|---|
| None* | 0.027406 | 43.39832 (0.0000) | 42.68353 (0.0000) |
| At most 1 | 0.000465 | 0.714797 (0.3979) | 0.714797 (0.3979) |

Figures in () are p-values.

* denotes rejection of the hypotheses at the 0.05 level.

Both Trace and Max-Eigen value tests indicate 1 co integrating eqn (s) at the 0.05 level.

The presence of co integration is confirmed by the Johansen co integration tests (both Trace and Eigen value). Since the series are 1(1) and are co integrated, they are modeled using VECM and the residuals are obtained. Fig. 5.2 and Fig. 5.3 depict the residuals of VECM applied to 'log spot' and 'log futures' respectively.

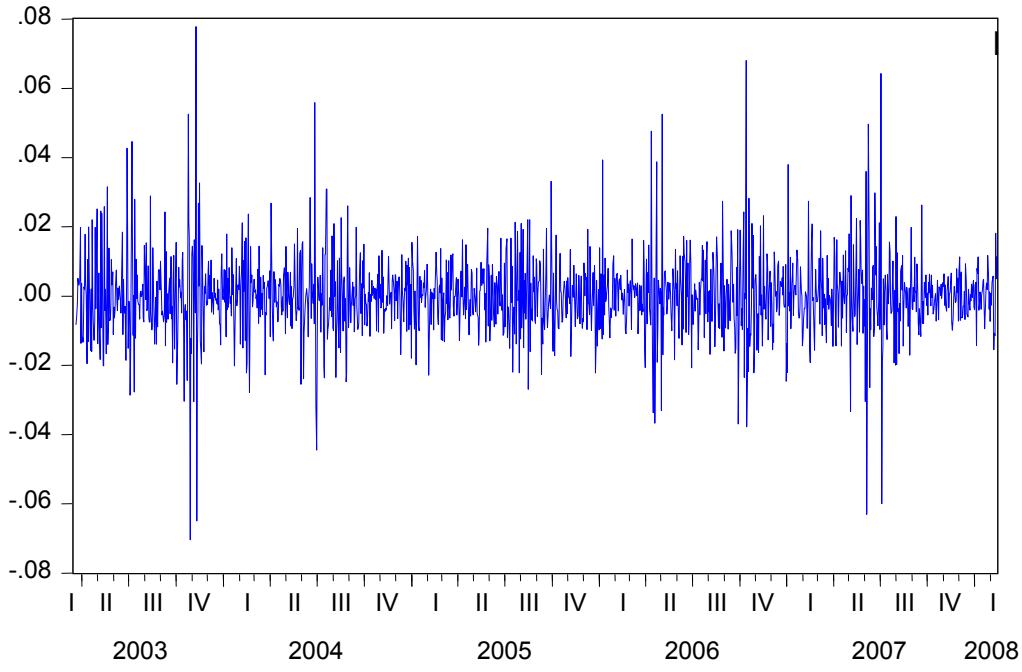



**Fig. 5.2 : Residuals of log spot from VECM (Rubber Period 1)**

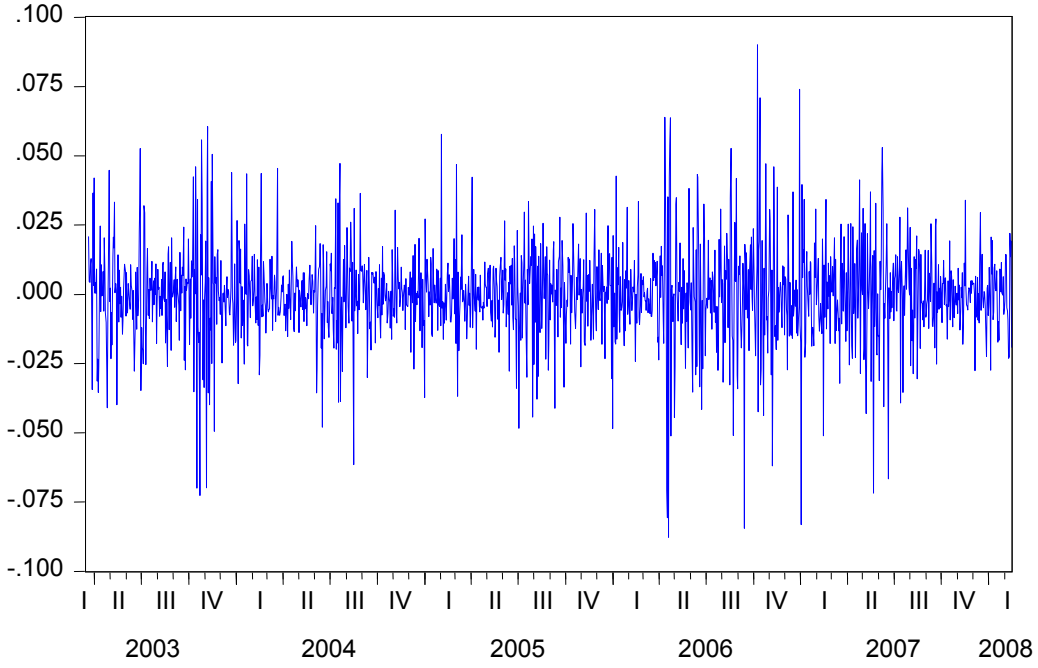



**Fig. 5.3: Residuals of log futures from VECM (Rubber Period 1)**

The descriptive statistics of the residual series from VECM are reported below.

**Table 5.3 : Descriptive Statistics of the Residuals from VECM (Rubber Period – 1)**

| | Residual (Future) $\varepsilon_{ft}$ | Residual (spot) $\varepsilon_{st}$ |
|---|---|---|
| Mean | 2.89E-19 | -1.683E-19 |
| Median | 0.000388 | -0.000145 |
| Std. deviation | 0.017259 | 0.011564 |

$$\text{The Optimal Hedge Ratio (H)} = \frac{\sigma_{sf}}{\sigma_f} = 0.33$$

$$\text{Hedging Effectiveness (E)} = \frac{\text{Var (u)} - \text{Var (H)}}{\text{Var (u)}} = 0.1059$$

Next the residual series are tested for ARCH effect using CCC-M GARCH Model. The results obtained are reported below.

**Table 5.4 : Testing Futures Residuals for ARCH effect**

**(Rubber Period – 1)**

| Variable | Coefficient | Std. Error | Z-Statistic | p-Value |
|---|---|---|---|---|
| C | 8.22E-05 | 0.000351 | 0.234440 | 0.8146 |
| Variance Equation | | | | |
| C | 1.91E-05 | 2.64E-06 | 7.235294 | 0.0000 |
| RESID(-1)^2 | 0.137953 | 0.015928 | 8.661292 | 0.0000** |
| GARCH(-1) | 0.802192 | 0.017262 | 46.47052 | 0.0000** |

** Significance at 1% level.

**Table 5.5 : Testing Spot Residuals for ARCH effect**

**(Rubber Period – 1)**

| Variable | Coefficient | Std. Error | Z-Statistic | p-Value |
|---|---|---|---|---|
| C | 0.000320 | 0.000209 | 1.531793 | 0.1256 |
| Variance Equation | | | | |
| C | 6.21E-06 | 0.55E-07 | 6.501092 | 0.0000 |
| RESID(-1)^2 | 0.166900 | 0.017405 | 9.588975 | 0.0000** |
| GARCH(-1) | 0.797634 | 0.015916 | 50.11464 | 0.0000** |

** Significance at 1% level.

GARCH effect in spot and future series are presented below

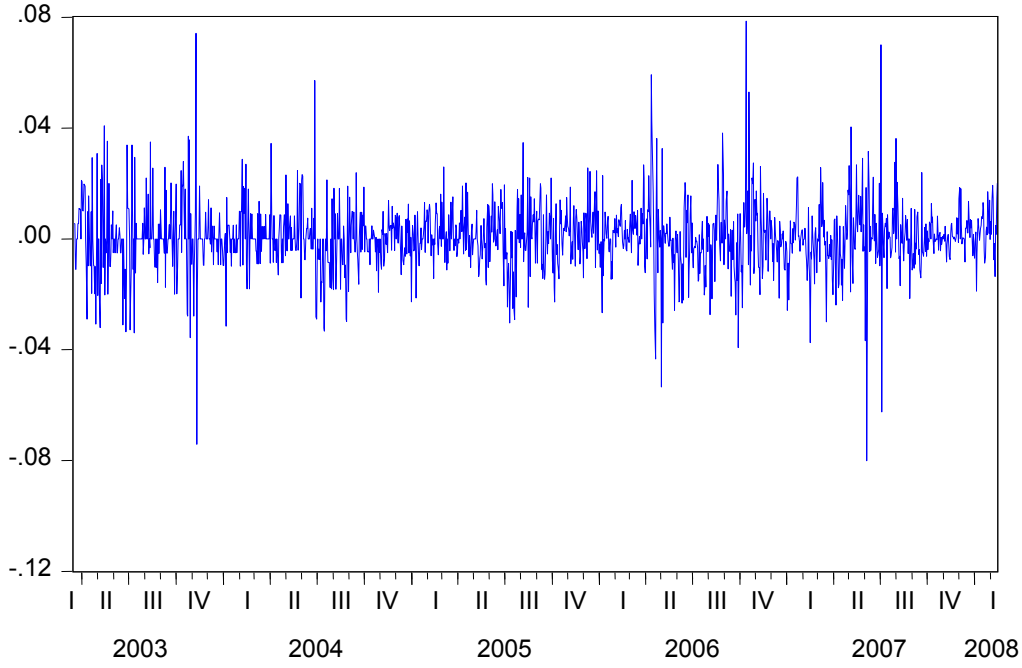
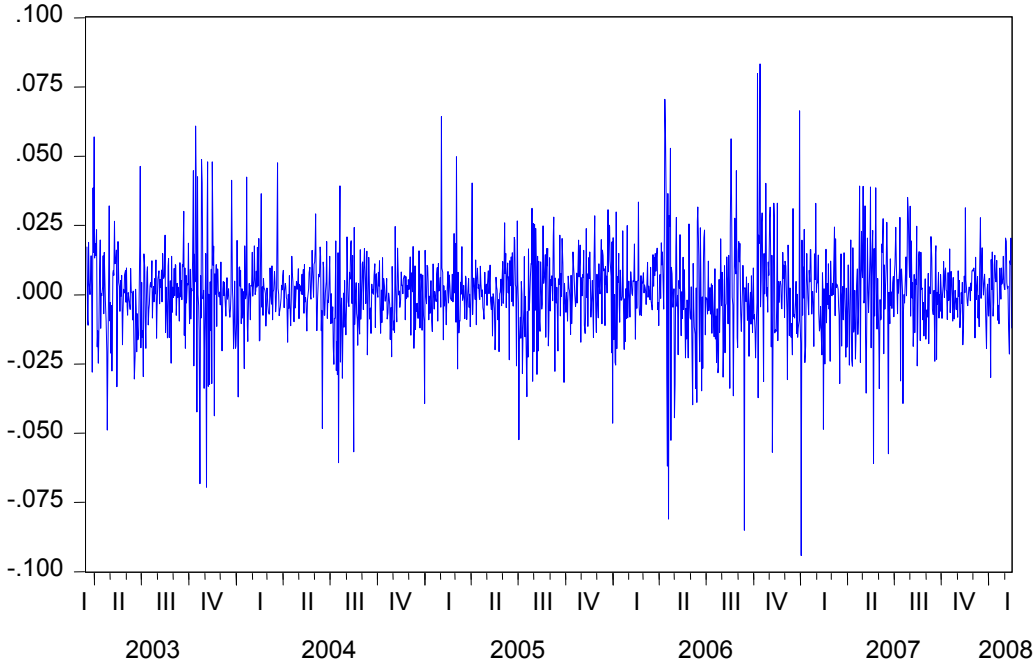



**Fig. 5.4 ARCH effect in spot returns series (Rubber Period 1)**




**Fig,. 5.5. ARCH effect in futures returns series (Rubber Period 1)**

Average Time-varying Hedge Ratio $(H_t) = \frac{h_{sf,t}}{h_{ff,t}}$

$= 0.30$

Average Dynamic Hedging Effectiveness

$$(E_t) = \frac{Var(u) - Var(H)}{Var(u)} = 0.26$$

The time-varying hedge ratios of near month rubber futures for the first sub-period under study are depicted below.

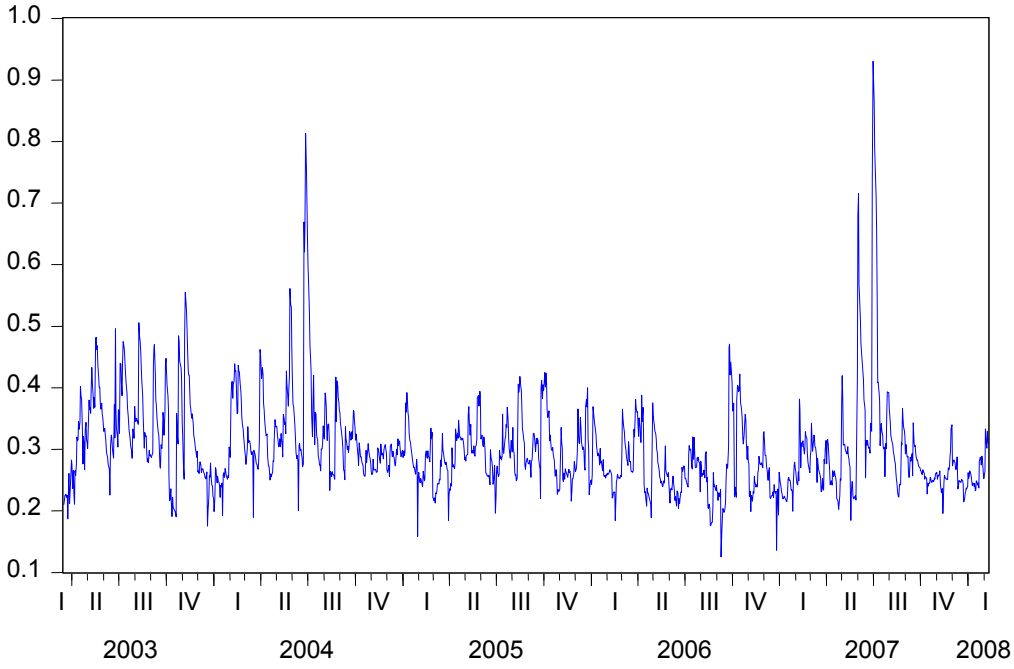



**Fig 5.6 Time-varying hedge ratios of Rubber futures (Period – 1)**

***B) Second Sub-period (4 December 2008 to 31 July 2012)***

After the spot and near month futures price series are subjected to logarithmic transformation, the log series obtained are tested for stationarity at levels as well as first difference using ADF test. The results are presented in Table 5.6.

**Table 5.6: Unit root tests of Rubber (Period-II)**

| Variables | Levels | First difference |
|---|---|---|
| Log spot | -1.661548 (0.7676) | -24.65136 (0.0000)** |
| Log future | -1.261616 (0.8962) | -32.74233 (0.0000)** |

Figures in ( ) are P-values

** Significance at 1% level.

Both 'log spot' and 'log future' series are non-stationary but are found to be stationary at first difference.

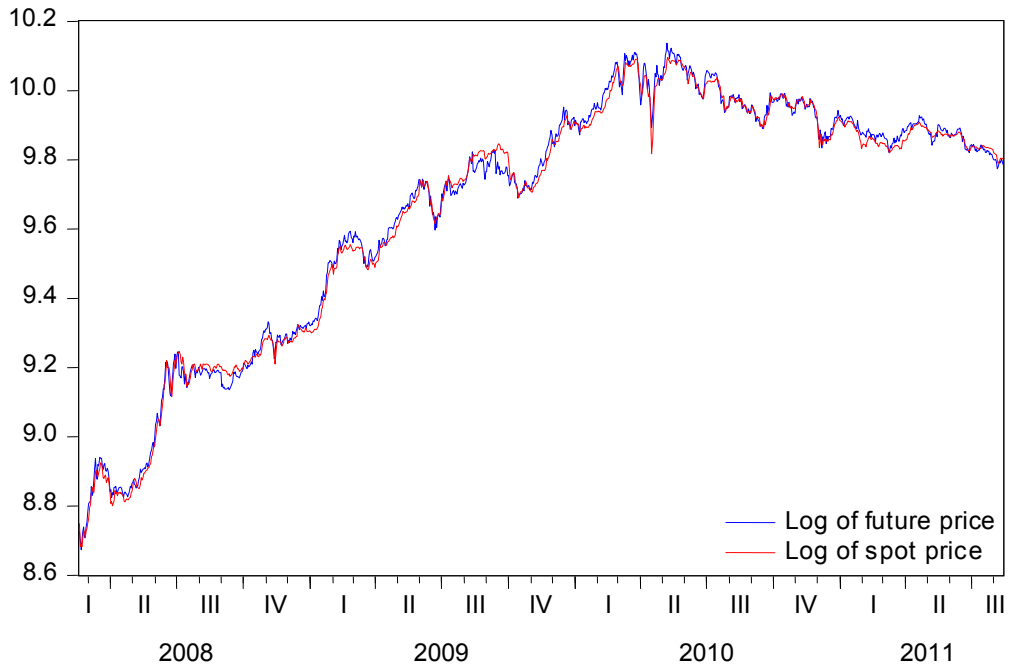



**Fig 5.7: Graph of 'log spot' and 'log futures' of Rubber (Period-II)**

Graph of log series indicates long run relationship between spot and future prices.

**Table 5.7: Testing co integration between 'log spot' and 'log futures' using Johansen co integration tests (Rubber-Period-II)**

| Hypothesized No.of CE (s) | Eigen value | Trace Statistic | Max-Eigen Statistic |
|---|---|---|---|
| None* | 0.037383 | 42,91049 (0.0000) | 41.41419 (0.0000) |
| At most 1 | 0.001376 | 1.496307 (0.2212) | 1.496307 (0.2212) |

Figures in ( ) are p-values

* denotes rejection of the hypothesis at the 0.05 level

Both Trace and Max-Eigen value tests indicate one co integrating eqn(s) at the 0.05 level.

Since the series are 1 (1) and are co integrated, we model them using VECM and the residuals are obtained. Fig. 5.8 and Fig. 5.9 present the residuals of Vector Error Correction Model applied to 'log spot' and 'log future' series of rubber for Period – II under study.

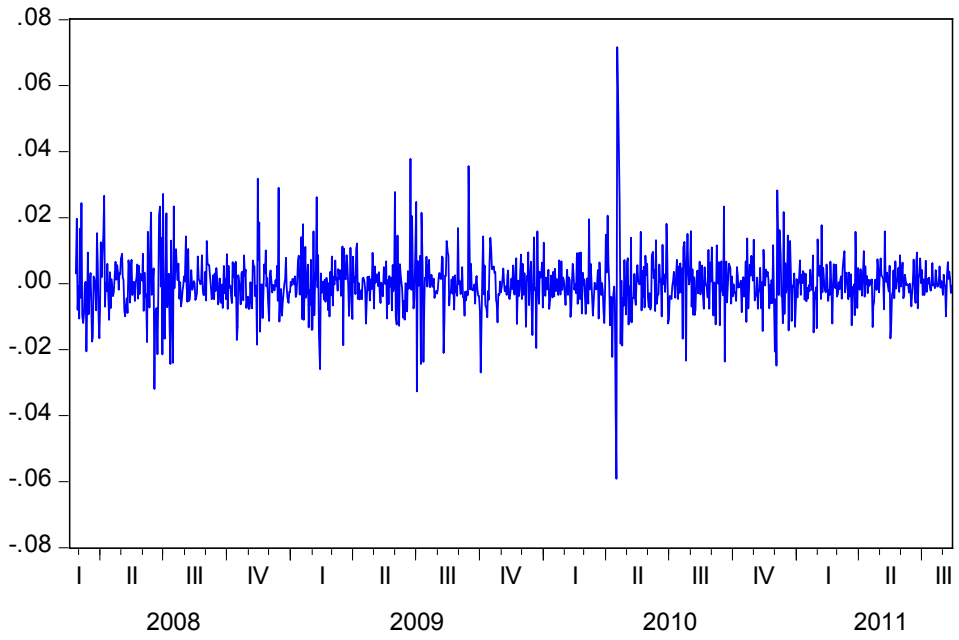



**Fig. 5.8 – Residuals of 'log spot' from VECM (Rubber Period-II)**

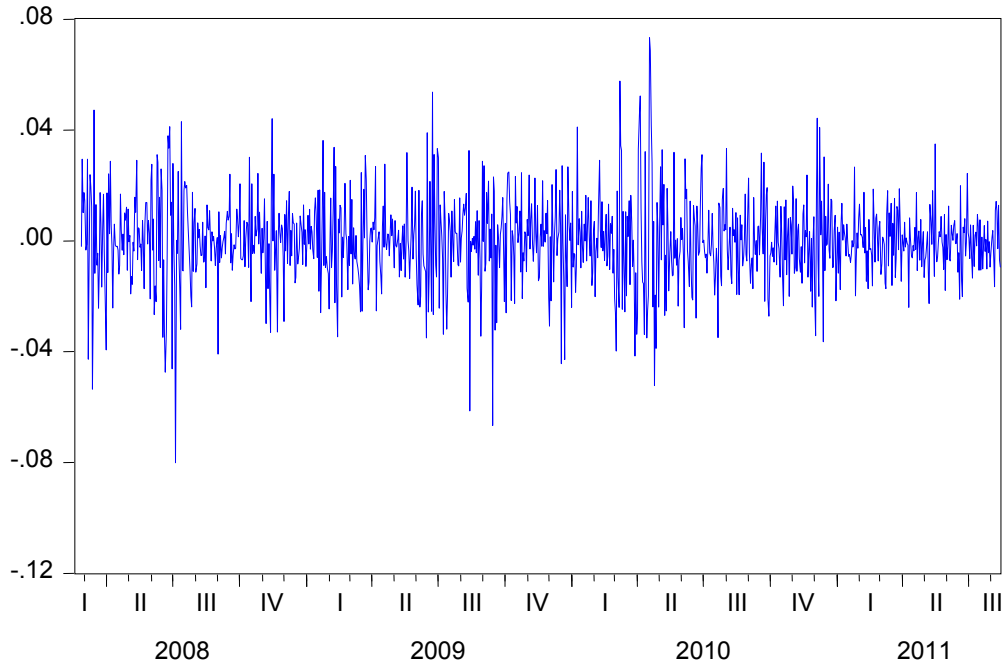



**Fig. 5.9 – Residuals of 'log futures' from VECM (Rubber Period – II)**

The descriptive statistics of the residual series from VECM are reported below.

**Table 5:8 – Descriptive Statistics of the residuals from VECM (Rubber Period-II)**

| | Residual (Future) $\varepsilon_{ft}$ | Residual (Spot) $\varepsilon_{st}$ |
|---|---|---|
| Mean | 0.000972 | 0.000966 |
| Median | 0.000932 | 0.000788 |
| Std. deviation | 0.015064 | 0.011162 |

The Optimal Hedge Ratio (H ) $= \frac{\sigma_{sf}}{\sigma_f} = 0.31$

Hedging Effectiveness (E) $= \frac{\text{Var (u)} - \text{Var (H)}}{\text{Var (u)}} = 0.16$

The residual series are tested for ARCH effect using CCC-M GARCH model. The results obtained are reported below.

**Table 5.9: Testing Futures residuals for ARCH effect**
**(Rubber Period – II)**

| Variable | Co-efficient | Std. Error | Z-Statistic | p-Value |
|---|---|---|---|---|
| C | 3.97E-05 | 0.000397 | 01.00001 | 0.9203 |
| Variance Equation | | | | |
| C | 1.40E-05 | 3.09E-06 | 4.513695 | 0.0000 |
| RESID(-1)^2 | 0.130209 | 0.020322 | 6.407115 | 0.0000** |
| GARCH(-1) | 0.811807 | 0.026549 | 30.57761 | 0.0000** |

** significance at 1% level.

**Table 5.10 – Testing spot residuals for ARCH effect**
**(Rubber Period – II)**

| Variable | Coefficient | Std. Error | Z-Statistic | p-Value |
|---|---|---|---|---|
| C | 0.000130 | 0.000194 | 0.667770 | 0.5043 |
| Variance Equation | | | | |
| C | 8.16E-06 | 1.23E-06 | 6.619149 | 0.0000 |
| RESID(-1)^2 | 0.193586 | 0.024613 | 7.865248 | 0.0000** |
| GARCH(-1) | 0.691498 | 0.031332 | 22.06981 | 0.0000** |

** significance at 1% level.

GARCH effect in spot and futures series are graphically presented below.

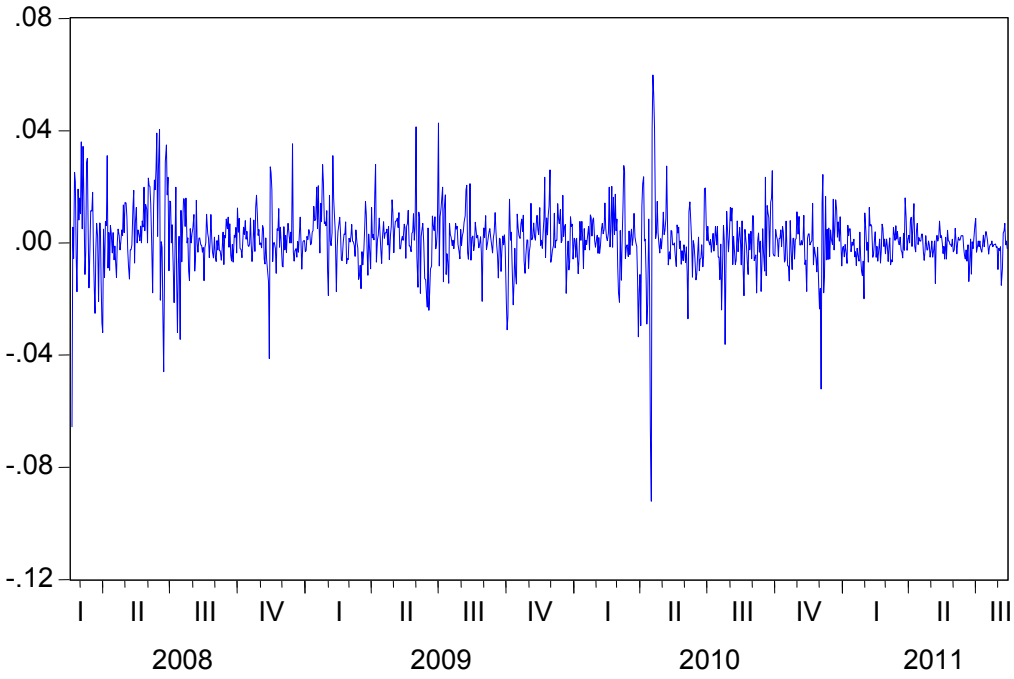



**Fig.5:10 – GARCH effect in spot return series (Rubber Period – II)**

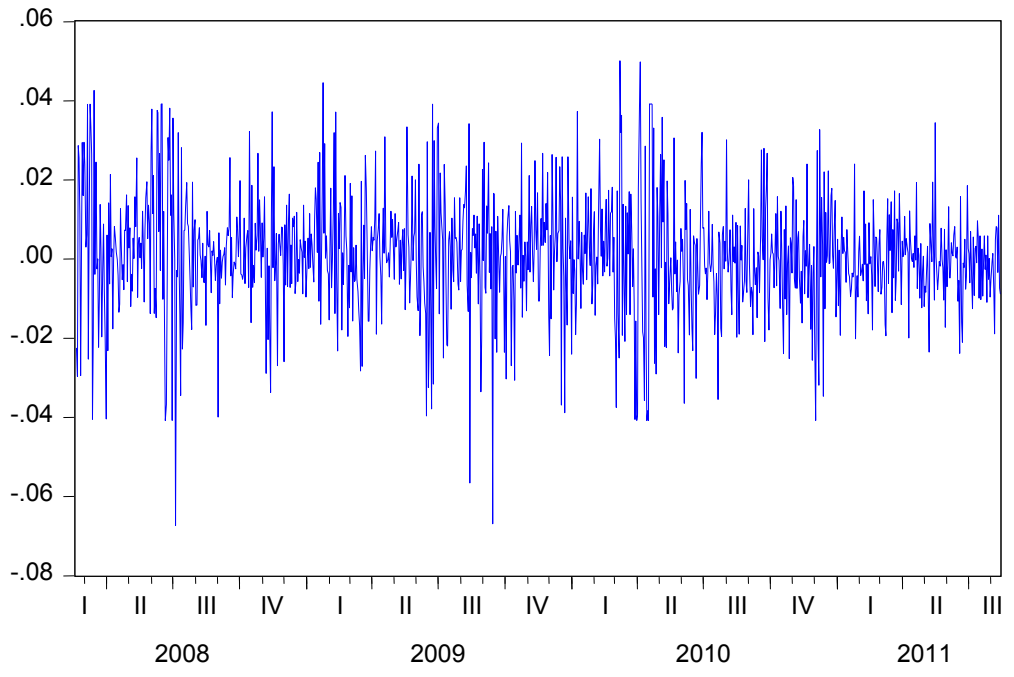



**Fig.5:11- GARCH effect in Futures returns series (Rubber Period-II)**

Average Time – Varying Hedge Ratio ($H_t$) = $\frac{h_{sf,t}}{h_{ff,t}} = 0.27$

Average Dynamic Hedging Effectiveness

$$(E_t) = \frac{Var\,(u) - Var\,(H)}{Var\,(u)} = 0.15$$

Fig. 5:12 – below depicts the time-varying hedge ratios of rubber futures for the second sub period under study

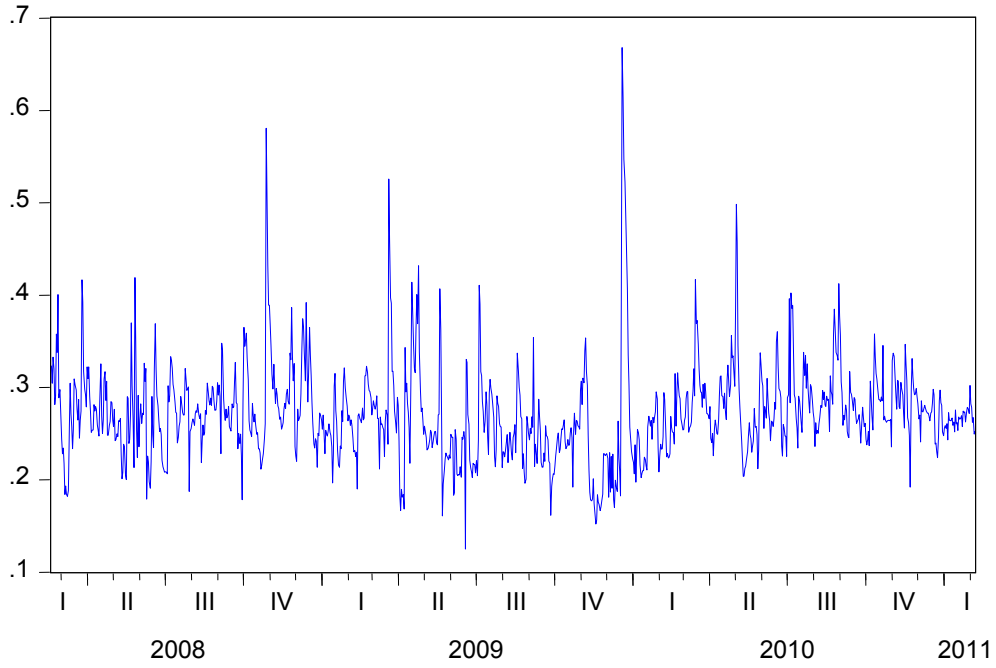



**Fig. 5:12 – Time – Varying hedge ratios of Rubber futures (Period-II)**

From the above analysis it can be concluded that the variances of return from a hedged portfolio of rubber shall be minimum when a position in physical commodity is combined with a position in futures market to the extent of 31 to 33 percent of the former. Further, the time varying hedge ratio of rubber is not substantially different from the constant ratio. Hedging efficiency of rubber futures is approximately 16 percent.

## II Estimating OHR and Hedging Effectiveness of Pepper Futures

The spot price and futures price series are first converted to logarithmic series and are designated as 'long spot' and 'log future' respectively. These series are tested for stationarity at levels and first difference using Augmented Dickey-Fuller test. The results are reported below.

**Table 5:11 – Unit root tests of Pepper**

| Variables | Levels | First difference |
|---|---|---|
| Log spot | -1.678395 (0.7607) | -22.64112 (0.0000)** |
| Log future | -1.946077 (0.6297) | -44.37185 (0.0000)** |

Figures in ( ) are P-values

** significance at 1% level.

Both 'long spot' and long future' series are found to be non stationary but are stationary at first difference.

Next we test the series for any co integrating relationship between the two Johansen co integration tests (both Trace and Eigen value) are used to examine the co integration. The results obtained are reported below.

**Table 5:12 – Test Co integration between 'log spot' and 'log futures' using Johansen Co integration test (Pepper)**

| Hypothesized No. of CE (s) | Eigen value | Trace Statistic | Max-Eigen Statistic |
|---|---|---|---|
| None* | 0.266798 | 910.0781 (0.0001) | 659.4611 (0.0001) |
| At most 1 | 0.111248 | 0.8170 (0.1264) | 0.8170 (0.1264) |

Figures in ( ) are p-values

* denoted rejection of the hypothesis at the 0.05 level.

Both Trace and Max-Eigen value tests indicate one co integrating eqn (s) at the 0.05 level.

The same results are indicated by the graph of log spot and log futures series also.

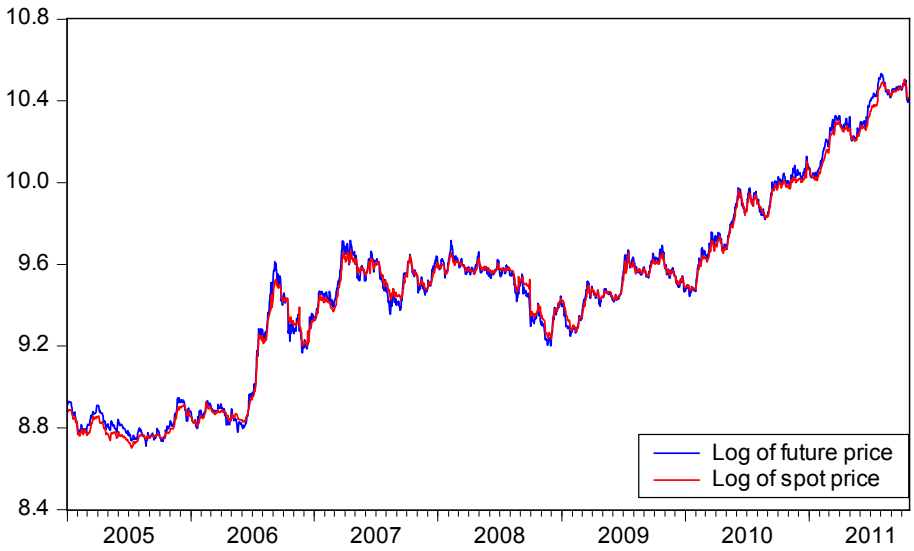



**Fig. 5:13 – Graph of 'log spot' and 'log futures' of Pepper**

Since the series are 1 (1) and are co integrated, they are modeled using VECM and the residuals are obtained. Fig 5:14 and Fig. 5:15 depict the residuals of VECM.

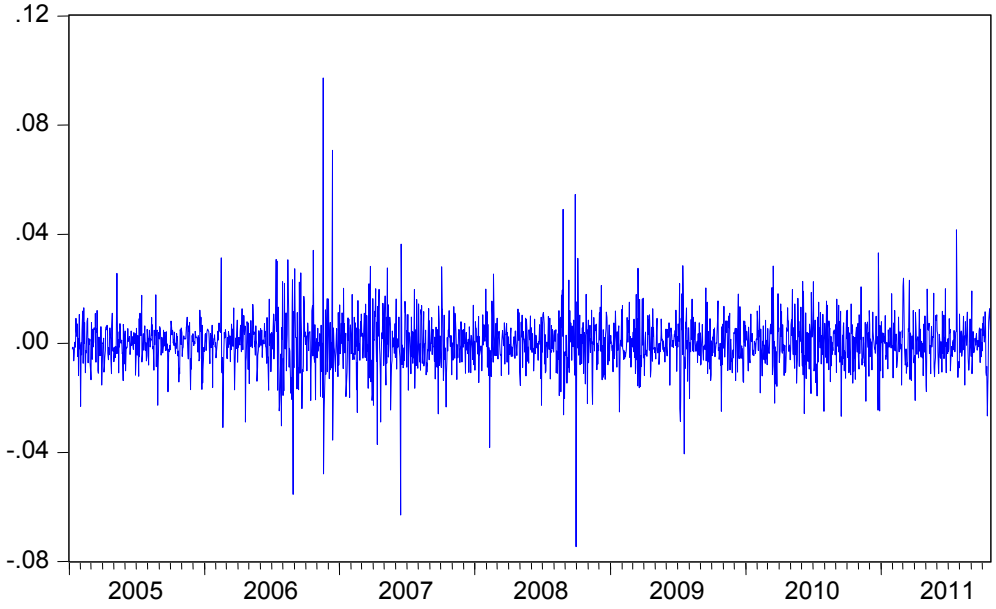



**Fig. 5:14 – Residuals of log spot from VECM (Pepper)**

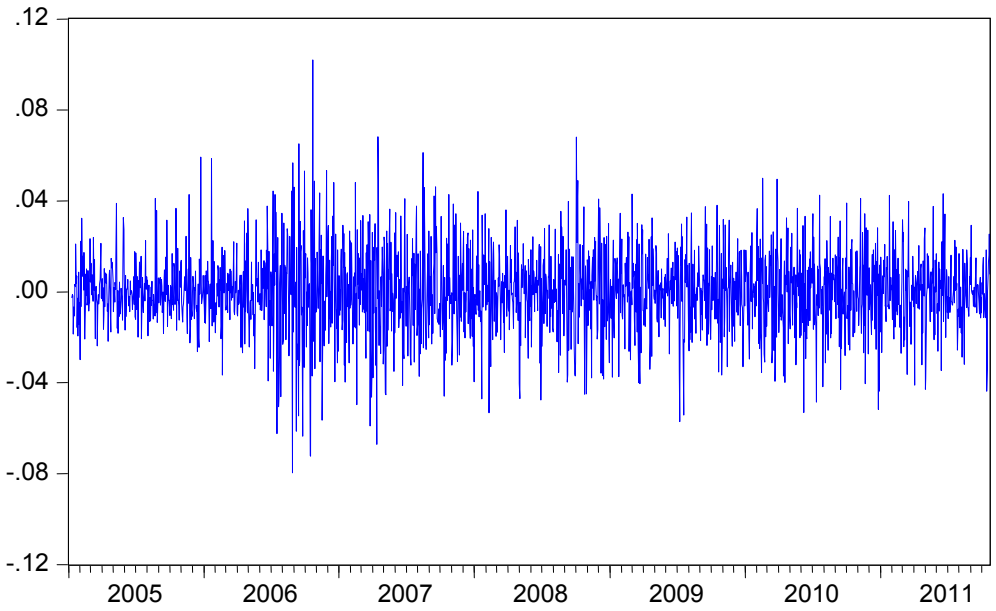



**Fig. 5: 15 – Residuals of log futures from VECM (Pepper)**

The descriptive statistics of the residual series which are used in the calculation of hedge ratios are reported below.

**Table 5:13 – Descriptive Statistics of the residuals from VECM (Pepper)**

| | Residual (Future) $\varepsilon_{ft}$ | Residual (Spot) $\varepsilon_{st}$ |
|---|---|---|
| Mean | 0.000696 | 0.000720 |
| Median | 0.000000 | 0.000120 |
| Std. deviation | 0.017111 | 0.011660 |

$$\text{The Optimal Hedge Ratio (H )} = \frac{\sigma_{sf}}{\sigma_f} = 0.30$$

$$\text{Hedging Effectiveness (E)} = \frac{\text{Var (u)} - \text{Var (H)}}{\text{Var (u)}} = 0.19$$

Next the residual series are tested for ARCH effect using CCC-M GARCH Model. The results obtained are reported below.

**Table 5:14 – Testing Future residuals for ARCH effect (Pepper)**

| Variable | Co-efficient | Std. Error | Z-Statistic | p-Value |
|---|---|---|---|---|
| C | 6.33E-06 | 0.000342 | .185022 | 0.8532 |
| Variance Equation | | | | |
| C | 4.96E-06 | 1.20E-06 | 4.127201 | 0.0000 |
| RESID(-1)^2 | 0.043996 | 0.006910 | 6.366774 | 0.0000** |
| GARCH(-1) | 0.940507 | 0.009183 | 102.4162 | 0.0000** |

** significance at 1% level.

**Table 5.15 – Testing spot residuals for ARCH effect (Pepper)**

| Variable | Coefficient | Std. Error | Z-Statistic | p-Value |
|---|---|---|---|---|
| C | 0.000223 | 0.000164 | 1.356996 | 0.1748 |
| Variance Equation | | | | |
| C | 1.44E-05 | 1.23 E-06 | 11.70653 | 0.0000 |
| RESID(-1)^2 | 0.235717 | 0.013518 | 17.43765 | 0.0000** |
| GARCH(-1) | 0.631919 | 0.019865 | 31.81125 | 0.0000** |

** significance at 1% level.

The GARCH effect in spot and futures return series are depicted in the following.

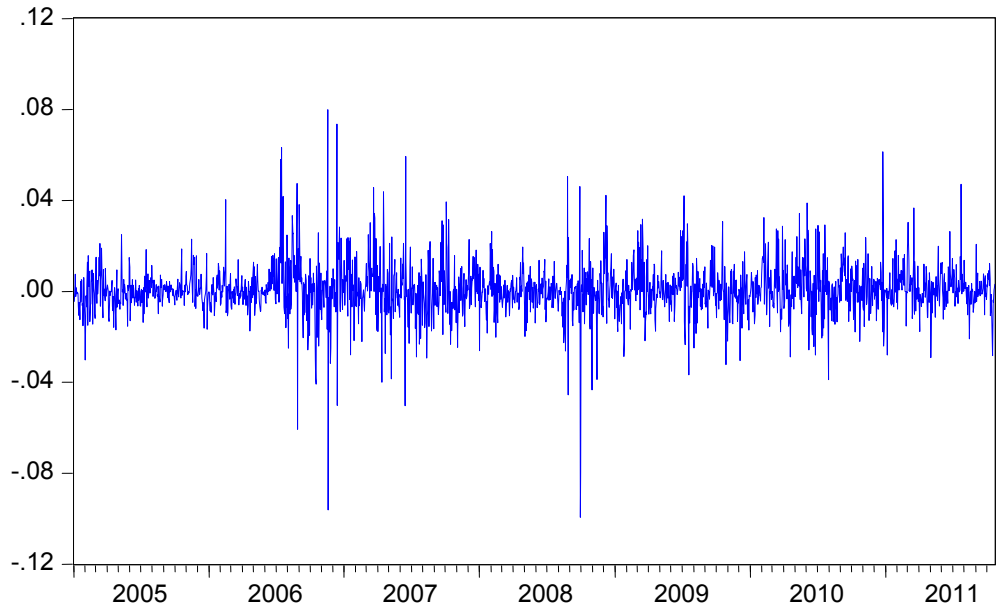



**Fig. 5:16 – GARCH effect in spot return series (Pepper)**

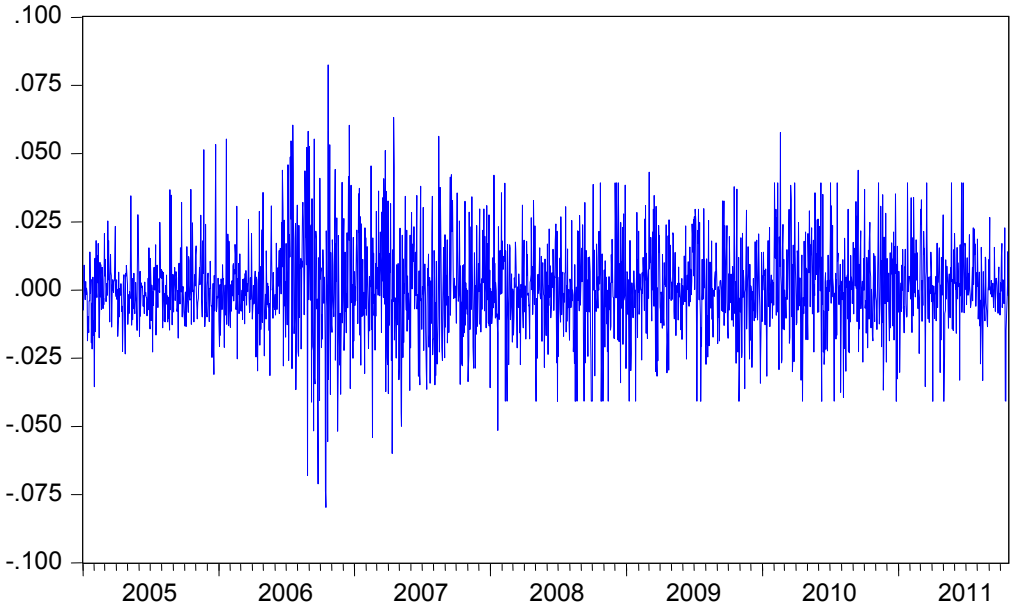



**Fig. 15:17 – GARCH effect in Futures return series (Pepper)**

Average Dynamic Hedge Ratio ($H_t$) = $\frac{h_{sf,t}}{h_{ff,t}} = 0.30$

Average Dynamic Hedging Effectiveness ($E_t$) = $\frac{Var\,(u) - Var\,(H)}{Var\,(u)} = 0.17$

Dynamic hedge ratios of the Indian Pepper futures for the period under study are presented in the following diagram.

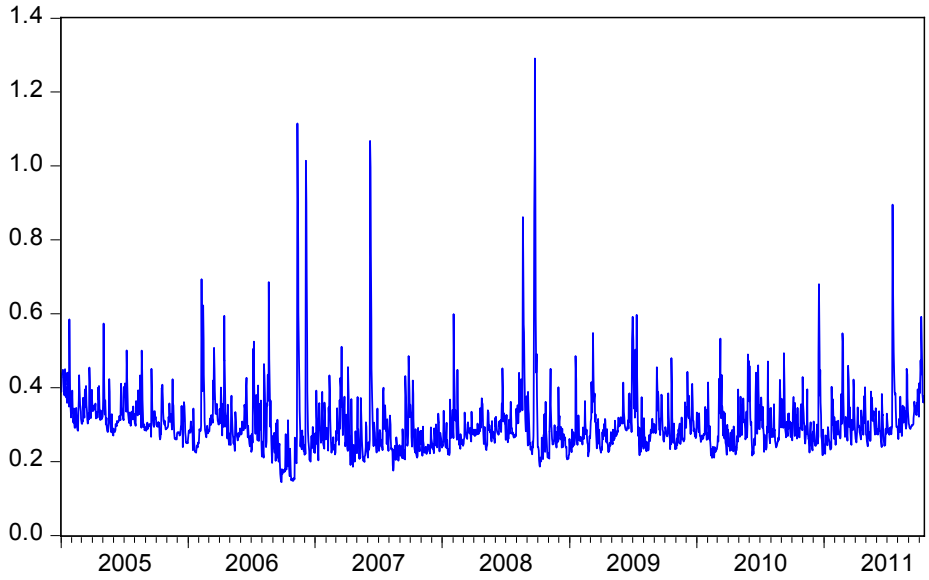



**Fig. 5:18 – Dynamic Hedge Ratios of Pepper futures**

The above analysis of the hedging efficiency of pepper futures shows that the optimum hedge ratio – both constant and time varying is 30 percent. It means that the variance of return from pepper shall be minimum when a position in physical commodity is accompanied by a position in pepper futures to the extent of 30 percent. Further, diversification of the portfolio by combining positions in physical pepper with pepper futures can reduce the overall risk by 15 to 17 percent only.

## III. Estimating Optimal Hedge Ratio and Hedging Effectiveness of Cardamom futures

Spot and futures prices of Cardamom taken from the website of MCX are first subjected to a logarithmic transformation and a 'log spot' and 'log future' series are generated. These log series are then tested for stationarity at levels and first difference. Though different unit root tests are available, the present study uses Augmented Dickey- Fuller tests. The results obtained are shown below.

**Table 5:16 Unit root tests of Cardamom series**

| Variables | Levels | First Difference |
|---|---|---|
| Log spot | -0.477821 (0.9845) | -38.01413(0.0000)** |
| Log futures | -0.843730 (0.9602) | -39.27631(0.0000)** |

Figures in ( ) are p-values
** significance at 1% level.

Both 'log spot' and 'log futures' series have a unit root (i.e., non-stationary) but are stationary at first difference.

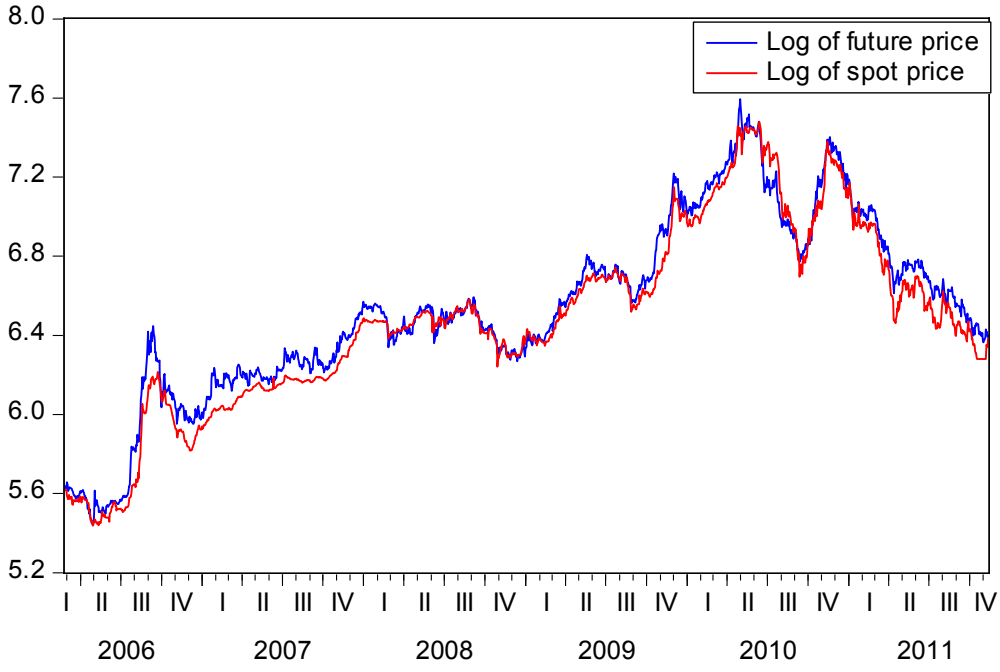



**Fig 5:19 -Graph of 'log spot' and 'log futures' of Cardamom**

Graph of 'log series presented above indicates a long term co integrating relationship between spot and futures prices.

**Table 5:17 Testing co integration between 'log spot' and 'log futures' using Johansen Co integration tests (Cardamom)**

| Hypothesized No.of CE (s) | Eigen value | Trace statistic | Max-Eigen Statistic |
|---|---|---|---|
| None* | 0.024824 | 46.09784(0.0000) | 44.89443(0.0000) |
| At most 1 | 0.000674 | 1.203415(0.2726) | 1.203415(0.2726) |

Figures in ( ) are p-values
* denotes rejection of the hypothesis at the 0.05 level.

Both Trace and Max-Eigen values tests indicate one co integrating equn(s) at the 0.05 level. The co integration between the series, indicated by the graph, is confirmed by Johansen test.

Since the log series are 1 (1) and are co integrated, we use VECM to model them and the residuals are obtained. These residuals are depicted in the graphs below.

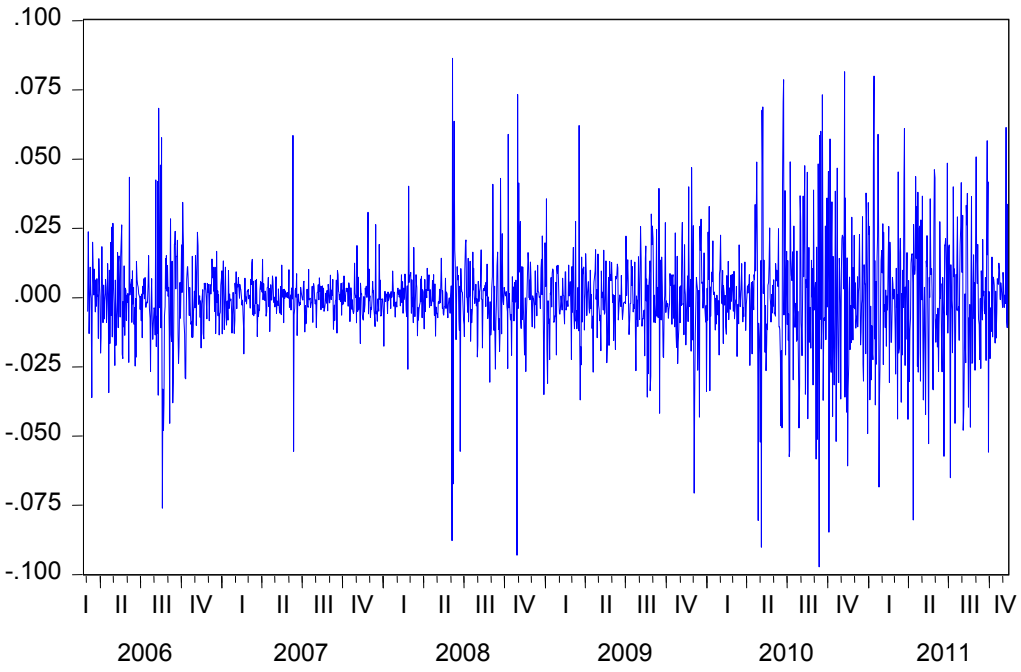



**Fig 5:20- Residuals of log spot from VECM (Cardamom)**

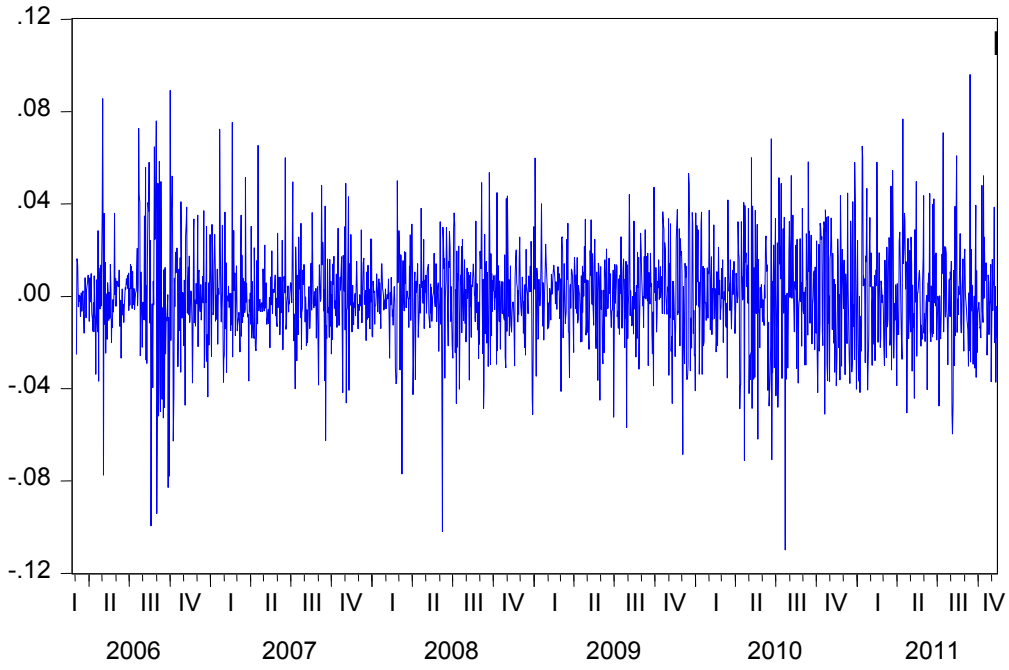



**Fig 5:21- Residuals of log future from VECM (Cardamom)**

The Following Table (5:18) lists the descriptive statistics of the residual series. Variances and covariance of the residuals used in the calculation of OHR are computed from the standard deviation reported below.

**Table 5:18 –Descriptive statistics of the residuals from VECM (Cardamom)**

| | Residual (Future) $\varepsilon_{ft}$ | Residual (spot) $\varepsilon_{st}$ |
|---|---|---|
| Mean | 1.44E -19 | 8.83E-19 |
| Median | 0.000172 | -5.62E-05 |
| Standard deviation | 0.021736 | 0.017966 |

The Optimal Hedge Ratio (H) $= \frac{\sigma_{sf}}{\sigma_f} = 0.32$

Hedging Effectiveness (E) $= \frac{\text{Var (u)} - \text{Var (H)}}{\text{Var (u)}} = 0.19$

The residual series are tested for ARCH effect using CCC-MGARCH model and the results are reported below.

**Table 5:19- Testing Future residuals for ARCH effect (Cardamom)**

| Variable | Coefficient | Std. Error | Z-Statistic | p-value |
|---|---|---|---|---|
| C | 0.000326 | 0.000425 | 0.768228 | 0.4424 |
| Variance Equation | | | | |
| C | 2.62E-05 | 3.65E-06 | 7.191368 | 0.0000 |
| RESID (-1)^2 | 0.106934 | 0.012147 | 8.803491 | 0.0000** |
| GARCH (-1) | 0.840735 | 0.015195 | 55. 33143 | 0.0000** |

** significance at 1% level.

**Table 5:20- Testing Spot residuals for ARCH effect (Cardamom)**

| Variable | Coefficient | Std. Error | Z-Statistic | p-value |
|---|---|---|---|---|
| C | 6.16E-05 | 0.000308 | 0.200082 | 0.8414 |
| Variance Equation | | | | |
| C | 9.54E-06 | 5.87E-07 | 16.26094 | 0.0000 |
| RESID (-1)^2 | 0.125620 | 0.009593 | 13.09556 | 0.0000** |
| GARCH (-1) | 0.87969 | 0.007772 | 109.1023 | 0.0000** |

** significance at 1% level.

GARCH effects in spot and futures series are presented graphically.

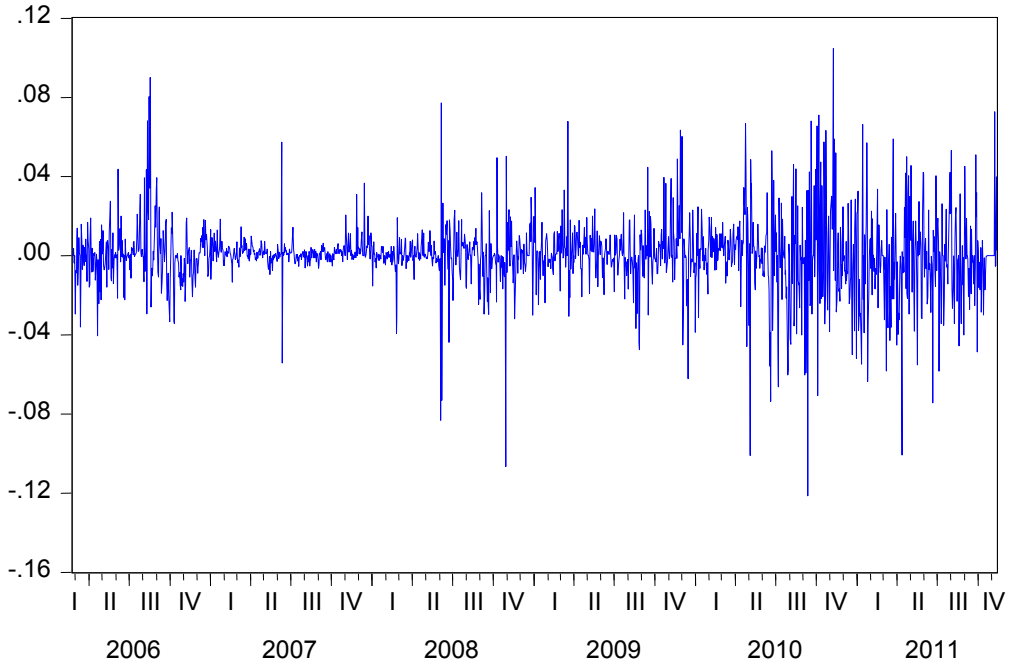



**Fig5:22- GARCH effect in spot returns series (Cardamom)**

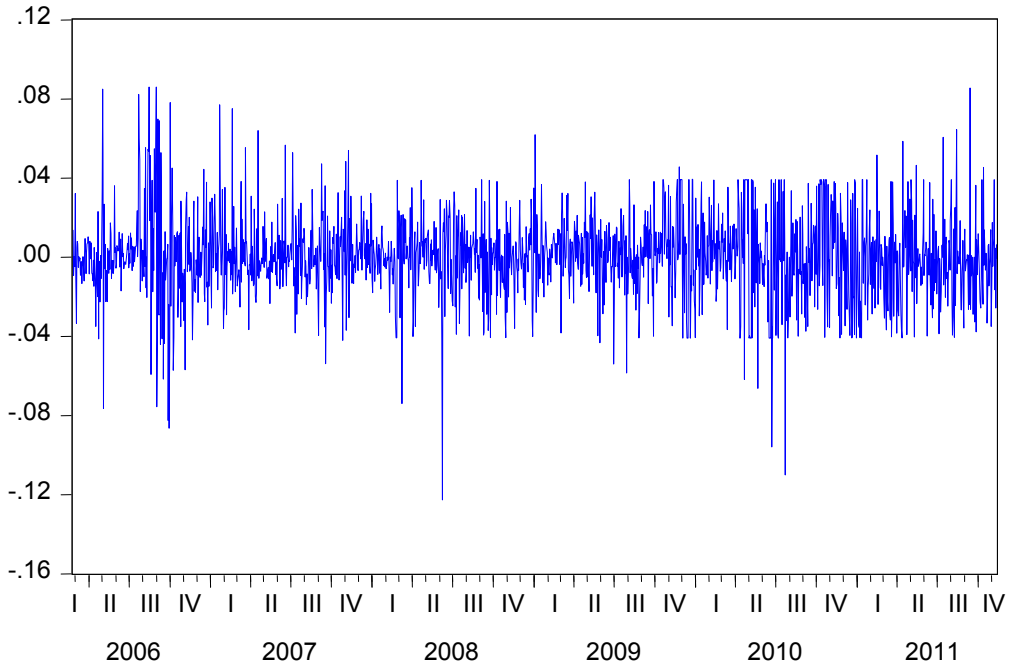



**Fig 5:23-GARCH effect in Futures returns series (Cardamom)**

Average Time-Varying Hedge Ratio $(H_t) = \frac{h_{sf,t}}{h_{ff,t}} = 0.35$

Average Time-Varying Hedging Effectiveness $(E_t) = \frac{Var(u) - Var(H)}{Var(u)} = 0.17$

The following diagram presents the dynamic hedge ratios of the Cardamom futures in India

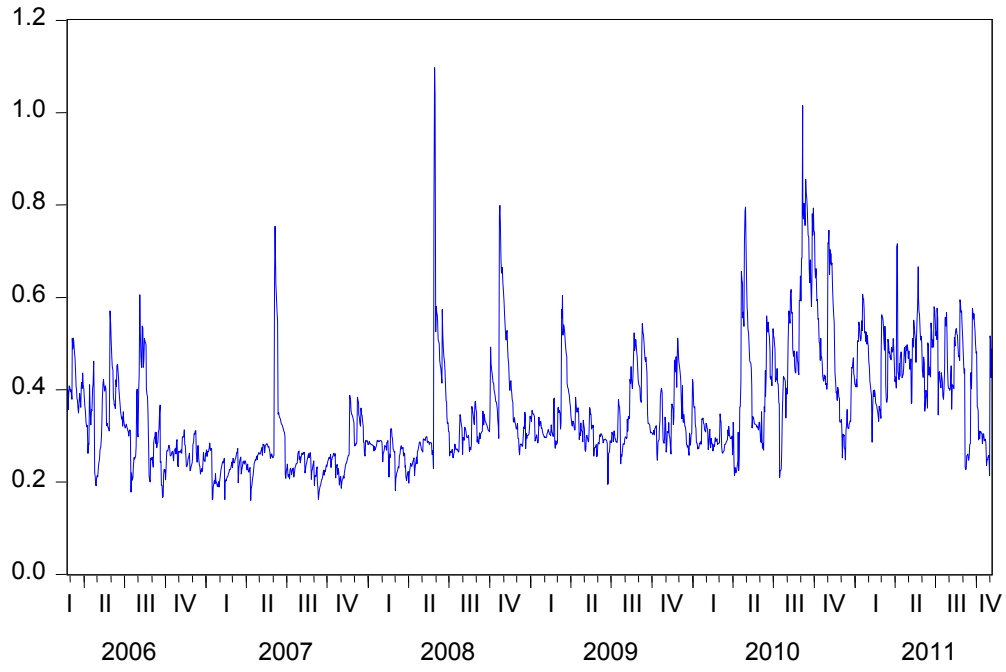



**Fig 5:24 Dynamic Hedge Ratio of Cardamom Futures**

From the above analysis of cardamom futures, it can be concluded that the risk involved in holding positions in cardamom can be minimized if combined with positions in cardamom futures to the extent of 32 to 35 percent of the former. Constant and dynamic hedging effectiveness of cardamom futures are 0.19 and 0.17 respectively. In other words, diversification with cardamom futures can reduce the risk arising from unexpected price variations of cardamom to the extent of a modest 19 percent.

## CONCLUSION

The constant as well as time-varying hedge ratios and hedging effectiveness of the commodities studied are presented in the following table.

**Table 5:21-OHR and Hedging Effectiveness of Rubber, Pepper and Cardamom futures**

| Commodity | Constant | | Time varying | |
|---|---|---|---|---|
| | OHR | Hedging Effectiveness | OHR | Hedging Effectiveness |
| Rubber (sub-period I) | 0.33 | 0.1059 | 0.30 | 0.26 |
| Rubber (sub-period II) | 0.31 | 0.16 | 0.27 | 0.15 |
| Pepper | 0.30 | 0.19 | 0.30 | 0.17 |
| Cardamom | 0.32 | 0.19 | 0.35 | 0.17 |

The optimal hedge ratio, in case of all the three commodities, is around 0.30 which means that the variance of a hedged portfolio shall be the minimum when a position in physical commodity is combined with a position in the futures market to the extent of 30 percent of the former. Further, the time-varying hedge ratios are not substantially different from the constant ratios.

The study highlights that the hedging efficiency of the commodities under study is poor (i.e., only around 17%). It means that by hedging, in these commodities, one shall be able to bring down the risk of an unhedged portfolio only to the extent of 17%.

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# CHAPTER 6

# INVESTOR AWARENESS AND PERCEPTION OF COMMODITY FUTURES IN KERALA

## 6.1 INTRODUCTION

Ever since the revival of organised futures trading in India, in the initial years of the present century, there has been phenomenal growth in the volume of trade as well as number of players in the commodity markets in the country. The newly established national level electronic commodity exchanges have been successful in reaching out to the rural masses with the broking firms setting up their branches and providing terminals in medium and small towns throughout the country. The experience of Kerala has not been different. Commodity futures have fast emerged as an important item in investors' portfolio in the state. This study attempts to evaluate the awareness as well as perception of investors about commodity futures in Kerala. The present chapter deals with the analysis of the primary data collected from the sample of 150 respondents.

This chapter consists of four parts. Part A deals with the profile of the sample studied. Part B deals with the experience of the respondents with the commodity futures. Part C is an attempt to evaluate the investors' awareness of futures market and Part D discusses investors' perception of commodity markets.

## 6.2 PART A: PROFILE OF THE SAMPLE RESPONDENT

Players in the derivative market can be broadly classified into 'hedgers' and 'speculators' with reference to their main trading motive. Though

arbitrage might also be an important trading motive, it has not been stated as the primary motive by any of the respondents surveyed.

One of the objectives of this study is to assess the demographic influence on investing in the futures market. Hence it is imperative to assess the demographic profile of the sample respondents on different aspects such as age, education, occupation, income, place of residence, marital status and size of family. In addition to the profile of the sample as a whole, the study also reports the profile of hedgers and speculators separately.

### 6.2.1 Gender wise Distribution of the sample Respondents

Though Kerala is known for gender equality in several respects, gender wise distribution of the respondents shows that female participation in futures trading is surprisingly low. Out of the 150 respondents, only eight are women. Of the 40 hedgers surveyed, just one is female.

TABLE 6.1
**Distribution of Respondents According to Gender and Trading Motive**

| Gender | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Male | 103 | 93.6 | 39 | 97.5 | 142 | 94.7 |
| Female | 7 | 6.4 | 1 | 2.5 | 8 | 5.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

### 6.2.2 Age wise Distribution of the Sample Respondents

Age wise distribution shows that 32% of the samples are in the age group of 30-40. While the highest number of speculators is in the age group of 30-40 (33.6%), the maximum number of hedgers falls in the age group of 40-50 (37.5%).This can be seen from table 6:2 and Fig. 6.1.

TABLE 6:2

**Distribution of Respondents According to Age and Trading Motive**

| Age (in years) | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Below 30 | 26 | 23.6 | 6 | 15 | 32 | 21.3 |
| 30-40 | 37 | 33.6 | 11 | 27.5 | 48 | 32 |
| 40-50 | 25 | 22.7 | 15 | 37.5 | 40 | 26.7 |
| 50 & above | 22 | 20 | 8 | 20 | 30 | 20 |
| Total | 110 | 100 | 40 | 100 | 150 | 100 |

Source: Survey data

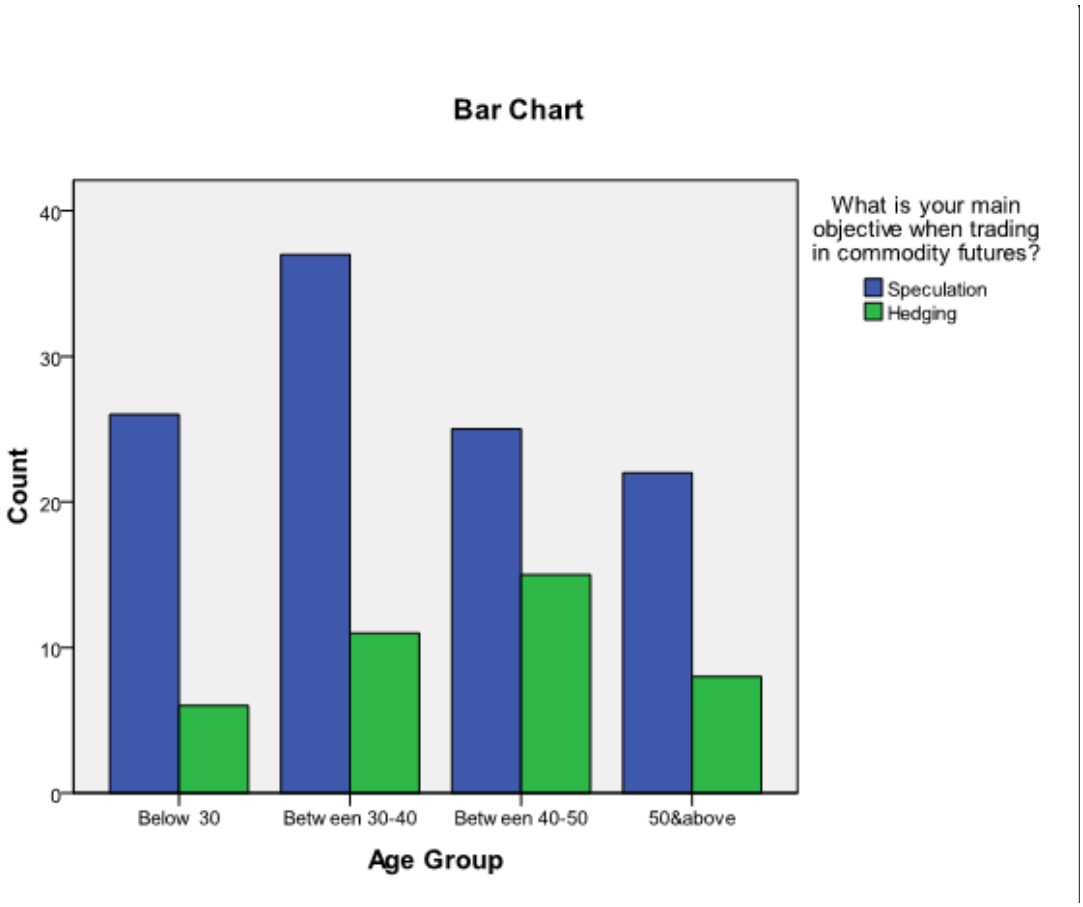


**Fig.6.1- Bar chart showing the age wise distribution of Respondents as Speculators and Hedgers**

### 6.2.3 Education wise Distribution of the sample Respondents

Level of education is an important factor influencing the people in adopting appropriate risk reduction measures because of its technical nature. Hence the data have been classified education – wise and presented in Table 6.3.The table shows that more than 50% of the respondents, irrespective of their trading motive, are graduates. Respondents with SSLC and Plus Two constituted next major trading group in both the categories. Around 10% of the participants are post graduates. While only 4.5 percent of the speculators possess professional qualification, 12.5 percent of the hedgers are professionally qualified.

TABLE 6.3
**Respondents classified according to Education and Trading motive**

| Education | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Below SSLC | 7 | 6.4 | 1 | 2.5 | 8 | 5.3 |
| SSLC/Plus Two | 22 | 20.0 | 9 | 22.5 | 31 | 20.7 |
| Graduation | 62 | 56.4 | 21 | 52.5 | 83 | 55.3 |
| Post Graduation | 12 | 10.9 | 4 | 10.0 | 16 | 10.7 |
| Professional Qualification | 5 | 4.5 | 5 | 12.5 | 10 | 6.7 |
| Others | 2 | 1.8 | 0 | 0.0 | 2 | 1.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

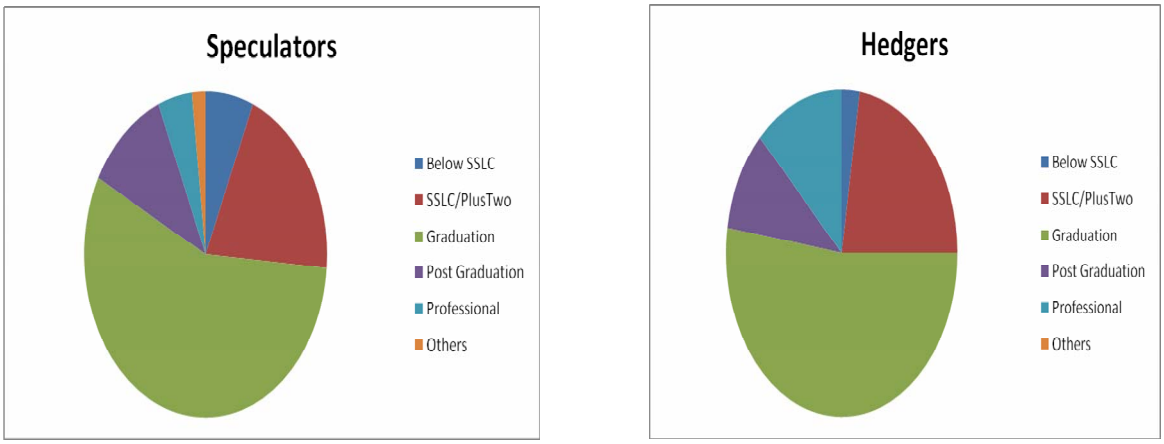


**Fig.6.2: Pie Chart showing the Education wise distribution of speculators and hedgers**

### 6.2.4 Occupation wise Distribution of the sample Respondents

An examination of the occupation – wise distribution of the respondents, presented in Table 6.4, shows that among the players in the commodity market, business class is the highest with 44 percent, followed by private sector employees (19.3%) and agriculturists (14.7%). While 55 percent of the hedgers are from the business group, business people account for only 40 percent of the speculators.

TABLE 6.4
**Occupation wise distribution of the sample**

| Occupation | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Government Employee | 12 | 10.9 | 0 | 0.0 | 12 | 8.0 |
| Pvt. Sector Employee | 23 | 20.9 | 6 | 15.0 | 29 | 19.3 |
| Retired Employee | 7 | 6.4 | 2 | 5.0 | 9 | 6.0 |
| Self-employed | 4 | 3.6 | 3 | 7.5 | 7 | 4.7 |
| Business | 44 | 40.0 | 22 | 55.0 | 66 | 44.0 |
| Agriculture | 16 | 14.5 | 6 | 15.0 | 22 | 14.7 |
| Professional | 2 | 1.8 | 1 | 2.5 | 3 | 2.0 |
| Others | 2 | 1.8 | 0 | 0.0 | 2 | 1.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

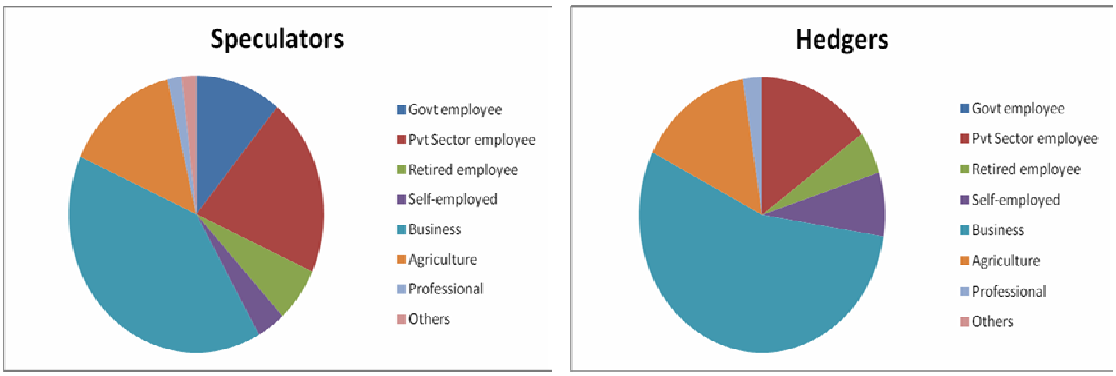


**Fig.6.3 Pie Chart showing occupation wise distribution of speculators and hedgers**

### 6.2.5 Income wise Distribution of the sample Respondents

Income wise distribution (Table 6.5) shows that 60.7 percent of the respondents are having annual income below Rs.4 lakhs, 26 percent have income between Rs. 4 lakh and 10 lakhs, while 13.3 percent fall in the income group of Rs. 10 to 25 lakhs. While the maximum number of speculators (70%) are in the income group of below Rs.4 lakhs, among hedgers those in the category of Rs.4 to 10 lakhs annual income (37.5%) out number other classes.

TABLE 6.5

**Respondents classified according to annual income**

| Annual income (in rupees) | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Below 4,00,000 | 77 | 70.0 | 14 | 35.0 | 91 | 60.7 |
| 4,00,000-10,00,000 | 24 | 21,8 | 15 | 37.5 | 39 | 26.0 |
| 10,00,000-25,00,000 | 9 | 8.2 | 11 | 27.5 | 20 | 13.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

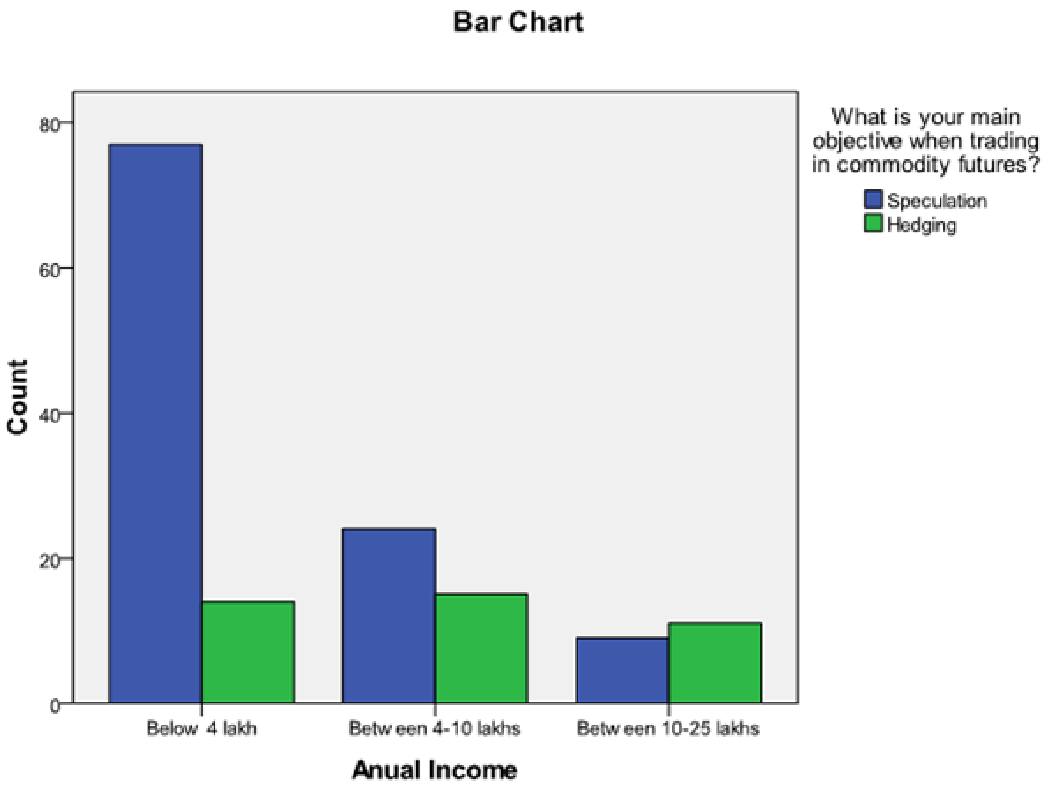


**Fig.64: Bar Chart showing Income wise distribution of respondents**

### 6.2.6 Distribution of Sample Respondents According to place of Residence

Table 6.6 below presents the distribution of respondents according to their place of residence. Those residing in panchayaths account for the highest share (60.7%) followed by those from corporations (25.3%) and municipalities (14%). The pattern is uniform among speculators and hedgers, with the exception that those residing in municipality out number corporation dwellers among the hedgers.

TABLE 6.6

**Domicile wise Distribution of sample Respondents**

| Place of residence | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Corporation | 33 | 30.0 | 5 | 12.5 | 38 | 25.3 |
| Municipality | 15 | 13.6 | 6 | 15.0 | 21 | 14.0 |
| Panchayath | 62 | 56.4 | 29 | 72.5 | 91 | 60.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

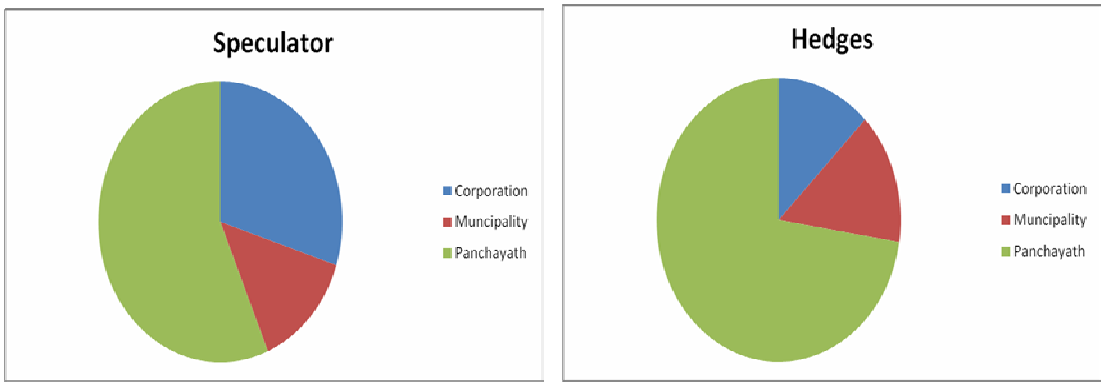


**Fig. 6.5: Pie chart showing speculators and hedgers according to their place of residence**

### 6.2.7 Distribution of Respondents According to Marital Status

As per Table 6.7 more than 80 percent of the sample respondents are married. While 87.5 percent of the hedgers are married, 81.8 percent of the speculators are in the married category.

TABLE 6.7

**Distribution of Respondents According to Marital Status**

| Marital Status | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Married | 90 | 81.8 | 35 | 87.5 | 125 | 83.3 |
| Single | 20 | 18.2 | 5 | 12.5 | 25 | 16.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

### 6.2.8 Distribution of the sample Respondents According to size of Family

Kerala is known for small families. This aspect has been examined among hedgers and speculators and the relevant data are presented in Table 6.8. From the table it can be noted that majority of the sample respondents (70%) belong to medium sized families of three to five members. While 22.5 percent of the hedgers are from large families of six or more members, only 14.5 percent of the speculators belong to large families.

TABLE 6.8

**Distribution of Respondents According to size of family**

| Size of family (No. of persons) | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Less than 3 | 17 | 15.5 | 3 | 7.5 | 20 | 13.3 |
| 3-5 | 77 | 70.0 | 28 | 70.0 | 105 | 70.0 |
| 6 and above | 16 | 14.5 | 9 | 22.5 | 25 | 16.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

## 6.3 PART B: EXPERIENCE OF RESPONDENTS WITH SECURTIES AND COMMODITY FUTURES

### 6.3.1 Investment Pattern of Respondents

The respondents in the study were asked to distribute a total of ten points among eleven broad investment avenues identified in the pilot survey. The results obtained are presented in Table 6.9 below. The table shows that 22.5 percent of the total funds invested by the sample respondents collectively are in commodity futures. The share of corporate securities is 18.1 percent while bank deposits and real estate account for 14.5 percent and 10.5 percent respectively. This is against the general trend in Kerala where 'bank deposit' is the most popular investment avenue.

TABLE 6.9

**Percentage wise Allocation of Respondents' Total Investment among Different items**

| Investment Avenue | Percentage of Total |
|---|---|
| Bank Deposits | 14.5 |
| Real Estate | 10.5 |
| Chit Fund | 5.0 |
| Provident Fund | 1.5 |
| Insurance | 5.8 |
| Post Office SB/RD | 1.1 |
| Bullion/Jewellary | 5.5 |
| Mutual Fund | 4.4 |
| Corporate Securities | 18.1 |
| Financial Derivatives | 2.0 |
| Commodity futures | 22.5 |
| Others | 9.1 |
| Total | 100.0 |

Source: Survey data

### 6.3.2 Risk Tolerance of sample Respondents

Investors differ considerably in their attitude towards risk. By risk tolerance we mean the extent of risk which a particular investor is prepared to assume. As part of the present study we look into the risk tolerance level of speculators and hedgers in the commodity futures market.

Table 6.10 shows the distribution the respondents according to their risk tolerance level. The results of the survey indicate that nearly half of the speculators and 42.5 percent of the hedgers are "moderate risk loving". While "less risk loving" respondents form the second largest group among speculators, "great risk loving" category occupy the second position among hedgers. This relationship between the risk tolerance levels of the two groups are compared and tested with $\chi^2$ test and the result is presented in Table 6.11.

TABLE 6.10

**Distribution of Respondents According to Risk Tolerance**

| Risk Tolerance Level | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Risk Averse | 1o | 9.1 | 1 | 2.5 | 11 | 7.3 |
| Less Risk Loving | 32 | 29.1 | 10 | 25.0 | 42 | 28.0 |
| Moderate Risk Loving | 54 | 49.1 | 17 | 42.5 | 71 | 47.3 |
| Great Risk Loving | 14 | 12.7 | 12 | 30.0 | 26 | 17.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

TABLE 6.11

**Risk Tolerance - Result of Chi-Square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-Square | 7.231 | 3 | 0.065 |
| No. of Valid cases | 150 | | |

Since p (0.065) is greater than the given value of 0.05 at 5% significance level, there is no association between trading motive and the risk tolerance level. In other words, speculators and hedgers do not differ significantly in their attitude towards risk.

### 6.3.3 Experience in Securities

As part of the study we look into the period of respondents' association with investment in securities and the extent of profit earned or loss suffered as a percentage of the funds invested. We also attempt to find out whether speculators and hedgers differ in these respects.

### 6.3.4 Duration of Experience

Period of association with security market investment has a strong influence on the success in security investment. People having more experience in the field are supposed to understand the technicalities and earn better returns and vice-versa.

Table 6.12 furnishes the distribution of respondents according to the duration of their association with security market. While the maximum number of speculators (28.2%) have an experience of one to three years with investing in securities, among hedgers, those with three to five years of experience form the largest group (32.5%). While 9.1 percent of speculators and 7.5 percent of hedgers have never tried their luck in the securities market, speculators and hedgers with more than 10 years of experience in securities account for 13.6 percent and 27.5 percent of the categories respectively.

This relationship between duration of experience in securities market and the trading motive namely hedging and speculation are compared and tested using chi-square test and the result is reported in Table 6.13.

TABLE 6.12

**Distribution of Respondents According to period of experience in security Market**

| Period of Experience (years) | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| No experience | 10 | 9.1 | 3 | 7.5 | 13 | 8.7 |
| Les than 1 year | 7 | 6.4 | 2 | 5.0 | 9 | 6.0 |
| 1 - 3 years | 31 | 28.2 | 4 | 10.0 | 35 | 23.3 |
| 3 - 5 years | 27 | 24.5 | 13 | 32.5 | 40 | 26.7 |
| 5 - 10 years | 20 | 18.2 | 7 | 17.5 | 27 | 18.0 |
| More than 10 years | 15 | 13.6 | 11 | 27.5 | 26 | 17.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

TABLE 6.13

**Period of Experience in securities - Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-Square | 8.289 | 5 | 0.141 |
| No. of Valid cases | 150 | | |

Since p (0.141) is greater than the given value of 0.05 at 5% significance level, the difference is statistically not significant and there is no association between trading motive and the experience of respondents in the securities market.

### 6.3.5 Trading Result in Securities

Though investors might gain or loose from individual investments, the net result of all investments over a period of time shall be either a profit or a loss. Of the 150 respondents whom the researcher interviewed 13 persons

who have never invested in shares did not respond to the question on net trading result. While 58 persons said that they have earned profits from securities, 50 reported that their net trading result was loss. Respondents who have neither gained nor lost from securities numbered 29. Among speculators, 37% have gained whereas 36% have lost. In hedgers' category 42.5% gained whereas 25% lost.

TABLE 6.14

**Distribution of Respondents According to Net Trading Result in securities**

| Net Trading experience in securities | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Profit | 41 | 37.3 | 17 | 42.5 | 58 | 38.7 |
| Loss | 40 | 36.4 | 10 | 25.0 | 50 | 33.3 |
| No profit No loss | 19 | 17.3 | 10 | 25.0 | 29 | 19.3 |
| No Response | 10 | 9.1 | 3 | 7.5 | 13 | 8.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

TABLE 6.15

**Net result of Securities Trading Result of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-Square | 2.335 | 3 | 0.506 |
| No. of Valid cases | 150 | | |

The difference is not statistical since p (0.506) is greater than the given value of 0.05 at 5% significance level. Hence it can be concluded that no significant association exists between the trading motive of the respondents and their over all experience of investing in securities.

### 6.3.6 Extent of Profit from Security Trading:

Every investor wants to have a reasonable rate of returns from the funds that he invests, whether in securities or in any other asset class. In the present study an attempt is made to classify hedgers and speculators according to the average returns from their investments in securities.

The 58 respondents who have earned profits from securities are classified according to the extent of profits in Table 6.16. 34.5 percent earned profits between 5% and 10%, while 32.8 percent claim to have earned between 10 percent and 20 percent. Among hedgers 41.2 percent got profits above 20 percent where as in the case of speculators those who earned profits between 5 percent and 10 percent emerged the largest class (41.5 percent).

TABLE 6.16

**Distribution of Profit making Respondents According to the extent of profits**

| Profit as percentage of investment | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Less than 5% | 3 | 7.3 | 3 | 17.6 | 6 | 10.3 |
| 5% - 10% | 17 | 41.5 | 3 | 17.6 | 20 | 34.5 |
| 10% - 20% | 15 | 36.6 | 4 | 23.5 | 19 | 32.8 |
| 20% & above | 6 | 14.6 | 7 | 41.2 | 13 | 22.4 |
| Total | 41 | 100.0 | 17 | 100.0 | 58 | 100.0 |

Source: Survey data

TABLE 6.17

**Extent of Profit from Security Trading - Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-Square | 7.619 | 3 | 0.055 |
| No. of Valid cases | 150 | | |

The association between trading motive (i.e., speculation or hedging) and the average rate of profit they earn is compared and tested with chi-square test. The result obtained is reported in Table 6.17. As p (0.055) is greater than the given value of 0.05, there is no association between the trading motive and the extent of profits earned from trading in securities.

### 6.3.7 Extent of Loss from Security Trading

As in the case of investors who have gained from securities market, those who sustained losses are also classified and presented according to the extent of loss and the trading motive. Among the respondents who suffered net loss in security trading, about 50 percent had net loss of more than 20 percent. Table 6.18 shows that among the loss makers, 25 percent of the speculators and 30 percent of the hedgers sustained losses between 10 percent and 20 percent.

The association between trading motive and the quantum of loss suffered from securities market is tested using chi-square test and the result is presented in Table 6.19.

TABLE 6.18

**Distribution of Loss-Suffering Respondents according to the extent of loss**

| Loss as percentage of investment | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Less than 5% | 1 | 2.5 | 1 | 10.0 | 2 | 4.0 |
| 5% - 10% | 8 | 20.0 | 1 | 10.0 | 9 | 18.00 |
| 10% - 20% | 10 | 25.0 | 3 | 30.0 | 12 | 26.0 |
| 20% & above | 21 | 52.5 | 5 | 50.0 | 26 | 52.0 |
| Total | 40 | 100.0 | 10 | 100.0 | 50 | 100.0 |

Source: Survey data

TABLE 6.19

**Extent of Loss from Security Trading - Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-Square | 1.656 | 3 | 0.647 |
| No. of Valid cases | 150 | | |

Since p (0.647) is greater than the given value of 0.05 at 5% significance level, speculators and hedgers do not differ significantly in respect of losses they suffer from security trading.

### 6.3.8 Awareness about Commodity Futures

Investors who have better awareness about futures markets and its intricacies are expected to make better returns. Further, hedgers are presumed to have better knowledge of the technicalities of derivative trading than the speculators who are mostly noise traders.

Table 6.20 depicts the classification of respondents according to the level of their awareness on commodity futures. While 36.6 percent claim to be fairly aware, 30.7 percent feel that they have moderate awareness about the concept. While only 13.6 percent of the speculators claim to be thoroughly aware of commodity futures, 37.5 percent of the hedgers are confident of being thoroughly informed. 17.3 percent of the speculators admitted that they have only slight awareness of the topic while more of the hedgers fall in that category.

TABLE 6.20

**Distribution of Respondents According to Awareness about Commodity futures**

| Awareness Level | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Slightly aware | 19 | 17.3 | 0 | 0.0 | 19 | 12.7 |
| Moderately aware | 35 | 31.8 | 11 | 27.5 | 46 | 30.7 |
| Fairly aware | 41 | 37.3 | 14 | 35.0 | 55 | 36.6 |
| Thoroughly aware | 15 | 13.6 | 15 | 37.5 | 30 | 20.0 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

TABLE 6.21

**Awareness on Commodity Futures - Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-Square | 15.481 | 3 | 0.001 |
| No. of Valid cases | 150 | | |

The association between awareness level of speculators and hedgers is compared and tested with chi-square test and the results are reported in Table 6.21. As the p (0.001) is less than the given value of 0.05 at 5% significance

level, it is concluded that speculators and hedgers differ significantly in respect of their awareness on commodity futures.

### 6.3.9 Source of Information

The distribution of respondents according to the source of information on futures is furnished in Table 6.22. The table shows that brokers and financial advisors are the most important sources of information both for speculators and hedgers. While friends and family introduced 20 percent of the respondents to the world of commodity futures, media was the source of information for 11.3 percent of the sample.

TABLE 6.22
**Distribution of Sample Respondents According to source of information**

| Source of Information | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Friends/Family | 23 | 20.9 | 7 | 17.5 | 30 | 20.0 |
| Brokers/Financial Advisors | 65 | 59.1 | 27 | 67.5 | 92 | 61.3 |
| Media | 15 | 13.6 | 2 | 5.0 | 17 | 11.3 |
| Self research | 6 | 5.5 | 4 | 10.0 | 10 | 6.7 |
| Others | 1 | 0.9 | 0 | 0.0 | 1 | 0.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

### 6.3.10 Pattern of Investment in Commodity Groups

By 'pattern of investment' in the context of futures trading, we refer to the relative share of different commodity groups in a trader's portfolio. Table 6.23 furnishes the percentage breakup of the total investments of speculators as well as hedgers in different commodity groups namely precious metals, other metals, energy, agricultural commodities. In aggregate 36.6% is invested in agricultural product and 31% is invested in precious metals. Other

metals and energy sectors account for 18.6% and 13.3% respectively. But speculator and hedger wise analysis shows marked difference in this respect. Hedgers mostly prefer agricultural commodities (61.5%) whereas speculators prefer precious metals first (36%) followed by agricultural commodities with approximately 25%.

TABLE 6.23

**Pattern of Mean Percentage of Investment of Speculators and Hedgers among Commodity groups (Figures are percentages)**

| Commodity group | Speculators | Hedgers | Total |
|---|---|---|---|
| Precious metals | 36.3 | 16.5 | 31.0 |
| Other metals | 20.9 | 12.2 | 18.6 |
| Energy | 14.5 | 9.8 | 13.3 |
| Agri-Commodities | 27.8 | 61.5 | 36.8 |
| Others | 0.5 | 0.0 | 0.3 |
| Total | 100.0 | 100.0 | 100.0 |

Source: Survey data

TABLE 6.24

**Pattern of Investment in Commodity Groups - Results of t-test**

| Variable | DF | t-value | p-value |
|---|---|---|---|
| Precious metals | 148 | 3.383 | 0.001 |
| Other metals | 148 | 1.669 | 0.091 |
| Energy | 148 | 1.155 | 0.250 |
| Agricultural commodities | 148 | -4.804 | 0.000 |
| Others | 148 | 1.011 | 0.314 |

The relationship between the trading motive and the pattern of investment in commodities is tested using t-test. The results obtained are presented in Table 6.24. The results of the analysis reveal that in the case of precious metals and agricultural commodities p-values are less than 0.05 and

hence it can be inferred that there is significant difference between speculators and hedgers in respect of investment in these commodity groups. But as the p-values are more than 0.05, there is no significant difference between speculators and hedgers in their investment pattern in 'other metals', 'energy' and 'other commodities'.

## 6.4 PART C: AWARENESS OF DERIVATIVE PRODUCTS AND THEIR TRADING MECHANISM

History has innumerable examples for people enthusiastically embracing new innovations as they are introduced. As in the case of every other financial innovation the success of commodity derivatives depends on the extent of public awareness of the product of the futures market is to attain maturity, it is thoroughly informed of the concept of commodity derivatives and its trading mechanism. As part of the present study an attempt is made to verify whether there is significant difference in the level of awareness on commodity futures between speculators ad hedgers. As stated in Chapter one, the awareness level is measured using a tool which we have developed. The tool comprises of eight variables of equal weightage which relate to the different aspects of futures trading.

The respondents' awareness is measured on a five point Likert Scale which consists of responses namely 'Not at all aware (1)', 'Slightly aware (2)', 'Moderately aware (3)', 'Fairly aware (4)' and 'Thoroughly aware (5)'. The data obtained on ordinal scale is converted into ratio scale and the score obtained is taken to be the mid point of the class concerned. Thus '1' is the midpoint of the class '0.5-1.49', '2' the midpoint of the class 1.5-2.49 and so on.

### 6.4.1 Trading Platform

By trading platform we refer to the different commodity exchanges which facilitate trading in derivative contracts. Since the exchanges differ in their trading practices and margin requirements and contract specifications, a fair understanding of the exchanges is crucial in the selection of the right platform. In the present study the awareness on trading platforms is verified with reference to the respondent's familiarity with different exchanges namely MCX, NCDEX and NMCE.

Table 6.25 shows the awareness of informants on trading platform. Since no empirically tested standard is available to interpret the mean value, the mean score is compared with '3', the central value which is the score for moderate awareness. The mean value of hedgers' awareness on commodity exchanges is 4.03 while that of speculators is 3.53. The aggregate mean awareness score is 3.66 with a standard deviation of 1.073.

**Table 6.25: Awareness Level of Respondents on Trading Platforms**

| | Mean | SD |
|---|---|---|
| Speculators | 3.53 | 1.047 |
| Hedgers | 4.03 | 1.074 |
| Aggregate sample | 3.66 | 1.073 |

The difference in the awareness level between speculators and hedgers is statistically significant as the calculated p value of 0.014 is less than the given value of 0.05 at 5% significance level. This can be noticed from Table 6.26.

**Table 6.26 : Results of T-test – Awareness on Trading Platform**

| Variable | t-value | DF | P-value |
|---|---|---|---|
| Level of awareness with regard to the MCX, NCDEX and NMCE | -2.527 | 148 | 0.014 |

### 6.4.2 Margin Requirements

'Margin' refers to the amount which a trader has to deposit with the commodity exchange for holding a position in the futures contracts. Thus the position a trader can held for a given amount of money would vary according to the margin requirements of a particular commodity exchange.

Respondents' knowledge on the margin requirements for futures trading has been studied with reference to their awareness of initial margin requirements. Table 6.27 depicts the level of awareness of the respondents on initial margin requirements. The mean score for speculators is 3.64 and for hedgers 3.95. It means that both speculators and hedgers are fairly aware of the margin requirements of futures trading. The aggregate mean score is 3.72 with a standard deviation of 1.088.

**Table 6.27 : Awareness Level of Respondents on Margin Requirements**

| | Mean | SD |
|---|---|---|
| Speculators | 3.64 | 1.098 |
| Hedgers | 3.95 | 1.037 |
| Aggregate sample | 3.72 | 1.088 |

The difference in the awareness on margin requirements between speculators and hedgers is statistically not significant as the calculated p value

of 0.111 is greater than the given value of 0.05 at 5% significance level. This can be noticed from Table 6.28.

**Table 6.28 : Results of T-test – Awareness on Margin Requirements**

| Variable | t-value | DF | P-value |
|---|---|---|---|
| Level of awareness with regard to the initial margin | -1.613 | 148 | 0.111 |

### 6.4.3 Market Regulator

The commodity derivative market in India is regulated by the Forward Market Commission (FMC). Familiarity with the FMC is taken as one of the indicators of respondent's awareness of Futures market. This aspect has been studied in this part and the relevant data are presented in Table 6.29. From the table it can be observed that the aggregate awareness level is moderate (mean value is 3.01). Category wise, hedgers (mean 3.5) have greater awareness than speculators (mean 2.83) in this respect.

**Table 6.29 : Awareness Level of Respondents on Forward Market Commission**

| | Mean | SD |
|---|---|---|
| Speculators | 2.83 | 1.233 |
| Hedgers | 3.50 | 1.155 |
| Aggregate sample | 3.01 | 1.245 |

The difference in the level of awareness on market regulator is statistically significant as the calculated p value of 0.003 is less than the standard value of 0.05 at 5% level of significance. This can be noticed from Table 6.30.

**Table 6.30 : Results of T-test – Awareness on Forward Market Regulator**

| Variable | t-value | DF | p-value |
|---|---|---|---|
| Level of awareness with regard to the Forward Market Commission | -3.098 | 148 | 0.003 |

### 6.4.4 Settlement Procedure

In futures trading, price variations are accounted for and settlements are made on a daily basis by a procedure called marking-to-market. Knowledge about mark-to-market is fundamental to the awareness on futures trading mechanism. Table 6.31 presents the level of awareness of the sample respondents on marking-to-market. The aggregate mean awareness score is 3.42 with a standard deviation of 1.166. While speculators (mean 3.31) are only moderately aware of the settlement procedure, hedgers (mean 3.73) are fairly aware of the concept.

**Table 6.31 : Awareness Level of Respondents on Mark-to-Market**

| | Mean | SD |
|---|---|---|
| Speculators | 3.31 | 1.179 |
| Hedgers | 3.73 | 1.086 |
| Aggregate sample | 3.42 | 1.166 |

The difference in the awareness level on mark-to-market between speculators and hedgers is tested with t-test and the result is reported in Table 6.32. Since the calculated p-value of 0.046 is less than the given value of 0.05 at 5% significance level, the difference in the level of awareness in this respect is statistically significant.

**Table 6.32 : Results of T-test – Awareness on Settlement Procedure**

| Variable | t-value | DF | p-value |
|---|---|---|---|
| Level of awareness with regard to marking-to-market | -2.027 | 148 | 0.046 |

### 6.4.5 Spot-Future Price Relationship

Familiarity with concepts such as 'backwardation' and 'contango' has been taken as an indicator of the awareness on the inter-relationship between spot and futures prices. The level of awareness on the concepts of backwardation and contango in respect of speculators, hedgers and the sample as a whole is furnished in Table 6.33. The aggregate mean awareness score is only 1.80 with a standard deviation of 1.141. The awareness of both speculators (mean 1.72) and hedgers (mean 2.03) on the spot-future price relationship is relatively low.

**Table 6.33 : Awareness Level on Backwardation and Contango**

| | Mean | SD |
|---|---|---|
| Speculators | 1.72 | 1.09 |
| Hedgers | 2.03 | 1.330 |
| Aggregate sample | 1.80 | 1.141 |

The difference in the awareness level of speculators and hedgers in respect of spot-future price relationship is tested using t-test. Since the calculated p value (0.194) is more than the given value of 0.05 at 5% significance level, the difference in awareness in this respect between speculators and hedgers is statistically not significant. This can be noticed from Table 6.34.

**Table 6.34 : Results of T-test – Awareness on Backwardation and Contango**

| Variable | t-value | DF | p-value |
|---|---|---|---|
| Level of awareness with regard to backwardation / contango | -1.315 | 148 | 0.194 |

### 6.4.6 Hedging Function of Futures

Hedging against price risk is one of the primary functions of commodity futures. The understanding of respondents on this function of futures contracts is studied by measuring their awareness of the concept of 'hedge ratio'. Table 6.35 shows that the aggregate sample's mean awareness score is 1.96 with a standard deviation of 1.203. The awareness of the respondents, irrespective of their trading motive, is quite moderate, the mean scores for speculators and hedgers being 1.92 and 2.10 respectively.

**Table 6.35 : Awareness Level on Hedge Ratio**

| | Mean | SD |
|---|---|---|
| Speculators | 1.91 | 1.177 |
| Hedgers | 2.10 | 1.374 |
| Aggregate sample | 1.96 | 1.203 |

The difference in the awareness level of speculators and hedgers is tested using t-test and the result is reported in Table 6.36. Since the p value of 0.438 is greater than the given value of 0.05 at 5% level of significance it is concluded that speculators and hedgers do not differ significantly in respect ot their awareness on the hedging function of futures.

**Table 6.36 : Results of T-test – Awareness on Hedging Function of Futures**

| Variable | t-value | DF | p-value |
|---|---|---|---|
| Level of awareness with regard to hedge ratio | -0.781 | 148 | 0.438 |

### 6.4.7 Price Integration

Basis refers to the difference between the spot price and current price of the futures contracts of a commodity. Spot and futures prices are expected to converge as the futures contract approaches the maturity. The awareness about this price integration is measured with reference to the respondents' familiarity with the concept of 'basis'. The mean score of awareness of the entire sample is 2.05 with a standard deviation of 1.312, while that of speculators and hedgers are 1.93 and 2.38 respectively.

**Table 6.37 : Awareness Level of Respondents on 'Basis'**

| | Mean | SD |
|---|---|---|
| Speculators | 1.93 | 1.232 |
| Hedgers | 2.38 | 1.480 |
| Aggregate sample | 2.05 | 1.312 |

The p-value of 0.064 is greater than the given value of 0.05 at 5% significance level. Hence it can be concluded that speculators and hedgers do not differ significantly in their understanding of the concept of 'basis'. The results of t-test conducted are reported in Table 6.38.

**Table 6.38 : Results of T-test – Awareness with regard to 'Basis'**

| Variable | t-value | DF | p-value |
|---|---|---|---|
| Level of awareness with regard to 'Basis' | -1.863 | 148 | 0.064 |

### 6.4.8 Derivative Products

Every futures contract has an underlying commodity of a definite specification in respect of quality and quantity which is called the base commodity. The awareness of the underlying commodity is also examined in the present study. Table 6.39 shows that speculators with a mean score of 2.82 have only moderate awareness of the concept while hedgers with a mean score of 3.63 are fairly aware of the base commodities underlying futures contracts. The aggregate average mean score is 3.03 with a standard deviation of 1.387.

**Table 6.39 : Awareness Level of Respondents on Base Commodity**

| | Mean | SD |
|---|---|---|
| Speculators | 2.82 | 1.389 |
| Hedgers | 3.63 | 1.213 |
| Aggregate sample | 3.03 | 1.387 |

The difference in the awareness level in Base commodity between speculators and hedgers is statistically significant as the p-value of 0.001 is less than the given value of 0.05 at 5% level of significance. This can be noticed from Table 6.40.

**Table 6.40 : Results of T-Test – Awareness on Base Commodity**

| Variable | t-value | DF | p-value |
|---|---|---|---|
| Level of awareness with regard to Base Commodity | -3.462 | 148 | 0.001 |

### 6.4.9 Overall Awareness on Commodity Futures

In addition to the awareness on individual facets of futures the overall awareness has also been tested. Table 6.41 below presents the overall score for the awareness on commodity future, which is the average of the eight components discussed earlier. The overall awareness score for the aggregate sample is 2.8313 with a standard deviation of 0.8632. The mean score for speculators is 2.7091 and for hedgers 3.1656.

**Table 6.41 : Overall Awareness on Commodity Futures**

| | Mean | SD |
|---|---|---|
| Speculators | 2.7091 | 0.8685 |
| Hedgers | 3.1656 | 0.8485 |
| Aggregate sample | 2.8313 | 0.8632 |

The difference in the overall awareness on commodity futures between speculators and hedgers is statistically significant as the p-value of 0.005 is less than the given value of 0.05 at 5% level of significance. Thus it can be concluded that speculators and hedgers differ in their level of understanding on commodity futures and its trading mechanism.

## 6.5 PART D: INVESTORS' PERCEPTION OF COMMODITY MARKET

Any investment avenue is evaluated in terms of its return, risk, liquidity and safety. Commodity futures are no exception. Speculators and hedgers, the two major classes of players in the derivative market have their own norms of return and risk. They also might differ in terms of their liquidity requirements and the importance they attach to the safety of their funds. The present study attempts to verify whether hedgers and speculators differ in their perception of commodity futures as an investment option.

Investors' perception has been studied on the basis of their responses to certain statements pertaining to return, risk, liquidity and safety of futures. The responses to these statements have been obtained on a five point Likert scale ranging from "strong disagreement' to "strong agreement" with the neutral point at the centre. The results of Chi-square tests of independence on these statements are also furnished below.

### 6.5.1 RETURN

Investors' perception about the return from futures is studied with reference to their responses to three statements.

**Statement 1:** Investment in Commodity futures fetches better return than investment in financial securities.

TABLE 6.42

**Response to Statement –I on 'Return'**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Strongly disagree | 21 | 19.1 | 4 | 10.0 | 25 | 16.7 |
| Disagree | 16 | 14.5 | 5 | 12.5 | 21 | 14.0 |
| Neither agree nor disagree | 9 | 8.2 | 10 | 25.0 | 19 | 12.7 |
| Agree | 48 | 43.6 | 8 | 20.0 | 56 | 37.3 |
| Strongly agree | 16 | 14.5 | 13 | 32.5 | 29 | 19.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

Table 6:42 shows that while 58.1 percent of the speculators and 52.5 percent of the hedgers consider futures capable of fetching better returns than financial assets, only 33.6 percent of the speculators and 27.5 percent of the hedgers expressed their disagreement to the statement.

Since p (0.002) is less than the given value of 0.005 at 5% significance level, the null hypothesis is rejected and it is concluded that speculators and hedgers differ significantly on their perception of statement - I on return. The results of Chi – square tests are reported in Table 6:43.

TABLE 6. 43

**Return 1 -Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 17.373 | 4 | 0.002 |
| Number of valid cases | 150 | | |

**Statement 2:** Since we can hold a position in commodity futures by depositing margins alone, the return from the amount invested will be comparatively high.

TABLE 6.44

**Response to Statement II on Return**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 7 | 6.4 | 2 | 5.0 | 9 | 6.0 |
| Disagree | 17 | 15.5 | 0 | 0.0 | 17 | 11.3 |
| Neither agree nor disagree | 9 | 8.2 | 6 | 15.0 | 15 | 10.0 |
| Agree | 44 | 40.0 | 14 | 35.0 | 58 | 38.7 |
| Strongly agree | 33 | 30.0 | 18 | 45.0 | 51 | 34.0 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

As shown in Table 6:44, about three- fourth of the respondents believe that the facility for holding positions in the futures contracts by depositing margins alone provide increased leverage to investments in commodity. The results of Chi – square tests of independence are reported in Table 6:45.

TABLE 6. 45

**Perception of Return (2)-Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 9.767 | 4 | 0.045 |
| Number of valid Cases | 150 | | |

Since p (0.045) is less than the given value of 0.05, it is concluded that the difference in perception of this statement is statistically significant.

**Statement 3:** The portfolio can be made more efficient (i.e. more return for same risk or less risk for same return) by including commodity futures in the portfolio.

The investors' perception with regard to the capability of commodity futures to make one's portfolio more efficient has also been studied. Responses reported in Table 6:46 show that while 45.5 percent of the speculators and 62.5 percent of the hedgers expressed their agreement to the proposed statement, 38.2 percent of speculators and 20 percent of hedgers had a different opinion. 16.7 percent of the respondents were neutral in their response to the statement.

TABLE 6.46

**Response to Statement III on Return**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 11 | 10.0 | 2 | 5.0 | 13 | 8.7 |
| Disagree | 31 | 28.2 | 6 | 15.0 | 37 | 24.7 |
| Neither agree nor disagree | 18 | 16.4 | 7 | 17.5 | 25 | 16.7 |
| Agree | 39 | 35.5 | 19 | 47.5 | 58 | 38.7 |
| Strongly agree | 11 | 10.0 | 6 | 15.0 | 17 | 11.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

The results obtained from Chi – square tests are reported in Table 6:47.

TABLE 6. 47

**Perception of Return (3)-Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 4.683 | 4 | 0.321 |
| Number of valid cases | 150 | | |

Since p (0.321) is greater than the given value at 0.05 at 5% significance level, the null hypothesis is accepted and hedgers and speculators do not differ significantly on their perception of the statement.

**Conclusion:** Analysis of the responses on 'return' shows that investors regard commodity futures as capable of fetching better returns than financial securities and believe that portfolio can be made efficient by diversifying into commodity futures also.

### 6.5.2 RISK

**Statement (1):** "The Option of delivery of Goods' is effective in dissuading the participants from artificially rigging up or depressing the future's prices.

TABLE 6.48

**Response to Statement I on Risk**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 25 | 22.7 | 8 | 20.0 | 33 | 22.0 |
| Disagree | 30 | 27.3 | 15 | 37.5 | 45 | 30.0 |
| Neither agree nor disagree | 24 | 21.8 | 7 | 17.5 | 31 | 20.6 |
| Agree | 26 | 23.6 | 5 | 12.5 | 31 | 20.7 |
| Strongly agree | 5 | 4.5 | 5 | 12.5 | 10 | 6.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

Table 6:48 shows that only 27.4 percent of the respondents believed that the option to make / take delivery of base commodity is effective in preventing manipulations in futures' prices. While 52 percent disagreed to the statement, another 20.6 percent remained neutral in their response.

TABLE 6. 49

**Perception of Risk (1)-Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 5.931 | 4 | 0.204 |
| Number of valid cases | 150 | | |

Since p (0.204) is greater than the given value of 0.05, the null hypothesis is accepted and there is no significant difference between speculators and hedgers on their perception of statement I on risk.

**Statement (2):** Limits imposed on the open position held by speculators curb over-speculation and reduces the chances for 'scams' in Commodity futures market.

TABLE 6.50

**Response to Statement II on Risk**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 13 | 11.8 | 4 | 10.0 | 17 | 11. 3 |
| Disagree | 19 | 17.3 | 13 | 32.5 | 32 | 21.3 |
| Neither agree nor disagree | 31 | 28.2 | 8 | 20.0 | 39 | 26.0 |
| Agree | 34 | 30.9 | 11 | 27.5 | 45 | 30.0 |
| Strongly agree | 13 | 11.8 | 4 | 10.0 | 17 | 11.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

The response to the question 'whether the practice of imposing limits on positions held by speculators is effective in curbing over speculation' has been mixed. While 41.3 percent of the total believed that it is effective, 32.6 percent were of a different opinion.

TABLE 6. 51

**Perception of Risk (2)-Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 4.288 | 4 | 0.376 |
| Number of valid cases | 150 | | |

Since p (0.376) is greater than 0.05 the null hypothesis is accepted and there is no significant difference in the perception of speculators and hedgers in this respect.

**Conclusion:** Analysis of the perception on the 'risk' of commodity futures shows that investors do not consider the measures available for protecting their interest sufficiently effective.

### 6.5.3 LIQUIDTY

**Statement (1):** The Indian commodity futures market has attained sufficient depth so as to ensure high liquidity to futures contracts.

As shown in Table 6:52, nearly 65 percent of speculators and 50 percent of hedgers feel that Indian commodity market has attained sufficient depth as to ensure high liquidity. While 42.5 percent of the hedgers and 23.7 percent of the speculators consider that the Indian market is yet to attain the required depth, 10.7 percent of the total respondents were without a clear opinion.

TABLE 6.52

**Response to Statement I on Liquidity**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 7 | 6.4 | 5 | 12.5 | 12 | 8.0 |
| Disagree | 19 | 17.3 | 12 | 30.0 | 31 | 20.7 |
| Neither agree nor disagree | 13 | 11.8 | 3 | 7.5 | 16 | 10.7 |
| Agree | 52 | 47.3 | 14 | 35.0 | 66 | 44.0 |
| Strongly agree | 19 | 17.3 | 6 | 15.0 | 25 | 16.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

TABLE 6. 53

**Perception of Liquidity (1) -Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 5.288 | 4 | 0.259 |
| Number of valid cases | 150 | | |

Since p (0.259) is greater than the given value of 0.05 at 5% significance level, the null hypothesis is accepted and it is concluded that speculators and hedgers do not differ significantly in this respect.

**Statement (2):** Government interventions with ban and restrictions have not affected the liquidity of the agricultural commodity futures contracts.

As seen from Table 6:54 below, 51.3 percent of the respondents believe that frequent government interventions with ban and restrictions have adversely affected the liquidity of the Indian commodity futures market. Only

27.3 percent respondents feel that Government interventions had no such impact on liquidity.

TABLE 6.54

**Response to Statement II on Liquidity**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 26 | 23.6 | 9 | 22.5 | 35 | 23.3 |
| Disagree | 31 | 28.2 | 11 | 27.5 | 42 | 28.0 |
| Neither agree nor disagree | 23 | 20.9 | 9 | 22.5 | 32 | 21.3 |
| Agree | 17 | 15.5 | 7 | 17.5 | 24 | 16.0 |
| Strongly agree | 13 | 11.8 | 4 | 10.0 | 17 | 11.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

TABLE 6. 55

**Perception of Liquidity (2) -Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 0.218 | 4 | 0.994 |
| Number of valid cases | 150 | | |

Since p (0.994) is greater than the given value of 0.05, the null hypothesis is accepted and there is no significant difference between speculators and hedgers in respect of their perception of this statement on liquidity.

**Conclusion:** While players in futures contracts believe that the Indian commodity futures market has attained sufficient depth as to ensure high liquidity, they have apprehensions about frequent Government interventions with ban and restrictions.

### 6.5.4 SAFETY

**Statement (1):** The operations of Commodity exchanges in India are transparent.

TABLE 6.56

**Response to Statement I on Safety**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 20 | 18.2 | 7 | 17.5 | 27 | 18.0 |
| Disagree | 18 | 16.4 | 14 | 35.0 | 32 | 21.3 |
| Neither agree nor disagree | 13 | 11.8 | 5 | 12.5 | 18 | 12.0 |
| Agree | 40 | 36.4 | 8 | 20.0 | 48 | 32.0 |
| Strongly agree | 19 | 17.3 | 6 | 15.0 | 25 | 16.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

While 38.7 percent of the respondents consider the operations of Indian commodity exchanges reasonably transparent, 39.3 percent did not agree to that.

TABLE 6. 57

**Perception of Safety (1) -Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 7.340 | 4 | 0.119 |
| Number of valid cases | 150 | | |

As p (0.119) is greater than the given value of 0.05 at 5% significance level, it is concluded that speculators and hedgers do not differ on their perception of statement (1) on safety.

**Statement (2): "**The FMC's surveillance over the exchanges is effective and the interests of the clients are well protected".

Investors' perception on the safety of futures market was also studied with reference to the effectiveness of FMC's surveillance on exchanges. The results obtained are reported in table 6:58. While among speculators the number of those agreeing (44) and disagreeing (45) to the proposed statement are almost equal, in case of hedgers there is more disagreement (33) than agreement (13).

TABLE 6.58

**Response to Statement II on safety**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 19 | 17.3 | 12 | 30.0 | 31 | 20.7 |
| Disagree | 26 | 23.6 | 11 | 27.5 | 37 | 24.7 |
| Neither agree nor disagree | 21 | 19.1 | 4 | 10.0 | 25 | 16.7 |
| Agree | 30 | 27.3 | 8 | 20.0 | 38 | 25.3 |
| Strongly agree | 14 | 12.7 | 5 | 12.5 | 19 | 12.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

TABLE 6. 59

**Perception of Safety (2) -Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 4.545 | 4 | 0.337 |
| Number of valid cases | 150 | | |

Here p value (0.337) is greater than 0.05. Hence it is concluded that the difference in the perception of speculators and hedgers on the above statement on the safety of futures contracts is statistically not significant.

**Conclusion:** Investors' responses to questions on safety indicate that players in the market consider the operations of commodity exchanges to be rather transparent. But they do not consider the FMC effective in safeguarding the interests of the stake holders.

### 6.5.5 Miscellaneous Issues Relating to Futures

**Statement (1):** "Introduction of agricultural commodity futures has reduced the price volatility of base commodities".

TABLE 6.60

**Response to the Role of Futures on Price Volatility**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 39 | 35.5 | 26 | 65.0 | 65 | 43.3 |
| Disagree | 24 | 21.8 | 9 | 22.5 | 33 | 22.0 |
| Neither agree nor disagree | 20 | 18.2 | 3 | 7.5 | 23 | 15.3 |
| Agree | 22 | 20.0 | 2 | 5.0 | 24 | 16.0 |
| Strongly agree | 5 | 4.5 | 0 | 0.0 | 5 | 3.4 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

Table 6:60 above shows investors' perception of the role of commodity futures in reducing price volatility of base commodities. While 65.3 percent of respondents expressed their disagreement to the statement that commodity futures reduce price volatility, a meager 19.3 percent supported the same.

TABLE 6. 61

**Perception of the Role of Futures on Price Volatility - Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 14.041 | 4 | 0.007 |
| Number of valid cases | 150 | | |

Since p (0.007) is less than the given value of 0.05, the null hypothesis is rejected. Thus speculators and hedgers differ significantly in their perception on the role of futures trading in reducing the price volatility of underlying commodities.

**Statement (2):** Commodity futures are useful in hedging against the loss from undesirable price fluctuations.

TABLE 6.62

**Response to the Hedging Efficiency of Commodity Futures**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 5 | 4.5 | 0 | 0.0 | 5 | 3.3 |
| Disagree | 13 | 11.8 | 1 | 2.5 | 14 | 9.3 |
| Neither agree nor disagree | 17 | 15.5 | 4 | 10.0 | 21 | 14.0 |
| Agree | 50 | 45.5 | 8 | 20.0 | 58 | 38.7 |
| Strongly agree | 25 | 22.7 | 27 | 67.5 | 52 | 34.7 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

Both speculators and hedgers consider commodity futures as effective in hedging against undesirable price fluctuations. But while 67.5 percent

hedgers strongly agree to the hedging role only 22.7 percent speculators express strong agreement.

TABLE 6. 63

**Perception on Miscellaneous Issues (2)-Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 27.048 | 4 | 0.000 |
| Number of valid cases | 150 | | |

Since p (0.000) is les than the given value of 0.05, the null hypothesis is rejected and it is concluded that speculators and hedgers differ in their perception regarding the role of commodity futures in hedging.

**Statement (3):** "Commodity futures trading has not led to speculation in commodity prices".

TABLE 6.64

**Response to 'Futures Causing Speculation'**

| Response | Speculators | | Hedgers | | Total | |
|---|---|---|---|---|---|---|
| | No | % | No | % | No | % |
| Strongly disagree | 35 | 31.8 | 19 | 47.5 | 54 | 36.0 |
| Disagree | 28 | 25.5 | 10 | 25.0 | 38 | 25.3 |
| Neither agree nor disagree | 18 | 16.4 | 6 | 15.0 | 24 | 16.0 |
| Agree | 20 | 18.2 | 3 | 7.5 | 23 | 15.3 |
| Strongly agree | 9 | 8.2 | 2 | 5.0 | 11 | 7.3 |
| Total | 110 | 100.0 | 40 | 100.0 | 150 | 100.0 |

Source: Survey data

Neither speculators nor hedgers agree to the statement that futures trading has not led to speculation in commodity prices. While 57.3 percent of the speculators and 72.5 percent of the hedgers believe that futures trading has been responsible for increased speculation in commodity prices, only 22.6 percent of the total respondents preferred to believe the other way.

TABLE 6.65

**Perception of Miscellaneous Issues-Results of Chi-square Test of Independence**

| | Value | DF | p-value |
|---|---|---|---|
| Pearson Chi-square | 4.628 | 4 | 0.328 |
| Number of valid cases | 150 | | |

As p value (0.328) is greater than the given value of 0.05, the Ho is accepted and it is concluded that there is no significant difference in the perception of hedgers and speculators, on the role of commodity futures in restricting speculation in commodity prices.

## CONCLUSION

The analysis of the primary data collected from 150 respondents show that speculators and hedgers in the commodity futures market do not differ significantly in their profile or experience with securities and derivatives. But the two categories of market players seem to differ in their preference of commodity group for investment.

Of the eight different aspects of futures trading, on which the respondents' awareness was measured, speculators and hedgers seem to differ in their level of awareness on five aspects. The two groups also appear to be

reasonably informed of the concept and mechanism of futures trading. The overall awareness score of the entire sample is 2.8313 against a maximum score of five and that of speculators and hedgers are 2.7091 and 3.1656 respectively. The study of investors' perception shows that except for certain issues relating to the return from futures trading, there is no substantial difference in the perception of the two groups on other aspects such as risk, liquidity and safety.

# CHAPTER 7

# SUMMARY, FINDINGS, CONCLUSION AND SUGGESTIONS

## 7.1 SUMMARY

Agriculture is a critical sector of the Indian economy. Two-thirds of the rural population is either self-employed in agriculture or are agricultural labourers. Agricultural sector is estimated to have contributed 13.7% of India's GDP in 2012 – 13. Farmers face multiple risks - yield, price, input, technology and credit. The most tragic face of India's agrarian crisis can be seen in the increasing number of farmer suicides. Agricultural commodity prices in India are primarily determined by domestic demand and supply factors influenced by domestic price policy. Government used to interfere at every stage of agricultural marketing in India. Thus, Minimum Support Prices (MSP) and regulated markets set up by Agriculture Produce market Committees (APMCs) were corner stones of India's agricultural marketing.

Ever since India embarked upon liberalization and globalization, the government has been slowly withdrawing from agricultural marketing. In an open economy long run domestic prices will be affected by trends in international prices. Since world prices fluctuate considerably around their long-run trends, it would be necessary to ensure a mechanism which reduces, if not, prevents the influence of international prices on domestic prices. Traditional system of price stability through restrictions on international trade is against the spirit of economic liberalization which the country has embarked upon. Further, the Minimum Support Price (MSP) system has increased governments' food subsidy burden and hence is unviable. It is in this context that derivative trading in agricultural commodities is proposed as an alternative mechanism for price risk management.

### 7.1.1 Commodity Futures Market in India

'Futures' are the most popular among the different types of derivative instruments, others being forwards, options and swaps. Futures contracts are agreements to purchase or sell a given quantity of a commodity at a predetermined price with the settlement expected to take place at a future date. They are standardized in terms of quality and quantity of the commodity and place and date of delivery and are invariably traded through formal exchanges. Historically, organized trading in commodity futures began in the United States of America in the middle of the 19th century with "maize contracts" at Chicago Board of Trade (CBOT). The first commodity exchange in India was set up by Bombay Cotton Trade Association in 1875. Subsequently many exchanges came up in different parts of the country for futures trading in various commodities. But in 1939 the government banned futures trading in several commodities because of the outbreak of the World War II. After independence the government enacted the Forward Contracts (Regulation) Act, 1952 and set up the Forward Markets Commission (FMC) in 1953. Futures trading which was resumed in 1953 was again banned in the 1960s. Later, on the recommendations of different expert committees and in tune with the spirit of economic liberalization of 1990s, futures trading was reintroduced in the country.

The beginning of the 21st century witnessed the setting up of national level electronic commodity exchanges in India. Thus the National Multi Commodity Exchange, Ahmadabad (2002), the Multi Commodity Exchange, Mumbai (2003) and the National Commodity and Derivative Exchange, Mumbai (2003) started functioning offering national level, screen-based platform to trade in a number of agricultural and non-agricultural commodities. Two more national level exchanges namely the Indian Commodity Exchange, Gurgoan (2009) and the Ahmadabad Commodity

Exchange (2010) were added later. Thus as on today we have 21 exchanges of which five are national level multi-commodity exchange and 16 others are regional or commodity-specific exchanges. There has been a tremendous growth in the turnover of the exchanges too. The collective turnover of all exchanges in India which stood at 665.3 billion rupees in 2002-03 rose to 1, 81,261.04 billion rupees in 2011-12.

### 7.1.2 Commodity Futures as Hedging Tool

The primary benefit of commodity futures market is that they provide hedging against price risk. Hedging is the practice of offsetting the price risk in a cash market by taking an opposite position in the futures market. By taking a position in the futures market, which is opposite to the position held in the spot market, the producer can offset the losses in the latter with the gains in the former.

### 7.1.3 Significance of the Study

A unique feature of Kerala's agricultural development has been the gradual shift from food crops to commercial crops. Thus plantation crops such as rubber, cardamom and pepper assume great significance in Kerala's economy. During the last few decades the plantation sector in the state has been passing through severe crisis on account of wide spread crop failures, higher input costs and labour unrests. Wide fluctuations in the prices of crops have been aggravating the problem of agricultural crisis which resulted in wide spread farmer suicides in the state. Commodity futures trading has been projected as an effective tool to minimize price risk through hedging. Further, futures trading which discounts all the available information on the economy and the commodity traded is expected to reduce cash price volatility and achieve price stabilization.

From the review of the available literature it is clear that no detailed study has so far been made into the hedging efficiency of plantation crops in the country and the influence of futures trading on spot price volatility. The present study is meant to fill this research gap. The study also reveals the perceptual differences between hedges and speculators which might exert great influence on their trading behavior in the derivative market.

### 7.1.4 Research Problem

There has been an unresolved debate as to the desirability of futures trading in the country. Critics have been alleging that futures trading leads to higher volatility in the spot prices in the physical market due to the involvement of speculators. The hedging efficiency of derivatives has also been questioned. Thus the problem under study is to examine the impact of futures trading on cash price volatility and the hedging effectiveness of futures contracts in reducing the risk on account of unexpected price variations.

### 7.1.5 Scope of the Study

The present study has two dimensions – narrow and wide. The study on volatility and hedging efficiency are with nationwide data on rubber, pepper and cardamom taken from NMCE, NCDEX and MCX respectively. The selection of commodities has been made with regard to the economic importance of the crop and the popularity in the futures market. The present study is also an attempt to make an in-depth analysis of the profile, level of awareness and perceptual differences, if any, between speculators and hedgers among the players in the commodity futures market in Kerala.

### 7.1.6 Major Objectives

This study mainly aims to examine the impact of futures trading on the spot price volatility of agricultural commodities and to analyze the hedging efficiency of selected crops. Other important objectives of the study include finding out the difference in the level of awareness of hedgers and speculators in the futures market with regard to contracts and their trading mechanism and to study the perception of investors in respect of commodity futures.

### 7.1.7 Major Hypotheses

After setting the objectives, hypotheses to be tested are listed out. Major hypotheses are: Variations in the 'Volume' or 'Open Interest' of futures trading do not affect spot price volatility of agricultural commodities; there is no significant difference between constant and time – varying hedge ratios or hedging effectiveness of agricultural futures contracts; speculators and hedgers in Kerala do not differ in their perception or level of awareness with regard to commodity futures and their trading mechanism.

### 7.1.8 Methodology

This study is designed as a descriptive one based on both secondary and primary data. The study of the impact of futures trading on price volatility of base commodities and the calculation of optimum hedge ratios and hedging effectiveness are done on the basis of secondary data obtained from the official websites of NMCE, NCDEX and MCX. Secondary data used include the daily closing spot prices, daily closing futures prices, daily open interests and daily trading volumes in respect of natural rubber, pepper and cardamom.

The present study used primary data mainly for drawing inferences on the trading experience, level of awareness and the perception of investors. The population of the study is the investors in commodity futures in the state

of Kerala. Primary data was collected from 150 sample respondents from selected districts of Kerala. The required data was gathered through undisguised direct personal interview using structured and pre-tested schedule.

### 7.1.9 Sample Design

The method of sampling used in this study is Proportionate Stratified Random Sampling. At first the major centers where futures trading in rubber, pepper and cardamom are active in Kerala were identified. Futures trading in the selected agricultural commodities was found to be active is South Eastern region of the 'High range' consisting of the districts of Kottayam and Idukki, in Ernakulam in Central Kerala and in the North Eastern region of the state which includes the districts of Kozhikode, Malappuram and Waynad. Then the scholar visited the branches of all commodity broking firms in the selected districts from where the lists of their clients were obtained. These lists of clients had to be edited for duplications as the same investor figured in the lists of different brokers in the same region. Thus a list of 1565 investors as 673 from South Eastern region, 325 from the Central region and 567 from the North Eastern region was finalized. From these a total of 165 respondents were selected into the sample as being approximately 10 percent of the total population. Out of the collected schedules 15 were excluded being incomplete or defective and only 150 good schedules are used in the study.

### 7.1.10 Tools of Data collection

A structured pre-tested schedule was used for collecting data from the informants. The draft schedule was pre tested by way of conducting a pilot study among 30 selected investors in the commodity futures market. After the pre test the schedule was modified by adding certain relevant questions

and deleting some unwanted questions. The modified schedule contains 33 questions divided into four groups.

### 7.1.11 Variables used in the study

The different variables used in the study can be grouped into two as 'background variables' and 'study variables'. The background variables are the demographic variables which highlight the profile of the sample respondents such as gender, age, education, occupation, income, domicile, marital status and family size. Pattern of investment, Investment consideration, Risk tolerance, Investment experience, Awareness level, Information source, Commodity groups, Net trading result and Perception are the important study variables used in the present study.

### 7.1.12 Scaling Technique

Respondents' awareness of commodity futures and its trading mechanism has been measured using a continuous order scale ranging from 1 to 5. For the measurement of perception a five-point 'Likert Scale' with neutrality at the centre has been used.

### 7.1.13 Data Summarization

Primary data collected from the sample respondents are classified according to their prominent trading motive and thus two classes namely speculators and hedgers are obtained. The focus of the study is to examine whether speculators and hedgers differ in their level of awareness, perception trading pattern etc.

### 7.1.14 Data Analysis

The tools and methods used for the analysis of data are the following.

**(i) Measuring Awareness Level:** The researcher has developed a tool for the measurement of the respondents' level of awareness on commodity futures. The tool comprises of measuring the awareness of eight different aspects relating to commodity futures and its trading practices on a continuous order scale ranging from 1 to 5. The reliability of the tool has been tested with the help of Cronbach's Alpha which is 0.863. The correlation coefficients (r) of individual awareness score to the aggregate average have also been found to be ranging between 0.724 and 0.807.

**(ii) Calculating Optimal Hedge ratio and hedging effectiveness:** First, the spot price and futures price data are subjected to a logarithmic transformation. Then the stationarity of the 'log series' is evaluated using the Augmented Dickey-Fuller (ADF) test. Next we examine whether the 'log spot' and 'log futures' series are co integrated using Johansen Co integration Tests. Where the log series are found to be first difference stationary and are co integrated, we use Vector Error Correction Model (VECM) to estimate the constant hedge ratio. The parameters of VECM are estimated and the residuals obtained are used to calculate Optimal Hedge Ratio and Hedging Effectiveness. Next the residuals obtained from VECM are tested for ARCH effect. Since ARCH effect is present in the residuals, the time-varying hedge ratios are also calculated using constant conditional correlation-multivariate GARCH (CCC- M GRACH) model.

**(iii) Measuring Volatility**: Data of daily closing prices, futures settlement prices, total futures Trading Volume (TV) and total Open Interests (OI) are used for analyzing the impact of future trading on spot price volatility. Cash price volatility is first modeled as a GARCH (1, 1) process. Total volumes as

well as open interests of futures contracts are decomposed into expected and unexpected components by using 21-day moving averages. This study examines the lead-lag relationship between the unexpected component of the futures trading (Volume and Open Interest) and cash price volatility using the Granger Causality Test and Forecast Error Variance Decompositions. Then the reliability of the causality results based on bivariate analysis is checked using Forecast Error Variance Decompositions based on Trivariate analysis, which includes a third variable namely Futures Price Volatility (FV).

**(iv) Awareness and Perception**: Using Chi – square (qualitative data) and T – test (quantitative data) we examine whether hedgers and speculators differ in their level of awareness and perception on commodity futures

### 7.1.15 Period of Study

This study covers a period of seven years from 2003-04 to 2010-11 in the case of rubber, seven years from 1-01-2005 to 31-12-2011 in the case of pepper and six years from 23-02-2006 to 31 -12-2011 in the case of cardamom depending on the commencement of futures trading in the respective commodity in national level exchanges. Primary data were collected from the month of May 2012 to October 2012.

### 7.1.16 Major Limitations

AS the respondents supplied the information using 'recall' method, the data might be subjected to recall errors. The study made use of time series data of price and quantities obtained from the websites of relevant commodity exchanges. Hence, all the limitations of the time series data on account of economic, political and climatic factors are applicable to the data used. The respondents' level of awareness of commodity futures has been measured using an "awareness tool" developed by the researcher. In the absence of relevant theoretical support equal weightage has been given to all the eight

items forming part of the tool. This is a limitation of the tool and hence of the study.

### 7.1.17 Literature Review

A detailed review of relevant literature for the study is undertaken by the researcher. All the available literature in connection with commodity futures are reviewed and presented in six different heads.

#### 7.1.17.1 Review of Literature on the Role of Commodity Futures

Here, all the available literature which attempt to evaluate the role of futures both as an investment option and as a mechanism for price risk management are reviewed. The available studies seem to be contradicting on the relevance of commodity futures as an investment option. While certain studies show that the mean rate of return on a well diversified portfolio of commodity futures contracts is well in excess of the average risk – free rate and can serve as a far better hedge against inflation than stock portfolio, certain others opine that overall loss should be expected because futures trading is a zero- sum game even before paying commissions.

#### 7.1.17.2 Review of Studies on the Performance of Indian Commodity Futures market:

Review of the studies available on the performance of Indian futures market show that Indian commodity futures markets and contracts, barring a few, are not congenial for hedgers. The strong relationship between spot and futures prices required for the efficient functioning of futures market has not yet developed for many commodities.

#### 7.1.17.3 Review of Studies on Volatility

Studies appear to differ on the issue of the impact of futures trading on the volatility of base commodities. Certain studies hold the view that higher prices in the cash markets have been caused by economic fundamentals and there is evidence to show that price volatility has come down in the post futures trading era. In striking contrast, certain other studies indicate increased spot price volatility subsequent to the introduction of futures trading.

#### 7.1.17.4 Review of Literature on the Role of Futures in Hedging

Empirical research has mostly concentrated on identifying the optimal hedge ratio and hedging effectiveness. Certain studies opine that agricultural producers may, even in months of high price volatility, freely construct seasonal hedges of their spot price risk in the futures market without lowering their expected return. Certain other studies hold that at least in the case of some commodities, the convergence of price worsens during the expiration week indicating the non – usability of futures contracts for hedging.

#### 7.1.17.5 Review of Literature on Futures and Price Discovery

Several studies found a high degree of interaction between the cash and futures, with futures tending to dominate in the pricing process. Using Granger causality it has been found that information is first discovered in the futures market and then transferred to cash markets. But some other studies conclude that both spot and futures markets react simultaneously to new information. At longer forecast horizons, forecasting performance declines, which is reasonable as more unexpected information enters the market, making forecasts less precise.

### 7.1.17.6 Review of Miscellaneous Studies on Futures

Several other studies dealing with miscellaneous topics relating to commodity futures such as spatial and inter temporal price integration, CAPM, behavior of 'basis' etc have also been reviewed and reported. Studies which address the issue of whether futures are responsible for inflation are also reviewed and presented in this section.

### 7.1.18 Research Gap

From the literature review it is clear that no detailed study has so far been made in India to assess the impact of futures trading on spot price volatility and the hedging effectiveness of agricultural futures such as rubber, pepper and cardamom. Further, neither the perception of players in commodity futures in Kerala nor the difference in the level of awareness of hedgers and speculators in the state has been studied in detail. Hence the present study is highly relevant.

### 7.1.19 Futures Trading: The Indian scenario

The evolution of commodity futures has a long history spread over several centuries and the practice of trading in commodity derivatives prevailed in different parts of the world from time immemorial. Organized trading in commodity futures began in America in the middle of the 19$^{th}$ century. Almost at the same time the first commodity exchange in India was setup by the Bombay Cotton Trade Association. This was followed by similar initiatives in different parts of the country. But the history of futures trading in India was marked by frequent bans and restrictions on account of the apprehension that futures trading in commodities would lead to price instability and inflation.

The Indian commodity futures market which was in a state of hibernation for decades was given a fresh life with the setting up of national level multi – commodity exchanges as part of India's liberalization process in the 1990s. Since then the commodity derivatives market in India has been growing in leaps and bounds.

The present study highlights certain striking features of the commodity futures market in India. The collective turnover of all exchanges which stood at 19.24% of the GDP in 2004-05, surpassed the country's Gross Domestic Product in 2006-07 (103.13%). The total turnover of all exchanges together in 2011-12 was 1,81,261.04 billion rupees while the country's GDP was only 52,025.15 billion rupees at constant prices (base year 2004-05) Thus the total turnover of the commodity exchanges in the year was 348.41% of the GDP.

While the turnover of commodity derivative exchanges which was less than the turnover in the cash segment of the stock exchanges in the country marched ahead to surpass the latter in 2006-07 and was 256% of the stock exchanges' volume in the cash segment in 2010-11.During the last decade the role of regional and commodity specific exchanges have declined while the national multi commodity exchanges have grown considerably in terms of volume and turnover. Though futures contracts were originally introduced as a tool for hedging in agricultural commodities, the share of agricultural products in the total trade volume of commodity exchanges has been steadily declining. Bullion, base metals and energy are fast emerging as investors' preferred choices.

### 7.1.20 Futures Trading and Price Volatility of Base Commodities

The results of Granger causality tests show that there is a bi – directional causality running between UTV and CV in the case of all the three commodities studied. But the results in respect of causality between UOI and

CV are mixed. While UOI is found to Granger cause CV in the case of Rubber (Sub period II) and Pepper, a uni – directional causality running from CV to UOI is found in the case of Cardamom. In the case of rubber in sub period I, no causality is found to exist between UOI and CV.

The reliability of causality results based on bivariate analysis is checked by conducting Forecast Error Variance Decompositions based on trivariate analysis, which includes a third variable namely futures price volatility (FV).

In the case of Rubber ( sub period I ), cash price volatility is explained by Unexpected Trade Volume to the extent of 9.38% but only around 2% of the variations in Unexpected Trade Volume is explained by CV . Unexplained Open Interest (UOI) explains only 0.7% of the cash price Volatility. Similarly unexpected open interest is explained by CV only to the extent of 3%. In the case of Rubber (sub period II), 3.15% of the cash price volatility is explained by unexpected trade volumes; while 3.34% of the variations in trade volumes is explained by cash price volatility. Thus the univariate causality indicated by Granger Causality test is supported by the trivariate VAR analysis also.

The trivariate VAR analysis conducted in the case of Pepper revealed that 5.799% of the cash price volatility is explained by Unexpected Trade Volume while only 1.5% of the fluctuations in Unexpected Trade Volume are explained by the spot price volatility. Hence the findings of pair-wise Granger causality (i.e. bi directional causality between volume and cash price volatility) is contradicted. Similarly only 0.77% of the cash price volatility is explained by Unexpected Open Interest and Open Interest explains only 1.28% of the cash price volatility.

Error Variance Decomposition in the case of Cardamom shows that while 3.5% of the unexpected trade volume is explained by cash price

volatility only 0.98% of the cash price volatility is explained by the trade volume .In the same way only 1.07% of the unexpected open interest is explained by cash price volatility and open interest explain only 0.3% of the cash price volatility.

### 7.1.21 Commodity Futures as Hedging Tool

The optimal hedge ratio, in case of rubber, pepper and cardamom is around 0.30 which means that the variance of a hedged portfolio shall be the minimum when a position in physical commodity is combined with a position in the futures market to the extent of 30 percent of the former. Further, the time-varying hedge ratios are not substantially different from the constant ratios. The study also highlights that the hedging efficiency of the commodities under study is poor (i.e., only around 17%). It means that by hedging, in these commodities, one shall be able to bring down the risk of an unhedged portfolio only to the extent of 17%.

### 7.1.22 Profile of Sample Respondents

One of the objectives of this study is to assess the demographic influence on investing in the futures market. Hence it is imperative to assess the demographic profile of the sample respondents on different aspects such as age, education, occupation, income, place of residence, marital status and size of family. In addition to the profile of the sample as a whole, the study also reports the profile of hedgers and speculators separately. The analysis of the primary data collected from 150 respondents show that speculators and hedgers in the commodity futures market do not differ significantly in their profile or experience with securities and derivatives. But the two categories of market players seem to differ in their preference of commodity group for investment.

### 7.1.23 Awareness of Derivative Products

Of the eight different aspects of futures trading, on which the respondents' awareness was measured, speculators and hedgers seem to differ in their level of awareness on five aspects. The two groups also appear to be reasonably informed of the concept and mechanism of futures trading. The overall awareness score of the entire sample is 2.8313 against a maximum score of five and that of speculators and hedgers are 2.7091 and 3.1656 respectively.

### 7.1.24 Investors' Perception of Commodity Futures

Any investment avenue is evaluated in terms of its return, risk, liquidity and safety. Commodity futures are no exception. Speculators and hedgers, the two major classes of players in the derivative market have their own norms of return and risk. They also might differ in terms of their liquidity requirements and the importance they attach to the safety of their funds. The present study attempts to verify whether hedgers and speculators differ in their perception of commodity futures as an investment option.

Investors' perception has been studied on the basis of their responses to certain statements pertaining to return, risk, liquidity and safety of futures. The responses to these statements have been obtained on a five point Likert scale ranging from "strong disagreement' to "strong agreement" with the neutral point at the centre. The study of investors' perception shows that except for certain issues relating to the return from futures trading, there is no substantial difference in the perception of the two groups on other aspects such as risk, liquidity and safety.

## 7.2 FINDINGS

Major findings of the study are listed below:

### 7.2.1 Futures Trading: The Indian Scenario

- The turnover of Indian Commodity derivative exchanges which stood at 665.30 billion rupees in 2002-03 rose to 181261.04 billion rupees in 2011-12.
- The turnover of derivative exchanges which was 19.24% of country's GDP in 2004-05 increased to 348.41% of GDP in 2011-12.
- The collective turnover of the cash segment of BSE and NSE was 34779 billion rupees in 211-12, where as that of commodity exchanges was 181261.04 billion rupees i.e., 52.18% of the former.
- MCX has emerged as the largest commodity exchange in India with a market share of 86% of the total turnover of exchanges in 2011-12.
- The share of agricultural commodities to the total traded volume which was 68.18% in 2004-05 has declined to 19% in 2011-12, while bullion (45%) and base metals (24%) emerged as investors' favorites.

### 7.2.2 Futures trading and Cash price volatility

- There is a bi- directional causality between Unexpected Trade Volumes (UTV) and Cash price volatility (CV) in the case of rubber in sub period I of the study.
- There is no causality between Unexpected Open Interest (UOI) and CV in case of rubber in sub period I.

- In case of rubber in sub period I, on the 21st day after a one standard deviation shock, CV is explained by UTV to the extent of 9.38% while UTV is explained by CV to the extent of 1.75%.
- In case of rubber in sub period I, on the 21st day after a one standard deviation shock, CV is explained by UOI to the extent of 0.70% while UOI is explained by CV to the extent of 3.01%.
- There is a bi- directional causality between Unexpected Trade Volumes (UTV) and Cash price volatility (CV) in the case of rubber in sub period II of the study.
- In the case of rubber in sub period II, there is a uni- directional causality running from UOI to CV.
- In case of rubber in sub period II, on the 21st day after a one standard deviation shock, CV is explained by UTV to the extent of 3.15% while UTV is explained by CV to the extent of 3.34%.
- In case of rubber in sub period II, on the 21st day after a one standard deviation shock, CV is explained by UOI to the extent of 8.196% while UOI is explained by CV to the extent of 5.16%.
- In the case of pepper there is a bi- directional causality between UTV and CV.
- In the case of pepper, UOI is found to Granger cause CV but CV does not cause UOI.
- In case of pepper, on the 21st day after a one standard deviation shock, CV is explained by UTV to the extent of 5.78% while UTV is explained by CV to the extent of 1. 5%.
- In case of pepper, on the 21st day after a one standard deviation shock, CV is explained by UOI to the extent of 0.77% while UOI is explained by CV to the extent of 1.28%.
- The study shows that there is a bi- directional causality between UTV and CV in the case of cardamom.

- Tri- variate VAR analysis shows that in the case of cardamom, on the 21st day after a one standard deviation shock, CV is explained by UTV to the extent of 0.98% while UTV is explained by CV to the extent of 3. 5%.
- In case of cardamom, on the 21st day after a one standard deviation shock, CV is explained by UOI to the extent of 0.3% while UOI is explained by CV to the extent of 1.07%.

### 7.2.3 Commodity Futures as Hedging Tool

- The Optimal Hedge Ratio of rubber in sub period I of the study is 0.33.
- Hedging effectiveness of rubber in sub period I is 0.1059.
- Average time- varying Hedge Ratio of rubber in sub period I is 0.30.
- Average dynamic hedging effectiveness of rubber in sub period I is 0.26.
- The Optimal Hedge Ratio of rubber in sub period II of the study is 0.31.
- Hedging effectiveness of rubber in sub period II is 0.16.
- Average time- varying Hedge Ratio of rubber in sub period II is 0.27.
- Average dynamic hedging effectiveness of rubber in sub period II is 0.15.
- The Optimal Hedge Ratio of pepper futures is 0.30.
- Hedging effectiveness of pepper futures is 0.19.
- Average time- varying Hedge Ratio of pepper is 0.30.
- Average dynamic hedging effectiveness of pepper futures is 0.17.
- The Optimal Hedge Ratio of cardamom futures is 0.32.
- Hedging effectiveness of cardamom futures is 0.19.
- Average time- varying Hedge Ratio of cardamom is 0.35.
- Average dynamic hedging effectiveness of cardamom futures is 0.17.

### 7.2.4 Profile of Sample Respondents

- Gender wise distribution shows that 93.6% of the speculators and 97.5% of the hedgers in the sample are male.
- The maximum number of speculators are in the age group of 30- 40 years; while the age group of 40- 50 years has the maximum number of hedgers.
- Education wise distribution of the sample shows that more than 50% of the respondents, irrespective of whether speculators or hedgers, are graduates.
- Occupation wise distribution shows that business class constitutes the most prominent group among both speculators and hedgers in Kerala.
- Income wise distribution shows that 70% of the speculators have an annual income of less than 4 lakh rupees, while 65% of the hedgers have annual income above 4 lakh rupees.
- Domicile wise distribution of respondents shows that 56.4% of the speculators and 72.5% of the hedgers reside in panchayaths.
- Marital status wise distribution of the sample group shows that 83.3% of the players in the derivative market are married.
- 70% of speculators and hedgers are from medium- sized families of three to five members.

### 7.2.5 Experience with Securities and Commodity Futures

- Commodity derivatives and corporate securities are more popular investment avenues among the players in the derivative markets.
- Nearly 50% of the speculators and hedgers are 'moderately risk loving'.

- Distribution according to net trading result shows that 38.7% of the respondents had profit while 33.3% had loss as their net result from trading in securities.
- Brokers and financial advisors constitute the most important source of information for hedgers and speculators.
- Precious metals are the most preferred commodity group to invest in for speculators while agricultural commodities are preferred by hedgers.

### 7.2.6 Awareness Level

- Though both speculators and hedgers are well aware of the trading platform for derivatives products, the latter have better awareness than the former and the difference is statistically significant.
- Both speculators and hedgers are fairly aware of the margin requirements for trading in commodity futures.
- Hedgers are better aware of FMC, the market regulator and its operations.
- While speculators are only moderately aware of the settlement procedure, hedgers are fairly aware of the concept.
- The awareness of both speculators and hedgers on the relationship between spot and futures prices is quite low.
- The awareness of respondents on the hedging function of futures and the hedging practices are only moderate.
- Respondents' awareness of the concept of 'basis' and price convergence are quite moderate.
- Overall awareness of hedgers on commodity futures and its trading mechanism is higher than that of speculators.

### 7.2.7 Perception on Commodity futures

- Hedgers and speculators differ in their perception on the returns from investing in commodity futures.
- Hedgers and speculators have similar perception regarding the risk of investing in commodity futures contracts.
- The perception of speculators and hedgers on the liquidity of investments in commodity futures is similar.
- Speculators and hedgers have similar perception on the safety of investments made in commodity futures contracts.

**Table 7.1: Results of Hypotheses Testing**

| No | Hypotheses Tested | Tools used | Results of Hypotheses Testing |
|---|---|---|---|
| H1 | Variations in volume of futures trading do not affect spot price volatility of agricultural commodities | Granger Causality, Error variance decomposition | In the case of rubber, pepper and cardamom volume affects and is affected by spot price volatility. Hence, H1 is rejected |
| H2 | Variations in the Open Interests of futures contracts do not affect spot price volatility of agricultural commodities | Granger Causality, Error variance decomposition | In the case of rubber Open interest is found to affect cash volatility in sub period II but not in sub period I. While for pepper UOI affects CV, for cardamom it doesn't. |
| H3 | There is no significant difference between constant and time – varying optimal hedge ratios of agricultural futures contracts. | Augmented Dickey Fuller, Johansen co integration, VECM | Both constant and time varying optimal hedge ratios for all the commodities are found to be around 0.3. Hence H3 is accepted. |
| H4 | There is no significant difference between constant and dynamic hedging effectiveness of agricultural futures contracts | CCC-MGARCH | Except for rubber in sub period I, constant and dynamic hedge ratios are not found to be varying significantly. Hence except in the case of rubber (period I), H4 is accepted. |
| H5 | There is no significant difference in the trading experience of speculators and hedgers in the commodity futures market in Kerala. | Chi-Square test | Speculators and hedgers in futures market in Kerala are found to have similar risk tolerance, experience and trading results. Hence, H5 is accepted. |
| H6 | Speculators and hedgers in Kerala do not differ in their level of awareness with regard to commodity futures and its trading mechanism. | Arithmetic mean, Standard deviation and t-test | Though the results of t – tests on eight individual components of awareness are mixed, hedgers and speculators are found to differ in their overall awareness on commodity futures. Hence, H6 is rejected. |
| H7 | There is no significant difference between hedgers' and speculators' perception of commodity futures as an investment option | Chi-Square test | Except for certain aspects of return, speculators and hedgers are found to be not differing in their perception of the risk, liquidity and safety of commodity futures. Hence, H7 is accepted. |

## 7.3 CONCLUSION

Based on the findings of the study it can be concluded that the Indian commodity futures market has been growing fast since the setting up of the national level multi- commodity exchanges. The growth in turnover of commodity exchanges has been quite impressive both as a percentage of country's GDP and in comparison to the turnover of India's major stock exchanges. A striking feature of the growth of futures market has been the emergence of MCX as the largest commodity exchange in India with a market share of 86% in 2011- 12.The emergence of bullion and base metals as investors' favorites and the decline in importance of agricultural commodities are also noteworthy.

The findings of the present study indicate a bi- directional causality between the unexpected components of trade volume and cash price volatility in the case of all the three commodities studied. But the findings in respect of the impact of open interest on spot price volatility have been mixed. Unexpected open interest is found to affect cash volatility only in the case of pepper and rubber in sub- period I. The results of Error variance Decomposition are also found to support the findings of Granger Causality.

The optimal hedge ratios of rubber, pepper and cardamom are found to be around 0.30, which means that the risk of holding these commodities shall be minimized if positions in physical commodities can be combined with future contracts in respective commodities to the extent of 30% of the former. The hedging effectiveness of the commodities studied varies between 0.11 and 0.19. Further, there is no significant difference between constant and time- varying hedge ratios or hedging effectiveness.

The study of the sample respondents shows that there is no significant difference in the profile of speculators and hedgers in the futures market in

Kerala. Further, the two categories of market players are not found to differ considerably in their level of awareness or their perception on the risk, safety and liquidity of futures as an investment option.

## 7.4 SUGGESTIONS

Based on the findings of the study and the interactions with the players in the futures market, the following suggestions are made to make improvements in the working of commodity futures markets.

(1) In spite of high level of literacy in the state, vast majority of agricultural producers in Kerala do not take part in futures trading. Hence the FMC and commodity exchanges should take necessary steps to educate farmers of the benefits of futures trading.

(2) Majority of players in the futures markets have apprehensions about the transparency in the working of exchanges. Hence efforts should be made to build up confidence in the working of exchanges.

(3) Since daily settlement by way of marking- to- market is done, buyers in the market will be forced to liquidate their positions when they are not able to remit additional amounts to meet the margin requirements when prices fall. Thus they are forced to exit by incurring huge losses. Hence, players should see that that they take positions only to the extent of 60 to 70 percent of their total liquidity.

(4) Investors complain that certain broking firms and their staff indulge in trading and this adversely affects the interests of their clients. Hence effective measures should be taken to prevent trading by brokers and their staff.

(5) Investors complain that large fund houses and syndicates involve in artificial manipulation of prices for the benefit of vested interests.

Hence the government as well as the FMC should have better surveillance over the operations of brokers and their large clients.

(6) Certain brokers are found to induce their clients to take positions just for the sake of achieving branch targets on volume and brokerage. This results in many uninformed clients losing their money, which in turn, adversely affects their confidence in the system. Therefore, such practices should be discouraged.

(7) Measures should be taken to remove the restrictions in the interstate movements of commodities on account of octroi and duties so that more players are encouraged to settle positions by making/ taking physical delivery. This will enhance the liquidity in the commodities market and promote effective arbitrage and hedging.

(8) Presently different agencies like BIS, AGMARK and EIA are involved in the certification of standards for agricultural commodities, which prescribe different norms of standards. Hence there is a need for a central notification agency for standards and grades including sampling

(9) The poor hedging effectiveness of the futures studied might be due to the lack of integration of the spot and futures prices on account of low trade volume and price distortions due to manipulations. Hence steps should be taken to minimize price distortions and improve the hedging efficiency of agricultural commodity futures.

## 7.5 SCOPE FOR FURTHER RESEARCH

This study opens up new areas for further research in several related topics. Some of them are listed below;

1. Price discovery and agricultural commodity futures market.
2. Information dissemination and efficiency of Indian futures market.
3. Factors affecting hedging efficiency of commodity futures.
4. Expiration effects of futures contracts.
5. Agricultural prices and volatility spillovers.
6. Role of futures market in cropping decisions.

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# APPENDIX

## SCHEDULE FOR INTERVIEW OF INVESTORS

### A. PERSONAL DETAILS

1. Name (Optional) :

2. Sex : Male ☐ Female ☐

3. Age Group : Below 30 ☐ 30-40 ☐
   40-50 ☐ 50 & above ☐

4. Educational Qualification : Below SSLC ☐ SSLC/Plus Two ☐
   Degree ☐ Post Graduate ☐
   Professional ☐ Others (specify)..... ☐

5. Occupation : Govt. Employee ☐ Pvt. Sector Employee ☐
   Retired Employee ☐ Self Employed ☐
   Business ☐ Agriculture ☐
   Professional ☐ Others (specify)..... ☐

6. Annual Income : Below Rs4, 00,000 ☐
   Rs4, 00,000-Rs10,00,000 ☐
   Rs 10, 00,000- Rs 25,00,000 ☐
   Above Rs25,00,000 ☐

7. Place of Residence : Corporation ☐ Municipality ☐
   Panchayath ☐

8. Marital Status : Single ☐ Married ☐

9. Size of Family (No. of Members) : Less than 3 ☐ 3-5 ☐ 6 & above ☐

## B. INVESTMENT DETAILS

1. Pattern of your investment (Please distribute a total of 10 points among the options)

| | | | |
|---|---|---|---|
| Bank Deposit | ☐ | Real Estate | ☐ |
| Chit Fund | ☐ | Provident Fund | ☐ |
| Insurance | ☐ | Post Office SB/RD | ☐ |
| Bullion / Jewellery | ☐ | Mutual Fund | ☐ |
| Corporate Securities | ☐ | Financial Derivatives | ☐ |
| Commodity Futures | ☐ | | |

Any others (specify)..... ☐

2. Prominent considerations while making an investment:
(Please distribute a total of 10 points among the options)

| | | | |
|---|---|---|---|
| Risk | ☐ | Liquidity | ☐ |
| Tax Savings | ☐ | Easy to transact | ☐ |
| Short-term gain | ☐ | Long-term gain | ☐ |
| Social status | ☐ | | |
| Others (specify..... | ☐ | | |

3. What is your risk tolerance level?

| | | | |
|---|---|---|---|
| Risk Averse | ☐ | Less Risk loving | ☐ |
| Moderate risk loving | ☐ | Great Risk loving | ☐ |

4. How long have you been investing in securities?

| | | | |
|---|---|---|---|
| Less than one year | ☐ | 1-3 years | ☐ |
| 3-5 years | ☐ | 5-10 year s | ☐ |
| Above 10 years | ☐ | | |

5. What has been your general experience of investing in securities?

Profit ☐ No profit no loss ☐ Loss ☐

6. If Profit, the average percentage of return (p.a.)?

Less than 5% ☐ 5-10% ☐ 10-20% ☐ Above 20% ☐

7. If loss, the average percentage of loss (p.a.)?

Less than 5% ☐ 5-10% ☐ 10-20% ☐ Above 20% ☐

## C. EXPERIENCE IN COMMODITY FUTURES

8. Are you aware of Commodity Futures?

Thoroughly aware ☐ Fairly aware ☐

Moderately aware ☐ Slightly aware ☐

Not at all aware ☐

9. If you are aware, how did you get to know about it?

Friends/Family ☐ Brokers / Financial advisors ☐

Media ☐ Self research ☐

Others (specify)..... ☐

10. Have you traded in commodity futures?

Yes ☐ No ☐

If 'Yes', answer questions 11 to 16(a)

11. How often do you trade in commodity futures?

Regularly ☐ Frequently ☐ Occasionally ☐ Rarely ☐

12. What are the commodity groups you invest in?
(Please distribute 10 points among the options)

Precious Metals ☐ Other metals ☐

Energy ☐ Agriculture ☐

Other ☐

13. What has been your overall experience of investing in commodity futures?

Profit ☐ No profit – no loss ☐ Loss ☐

14. The rate of profit / loss as a percentage of funds invested?

Less than 5% ☐ 5-10% ☐ 10-20% ☐ Above 20% ☐

15. What is your main objective when trading in commodity futures?

Speculation ☐ Hedging ☐ Arbitrage ☐

Any other (specify)..... ☐

15(a) If you are a hedger, how often do you take/make delivery of the underlying asset?

Always ☐ Frequently ☐ Occasionally ☐ Rarely ☐ Never ☐

16. Do you hold the underlying asset?

Always ☐ Frequently ☐ Occasionally ☐ Rarely ☐ Never ☐

17. If you hold the underlying asset? How long?

Only until the expiry of the contract ☐ on a long term basis ☐

**AWARENESS LEVEL**

18. Please indicate your level of awareness with regard to the terms / concepts relating to commodity futures. **Circle** only one number for each term.

    Key: Scale – "Not at all aware" (1) to "Thoroughly well aware" (5)

| | | | | | | |
|---|---|---|---|---|---|---|
| (i) | MCX, NCDEX, NMCE | 1 | 2 | 3 | 4 | 5 |
| (ii) | Initial margin | 1 | 2 | 3 | 4 | 5 |
| (iii) | Forward Market Commission | 1 | 2 | 3 | 4 | 5 |
| (iv) | Mark-to-market | 1 | 2 | 3 | 4 | 5 |
| (v) | Backwardation | 1 | 2 | 3 | 4 | 5 |
| (vi) | Hedge ratio | 1 | 2 | 3 | 4 | 5 |
| (vii) | Basis | 1 | 2 | 3 | 4 | 5 |
| (viii) | Base commodity | 1 | 2 | 3 | 4 | 5 |

**D. INVESTOR'S PERCEPTION**

Please indicate the degree to which you agree/disagree with the statements below, referring to your perception of commodity futures as an investment option. Put (✓) mark in one column for each statement.

**Return**

| | | Strongly disagree | Disagree | Neither agree/ Nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|---|
| 19 | Investment in commodity futures fetches better return than investment in financial securities | | | | | |
| 20. | Since we can hold a position in commodity futures by depositing margins alone, the return from the amount invested will be comparatively high | | | | | |
| 21. | The portfolio can be made more efficient (i.e., more return for same risk, or less risk for same return) by including commodity futures in the portfolio | | | | | |

**Risk**

| | | Strongly disagree | Disagree | Neither agree/ Nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|---|
| 22. | Commodity futures are less risky when compared to stock market securities | | | | | |
| 23. | The option of 'delivery of goods' is effective in dissuading the participants from artificially rigging up or depressing the futures prices | | | | | |
| 24. | Limits imposed on the open position held by speculators curbs over-speculation and reduces the chances for 'scams' in Commodity Futures market | | | | | |

**Liquidity**

| | | | | | | |
|---|---|---|---|---|---|---|
| 25 | The Indian Commodity Futures market has attained sufficient depth so as to ensure high liquidity to futures contracts | | | | | |
| 26 | Government interventions with ban and restrictions have not affected the liquidity of the agricultural commodity futures contracts | | | | | |
| 27 | Commodity futures contracts are easily convertible to cash | | | | | |

**Safety**

| | | | | | | |
|---|---|---|---|---|---|---|
| 28 | The operations of commodity exchanges in India are transparent | | | | | |
| 29 | The FMC's surveillance over the exchanges is effective and the interests of the clients are well protected | | | | | |
| 30 | Possibility of loss making in commodity futures market is comparatively less | | | | | |

**Miscellaneous**

| | | Strongly disagree | Disagree | Neither agree/ Nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|---|
| 31 | Introduction of agricultural commodity futures has reduced the price volatility of base commodities | | | | | |
| 32 | Commodity futures are useful in hedging against loss from undesirable price variations | | | | | |
| 33 | Commodity futures trading has not led to speculation in commodity prices | | | | | |

**Remarks if any**

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**Thank You**