# A STUDY ON FUTURES TRADING IN COMMODITIES WITH SPECIAL REFERENCE TO RUBBER

*Thesis Submitted to the*

***Cochin University of Science and Technology***

*For the award of the Degree of*

***Doctor of Philosophy***

*Under the Faculty of Social Sciences*

*By*


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# A Study on Futures Trading in Commodities with Special Reference to Rubber

***Ph.D. Thesis under the Faculty of Social Sciences***


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# Certificate

This is to certify that the thesis entitled **"A Study on Futures Trading in Commodities With Special Reference to Rubber"** submitted by Mr. Peter Thenankal to Cochin University of Science and Technology, for the award of the Degree of Doctor of Philosophy under the Faculty of Social Science is a record of bona fide research work carried out by him under my supervision and guidance. The thesis has not previously formed the basis for the award of any Degree, Diploma, Associateship, Fellowship or any other similar title of any University or Institution.

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# *Declaration*

I, Peter Thenankal hereby declare that the dissertation entitled **"A Study on Futures Trading in Commodities with Special Reference to Rubber"** submitted to Cochin University of Science and Technology for the award of the Degree of Doctor of Philosophy is a record of bona fide research done by me under the guidance and supervision of Prof. (Dr.) P. Sudarsanan Pillai, Chairman, Board of Studies in Commerce, in the School of Management Studies, Cochin University of Science and Technology and that it has not previously formed the basis for the award of any Degree, Diploma, Associateship, Fellowship, or any other similar title of recognition.

Kochi **Peter Thenankal**

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## Abstract

Futures trading in Commodities has three specific economic functions viz. price discovery, hedging and reduction in volatility. Natural rubber possesses all the specifications required for futures trading. Commodity futures trading in India attained momentum after the starting of national level commodity exchanges in 2003. The success of futures trading depends upon effective price risk management, price discovery and reduced volatility which in turn depends upon the volume of trading. In the case of rubber futures market, the volume of trading depends upon the extent of participation by market players like growers, dealers, manufacturers, rubber marketing co-operative societies and Rubber Producer's Societies (RPS). The extent of participation by market players has a direct bearing on their awareness level and their perception about futures trading.

In the light of the above facts and the review of literature available on rubber futures market, it is felt that a study on rubber futures market is necessary to fill the research gap, with specific focus on (1) the awareness and perception of rubber futures market participants viz. (i) rubber growers, (ii) dealers, (iii) rubber product manufacturers, (iv) rubber marketing co-operative societies and Rubber Producer's Societies (RPS) about futures trading and (2) whether the rubber futures market is fulfilling the economic functions of futures market viz. hedging, reduction in volatility and price discovery or not.

The study is confined to growers, dealers, rubber goods manufacturers, rubber marketing co-operative societies and RPS in Kerala. In order to achieve the stated objectives, the study utilized secondary data for the period from 2003 to 2013 from different published sources like bulletins, newsletters, circulars from NMCE, Reserve Bank of India (RBI), Warehousing Corporation

and traders. The primary data required for this study were collected from rubber growers, rubber dealers, RPS & Rubber Marketing Co-operative Societies and rubber goods manufacturers in Kerala. Data pertaining to the awareness and perception of futures trading, participation in the futures trading, use of spot and futures prices and source of price information by dealers, farmers, manufacturers and cooperative societies also were collected. Statistical tools used for analysis include percentage, standard deviation, Chi-square test, Mann – Whitney U test, Kruskal Wallis test, Augmented Dickey – Fuller test statistic, t- statistic, Granger causality test, F- statistic, Johansen co – integration test, Trace statistic and Max –Eigen statistic.

The study found that 71.5 per cent of the total hedges are effective and 28.5 per cent are ineffective for the period under study. It implies that futures market in rubber reduced the impact of price risks by approximately 71.5 per cent. Further, it is observed that, on 54.4 per cent occasions, the futures market exercised a stabilizing effect on the spot market, and on 45.6 per cent occasions futures trading exercised a destabilizing effect on the spot market. It implies that elasticity of expectation of futures market in rubber has a predominant stabilizing effect on spot prices. The market, as a whole, exhibits a bias in favour of long hedges. Spot price volatility of rubber during futures suspension period is more than that of the pre suspension period and post suspension period. There is a bi-directional association-ship or bi-directional causality or pair- wise causality between spot price and futures price of rubber. From the results of the hedging efficiency, spot price volatility, and price discovery, it can be concluded that rubber futures market fulfils all the economic functions expected from a commodity futures market. Thus in India, the future of rubber futures is Bright…!!!

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# Abbreviations

| | | |
|---|---|---|
| ADF | - | Augmented Dickey Fuller test |
| AIC | - | Akaike Information Criterion |
| AOI | - | All-Ordiaries Index |
| ARMA | - | Auto Regressive Moving Average |
| ARIMA | - | Auto Regressive Integrated Moving Average |
| BSE | - | Bombay Stock Exchange |
| CBT | - | Chicago Board of Trade |
| CCB | - | Commodity Control Board |
| CFTC | - | Commodity Futures Trading Commission |
| CME | - | Chicago Mercantile Exchange |
| CNX | - | CRISIL NSE Index/Exchange |
| CST | - | Central Sales Tax |
| CWC | - | Central Warehousing Corporation |
| EICA | - | East India Cotton Association |
| FC(R ) Act | - | Forward Contract (Regulations) Act,1952 |
| FMC | - | Forward Market Commission |
| FPE | - | Final Prediction Error |
| GARCH | - | Generalized Auto-Regressive Conditional Heteroscedasticity |
| HAFED | - | The Haryana State Cooperative Supply and Marketing Federation Limited. |
| HQ | - | Hannan-Quinn information criterion |
| ICEX | - | India Commodity Exchange |
| IATP | - | Institute for Agriculture and Trade Policy |
| IIMB | - | Indian Institute of Management, Bangalore. |
| IPSTA | - | India Pepper and Spice Trade Association |
| ICEX | - | Indian Commodity Exchange Ltd., Mumbai |
| MCX | - | Multi Commodity Exchange |
| MGARCH | - | Multivariate GARCH |
| MSP | - | Minimum  Support Price |

| | | |
|---|---|---|
| NBOT | - | National Board of Trade |
| NCDEX | - | National Commodities and Derivatives Exchange |
| NGO | - | Non- Government Organization |
| NIFTY | - | ‘N’ational Stock Exchange F‘ifty’ |
| NMCE | - | National Multi Commodity Exchange |
| NTSD | - | Non-transferable Specific Delivery contract |
| NSE | - | National Stock Exchange |
| NYSE | - | New York Stock Exchange |
| OHR | - | Optimal Hedge Ratio |
| OLS | - | Ordinary Least Squares |
| OTC | - | Over The Counter Exchange |
| PP | - | Philips Perron test |
| RSS | - | Ribbed Smoke Sheet |
| RW | - | Random Walk |
| SFE | - | Sydney Futures Exchange |
| SIC | - | Schwarz Information criterion |
| SPSS | - | Statistical Package for Social Sciences |
| S&P | - | Standard & Poor |
| TSD | - | Transferable Specific Delivery contract |
| RBI | - | Reserve Bank of India. |
| RPS | - | Rubber Producing Societies |
| UNCTAD | - | United Nations Conference on Trade and Development |
| VaR | - | Value-at-Risk |
| VAR | - | Vector Auto Regressive |
| VECM | - | Vector Error Correction Model |
| WLS | - | Weighted Least Squares |
| WPI | - | Whole Sale Price Index |
| WTO | - | World Trade Organization |

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# Chapter 1

## INTRODUCTION

Contents



### 1.1 Introduction

Agricultural commodity prices in India are showing extreme volatility due to many reasons. Demand and supply factors, shift in Government policies, frequent floods and droughts, transport and warehousing problems, lack of finance, strikes, media reports, speculative transactions, hoarding by traders, import and export, global competition, hike in input cost of power, seeds and fertilizer etc are the contributing factors of price volatility. In this context futures market plays an important role in the economy. It has three specific economic functions viz. price discovery, hedging and reduction in volatility.

A commodity futures market is a risk management market. It is not a mechanism for controlling prices. Derivative instruments are used to avoid or reduce the price risk arising from price variability. It neither raises nor depresses prices. A commodity derivative market cannot find a remedy for prolonged upward or downward movement in the prices, due to inherent demand and supply mismatch. The efficiency of commodity futures contract for effective price risk management depends essentially on the relation between the market price and the futures price discovered earlier. The higher the correlation, the more efficient the futures contract. To ensure such correlation, futures contracts need to be settled on their maturity by either delivery of physical goods or by cash on the due date at prices prevailing in the physical market.

Commodity futures market helps to discover likely or probable prices in future because the players in futures market gather and interpret information regarding demand and supply based on which they formulate the ask price and the bid price. The futures market immediately reflects dynamic adjustments resulting from new information at any time. In addition to price discovery, the economic benefits of commodity futures trading are many. Futures market acts as an information supermarket. It eliminates manipulators in the spot market, integrates geographically separated markets, eliminates intermediaries of the spot market and helps to give better price to farmers for their produce.

Commodity derivative market is a sort of information supermarket which offers price signals to the spot-market. Futures markets are said to emit price signals for the periods ahead which enable growers, producers, processors and manufacturers to plan their activities. In fact, it is generally believed that the futures market assimilates information faster than the underlying product market and efficiently predicts price movements of the product. In an efficient commodity market, the futures price is considered to be an optimal forecast of the spot price at contract termination.

In fact, commodity prices are more susceptible to manipulations and fluctuations in the absence of futures trading. This is because physical markets in most commodities are imperfect than futures market. The facilities for disseminating market information and prices are so built around a futures market that its quotations reach rapidly all parts of the country through quick transmission by modern information technology. As a result, futures prices substantially influence the prices in physical market. Thus futures market acts as a hindrance to market manipulators, exploitations and hoardings.

The physical commodity markets are fragmented in India over regions, mainly because of the varietal differences in agricultural commodities, following the widely varying geo-climatic and soil conditions in different areas and lack of adequate research and agricultural technology. The growth of commodity exchanges has helped to integrate geographically separated markets due to the fact that they are playing the role of reference markets.

The futures market minimizes or eliminates control of a few groups in price determination of commodities. The price transparency of the futures contracts has reduced or eliminated exploitive practices by brokers, middlemen and numerous intermediaries in the commodity supply chains. Futures markets reduce the long chain of intermediaries to reduce the gap between producer's price and consumer's price and provide higher share of consumer's price to the producers.

There are certain cartels in different commodities. Traders in these centres command significant control on price determination of such commodities. This segment thrives on benefit from the fragmentation of the spot market and information asymmetry between producers and well-organized traders. The prices discovered on the electronic platform will be determined on the basis of information about demand and supply situations by participants throughout the country. The electronic platform information will lead to a more holistic price discovery and empower producers to maximize their marketing gains and minimize risks. It will eliminate the undue advantage enjoyed by a trading cartel in a fragmented market and make the trading process open.

In the immediate post harvest periods, small farmers with little holding power are compelled to sell produces at depressed un-remunerative prices. Consumers have to pay high prices for food grains in the lean season. Thus both producers and consumers are the losers and the trader is the gainer. Futures market has been envisaged as a solution to the above problem and it enables both the farmers and consumers to adopt suitable strategies based on market trends and futures prices.

All the commodities are not suitable for futures trading. Following are the characteristics of a commodity suitable for futures trading.

1) Volume and marketable surplus of the commodity selected for futures trading should be large.
2) The spot price of the commodity selected for futures trading should be volatile to facilitate hedging through futures trading.
3) The supply, distribution, and price of the commodity selected for futures trading should be free from substantial control from Government regulations and other bodies.
4) The commodity should be homogenous or, alternately it must be possible to specify a standard grade and to measure deviations from

that grade. This condition is necessary for the futures exchange to deal with standardized contracts.

5) The commodity should have sufficient shelf life period. Commodities that are consumed rapidly as they are produced, do not involve much price risks, and hence, do not need futures trading.

Since natural rubber possesses all the specifications required for futures trading, it is one of the most important and favoured commodities in the futures market. India is the fourth largest producer and the second largest consumer of natural rubber in the world. Presently, there are 1250000 (Twelve lakh fifty thousand) small holdings and 538 large rubber estates in India. The number of rubber dealers, rubber manufacturers, Rubber Producers' Societies (RPS) and Rubber Marketing Co-operative Societies in India are 9533, 4334, 2432 and 35 respectively. During 2012-'13, the production of rubber in India is reported as 913700 tonnes, area of rubber plantation as 75800 hectares, consumption of natural rubber 972705 tonnes, cess collected on natural rubber 128.8 crores, excise duty collected on natural rubber 1282.83 crores and rubber marketed by 266 rubber marketing societies and rubber producers' societies 57000 tonnes registering a growth of 1.1 per cent, 3.2 per cent, 0.9 per cent, 1.3 per cent, 1.26 per cent and 1.2 per cent respectively compared to the previous year. The average daily employment in rubber plantations in 2012 is 493000 with a growth rate of 1 per cent compared to the previous year.

The price of rubber falls during the months of production and rises during off-season. Generally, a drop in rubber production can be seen during monsoon and summer due to the adverse climatic conditions. Majority of the growers in Kerala are small growers and hence, they cannot hold the commodity for much time. They will be forced to sell the commodity then and there to meet their needs. It is in this context that the relevance and importance of hedging arises. Future market provides a vehicle by which participants can hedge i.e. protect themselves from adverse price movements in a commodity in which they face a price risk. In general a person wishing to avoid upward price risk would buy futures contracts, thereby hedging himself the price at which he/she eventually purchase. A person wishing to avoid downward price risk would sell futures contract. Similarly manufacturers and dealers can use futures contract to minimize their price risk.

Commodity futures trading in India attained momentum after the starting of national level commodity exchanges in 2003. Futures trading in rubber started on 15$^{th}$ March 2003 on National Multi Commodity Exchange (NMCE). Soon after the starting of the futures trading, trading volume picked up exponentially on NMCE. In May 2008, futures trading in rubber was suspended in an attempt to curb the rise in domestic spot price. But it is paradoxical to state that even after suspension the spot price continued its upward trend. Though the suspension was removed and trading resumed from December 2008, this unexpected ban has created anxiety among market participants and led to a negative impression of the Indian commodity market at the international level.

Review of literature with respect to economic functions of commodity futures trading revealed the following;

- Loss/profit made in the spot market should be compensated by corresponding profit/loss made by futures market.
- Futures trading should reduce the erratic and sporadic spot price variability.

- Futures price should act as a reference price for spot market participants.
- Liquidity of the futures market is directly related to trading volume. In order to ensure trading volume there should be large number of buyers and sellers of the contracts than in the spot market.

Prof. Holbrook Working of Stanford University , who is considered as the father of commodity derivative economics, and followed subsequently by Prof. Roger W Gray, Prof. B.S Yamey of London School of Economics, Prof. Ann Peck, and many others in recent years have invariably confirmed that commodity derivative trading performs the useful function of price discovery and risk management.

## 1.2 Statement of the Problem

Major economic functions of futures trading are hedging, competitive price discovery and reduction in price volatility. From the point of view of an economic analyst, a futures market would be perfect if it was perfectly efficient on all the three criteria: hedging efficiency, price stabilization and absence of bias. It is possible to set the standards for a perfect futures market against which actual market performance can be measured. The three criteria are clearly unattainable, but like most of the criteria of perfection in economics, their purpose is to evolve a yardstick against which the actual performance can be measured.

Several studies both in India and abroad have confirmed that seasonal and short term price variations are lower in the presence of futures trading than its absence. The true role of commodity derivative markets is to ensure stability in prices and reduce volatility. A futures market that reduces the abnormal seasonal and intra-seasonal price fluctuations is welcomed by all the players, produces as well as consumers and even the market intermediaries. The probability of adverse price movements of agro-commodities is referred to as price risk. Risk minimizing tools like futures contracts insulate buyers and sellers from unexpected changes in futures prices and enable them to lock in the price of commodities.

The derivative market helps price discovery resulting from the overall consensus of all the known market information. The price so arrived at is not a price forecast, as is widely believed, but merely serves as a reference price for physical market transactions, for either immediate or forward delivery by market functionaries of different hues throughout the comprehensive supply chain of commodities. This reference price helps to improve the efficiency of risk management by ensuring parallel or near-parallel movements in the physical and futures market prices.

As per the recommendations of the World Bank- UNCTAD, India re-started futures trading in almost all agricultural commodities. But farmers' participation in futures market is abysmally low because farmers' awareness about futures market is poor. Majority of farmers were not able to access futures markets directly because they lack the critical minimum size to fulfill the contract specification (Sahadevan K.G, 2009) and (IIM, 2006). The success of futures trading depends upon effective price risk management, price discovery and reduced volatility which in turn depends upon the volume of trading. A thin market can be easily manipulated and such a market may fail to manifest the economic functions. In the case of rubber futures market volume of trading depends upon the extent of participation by market players like growers, dealers, manufacturers, rubber marketing co-operative societies and

Rubber Producer's Societies (RPS). The extent of participation by market players has a direct bearing on their awareness level and their perception about futures trading.

In the light of the above facts and from the review of literature available on rubber futures market, it is felt that there is a necessity to study rubber futures market with specific focus to examine (1) the awareness and perception of rubber futures market participants viz. (i) growers, (ii) dealers, (iii) rubber product manufacturers, (iv) rubber marketing co-operative societies and Rubber Producer's Societies (RPS) about futures trading and (2) whether the rubber futures market is fulfilling the economic functions of futures market viz. hedging, reduction in volatility and price discovery or not.

## 1.3 Objectives of the Study

The general objective of the study is to examine the economic functions of rubber futures market. The specific objectives are the following.

1) To study hedging efficiency;
2) To analyse elasticity of expectation;
3) To examine index of bias;
4) To analyse the volatility of spot price of rubber;
5) To examine whether futures trading in rubber helps in price discovery or not; and
6) To study the awareness and perception of rubber futures market participants viz. (i) rubber growers, (ii) rubber dealers, (iii) rubber product manufacturers (iv) Rubber Producers' Societies and Rubber Marketing Co-operative Societies.

## 1.4 Scope of the Study

Kerala accounts for 88 per cent of the natural rubber production and 73 per cent of the area of cultivation. 85 per cent of the rubber dealers are in Kerala. 17 per cent of the manufacturers are in Kerala and all the rubber marketing co-operative societies and rubber producers' societies are in Kerala. In the light of the above, the present study is confined to growers, dealers, rubber goods manufacturers, rubber marketing co-operative societies and RPS in Kerala.

## 1.5 Hypotheses

The following hypotheses are formulated for the study.

H1: There exists significant difference in the awareness about futures trading of participant and non-participant growers.

H2: There exists significant difference in the perception about futures trading of participant and non-participant growers.

H3: There exists significant difference in the awareness about futures trading of participant and non-participant dealers.

H4: There exists significant difference in the perception about futures trading of participant and non-participant dealers.

H5: There exists no significant difference in the awareness about futures trading of participant and non-participant rubber product manufacturers.

H6: There exists no significant difference in the perception about futures trading of participant and non-participant rubber product manufacturers.

H7: There exists no significant difference in the awareness about futures trading of participant and non-participant rubber marketing co-operative societies & RPS.

H8: There exists no significant difference in the perception about futures trading of participant and non-participant rubber marketing co-operative societies & RPS.

## 1.6 Data and Methodology

The present study is both descriptive and analytical in nature and based on both primary and secondary data.

### 1.6.1 Sources of Secondary Data

In order to achieve the stated objectives, the study utilized secondary data for the period from 2003 to 2013 from different published sources like bulletins, newsletters, circulars from NMCE, Reserve Bank of India (RBI), Warehousing Corporation and traders.

### 1.6.2 Source of Primary Data

The primary data required for this study were collected from rubber growers, rubber dealers, RPS & Rubber Marketing Co-operative Societies and rubber goods manufacturers in Kerala, to find out the awareness and perception of futures trading, participation in the futures trading, use of spot and futures prices and source of price information by dealers, farmers, manufacturers and cooperative societies. A survey was conducted among rubber growers, rubber dealers, RPS & Rubber Marketing Co-operative Societies and rubber manufacturers in Kerala.

### 1.6.3 Sampling Method

Sample respondents were taken from rubber growers, rubber dealers, RPS & Rubber Marketing Co-operative Societies and manufacturers. Multi stage judgment sampling method was employed to collect data from growers, dealers and manufacturers. Judgment sampling technique was applied for taking sample from RPS & Rubber Marketing Co-operative Societies. A sample size of 500 each was taken from growers and dealers. Sample size taken from RPS & Rubber Marketing Co-operative Societies and manufacturers are 250 and 100 respectively. The number of futures market participant rubber growers, rubber dealers, RPS & Rubber Marketing Co-operative Societies and rubber manufacturers, are 26, 420, 4 and 3 respectively. The number of non participant rubber growers, rubber dealers, RPS & Rubber Marketing Co-operative Societies and rubber manufacturers are 474, 80, 246 and 97 respectively.

#### 1.6.3.1 Population

Growers, dealers, manufacturers, rubber producers' societies and rubber marketing cooperative societies are the rubber futures market participants. There are 12,50,000 (Twelve lakh fifty thousand) small holdings, 538 large rubber estates having area more than 20 hectares, 9533 licensed dealers, 4334 rubber goods manufacturers, 2432 rubber producers' societies and 35 rubber marketing cooperative societies in India.

#### 1.6.3.2 Growers

There are 12, 50,000 (Twelve lakh fifty thousand) small holdings and 538 large estates having area of more than 20 hectares in India. Multi stage judgment sampling method was employed to select sample respondents from rubber growers in Kerala. The state of Kerala was divided on the basis of districts. Kottayam, Ernakulam, Pathanamthitta and Idukki districts come on the first, second, third and fourth positions respectively on the basis of natural rubber production. Hence, these four districts are selected for collecting sample respondents. The sample respondents were taken from the growers on the basis of plantation area. The classification of growers on the basis of area is given by Rubber Board. The sampling distribution is as follows. From growers having area, 2 hectares and below, above 2 hectares and up to and including 4 hectares, above 4 hectares and up to and including 10 hectares, above 10 hectares and up to and including 20 hectares, above 20 hectares and up to and including 40 hectares, above 40 hectares and up to and including 200 hectares, above 200 hectares and up to and including 400 hectares, above 400 hectares and up to and including 600 hectares and above 600 hectares. Sample sizes taken are 100, 300, 44, 28, 9, 12, 2, 2 and 3 respectively. From the 8 category of growers the total sample respondents taken are 500.

#### 1.6.3.3 Dealers

Out of the 9533 licensed rubber dealers in India, 8055 dealers are in Kerala and among them 64 are major dealers. Multi stage judgment sampling method was employed to select ample respondents from dealers. Rubber dealers are spread across 25 states in India. From these states Kerala was selected and it was divided on the basis of districts. Kottayam, Kollam, Pathanamthitta and Ernakulam districts come first, second, third and fourth respectively on the basis of number of licensed dealers. Hence, these four districts are selected for collecting sample respondents from dealers. The sampling distribution of dealers shows that, the sample respondents taken from Kottayam, Kollam, Pathanamthitta and Ernakulam districts are 143, 50, 150, 150 and 7 respectively. From the traders of the above mentioned districts, the total sample respondents taken are 500.

### 1.6.3.4 Manufacturers

Out of the 4334 licensed rubber goods manufacturers in the country, 724 are in Kerala. Multi stage judgment sampling method was employed to collect data from manufacturers. Rubber goods are manufactured in 22 states in India. The highest number of manufacturers is in Kerala, hence, Kerala is selected. Rubber Board has divided manufacturers into 6 categories depending upon the quantity of consumption. In this study the sample respondents were selected on the basis of the quantity of consumption. The sampling distribution of manufacturers shows that from A (10 tonnes and below), B (above 10 tonnes and upto and including 50), C (above 50 tonnes and upto and including 100), D (above 100 tonnes and upto and including 500), E (above 500 tonnes and upto and including 1000) and F (above 1000 tonnes) consumption groups the sample sizes taken are 24, 30, 30, 10, 3 and 3 respectively. From all consumption group manufacturers together the total sample size taken is 100.

### 1.6.3.5 Co-operative Societies and RPS

Cluster groups formed among rubber farmers in India, popularly known as Rubber Producers Societies (RPS) are involved in the production of high quality grades in their group processing centres for domestic and world markets. Rubber Producers' Societies directly purchase latex from growers and convert it into higher grades RSS 1x to RSS 3, centrifuged latex, creamed latex, etc. Rubber Marketing Co-operative Societies are rubber traders, purchase rubber both from small traders and growers. Judgment sampling technique is applied for taking sample from Co- operative societies and RPS. There are 2432 RPS and 35 Rubber Marketing Co-operative Societies in India. More than 95 per cent of the RPS and all the Rubber Marketing Co-operative Societies are in Kerala. Sample respondents of 246 RPS and 4 Rubber

Marketing co-operative societies were surveyed. The total sample size taken from both groups is 250.

### 1.6.4 Instruments for Collecting Primary Data

Primary data were collected using four separate sets of interview schedules developed after pilot study. The interview schedules developed for collecting data were finalized after a pilot study among 50 dealers, 50 growers, 50 manufacturers and 50 RPS & rubber marketing cooperative societies. The interview schedule developed for collecting data was administered among 500 growers, 500 dealers, 100 manufacturers and 250 rubber marketing co-operative societies and RPS.

### 1.6.5 Tools of Analysis of Data

Primary data collected were analysed with the help of softwares like Microsoft Excel and SPSS 17. Statistical tools like percentage, standard deviation, Chi-square test, Mann – Whitney U test, Kruskal Wallis test, Augmented Dickey – Fuller test statistic, t- statistic, Granger causality test, F- statistic, Johansen co – integration test, Trace statistic and Max –Eigen statistic. Percentage is used for demographic classification; standard deviation is used for finding volatility. Chi-square test, Mann – Whitney U test and Kruskal Wallis test are used for significance of results obtained based on the analysis. To find the price discovery, secondary data were analysed with the help of EViews 7. Augmented Dickey – Fuller test statistic uses t- statistic is used to check unit root. Granger causality test uses F- statistic used to test causality. Johansen co – integration test uses Trace statistic and Max –Eigen statistic used to test long run association- ship.

## 1.7 Chapter Scheme

This thesis is presented in six chapters, viz.

**Chapter 1 – Introduction:** It gives a brief introduction, statement of the problem, objectives to be examined, scope of the study, methodology adopted, source of data, and scheme of chapterization and limitations of the study.

**Chapter 2 – Review of Literature:** In this section an attempt is made to present a review of various studies relating to awareness about futures trading, benefit of futures trading, economic functions of the futures contract, hedging effectiveness, market microstructure, spread/basis, carrying cost, price stabilization/destabilization, speculation, amendment to FC (R ) Act, types of forward contract, failure of futures contract, option trading, relationship between rubber price and crude oil price, rubber plantation management, volatility of the underlying asset price, price discovery at national and international level.

**Chapter 3 – Futures Trading in Rubber – An Overview:** This chapter is about derivatives in India: A historical over view, definition of futures Contract, rubber futures trading in National Multi Commodity exchanges, spot price trend of rubber after delisting and underlying fundamentals, destabilization hypotheses and increased spot market volatility, stabilization hypotheses and decreased spot market volatility and Stabilizing effect of futures trading.

**Chapter 4 – Economic Functions of Futures Market: An Analysis.** This chapter deals with the analysis of statistical data on hedging efficiency, elasticity of expectation, market bias, Volatility of spot rubber price and price discovery.

**Chapter 5 - Awareness and Perception of Market Participants: An Analysis.** This chapter presents the analysis of the statistical data on profile of futures market participants, spot price information sources and motivation for sale/purchase, awareness of market participants about spot and futures market, awareness and perception about futures trading.

**Chapter 6 - Summary of Findings, Suggestions, and Conclusions:** This chapter presents the summary of the thesis, briefs of various findings, recommendations, major contributions of this research and directions for future research.

## 1.8 Limitations of the Study

Even though, utmost care is exercised in all aspects of this research, certain limitations have been perceived and are acknowledged herewith.

- The major limitation of the study is that it does not cover the entire rubber futures market participants in Kerala.
- Hedge period less than one month has not been considered in this study.

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Chapter 2

# REVIEW OF LITERATURE

Contents



## 2.1 Introduction

This chapter summarizes the major conclusions and propositions of previous research studies on commodity futures trading. The review of literature is of paramount important in any research as it offers an explanation for the necessity of the current research initiatives. The economic functions and benefits of commodity futures trading are debated in many academic literatures across the world. The review of literature helped the researcher to evaluate various studies relating to awareness about futures trading, benefit of futures trading, economic functions of the futures contract, hedging effectiveness, market microstructure, spread/basis, carrying cost, price stabilization/destabilization, speculation, amendment to FC (R) Act, types of forward contract, failure of futures contract, option trading, relationship between rubber price and crude oil price, rubber plantation management, volatility of the underlying asset price, price discovery. Majority of the Indian literature on futures trading originated after the introduction of futures trading on national level multi commodity exchanges in 2003.

The review of literature is presented in two parts;

**2.2 Studies on Futures Trading in Indian Context**

**2.3 Studies on Futures Trading in International Context**

## 2.2 Studies on Futures Trading in Indian Context

Pavaskar, M.G., (1976), in his book "Economics of hedging" examined analysed the hedging efficiency of cotton futures market for the period 1953 to 1963 and found that average degree of efficiency for all hedges for one- month and two- months were -0.77and -0.72 respectively. The average efficiency of one month hedges remained negative for all the six years, the degree of efficiency varying from -0.15 to – 3.01. In the case of two month hedges average degree of hedging efficiency was positive during the years.

Somanathan (1993), in his thesis "Commodity and financial futures markets: An economic analysis", analysed the price spreads, hedging efficiency, price stabilization efficiency and bias index for pepper and sacking for the period 1978 to 1985. He found that the pepper market exhibited a contango 78.5 per cent of the time, there was a decline in contango 60 per cent of all instances, 79.5 per cent of the hedges studied were effective, market exhibited a stabilizing influence 90.1 per cent of the time and for the period as whole the bias index had a value of + 0.76. In the case of sacking, market exhibited a contango 70.9 per cent of the time, there was a decline in contango 47.7 per cent of all instances, 75.3 per cent of the hedges studied were effective, market exhibited a stabilizing influence 72.9 per cent of the time and for the period as whole the bias index had a value of + 0.57.

Thomas, S., and Karande, K., (2001), in their paper 'Price discovery across multiple spot and futures markets', analyzed price discovery in India's castor seed market, Ahemedabad and Bombay by using daily closing data on future and spot prices, which spans from May 1985 to December 1999. They found that out of four, three seasonal contracts in Bombay future prices lead the Ahemedabad future prices while the March contract in Ahemedabad future prices lead the former one. Despite having smaller volume, the Bombay dominates the future prices over the Ahemedabad prices for all contracts except the contracts maturing at the time of harvest. The reason is due to the fact that prices of castor seeds are largely driven by the export demand. Since the traders or exporters expose to the port in Bombay, the markets have a lead in getting information that drives prices in the June, September and December contracts. This study shows that markets that trade exactly the same asset, in the same time zone, do react differently to information and also small market may lead the large market.

Kiran Kumar, K., and Chiranjit Mukhopadyay (2002), in their paper "Equity Market Interlinkage: Transmission of volatility – A case study of US and India" an empirical investigation was done to find out the short run dynamic linkages between NSE Nifty in India and NASDAQ Composite in US during the recent 1999-2001 period using intra-daily data, which determine the daytime and overnight returns. They found that the granger causality results indicate unidirectional granger causality running from the US stock markets (both NASDAQ Composite and S & P 500 indices) to the Indian stock market, NSE Nifty index. The volatility spillover effects are significant only from NASDAQ Composite implying that the conditional volatility of Nifty overnight returns is imported from US. They also found that on an average the effect of NASDAQ daytime return volatility shocks on Nifty overnight return volatility is 9.5 per cent and that of Nifty daytime return is a mere 0.5 per cent.

Sahadevan, K.G., (2002), in his paper "Price discovery, return and market conditions: Evidence from commodity futures markets" a quantitative analysis of the relationship between price return, volume, market depth and volatility on a sample of twelve markets in six commodity items over a period of 38 months from January 1999 to August 2001. The result of the study shows that the market volume and depth are not significantly influenced by the return and volatility of futures as well as ready markets. The results also indicate that the futures and ready markets are not integrated. The price volatility in the ready markets does not have any impacts on the market conditions in futures markets. The exchange specific problems like low volume and market depth, lack of participation of trading members and irregular trading activities along with state intervention in many commodity markets are major ills retarding the growth of futures market.

Thenmozhi, M., (2002), in her paper "Futures Trading, Information and Spot Price Volatility of NSE-50 Index Futures Contract" examined the volatility of spot market before and after introduction of the stock index futures. She also examined the lead-lag relationship between stock index futures and spot index returns. In order to estimate the impact of futures trading on the volatility of Nifty, daily closing price returns of NSE-50 Index is considered for the period 15th June 1998 to 26th July 2002. The returns series comprises 1037 observations, of which 503 observations relate to the period prior to the introduction of futures trading and the remaining 534 observations to the period after the introduction of futures trading. In her study, volatility has been measured by computing the standard deviation of the daily returns. The study shows that inception of futures trading has reduced the volatility of spot index returns. She also examined the lead-lag relationship between stock index futures and spot index returns. The result shows that futures market leads the spot market.

Raju, M.T., and Karande, K., (2003), "Price Discovery and Volatility on NSE Futures Market", examined the price discovery between the S & P CNX Nifty and its corresponding futures. Cointegration technique and Error correction model has been employed for examining the objectives. Daily closing values of index futures and BSE 100 index were comprised for June 2000 through October 2002. All the required data information's were collected from website of NSE. The analysis revealed that the futures market (and not the spot market) responds the deviation from equilibrium and price discovery occurs in the both futures and the spot market.

Shenbagaraman, P., (2003), in her paper "Do Futures and Options trading increase stock market volatility?" investigated the impact of the introduction of derivative trading on cash market volatility using data on stock index futures and options contracts traded on the S & P CNX Nifty (India). The results suggest that futures and options trading have not led to a change in the volatility of the underlying stock index, but the nature of volatility seems to have changed post-futures. She also examined whether greater futures trading activity (volume and open interest) is associated with greater spot market volatility. She couldn't find any link between trading activity variables in the futures market and spot market volatility.

Kumar, S., and Sunil, B., (2004), in their paper 'Price discovery and market efficiency: evidence from agricultural future commodities', investigated the price discovery in six Indian commodity exchanges for five commodities. For their study they have used the daily futures and comparable ready price and also engaged the ratio of standard deviations of spot and future rates for empirical testing of ability of futures markets to incorporate information efficiently. Besides, the study has empirically analyzed the efficiency of spot and future markets by employing the Johansen cointegration technique. They found that inability of future market to fully incorporate information and confirmed inefficiency of future market. However, the authors concluded that the Indian agricultural commodities future markets are not yet mature and efficient.

Sudarsanan Pillai, P., (2004), in his book "Plantation Management-A Study of Rubber Plantation Industry in India and Malaysia" describes in detail the different aspect of the management practices in Rubber Plantation Industry in India. The book also describes the organizational set –up, functional areas of management such as production, personnel, industrial relations, marketing and finally a profile of Rubber Small holding and their problems. It also contains a discussion on the structure and management of rubber plantation in Malaysia, the number one producer of natural rubber in the world.

Ahuja Narender, L., (2006), in his paper "Commodity Derivatives Market in India: Development, Regulation and Future Prospects" emphasized that pricing and price risk management should be left to the market forces rather than trying to achieve these through administered price mechanisms. Promotion of free trade and removal of trade barriers are essential for the development of market.

Gupta, K., and Belwinder, S., (2006), in their paper "Price discovery and causality in spot and future markets in India", examined the price discovery mechanism in the NSE spot and future market. The study used the daily closing values of index future S&P CNX Nifty, from June 2002 to February 2005. By using the techniques like Johansen and VECM, it was empirically found that there was bilateral causality between the Nifty index and futures. Besides, it was also found that there exists stronger casual relation from Nifty futures to Nifty index as compared to the vice-versa.

IIMB (2006), FMC had commissioned a study by the Indian Institute of Management, Bangalore (IIMB) to study the impact of Futures Trading in some important agricultural commodities. In their paper "Performance of Futures Market and their Impact on Farmers of Wheat, Chana, Sugar, Guar seed, Urad and Tur" IIMB study with regard to gram, sugar, guar-seed, wheat, urad, and tur states that these commodities witnessed higher price increase in the post-exchange period as compared with the pre-exchange period. By and large, it concludes that changes in the fundamentals (mainly supply side) were important in causing the higher post-futures price rise, with government policies also contributing. Therefore, the role of futures trading remains unclear. The IIMB study also found that spot price volatility increased after introduction of futures in case of wheat and urad. However, it does not find any major change in volatility for gram, excepting an abnormal rise in FY 2006-07, or for tur and sugar. In case of guar seed, volatility was in fact found lower after introduction of futures trade. In an interesting extension to this, the study found evidence that increased spot price volatility especially for wheat but also of gram was associated with an increase in seasonality of prices. In case of sugar also, volatility of spot wholesale prices did not increase with introduction of futures. IIMB also conducted a primary survey of farmers, traders, processors to find out extent of awareness of futures trading, use of spot price information, sources of price information, participation in the futures trading and perception on futures market. They conducted the survey taking a sample of 781 Wheat farmers (UP, Gujarat, Haryana, MP, Maharashtra, Punjab, and Rajasthan), Chana 424 farmers (UP, Maharashtra, MP, and Rajasthan), 384 Tur farmers (Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh), 384 Urad farmers (Andhra Pradesh, Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh), 466 Sugarcane farmers (UP, Maharashtra, AP, Punjab, Haryana, Tamil Nadu) and 275 Guar farmers (Gujarat, Haryana, Punjab, Rajasthan). Number of farmers aware of futures trading about Wheat, Chana, Tur, Urad, Sugarcane and Guar are 11(1.4 per cent), 5(1.8 per cent), 6(1.6 per cent), 5(1.3 per cent), 10(2.1 per cent) and 0(0 per cent) respectively. Taking a sample of 30, 57, 47, 45, 30 and 30 for Wheat, Chana, Tur, Urad, Sugarcane and Guar respectively among traders to know the awareness of futures trading and found that 100 per cent wheat traders, 100 per cent Chana traders, 57 per cent Tur traders, 80 per cent Urad traders, 100 per cent Sugarcane traders and 100 per cent Guar traders were aware of it. They also found that 77 per cent Chana traders, 46 per cent Tur traders, 42 per cent Urad traders, 70 per cent Sugarcane traders and 100 per cent Guar were aware of futures trading.

Kedarnath Mukherjee and R. K. Mishra (2006), in their paper "Lead-Lag Relationship between Equities and Stock Index Futures Market and its Variation around Information Release: Empirical Evidence from India" an attempt has been made to investigate the possible lead-lag relationship, both in terms of return and volatility, among the NIFTY spot index and index futures market in India and also to explore the possible changes (if any) in such relationship around the release of different types of information by using intraday data from April to September 2004. Results suggests that though there is a strong contemporaneous and bi-directional relationship among the returns in the spot and futures market, the spot market has been found to play comparatively stronger leading role in disseminating information available to the market, and therefore said to be more efficient. Apart from this, there is also interdependence (in both direction) and therefore more or less symmetric spillovers among the stock return volatility in the spot and futures market. The results relating to the informational effect on the lead-lag relationship exhibit that though the leading role of the futures market wouldn't strengthen even for major market-wide information releases, the role of the futures market in the matter of price discovery tends to weakens and sometime disappear after the release of major firm-specific announcements.

Mukherjee and Mishra (2006), in their empirical study "Lead-Lag Relationship Between Equities and Stock Index Futures Market and It's Variation Around Information Release: Empirical Evidence from India" examined the cointegration, causality and lead-lag relationship between Indian NIFTY and 5 Stock Futures for the period April to Sept. 2004. They found that markets were cointegrated, causality was bidirectional and cash market leads futures market.

Praveen, D.G., and Sudhakara, A., (2006), in their paper "Price discovery and causality in the Indian derivative market", an attempt has made to study a comparison of price discovery between stock market and the commodity future market. They have taken Nifty future traded on National Stock Exchange (NSE) and gold future on Multi Commodity of India (MCX). The result empirically showed that the one month Nifty future did not have any influence on the spot Nifty, but influenced by future Nifty itself. The casual relationship test in the commodity market showed that gold future price influenced the spot gold price, but not the contrary. So this implies that information is first disseminated in the future market and then later reflected in the spot market. Their study on spot prices of gold during the period of April 2002 to

June 2005 showed that the Indian gold prices volatility is relatively higher than global market and Indian stock market has declined during their study period. It was found that the stock market has well developed spot market due to its presence of national wide stock exchange, which provides the stock market a perfect platform for price discovery while the spot commodity market is far away from this platform because spot gold is not confined to one place.

Sah and Kumar (2006), in their study "Price Discovery in Cash and Futures Market: The Case of S&P Nifty and Nifty Futures" examined the cointegration, causality and lead lag relationship between Indian Nifty Futures and Nifty Index for the period June 2000 to March 2005. They found that markets were cointegrated, causality was bidirectional and cash market leads futures market.

Thomas (2006), in her research "Interdependence and Dynamic Linkages Between S&P CNX Nifty Futures and Spot Market: with Specific Reference to Volatility, Expiration Effects and Price Discovery Mechanism" examined cointegration, causality and lead lag relationship between Indian Nifty Futures and Nifty Index for the period June 2000 to April 2005. She found that markets were cointegrated, causality was bidirectional and cash market leads futures market.

Bhatia (2007), in the paper "Do the S&P CNX Nifty Index and Nifty Futures Really Lead/Lag? Error Correction Model: A Cointegration Approach" examined cointegration and causality of Indian Nifty Futures and Nifty Index taking the price series from April 2005 to March 2006.The result shows that there is long run relationship between Nifty Futures and Nifty Index. It is further found that causality is bidirectional and futures market leads cash market.

Bose (2007), in the paper "Contribution of Indian Index Futures to Price Formation in the Stock Market" examined cointegration and lead and lag relationship between Indian Nifty Futures and Nifty Index for the period March 2002 to Sept. 2006. The study indicated that there is long run relationship between Nifty Futures and Nifty Index. It also found that Nifty Futures Causes Nifty and Futures Market Leads Cash Market.

IIM-LR and MCX (2007), in their report "Potatoes, Mentha Oil, Cardamom Commodity Futures Markets, an Assessment" it is mentioned that farmers are receiving better prices for potatoes, menthe oil, and cardamom since MCX launched futures contracts for these three products. The price transparency that the MCX contracts offer has reduced exploitive practices by brokers and middlemen and eliminated numerous markups in the commodity supply chains.

Kaul, Sanjay (2007), in their study "Commodity Futures Trading in India: Myths and Misconceptions', conducted an in house study on wheat, maize, sugar, urad and chana to determine the impact of futures trading on price volatility for the commodities in the pre- and post- futures period were compared. It concludes that price volatility in case of these commodities has declined with the advent of futures trading and this is due to increased price discovery. They further found that from empirical study that the introduction of derivatives does not destabilize the underlying market; either there is no effect or there is a decline in volatility. Further, the literature strongly suggests that the introduction of derivatives tends to improve liquidity and information of markets.

Ramaswami Bharat and Jatinder Bir Singh (2007), in their paper "Hedging and the Emergence of Commodity Futures: The Soya Oil Exchange in India" mentioned that the soya oil futures exchange National Board of Trade (NBOT) at Indore exercise a significant impact on the basis and provide enough short-term volatility to make the contract attractive to both hedgers and speculators.

Sahadevan K.G. (2007), in his study "Advantages of commodity futures trading through electronic trading platform for farmers of Uttar Pradesh: A study of Potato and Mentha" conducted an empirical study choosing three districts each for potato and metha. Three leading potato producing pockets in UP are located in these identified districts. They are Fatehgarh in Farrukhabad district, Sambhal in Moradabad district and Bakshi-ka-Talab and surrounding areas in Lucknow district. Similarly, three major mentha farming entres are identified which are Sambhal in Moradabad district, Sadar in Rampur district and Fatehpur in Barabanki district. The criteria used for selection of sample farmers are the volume of annual production and area under cultivation. He found that the supply and demand for these commodities are large enough to attract many potential futures markets players. As India is a leading producer of both the commodities they have the potential to attract international trading interests in the futures markets. These commodities are well standardized and storable. While mentha oil is high value and low volume commodity which is storable without any special and expensive infrastructure requirements, a large chain of cold storages network in UP is taking care of the storage of potatoes. Private and free markets forces operate in both commodities without monopolistic or government control. The most important among other conditions is their seasonal supply and large price variation between crop season and off season creating large price risks to producers and consumers alike.

Brajesh Kumar, Priyanka Singh and Ajay Pandey (2008), in their paper "Hedging Effectiveness of Constant and Time Varying Hedge Ratio in Indian Stock and Commodity Futures Markets" examined hedging effectiveness of futures contract on a financial asset and commodities in Indian markets. They estimated dynamic and constant hedge ratio for S&P CNX Nifty index futures, Gold futures and Soyabean futures. Various models (OLS, VAR, and VECM) are used to estimate constant hedge ratio. To estimate dynamic hedge ratios, they used VAR-MGARCH. They compared in-sample and out-of-sample performance of these models in reducing portfolio risk. It is found that in most of the cases, VAR-MGARCH model estimates of time varying hedge ratio provide highest variance reduction as compared to hedges based on constant hedge ratio.

Cardinal edge Management Services (2008), in their paper "Enabling farmers to leverage commodity exchanges" conducted a study among 67 member farmers, 23 physical market traders and 60 non-member farmers. By comparing the focus group and control group the following results were obtained. The average price realization of focus group farmers was ₹2541/quintal which is around 3.1 per cent more than the average price realization of ₹2460/quintal of control group farmers. The average price realization of focus group farmers for the year 2007 was ₹2531/quintal which is around 5.9 per cent more than their price realization of ₹2399/quintal in 2006. Around 38 per cent of the overall cotton produce of focus group farmers was sold after the month of November as compared to 27 per cent of the overall cotton produce of control group farmers. Around 38 per cent of the overall cotton produces of focus group farmers in 2007 sold after the month of November as compared to 29 per cent of their overall cotton produce in 2006.

One of the major benefits expressed by the focus group farmers was their better bargaining power with traders due to higher awareness of futures prices and cotton market development. They also found the following benefits of futures market. Market Information Access: The price information displayed by exchange provided a good reference point to assess the spot prices and negotiate with traders/agents. In addition, it created awareness among the farmers to track the market and form an outlook on prices based on the available information. Price discovery process provided them an idea about price movements. The price movement signals assisted them in planning their spot operations effectively. Positions on Exchange: This introduced awareness about new market system among farmers along with a mechanism for locking-in their desired prices. In addition, it provided an essential feature of price signal that assisted them in taking decisions about operations in spot market. During the pilot farmers benefited from price signals from futures market and decided to store their produce for the longer period in the expectation of better realization from spot market. Spot Market Operations: Information access and positions on exchange has assisted farmers in deciding about their physical market operations and store their produce for longer period in the expectation of better price realization. In absence of futures market, farmers try to manage their risk by collecting the information from local mandis and accordingly planning their process. Though, the need of cash, lack of storage options and vagaries of weather may force them to sell their produce without utilizing the benefit of price signals.

Gupta (2008), in his research "Testing the Efficiency of Indian Equity Futures Market" investigated efficiency of Indian Equity Futures Market taking Nifty Futures and 84 Individual Stocks for the period Jan. 2003 to Dec.

2006. He found that futures and cash markets are cointegrated, causality is bidirectional and cash market leads futures market.

Madhoo Pavaskar (2008), in his article "Demand for Commodity Futures Trading" states that the demand for commodity futures trading is essentially a derived demand – derived from two sets of demand: demand for hedging or risk management on the one hand, and demand for speculation, which implies profiting from accepting price risks, on the other. Both these types of demand emanate from a common source of price risks. Price risks arise from price fluctuations in commodities and their products. Price risks are positively related to price variability. Higher the price variability, higher is the price risks; and conversely, lower are the price variability lower are the price risks. Both hedging and speculative demand are also directly related to price variability in commodities and their products.

Madhoo Pavaskar (2008), in his article "Option Trading in Commodities" mentioned that Options were first traded in Holland through the $16^{th}$ century by the traders in tulips. In India Cotton was the first commodity to attract option (teji mandi) contract. The Government of Bombay issued an ordinance in September 1939 prohibiting options in cotton. Government of India banned options in other commodities from 1943. Options functions like insurance by paying a premium, buyers can protect themselves against the risks of deteriorating prices, while still remaining able to benefit from improving prices. Options would appear particularly useful for farmers, farmers' associations, and state trading companies. They are also attractive to speculators, since they provide the possibility of a theoretically unlimited gain for the payment of only a relatively small premium. Options may reduce the pressure on the underlying futures and lower the price volatility in them, resulting in better price discovery in the process.

Ministry of Consumer Affairs, food and Public Distribution Government of India (2008), the Expert Committee to study the impact of futures trading on agro-commodity prices (hereafter called Abhijit Sen Committee) “Report of the Expert Committee to Study the Impact of Futures Trading on Agricultural Commodity Prices” analysed the trend growth of WPI and its volatility for pre-and post - futures period for 21 agro-commodities, both weekly and monthly and being annualized. Both sets of data show that the annual trend growth rate in prices was higher in the post – futures period in 14 commodities (Chana, Pepper, Jeera, Urad, Chillies, Wheat, Sugar, Tur, Raw Cotton, Rubber, Cardamom, Maize, Raw Jute and Rice). All sensitive commodities (food grains and sugar) showed some acceleration in inflation after the start of the futures trading. The remaining 7 commodities (Soy oil, Soy bean, Rape seed / Mustard seed, Potato, Turmeric, Castor seed, and Gur) posted a fall in prices in the post- futures trading. Therefore the impact is adverse in the case of an increase or decrease in prices if there were no corresponding changes in the fundamental factors. The committee observes that inflation in certain sensitive commodities increased after the introduction of futures trading. However, it notes that it does not follow that introduction of futures trading was the cause. A comparative study of daily volatility analysis was conducted for 19 commodities. It was found that volatility was lower in 15 commodities (Potatoes, Turmeric, Chilly, Jeera, Wheat, RM seed, Maize, Urad, Soya bean, Pepper, Guar seed, Soya bean oil, Gur, Rubber, Sugar) during the post-futures period, higher in 3 commodities (Chana, Castor seed, Raw Jute) and remained same for Guar gum. Weekly and monthly price volatility increased in 10 commodities after introduction of futures trading, remained unchanged in two, and declined in 9. Given these conflicting results from daily as against weekly and monthly data, no strong conclusion can be drawn on whether introduction of futures trade is associated with decrease or increase in spot price volatility.

Ministry of Consumer Affairs, food and Public Distribution Government of India (2008), in their study “Report of the Expert Committee to Study the Impact of Futures Trading on Agricultural Commodity Prices” found that There are cartels in different commodities such as pulses in Akola and Mumbai, gur in Muzaffarnagar and Hapur menthol in Chandausi, guar-seed in Jodhpur, pepper in Kochi; jeera in Unjha, chillies in Guntur and Nizamabad, turmeric in Nizamabad and Sangli, and soya oil in Indore. Traders in these centres command significant control on price determination of these commodities. This segment thrives on benefit from the fragmentation of the spot market and information asymmetry between producers and well-organized traders. Futures trading has eliminated the undue advantage enjoyed by a trading cartel in a fragmented market and make the trading process open.

Naresh V. Deshpande (2008), in his article “Amendment to the Forward Contracts (Regulation) Act, 1952: An Assessment” states that the salient features of the amendments to the FC(R) Act, 1952 are change in the definition of specific delivery contracts, increase in the period of delivery of goods in ready delivery contracts, insertion of a definition of “Futures Contract”, removal of definition of option in goods, provision for registration of brokers, increase in the number of members of the FMC and enhancement of the powers of the FMC for imposing a minimum penalty ranging from ₹1,000 to ₹5,000.

Nilanjan Ghosh (2008), in the paper “The Futuristic Futures: How Gainful Currency Futures in India are to Commodity Market Players?” states that major commodities traded on the national commodity exchanges in India are mostly either imported or exported. These include crude oil, precious and non-ferrous metals, natural gas, steel, and carbon credits. Importers in these commodities are not only compelled to take positions in futures markets to hedge against international price fluctuations, but often realize a lower margin than expected due to a depreciation  of the domestic currency.

Nilanjan Ghosh (2008), in the article "Ruthlessness and Generosity of Markets: Futures as Instrument for Combating Agricultural Price Volatility." states that in dealing with basis risk and international price volatility some developing countries like Argentina, Brazil, China, Hungary, India, Malaysia, Philippines, Russia, and South Africa have established commodity derivative markets.  The success of agro-commodity futures in various other countries in dealing with international price volatility, and in helping local price discovery does prove a case for a developing nation like India to encourage further development of agro-commodity futures. Rather than banning agro- commodities from futures trading, the Government needs to create environments that will be more conductive for futures trading.

Nilanjan Ghosh (2008), in the article "Price Discovery in Commodity Markets: Floated Myths, Flouted Realities" states that in econometric point of view price discovery is cointegration, error correction models, simultaneous equation systems, and seemingly unrelated regression equations. In static sense, price discovery is implied by the existence of equilibrium prices, in dynamic framework price discovery describes how information is produced and transmitted across the markets.

Pradhan Kailash Chandra and Sham Bhat (2008), in their paper "Price Discovery and Causality in the NSE Futures Market" investigated the causal relationship between the spot and futures on 25 individual securities. The study employed Johansen's cointegration test and vector error correction model (VECM). The daily closing data is taken from November 9, 2001 to September 29, 2005 for the analysis. The results revealed that futures leads the spot in case of 9 individual securities, spot leads the futures in case of 7 individual securities and the feedback relation takes place between two markets in case of 9 individual securities.

Srinivasan, Sandhya (2008), in her paper "Futures Trading in Agricultural Commodities" explores the effect of the ban of the futures trading in four agricultural commodities – chickpea, potato, rubber and soya oil on 7 May, 2008. She found that, of the four banned commodities, only the price of potato declined after the ban due to the bumper crop. The ban resulted in a huge loss of trading volumes for the futures exchanges, but didn't impact food prices significantly. Analysts suggested that about ₹300-400 crore of business was affected on a daily basis on NCDEX and NMCE alone, the two largest exchanges for trading in agricultural commodities. The total trading volume for the four commodities in the three national exchanges was valued at ₹15000 crore a month, almost 10 per cent of the total traded volume (estimated at ₹164080 crore a month). The ban also created negative sentiments among market participants and public. Banning futures is an illogical solution because it obstructs the development of a mechanism to regulate unhealthy speculation.

The Institute for Agriculture and Trade Policy (2008)," Commodities Market Speculation: The Risk to Food Security and Agriculture" reported that excessive speculation in agro-commodity markets has played a major role in the rapid rise and fall in global food prices. Commodity index funds create a constant upward pressure on commodity prices. They contributed $1.5 billion to each of the Morgan Stanley and Goldman sachs bottom lines in 2008. The IATP report notes that due to high prices, the total food import bill in developing countries increased from about $191 billion in 2006 to $254 billion in 2007.

Ali Jabir (2009), in his paper "Performance of Commodity Markets for Pulses in India: Can Futures Trading Help in Market Efficiency?" analysed the performance of futures market for four major pulses- gram, tur, urad and lentil- for magnitude and direction of spot and futures prices relation by Johansen's Cointegration and Granger Causality test. Empirical results suggest the existence of a long-term equilibrium relation between futures and spot prices for three commodities, i.e gram, urad and lentil under the study. Lack of cointegration for tur may be because of partially developed futures commodity exchanges, market manipulation by large traders, and greater market intervention by the government for MSP and procurement.

Archana Kshirsagar (2009), in her article " A tale of organized commodity exchanges" states that the *Arthashastra* of Kautulya (300 BC) even describes that the price of futures "shall be fixed taking into account the investment, the quantity to be delivered, duty, interest, rent and other expenses." This description in reality matches the manner in which prices of forward and futures contracts are fixed at present in commodity markets. The *Arthashastra* even goes further and describes in detail the marketing system as prevalent then, and also the regulatory practices for both domestic trade as well as export-import trade during those times.

Bhuvan Sethi (2009), in the paper "Black Tea: A Peek into the Future" examines the price discovery function of domestic and world current prices from January 2000 to December 2007 using the Granger Causality Test. The stationarity of the price series were tested using Augmented Dickey Fuller Test. The result shows that world price cause India prices.

Gosh, N., and Purohit, H.K.S., (2009), in their paper "An Indicative Exposition of Two Aspects of Chana Trading in India: Price Volatility – Payoff Dynamics, and Hedge Transfer in Futures Contract" they have reported on hedge transfer mechanisms and net payoffs from the same, under various market conditions for chana. The critical element that emerges from this exercise is that hedge transfer has not really benefited the hedger under conditions of peak arrival time of the pulse at the marketplace, which is during March. On the other hand, such hedge transfers have extensively helped the hedger during the festival season of October-November.

Gosh, N., S., Chakravarty and S.Kumar (2009), in their paper "Volatility and Price Discovery in Indian Wheat Market: Was the Futures Market to Blame?" examined the volatility and price discovery of wheat futures market for the period June 2005 to August 2007. Volatility was identified using GARCH (1,1) equation. They found that volatility was encountered only in such periods when the price rise was arrested, was coincidental with the government's intervention at controlling the price, and with news of impending imports. They also found indications of information flows the futures market to the product market, and in fact, found instances of reverse flows.

Harish Kumar, Purohit, Bhuvan Sethi, Nilanjan Gosh (2009), in their paper "Price Dynamics of Natural Rubber in India" examines influence of crude oil price on domestic price of natural rubber using a regression equation for the period April 2003 to October 2009. They found that there is a positive relationship between crude oil price and natural rubber price.

Jatinder Bir Singh (2009), in his paper “Pricing Performance and Hedging Effectiveness: Soya Oil Futures Market in India” examined the cointegration among NBOT, NCDEX and MCX soya oil futures. It was found that there is a cointegrating relationship between the NBOT- NCDEX NBOT – MCX and NCDEX-MCX futures prices.

Kapil Gupta and Balwinder Singh (2009) , in their paper “Price Discovery and Arbitrage Efficiency of Indian Equity Futures and Cash Markets” investigated the price discovery efficiency and validity of Law of One Price of NIFTY and 50 stocks by using high frequency data available at National Stock Exchange of India. The Johansen Cointegration test results and suggests that both markets are integrated of order one hence, price convergence on contract expiry date does take place, which implies that Indian equity futures and cash markets observe strong and stable long-run relationship. Granger Causality results, which suggests that significant bidirectional relationship (except for Nifty) exists between Indian equity futures and cash markets, however, there is unidirectional Granger Causality between Nifty and Nifty futures.VAR results suggest that the Indian equity futures market significantly lead the Indian cash market where, Nifty futures lead Nifty by five minutes. However, the length of lead-lag relationship between individual stock futures and cash market varies in the range of five to fifty minutes. Out of fifty individual stocks considered in the study, twenty seven individual stock futures lead cash market by five to forty minutes. Whereas, fifteen individual stocks lead individual stock futures by five to fifty five minutes and no lead-lag relationship exists between eight individual stocks and their respective futures contracts.

Madhoo Pavaskar (2009), in his article “Economic functions of futures market” states that risk management and price discovery are the main economic functions of futures market. The process by which price risks are reduced through futures market is known as hedging, or in modern management parlance “risk management” To hedge is to assume a position in futures market equal and opposite to an existing position in the ready or forward market.

Madhoo Pavaskar (2009), in his article “Option Contracts in Commodities” states that the call option and put option in market parlance is known by the name *teji* and *mandi* respectively. A put and call in market parlance is called *teji-mandi*. Hedging through options on the futures contracts has distinct advantage over hedging through direct operation in the futures market. In direct hedging through the futures contracts, the loses on the physical market transactions are, offset by the gain in the futures contracts; similarly, the gain in the physical transactions are lost, either wholly or to a considerable extent, by the loses in the futures contracts. But options enable the market participants to retain the gains, while avoiding the price risks. For, in options they can exercise their right to buy or sell the futures contract, as the case may be, only when the price of such a contract moves to their advantage, and not otherwise. Their loss, if any, is limited to the premium amount only.

Madhoo Pavaskar and Archna Kshirsagar (2009), in their paper “Hedging Efficiency of Copper’’ assessed the efficiency of copper futures market taking carrying cost or cost of carrying the commodity in storage are conservatively assumed at 2 per cent per month. Out of 294 simulated hedges 257(87.4 per cent) were in favour of short hedges and 37(12.6 per cent) were in favour of long hedges.

Madhoo Pavaskar (2009), in his paper “Market Microstructure: Another perspective” states that the most important element in the market microstructure is, of course, the transaction and other costs of successive marketing services. Market microstructure studies scarcely require serious knowledge of either mathematics or econometrics.

Madhoo Pavaskar (2009), in his article “Contango and Backardation” states that if at any time, the futures price were above the ready price, by an amount more than the carrying costs merchants could make an easy profit by selling forward in the futures market, buying simultaneously the actual commodity in the ready market, and fulfilling the futures contract eventually by delivering the same commodity in that market. On the other hand, if at any time, the futures price were below the ready price, by an amount less than the carrying costs, then it would be profitable for the merchants to sell ready goods, buy futures contracts, and demand actual delivery against them in the month of maturity.

Madhoo Pavaskar (2009), in his article “Theory of Normal Backwardation” states that the theory of normal backwardation is subject to certain qualifications. The proposition that the futures price must fall short of the expected price by the amount of the marginal risk premium (FP = EP – r) is only true if the hedgers are sellers in the futures market and not buyer. The theory was developed by Keyness during the period of great depression of 1929, when farm prices slumped suddenly and left most producers in the cold. The situation will be far different in export commodities, where hedgers are mostly exporters buying in the futures to cover their export commitments. The theory may also not be valid in markets where both buying and selling speculators outnumber the hedgers. In such a market, the competition among the buying speculators may probably reduce or even inverse the risk premium so that the futures price may very well be identical with the expected price, if not above it. The theory was much more severely criticized by Holbrook, Working and Roger Gray.

Madhoo Pavaskar (2009), in his article "Types of Forward Contracts" describes different types of forward contracts. Ready delivery contract, forward contract, specific delivery contract, futures contract, non- transferable specific delivery contract, transferable specific delivery contract, on call contract, unfixed contract and option contract are the different types of forward contracts. Trading in on call and unfixed contracts came to an end after Central Government banned trading in NTSD contracts during 1960s.

Mahalik Mantu Kumar, Debashis Acharya and M. Suresh Babu (2009), in their paper "Price Discovery and Volatility Spillovers in Futures and Spot Commodity Markets: Some Empirical Evidence from India" examined price discovery and volatility spillovers in Indian spot-futures commodity markets by using cointegration, VECM and the bivariate EGARCH model. This study has used four futures and spot indices of Multi-Commodity Exchange (MCX), Mumbai that employs daily data spanning over 12$^{th}$ June 2005 to 31$^{st}$ December 2008. The four indices are MCXCOMDEX, MCXAGRI, MCXENERGY, and MCXMETAL. The above empirical findings reveal that the future commodity markets like LAGRIFP, LENERGYFP and LCOMDEXFP play a dominant role and serve effective price discovery in the spot commodity market but the reverse causality does not exist while metal commodity spot-future markets (LMETALFP & LMETALSP) are not taken into consideration as there is no coinetgrating relationship between them. The study claims that volatility spillover exists from futures to spot.

Nilanjan Ghosh (2009), in his paper "Market Microstructure in the Indian Context" states that market microstructure involves the study of the impact of market structure and individual behaviour on the process of exchange in the market. Microstructure research provides a comparison of existing market structures with the performance of alternative market structures. The efficient market hypothesis is challenged by microstructure studies. Microstructure literature can be classified under three components: (1) the actual transaction process, (2) the effects of market structure and trading rules on the transaction process, and (3) the transaction process' implication for fundamental economic decisions. Research on commodity market microstructure in India owes its origin well back to the 1930s, with research on cotton futures market in Mumbai by Prof.M.L. Dantwala and H.L. Dholakia, In the 1960s, Venkitaraman published his book on the theory of futures trading. At around the same time a host of articles and books came up on the microstructure of commodity derivative markets in India, most of them authored by Pavaskar.

Pavaskar M and Archana Kshirsagar (2009), in their paper" Pricing and Marketing Efficiency in Cotton and Need for Risk Management" they emphasise the need of price hedging through the use of commodity risk management instruments like futures contracts. Cotton prices decline almost as often as they rise notwithstanding the overall rising trend in cotton prices. During the last decade and a half, prices have risen 60 per cent of the times, and have fallen 40 per cent of the times over one-month, two-month periods for all three varieties of cotton. In other words, cotton market functionaries face the risk of price fall as well as price rise. When prices fall, stockists, be they merchants or mills, suffer losses; and when prices raise, exporters as well as those who have sold forward in the domestic markets suffer.

Raveendran,N., Selvam.S., Murugananthi,D., and Padmavathy, P., (2009), in their paper "Transmission of Futures Price to Spot Price: A Study on Indian Pepper" studied the cointegration of the pepper market for the period January 2004 to March 2007 taking data from Cochin market. They used Johansen's Vector Error Correction Model (VECM) for this study. They concluded that futures prices influence spot prices and not vice versa, proving that price formation process at the spot market is based on futures prices.

Ritu Gupta (2009), in the paper "Cashew: A nut worth a lot" states that in India cashew futures were launched by the leading exchanges NCDEX and MCX. But the contracts have so far evinced little interest from both traders and exporter. Analysis from leading brokerages feels that the exchanges have chosen the wrong product which has been the key reason for the poor performance of the cashew futures trade. For example, since April 2006 not a single trade in cashew futures has taken place on NCDEX. The situation on the MCX platform is similar.

Sahadevan, K.G., (2009), in his paper "Do Farmers Benefit from Futures Trading? A Case Study of Mentha Oil Futures", a sample survey was carried out among farmers in three major mentha growing districts of U.P., viz. Moradabad, Rampur, and Barabanki, revealed that farmers' participation in futures market was abysmally low. There are three important reasons for their poor participation, particularly in mentha oil futures market. First, though they are exposed to price risk, the storability of oil without loss of its value saves them from the risk of selling when the price is the lowest during the May-July season. Moreover, not only farmers have the advantage of limited seasonal supply, but its demand too is significantly seasonal. This assures them fairly predictable higher price during November-February when the demand is high.

Second, farmers' awareness about futures market is poor. Out of the 30 farmers examined, only seven were aware, only two had shown interest in initiating position in futures market, while the others had never taken positions. Finally, a majority of farmers are not able to access futures markets directly because they lack the critical minimum size to fulfill the contract specification. The market lot is prohibitive for them as no pooled investors (aggregators) are currently operating on their behalf.

Chatkrabarti, S., and Nilabja Ghosh (2010), in their research paper "Inter-Temporal Transfer of News and a Possible Asymmetry: Futures Trading in Agro- Commodities" explored the effect of information on futures prices, effect of underlying asset price on futures price and banning of future trading on futures prices with respect to information and volatility. They conducted the study for three agricultural commodities wheat, maize and chana taking nearest month maturity data from NCDEX website for the period 2004 to 2009. The time – series- based GARCH approach was used to study the behavior of price. The lag lengths (memory) are decided using the AKAIKE criterion and the t- statistics. They found that with respect to information futures price movement has a positive pressure on price movement. For wheat and maize spot price has positive impact on futures prices. But for chana the effect is neutral.

Madhoo Pavaskar (2010), in his article "In Search of Risk Premium" states that Holbrook Working, who has done pioneering empirical work in the U.S. on commodity futures trading for over five decades since the mid- 1920s and may well be regarded as the father of economics of commodity derivative markets, has criticized the Keynes-Hicks concept of risk premium and their theory of normal backwardation. Working's criticism rests mainly on two distinct logical as well as realistic arguments based on actual hedging practices. According to Working (1977) hedging is essentially a multipurpose concept, and is not necessarily done for avoiding risk of price fluctuations solely. Working distinguishes five kinds of hedging operations. They are anticipatory hedging, operational hedging, carrying charges hedging, risk avoidance hedging and selective hedging.

Madhoo Pavaskar (2010), in his article "Theory of Price Storage" states that according to Working, the backwardation in the futures price is better explained by the theory of price storage than the risk premium payable by hedgers to speculator. The price of storage that determines the relation between spot and futures prices, or between the prices of futures for two different delivery months, of any commodity at any time, could best be described algebraically by the equation $P = FP – SP$ or $FP_{t+1} - FP_t$ , where P is the price storage, FP is the futures price, SP is the spot price, $FP_{t+1}$ is the futures price for the distant delivery month contract, and $FP_t$ is the futures price for the current/ near delivery month contract.

Madhoo Pavakar (2010), in his paper "Economics of basis in commodity futures" states that basis is the difference between the spot price and the futures price. Hedging is essentially peculation on the basis; hedging returns depend on changes in the basis over the hedge period. A hedge involves the substitution of the basis risk for the price risk; its economic efficiency depends on the absolute as well as the relative limits of the two risks. The basis in commodity futures mostly works against short hedging, and in favour of long hedging.

Nilanjan Ghosh (2010), in his paper "Does thin commodity futures markets destabilize physical markets?. Wheat futures markets in India in the post – ban phase." examined the mutual dependence of NCDEX wheat futures price and Narela Mandi spot price of wheat for the period May 2009 to March 2010. The Granger Causality test shows that there is no existence of causality between the futures and the physical market price of wheat. Hence, there is no indicative evidence of the physical market players considering the futures prices as reference price for wheat. The volume of trading of wheat futures contract on NCDEX is very small and correlation between spot price and futures price is 0.9343. This degree of correlation is merely reflections of the common market fundamentals, rather than mutual dependence.

Shivakumar, K.M., and Paramasivam,P., (2010), in their paper "Exchange Rates, Energy and Expensive Metal Futures during the Global Economic Crisis" analysed the relation between commodity futures and exchange rates using time series data on daily prices of crude oil futures, gold futures and exchange rates for the rupee- dollar for the period January 2007 to October 2009 sourced from MCX and RBI websites. They found that both exchange rate and crude oil futures experienced bidirectional causality. There was no causality among gold and crude oil futures in the study period. The cointegration analysis revealed that there was a long run relation between the exchange rate and commodity futures. With respect to long run relation crude oil futures were highly affected, but gold futures were not. So it can be observed that during the global commodity crisis, gold futures were performing better.

Sunanda Sen and Mahual Paul (2010), in their paper "Trading in India's Commodity Futures Markets" an attempt was made to examine the direction of information transmission using Granger Causality test for chana, soya, potato and wheat markets. The result showed that for all the above four commodities changes in futures prices leading those in spot market. They also opined that, the opening up of futures markets has matched the rising spot prices for a majority of goods. The uptrend in the in the spot market can be interpreted as a fallout of trading of these commodities in the futures markets. For futures to provide "price discovery," spots should follow movements in the later. The spot price rise was obviously the answer to the lead by futures prices, which are subject to speculation. Thus, with futures prices on the rise, it generated an upward spurt in spot prices; too, leading to the suspicion that speculation in futures trade was behind the rise in spot prices. They also found that future trading also imparts volatility to both the spot and the futures markets. Comparing the monthly variations in spot prices of, rise, wheat, potato, onion, urad, and soya they have found a distinct rise in volatility for 5 out of the 6 sensitive items from January 2003 to December 2006, which were also the months when futures market in these commodities were open. This provides indirect evidence that probably the introduction of futures trade was responsible for wider fluctuations in the spot prices of these commodities.

Vasisht, A.K., (2010), in his paper "Econometric Analysis of Efficiency of Agro- Commodity Futures Market and Price Discovery" explored the efficiency of agro-commodity futures market operations in mitigating price risk and the price discovery function of futures for ensuring better hedge against price uncertainty in pepper, groundnut oil and guar gum. Daily futures and comparable spot price data for four contracts, each for three agro-commodities taken from NCDEX have been used to undertake the econometric study. The results revel that there is no cointegration between the series in all the 12 samples. The absence of cointegration implies lack of a long- run stable relation between spot and futures prices. This shows the inability of futures price to be the optimal forecast of the future spot price, and thus it can be concluded that the futures market is not efficient. The ratio of standard deviation of spot and futures were more than 1 for all samples of pepper and ground nut oil. This is indicative of a high level of speculative activity in these commodities.

Ali Jabir and Kriti Bardhan Gupta (2011), in their paper "Efficiency in agricultural commodity futures markets in India: Evidence from cointegration and causality tests" analysed the relationship between spot and futures markets of the commodities wheat, rice, maize, chickpea, black lentil, pepper, castor seed, soybean and sugar taking price series from NCDEX. The researchers used Johansen's cointegration analysis and Granger causality tests. They found that cointegration exists significantly in futures and spot prices for all the selected agricultural commodities except for wheat and rice. 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, black lentil and pepper, where bi-directional relationships exist in the short run.

Kushangur Dey and Debasish Maitra (2011), in his article "Price discovery and market efficiency revisited: Anecdotes from Indian commodity futures markets" suggests that Augmented Dickey Fuller (ADF) or Philippe-Perron (PP) test can be used for unit root. Garbade – Silver test can be used for estimating convergence and rate of convergence. Causality can be tested using Engle- Granger test. GARCH model will be considered to capture the volatility spillover.

Mukherjee Kedar Nath (2011), in his paper "Impact of Futures Trading on Indian Agricultural Commodity Market" an attempt has made to re-validate the impact of futures trading on 9 agricultural commodities chana, wheat, chilli, jeera, pepper, mustard seed, castor deed, soya oil, and menthe oil taking daily price information in spot and futures markets, for a period of 7 years (2004 – 2010) from NCDEX. He used Multiple Regression, Vector Auto Regression, Granger Causality Test and GARCH model to analyze the market. The daily volatility figures, both before and after the introduction of futures contract, clearly depicts the fact that the price volatility for most of the selected agricultural commodities were higher during the pre-futures period and have been significantly reduced after being listed in the commodity futures market. In other words, the underlying market has been found to be stabilized, for most of the commodities, after the initiation of futures trading. The results of co-movement or alternatively called lead-lag relationship among the spot and futures markets, suggests that both spot and futures markets would react simultaneously to much of the information. The volatility spillover results are also found to be mixed.

Nilamjan Ghosh and Sarika Ruchuri (2011), in their paper "Impact of tariff regimes on price discovery and spillover effects of Soya Oil futures in India: Some preliminary observation from an econometric analysis" examined the price discovery function of soya oil market of NCDEX for the period July 2005 to January 2011 using Garbade – Silver model. They found that futures market dominated price making prior to April 2008, after April 2008, the spot market has dominated the futures markets.

Peter and Pillai (2011), in their paper "Hedging Efficiency of Short Hedges of a Commodity Futures Market" assessed the hedging efficiency of rubber futures market by considering 12172 short hedges of contracts for 84 successive delivery months, beginning from June 2003 delivery till October

2010. The result showed that in as many as 83 out of 100 hedges in rubber futures, short hedgers; do not in any way benefit from hedging. The losses of the short hedgers in the physical market are not offset, either fully or even partially, by hedging in futures, but whenever the short hedgers made gains in the physical market, these are lost too through in the futures. The market exhibited a bias against short hedging i.e. the market exhibited a bias in favour of long hedging. This confirms the theory of inherent bias.

Peter and Pillai (2011), in their paper "Impact of Commodity Futures on Volatility of Underlying Asset Price" compared the spot price volatility of Indian Rubber for two periods. Spot price volatility during two different environments, i.e. spot price when there was futures' trading and spot price when the futures trading was suspended are compared. Spot price volatility of international rubber price for the above two periods was also compared. The result showed that spot market volatility of Indian rubber was decreased when futures trading in rubber was suspended and spot market volatility increased when there was futures trading. The increased volatility was due to speculative activity as a result of mismatch between demand and supply.

## 2.3 Studies on Futures Trading in International Context

Nathan Associates, (1974), in the paper "Review of Initial Trading Experience at the Chicago Board Options Exchange" studied the impact of listing options on the Chicago Board of Exchange. He reported that the introduction of options seemed to have helped stabilize trading in the underlying stocks. This was the first study to determine the stabilization/destabilization effect. This result has been supported by Skinner (1989) and also by other authors for the UK, Canada, Switzerland and Sweden.

Cox, C., (1976), in his study "Futures Trading and Market Information" found that futures trading can alter the available information and thus spot market volatility for two reasons. First, futures attract additional traders to a market. Second, as transaction costs in the futures market are lower than those in the spot market, new information may be transmitted to the futures market more quickly.

Danthine, J., (1978), in his study, "Information, futures prices, and stabilizing speculation" argues that the futures markets improve market depth and reduce volatility.

Edwards, Franklin, R., Edwards (1988 a), in his paper "Does Futures trading increase stock market volatility?" verified the fact that stock index futures trading has destabilized the spot market in the long run. Using variance ratio F tests from June 1973 to May 1987, he concludes that the introduction of futures trading has not induced a change in the volatility in the long run. He observes that there is some evidence of futures-induced short-run volatility, particularly on futures contract expiration days, but this volatility does not appear to carry over to longer periods of time.

Harris, L. H., (1989), in his paper "The October 1987 S&P 500 stock-futures basis" observed increased volatility after the introduction of index futures by comparing daily return volatilities during the pre-futures (1975-1982) and post-futures (1982-1987) between S&P 500 and a non S&P 500 group of stocks controlling for differences in firm attributes (beta, price-level, size and trading frequency). He noted that increase in volatility is a common phenomenon in different markets and index futures by themselves may not bear the sole responsibility. He pointed out other index-related instruments and developments such as growth in index funds and increase in foreign ownership of equity as possible explanations of higher volatility in stock markets.

Ross, S.A., (1989), in his paper "Information and volatility: The no-arbitrage martingale approach to timing and resolution irrelevancy" noticed that the volatility of the asset price will increase as the rate of information flow increases. Thus, if futures increase the flow of information, then in the absence of arbitrage opportunity, the volatility of the spot price must change.

Herbst, Anthony F. and Edwin D.Maberly, (1990), in their paper "Stock Index futures, expiration day volatility and the "special" showed that expiration day volatility of the stock index futures and the "special" Friday opening. Volatility is measured by the standard deviation of returns. It is seen that there is a fall in the triple witching hour due to change in settlement procedure from the third Friday to preceding Thursday.

Chin Kalok, Chan, K.C. and Karolyi, G.A., (1991), in their study "Intraday Volatility in the Stock Market and Stock Index Futures Markets" investigated the intraday relationship among price changes and volatility of price changes in the stock index and stock index futures markets. They have found the stronger interdependence in both the directions in the volatility of price changes between the cash and the futures markets than that observed in case of price changes only. Their evidence supported that the price innovations originate in one market, e.g. cash (futures) market, can predict the future volatility in the other, such as futures (cash), market. In other words, both cash and futures markets serve important role in discovering the price.

Hodgson, A, Nicholls, D., (1991), in their research paper "The impact of index futures on Australian share-market volatility" studied the impact of All

Ordinaries Share Index (AOI) futures on the Associated Australian Stock Exchanges over the All Ordinaries Share Index. The study spans for a period of six years from 1981 to 1987. Standard deviation of daily and weekly returns is estimated to measure the change in volatilities of the underlying index. The results indicate that the introduction of futures and options trading has not affected the long-term volatility.

Bessembinder, H., and Seguin, P.J., (1992), in their paper "Futures trading activity and stock price volatility" examined whether greater futures trading activity (volume and open interest) is associated with greater equity volatility. Their findings are consistent with the theories predicting that active futures markets enhance the liquidity and depth of the equity markets. They provide additional evidence suggesting that active futures markets are associated with decreased rather than increased volatility.

Kamara, A., Miller, T., and Siegel, A., (1992), in their study "The effects of futures trading on the stability of the S&P 500 returns" noticed the stability of S&P 500 index returns with the introduction of S&P 500 index futures. They also assess the change in the volatility of S&P 500 index due to the introduction of futures trading for the period 1976 to 1987. The changes in the volatilities are examined using parametric and nonparametric tests. Apart from F-tests, Kolmogorov-Smirnov two-sample test and Wilcoxon Rank sum test are used to find out if the dispersion is significantly high in the post-futures period. The results show that the daily returns volatility is higher in the post futures period while the monthly returns remain unchanged. He concludes that increase in volatility of daily return in the post-futures period is necessarily not related to the inception of futures trading.

Hamao, Y., Masulis, R., and Ng, V. (1994), in their study “Correlations in Price Changes and Volatility across International Stock Markets,” investigated the short-run interdependence of prices and price volatility across three major international stock markets namely, the Tokyo, London and New York with daytime and overnight returns data. Their analysis utilizes a Two-stage GARCH model, where in the first stage they extract the unexpected shocks from the daytime returns of one market and use it as a proxy for volatility surprise while modeling the other market’s overnight returns in the second stage GARCH model. They found that cross-market interdependence in returns and volatilities is generally bi-directional between the New York and Tokyo markets particularly after 1987 crash. So far very few studies have examined the co-movement of Indian stock market with foreign markets.

Lamoureux, Christopher G. and Sunil, K., Panikkath, (1994), in their study “Variations in Stock Returns: symmetries and other patterns, working paper” found that the direction of the volatility effect is not consistent over time. After 1987, the residual variance of both optioned stocks and stocks in a matched control group increased at the time of the option listing. This might be interpreted in two ways; viz. perhaps the listing has no true impact on volatility and there is some common unknown factor that is driving the magnitude of the idiosyncratic risk for different stocks. Or perhaps, there are spillover effects associated with listing options for some stocks, such that the dynamics of other stocks also changes.

Antoniou, Antonios, and Phil Holmes (1995), in their paper “Futures trading, information and spot price volatility: evidence for the FTSE -100 stock index futures contract using GARCH” studied the relationship between information and volatility in FTSE-100 index in the U.K. using GARCH technique. They found that introduction of FTSE-100 index futures has changed volatility in the spot market, they attribute this to better and faster dissemination of information flow due to trading in stock index futures.

Darrat, A.F., and Rahman, S., (1995), in their paper "Has futures trading activity caused stock price volatility?" studied if futures trading activity has caused stock price volatility. The study is conducted on S&P 500 index futures for a period of 1982 - 1991. The study also examines the influence of macro-economic variables such as inflation, term structure rates on the volatility of the S&P 500 stock returns. Granger causality tests are applied to assess the impact on stock price volatility due to futures trading and other relevant macro-economic variables. The results indicate that the futures trading have not caused any jump volatility.

Gregory, K., and Michael, T., (1996), in their paper "Temporal relationships and dynamic interactions between spot and futures stock markets" examined how volatility of S&P 500 index futures affects the S&P 500 index volatility. The study also examined the effect of good and bad news on the spot market volatility. The change in the correlation between the index and futures before and after October 1987 crash is also examined. Volatility is estimated by EGARCH model. It is shown that the bad news increases the volatility than the good news and the degree of asymmetry is much higher for the futures market. The correlation between the S&P 500 index futures and S&P500 index declined during the October 1987 crash.

Booth, G.G., Martikeinan, T., and Tse, Y., (1997), in their paper 'Price and Volatility spillovers in Scandavian stock markets', examined the price and volatility spillovers in the context of four Scandavian stock markets including

Danish, Norwegian, Swedish, and Finnish stock markets for the period 2 May 1988 to 30 June 1994 by employing the multivariate EGARCH model. They found that volatility transmission was asymmetric, spillovers being more pronounced for bad than good news. Significant price and volatility spillovers exist but they are few in number.

Wei,P., Poon, P.S., and Zee,S., (1997), in their paper “The effect of option listing on bid-ask spreads, Price volatility and trading activity of the underlying OTC stocks” reported an increase in volatility for options on OTC stocks in the USA. However no consensus result emerges, which probably a result of different data and time-periods studied, as also the inherent endogenously of the option listing decision.

Bollen et.al (1998), in their paper “A note on the impact of options on stock return volatility, Journal of Banking and Finance” found that the direction of the volatility effect is not consistent over time.

Chatrath, A., and Song, F., (1998), in their paper “Information and Volatility in Futures and Spot Markets: The Case of Japanese Yen” investigated the intraday behavior of the spot and futures market following the release of information and also investigated the role of such information in the volatility spill over among the two markets. Their results have supported that one market leading to greater volatility in the other is partly driven by information and therefore the leading role played by the futures market may be the result of new information efficiently reflected in the futures market.

Mayhew Stewart (2000), in their paper “The Impact of Derivatives on Cash Markets: What have we learned?” found that futures trading is associated with increased volatility in the United States and Japan. In some countries, there is no robust, significant effect, and in many others, volatility is lower after futures have been introduced.

Georgi Geogiev (2001), in his paper “Benefits of Commodity Investment”, shown that direct commodity investment can provide significant portfolio diversification benefits beyond those available from commodity based stock and bond investment. These benefits stem from the unique exposure of commodities to market forces such as unexpected inflation and positive return in futures- based commodity investment in periods of high volatility.

Gilgert, C.L., (2004), in the paper “Trends and Volatility in Agricultural Commodity Prices”, examined the volatility of 21 agro-commodity prices over the period of 1960 – 2002 and shows that volatility was high in many commodities but on the whole the negative trend was prevalent for all commodities averaging around 2 per cent. Among them volatility of coconut oil, groundnut oil, maize, rice, soya bean oil, sugar, cotton, jute, palm oil, rubber, soya bean and wheat were found to be -2.76 per cent, -1.56 per cent. -2.22 per cent, -2.54 per cent, -2.36 per cent, -2.57 per cent, -1.96 per cent, -3.56 per cent, -2.50 per cent, -2.51 per cent, -2.04 per cent and -1.41 per cent respectively.

Fu, L.Q., and Qing, Z.J., (2006), in their paper “Price discovery and volatility spillovers: Evidence from Chinese spot-futures markets” examined the price discovery process and volatility spillovers in Chinese spot-futures markets through Johansen cointegration, VECM and bivariate EGARCH model. The empirical results indicated that the models provided evidence to support the long-term equilibrium relationships and significant bidirectional information flows between spot and futures markets in China, with futures being dominant. Although innovations in one market could predict the futures volatility in another market, the volatility spillovers from futures to spot were more significant than the other way round.

Finnerty, J.E., and Park, H.Y., (1987), in their research paper “Stock Index Futures: Does the Tail Wag the Dog? A Technical Note,” noticed a significant lead-lag relationship between futures and spot prices of S&P 500 and Value Line futures lead the spot index between 0 to 16 minutes.

Kawaller et al., (1987), in their study “The Temporal Price Relationship Between S&P 500 Futures and the S&P 500 Index” an attempt was made to examine the cointegration and lead lag relationship between US S&P 500 Futures and S&P 500 Index for the period Jan. 1984- Dec. 1985. They found that markets were cointegrated, futures market leads cash market.

Protopapadakis and Stoll (1983), in their research paper “Spot and Futures Prices and the Law of One Price” examined the cointegration and causality between futures and cash commodity markets of Silver, Copper, Tin, Lead, Zinc, Coffee, Sugar, Soybean Meal, wheat and Rubber of U.S.A for a very long period from 1972 to 1980 . They found that markets were cointegrated and causality was bidirectional.

Witt, H. J., Schroeder, T. C., and Hayenga. M. L., (1986), in their paper “A Comparison of Analytical Approaches for Estimating Hedge Ratios for Agricultural Commodities.” illustrated the difference among the alternate hedge ratio estimation approaches. Each was estimated by using the same data to estimate cross- hedging relationships between barley and sorghum cash prices and nearby corn futures prices. The prices of Minneapolis barley (No.3) and Kansas City sorghum (No.2) are Thursday closing prices reported by the U.S

Department of agriculture. It was found that optimal hedge ratios generated by price –level regressions are statistically correct as those by the other procedures.

Ng (1987), in the paper "Detecting Spot Price Forecasts in Futures Prices Using Causality Tests" examined the causality for Value Line Futures and Value Line Index, S&P 500 Futures and S&P 500 Index, BP, DM, SF, CD and JY of U.S.A. for the periods Jan. 1981 to Dec. 1985, Apr. 1982 to Dec. 1986 and Jan. 1983 to Dec. 1986. The result shows that futures market causes cash market not vice versa.

Harris, C., (1989), in his paper "The October 1987 S&P 500 Stock-Futures Basis", examined the relationship between S&P 500 index and futures during the October 1987 stock market crash using five-minute data. A correlation technique and weighted least squires (WLS) model have been employed for examining the objective of the study. The analysis revealed that the S&P 500 cash index displayed more autocorrelation that the futures and the futures market lead the spot market.

Stoll, H.R., and Whaley, R.E., (1990), in their paper "Program trading and expiration day effects" used ARIMA model and ordinary least squares to estimate the lead-lag between S&P 500 index futures, Major Market Index futures and the underlying spot market. The results indicated that S&P 500 and Major Market Index futures lead the cash market by 10 minutes and they attribute this to faster dissemination of information into futures market.

Lai and Lai (1991), in their paper "A Cointegration Test for Market Efficiency" examined the cointegration of USD, BP, DM, SF, CD and JY of U.S.A, U.K., Germany, France, Canadan and Japan respectively for the period July 1973 to Dec. 1989. It was found out that the markets were cointegrated.

Schawrz, T.V., and Francis, E.L., (1991), in their paper "Dynamic efficiency and price leadership in stock index cash and futures markets" examined the price leadership of index futures over the spot market and test the dynamic efficiency of index futures as a price discovery vehicle. They used Garbade & Silber model to quantify the price discovery function of the futures market. The study is done on the Major Market Index for the sample period 1985 to 1988. The results show that the spot and futures are integrated such that average mispricing leading to arbitrage is eliminated within one to seven days.

Chan (1992), in the paper "A Further Analysis of the Lead-Lag Relationship Between the Cash Market and Stock Index Futures Market" examined the lead and lag relationship among US S&P500 Futures and S&P 500 Index MMI Futures and MMI Index and 20 Stock Futures taking the price series between Aug. 1984 to June 1985 and Jan.n1987 to Sept. 1987. The study said that causality is bidirectional and futures market leads cash market.

Chan, Kalok, (1992), in his paper "A further analysis of the lead-lag relationship between the cash market and stock index futures market" calculated the lead-lag relation between Major Market Index and Major Market Index futures under conditions of good and bad news, different trading intensities and under varying market wide movements. ARMA models are used for his study. It is seen that the futures market leads the spot again attributed to faster information processing by the futures market. However, under bad news it is the cash index that leads over the futures market while, there is no effect on the lead-lag relation during different trading intensities.

Tang, Y.N., Mak, S.C., and Choi, D.F.S., (1992), in their paper "The causal relationship between stock index and cash index prices in Hong Kong" examined the causal relationship between stock index futures and cash index prices in Hong Kong, which revealed that futures prices cause cash index prices to change in the pre-crash period but not vice versa. In the post-crash period, they found that bi-directional causality existed between the two variables.

James, T.W., (1993), in his paper "How price discovery by futures impacts the cash market" examined the impact of price discovery by futures market on the cash market volatility. The study is conducted using Garbade and Silber model to estimate the price discovery function of the futures market. The results affirm that futures market is beneficial with respect to cash market as it offers better efficiency, liquidity and also lowers the long-term volatility of the spot market.

Jegadeesh, Narasimhan, and Avanidhar Subrahmanyam, (1993), in their study "Liquidity effects of the introduction of the S&P 500 index futures contracts on the underlying stocks" compared the spread in NYSE before and after the introduction of futures on S&P 500 index as volatility can also be measured in terms of individual stock bid-ask spread. They found that average spread has increased subsequent to the introduction of futures trading. When they repeat their test by controlling for factors like price, return variance, and volume of trade, they still find higher spreads during the post-futures period. They also found that introduction of index futures did not reduce spreads in the spot market, and there is weak evidence that spreads might have increased in the post futures period.

Wahab and Lashgari (1993), in their study "Price Dynamics and Error Correction in Stock Index and Stock Index Futures Markets: A Cointegration

Approach" studied cointegration, causality and lead lag relationship between FTSE100- FTSE100 Futures and S&P 500-S&P 500 Futures of U.K. and U.S.A for the period Jan. 1988 to May 1992. They found that the markets were cointegrated, causality was bidirectional and cash market leads futures market.

Hong Choi and Subrahmanyam, A., (1994), in their paper "Using intraday data to test for effects of index futures on the underlying stock markets" studied the impact of futures trading on the volatility and liquidity (as measured by bid-ask spread) of the spot market. Intraday data of S&P 500 and Major Market Index is used for a period of one year. The results indicate that the average intraday day bid-ask spread in post Major Market Index futures has increased while there is no significant change in the volatility. The trading volume has registered a rise in both S&P 500 and Major Market Index. Information asymmetry also has posted an increase due the introduction of futures trading.

Abhyankar, A.H., (1995), in his paper "Return and volatility dynamics in the FT-SE 100 stock index and stock index futures markets" studied the lead-lag relationship between hourly returns in the FT-SE 100 stock index futures and the underlying cash index using hourly data for the period 1986 - 1990. They test the lead-lag relation for periods of differential transactional costs, good and bad news (measured by the size of returns), spot volume and spot volatility. The results revealed that the futures lead of the spot index. It was found that the futures lead over spot was insensitive to variations is spot transaction volume. An AR (2) - EGARCH (1,1) model was then fitted to spot and futures returns to give a time series of estimated volatilities, and it was observed that during periods of high volatility, futures markets led spot market returns.

Chatrath,A., Kamath,R., Chakornpipat, R., and Ramchander, S., (1995), in their paper "Lead-lag associations between option trading and cash market volatility" Found that S&P 100 stock index options trading had a stabilizing effect on the underlying stock index. Studies of volatility effects of individual equity options have also reported mixed results.

Martikainen et al., (1995), in their paper "On The Dynamics of Stock Index Futures and Individual Stock Returns" examined the cointegration and lead-lag relationship between RCAS, RFUT and 22 Individual Stock and Futures Contracts on Same Stocks of Finland for the period Jan. 1989 to Dec. 1990. The study revealed that markets were coitegrated, causality was bidirectional and futures market leads cash market.

Teppo, M., Jukka, P., and Vesa, P., (1995), in their research study "On the dynamics of stock index futures and individual stock returns," examined the two-way causality between the Finnish stock index futures and the stock index for a period of one year from 1989 - 1990. Granger Causality tests are applied on the daily returns due to non-availability of intra-day data. The results indicate that the futures market provides predictive information for both frequent and infrequently traded stocks while the reverse causality is found to be weak.

Tse, Y.K., (1995), in his paper "Lead-Lag relationship between spot index and futures price of Nikkei stock average" studied the behaviour of prices in the Nikkei index and the corresponding SIMEX traded futures contract and found that lagged changes of the futures price affect the short-term adjustments of the futures price.

Arshanapalli and Doukas (1997), in their study "The Linkages of S&P 500 Stock Index and S&P 500 Stock Index Futures Prices during October 1987" investigated the information transmission between S&P500 Futures and S&P500 Index of USA, taking the price series during October 1987. The result shows that there exists long run relationship and bidirectional causality between futures market and futures market. It was also found that futures market leads cash market.

Abhyankar, A., (1998), in his study "Linear and nonlinear Granger causality: evidence from the UK stock index futures market" examined the relationship using 5-minute returns by regressing spot returns on lagged spot and futures returns, and futures returns on lagged spot and futures returns using EGARCH. It was found that the futures returns led the spot returns by 15 - 20 minutes.

De Jong, F., and Donders, M.W.M., (1998), in their study "Intraday Lead-Lag Relationship between the Futures, Options and Stock Market" found that even in the presence of significant contemporaneous correlation among the spot, futures and the options market, the futures price changes lead both the changes in the cash index and index option by five to ten minutes. But, among the cash and the options market, the relations are largely symmetrical and neither market consistently leads the other.

Jong and Donders (1998), in their paper "Intraday Lead-Lag Relationships between the Futures, Options and Stock Market" examined the lead-lag relationships between European AEX Index Futures, AEX Index Options and AEX Index for the period Jan. to July 1992 and Jan. to June 1993. They found that there is unidirectional causality from futures to options and cash and bidirectional causality for Options and Cash. They also found that futures leads options and cash and no lead lag between options and cash.

Pizzi et al., (1998), in their paper “An Examination of the Relationship Between Stock Index Cash and Futures Markets: A Cointegration Approach” an attempt was made to study the cointegration, causality and lead lag relationship between US S&P 500 and S&P 500 Futures for the period Jan. 1987 to Mar. 1987. They noticed that markets were cointegrated, causality was bidirectional and futures market leads cash market.

Yoshie Saito Lord and Steven C. Turner (1998), in their paper “Basis risk for Rice” examined the relationship between basis risk and cross-hedging hedging – ratios using rice. The risk was modeled by using auto correlated cash prices and basis. The result suggests that incorporating prior basis information improves hedge ratio calculation under minimum variance criterion. They also found that basis risk is a decreasing function of information about certainty on production. The cross- hedging between rough rice futures contract and medium-grain rice was found to be ineffective.

Booth et al., (1999), in their study “Price Discovery in the German Equity Index Derivatives Markets” examined the price discovery function of German FDAX, ODAX and DAX taking the price series from Jan. 1992 to Dec.1994. The study found that there is cointegration among the price series. It was also found that there is unidirectional causality from futures to options and cash. There is also bidirectional causality for Options and Cash. The result of the lead lag relationship showed that futures leads options and cash and no lead lag between options and cash.

Min and Najand (1999), in their paper “A Further Investigation of the Lead-Lag Relationship Between The Spot Market and Stock Index Futures: Early Evidence from Korea” studied the cointegration and lead-lag relationship between Korean KOSPI200 Futures and KOSPI200 Index for the period May 1996 to Oct. 1996. It was found that markets were coitegrated, causality was bidirectional and futures market leads cash market.

Tse (1999), in the paper "Price Discovery and Volatility Spillovers in the DJIA Index and Futures Markets" examined the cointegration, causality and lead lag relationship between US DJIA Futures and DJIA Index for the period Nov. 1997 to April 1998. The result was that the markets were cointegrated, causality was bidirectional and futures market leads cash market.

Turkington, J., and Walsh, D., (1999), in their study "Price discovery and Causality in the Australian Share Price index Futures Market", examined the high frequency causal relationship between Shares Prices Index (SPI) futures and the All-Ordiaries Index (AOI) in Australia. The empirical analysis was evaluated by using the cost-of-carry model, ARMA (p,q), Bivariate VEC,VAR models and impulse response functions. The study found that SPI futures and the spot AOI index are integrated. It showed a strong evidence of bi-directional causality between the two series.

Frino A. et al. (2000), in their paper "The Lead-Lag Relationship between Equities and Stock Index Futures Markets around Information Releases" investigated the temporal relationship among the spot and the futures market around the release of different types of information. They have found that the lead of the futures market strengthens significantly around the release of macroeconomic information, while, the leading role of the futures market weakens around stock-specific information release. Therefore, according to them the disintegration in the relationship between the two markets is mainly driven by noise associated with trading activity around the release of different types of information.

Frino et al. (2000), in their study "The Lead-Lag Relationship between Equities and Stock Index Futures Markets around Information Releases" examined Lead-Lag Relationship between Australian AOI and SPI for the period Aug. 1995 to Dec. 1996. They found that markets are contegrated and causality is bidirectional and Futures Market Leads Cash Market.

Chan and Lien (2001), in their paper "Cash Settlement and Price Discovery in Futures Markets" studied cointegration and lead and lag relationship between Feeder Cattle and Live/Lean Hog Futures and Spot Markets of US commodity market taking prices from Sept. 1977 to Dec. 1998. The study revealed that causality is bidirectional, cash market leads futures market and there is cointegration between the markets.

Chris, B., Alistar, G.H., and Stuart, T., (2001), in their paper "A trading strategy based on the lead-lag relationship between the spot index and future contracts for the FTSE 100", examined to estimate the lead-lag relation between the FTSE 100 stock index futures and the FTSE 100 index. Cointegration and error correction model, ARMA model and vector auto regressive model have been employed to examine the objectives of the study. The result indicate that futures lead the spot market attributable to faster flow of information into the futures market mainly due to lower transaction costs.

Theobald and Yallup (2001), in their study "Mean Reversion and Basis Dynamics" examined the cointegration, causality and lead lag relationship between U.K. FTSE100 Futures and FTSE100 Index for the period Jan. 1999 to Dec. 1999. They found that those markets were cointegrated, causality was bidirectional and futures market leads cash market.

Chen et al. (2002), in their study "A Comparison of Hedge Effectiveness and Price Discovery Between TAIFEX TAIEX Index Futures and SGX MSCI Taiwan Index Futures" an attempt is made to find out the cointegration and lead and lag relationship between TAIFEXTAIEX- TAIEX and SGXMSCIb-MSCIb taking price series from July 1998 to July 2000. The study found that there is cointegration between the markets, causality is bidirectional and SGXMSCIb leads both TAIFEXTAIEX-TAIEX

Moosa, I.A., (2002), in his paper "Price discovery and risk transfer in the crude oil futures markets: some structural time series evidence" examined the price discovery function of crude oil future market using Garbade and Silber model using the daily data of spot and one-month future prices of WTI crude oil covering from 2 January 1985 to July 1996. He found that sixty percent of the price discovery function is performed in future market. The result also showed a fairly elastic supply of arbitrage service. This study shows that Garbade and Silber model is more suitable for description of intraday behaviour of spot and future prices.

Monoyios and Sarno (2002), in their paper "Mean Reversion in Stock Index Futures Markets: A Nonlinear Analysis" examined cointegration and lead-lag relationship between S&P 500 and FTSE 100 Futures U.S.A. and U.K. for the period Jan. 1988 to Dec. 1998. The result revealed that markets were coitegrated, causality was bidirectional and futures market leads cash market.

Sheng-Syan Chen, Cheng-few Lee and Keshab Shrestha (2002), in their paper "Futures hedge ratios: a review" reviewed different theoretical approaches to the optimal futures hedge ratios. These approaches are based on minimum variance, mean-variance, expected utility, mean extended-Gini coefficient, as well as semi variance. Under minimum variance hedge ratio different static hedge ratios are MV hedge ratio, Optimum mean-variance hedge ratio, Sharpe hedge ratio, Maximum expected utility hedge ratio, Minimum MEG coefficient hedge ratio, Optimum mean-MEG hedge ratio, Minimum GSV hedge ratio and Maximum mean-GSV hedge ratio. Various ways of estimating these hedge ratios are also discussed, ranging from simple ordinary least squares to complicated heteroscedastic cointegration methods. Under martingale and joint-normality conditions, different hedge ratios are the same as the minimum variance hedge ratio. Otherwise, the optimal hedge ratios based on the different approaches are different and there is no single optimal hedge ratio that is distinctly superior to the remaining ones.

Beaulieu et al. (2003), in the paper "Does Tick Size Influence Price Discovery? Evidence from the Toronto Stock Exchange" studied cointegration between TSE35 Index Futures and TSE35 Index of Canada, taking the price series from Aug. 1991 to Oct.1991. The result shows that there is long run relationship between TSE35 Index Futures and TSE35 Index. They also found that and futures market leads cash market.

Burak Cerrahoglu and Barsendu Mukherjee (2003), in their paper "The benefits of commodity investment" described the benefits of investment in commodities. They analysed monthly returns for a series of stock, bond, commodity, and hedge fund indices for the time period from January 1900 through December 2002.Data was obtained for each of the indices and relevant sub indices (GSCI), as well as the Standard and Poor's 500 and MSCI World Stock Indices, the Lehman Brothers etc. They found that commodity investment is a shield against inflation. Commodities provide a positive return while other asset classes decrease in value during inflation.

Kavussanos, M., and Nomikos, N.K., (2003), "Price Discovery, Causality and Forecasting in the Freight Futures Market", investigated the casual relationship between futures and spot prices in the freight futures markets employing the Vector Error Correction Model (VECM) and General Impulse Response(GIR). The study compared the forecasting performance of the VECM with that of Vector Auto Regressive (VAR), Auto Regressive Integrated Moving Average (ARIMA) and Random Walk (RW) models. The results found that futures price tend to discover new information more rapidly than spot prices and information from the futures prices can be used to generate more accurate forecasts of the spot prices.

Lien et al. (2003), in their study "Structural Change and Lead-Lag Relationship Between the NIKKEI Spot Index and Futures Price: A Genetic Programming Approach" examined the cointegration and Lead-Lag Relationship Between the NIKKEI Spot Index and Futures Price of Singapore for the period Sept. 1995 to Dec. 1999. They found that markets were cointegrated, causality is bidirectional and Cash Market Leads Futures Market.

Lin et al. (2003), in their paper "An Application of Threshold Cointegration to Taiwan Stock Index Futures and Spot Markets" studied the cointegration and lead-lag relationship between the Taiwan TAIFEXTAIEX and TAIEX for the period Jan. 1999 to Mar. 2000.They found that the markets were not cointegrated, causality was bidirectional and cash market leads futures market.

Chan et al. (2004), in their empirical study "Do Different Futures Contract in One Stock Exchange Have the Same Price Discovery Capability?

Empirical Study of Taiwan Futures Exchange" an attempt is made to find out the cointegration and lead and lag relationship between Taiwan TAIFEX, Mini-TAIEX, TE and TBI taking price series from Oct. 2001 to Mar. 2002.They found that there is cointegration between the markets, causality is bidirectional and futures market leads cash market.

Covrig et al. (2004), in their paper "The Contribution of a Satellite Market to Price Discovery: Evidence from the Singapore Exchange" investigated the cointegration and lead and lag relationship between Japan and Singapore Nikkei 225 Futures and Nikkei 225 Index for the period Mar. 2000 to June 2000. The result indicated that there is cointegration between the markets, causality is bidirectional and futures market leads cash market.

Gray Gorton; K., Geert Rouwenhorst (2004), in their paper "Facts and Fantasies about Commodity Futures" pointed out that as inflation accelerates beyond a point, stocks and bonds tend to dip, following the consequent increase in input and labour costs on the one hand, and the inelastic output prices, owing to the reduction in demand flowing from inflation on the other, resulting eventually in the decline in corporate profits. Commodity futures or derivatives, in contrast, are positively correlated with inflation. When inflation rises, prices of commodities and their derivatives tend to rise as well.

Ibrahim Bamba and Leigh Maynard (2004), in their paper "Hedging-Effectiveness of Milk Futures Using Value-At-Risk Procedures" tested the effectiveness of the Class III Milk futures market in terms of the reduction in Value-at-Risk (VaR) for milk producers located in four regions: Wisconsin, Northeast, Florida and California. Constant hedge ratios are estimated using Myers and Thompson's generalized conditional hedge ratio technique, and time-varying hedge ratios are estimated using an exponentially weighted moving average method. The results suggest that uniform hedging strategies can reduce substantially the VaR of milk cash price for appropriately chosen hedge length and hedge signals.

Kenourgios (2004), in the paper “Price Discovery in the Athens Derivatives Exchange: Evidence for the FTSE/ASE-20 Futures Market” studied cointegration, causality and lead lag relationship between FTSE/ASE-20 Futures and FTSE/ASE-20 Index of Athens for the period Aug. 1999 to June 2002. The researcher found that markets are cointegrated, causality is bidirectional and futures market leads cash market.

Pattarin and Ferretti (2004), in their study “The Mib30 Index and Futures Relationship: Econometric Analysis and Implications for Hedging” studied the cointegration, causality and lead lag relationship between Italian Mib30 and Fib30 for the period Nov. 1994 to Sept. 2002. They found that markets were cointegrated, causality was bidirectional and futures market leads cash market.

So and Tse (2004), in their study “Price Discovery in the Hang Seng Index Markets: Index, Futures and the Tracker Fund” examined the cointegration and lead lag relationship between Hong Kong HIS, HSIF and TF for the period Nov. 1999 to June 2002. They found that the markets were cointegrated and futures market leads cash market.

Nash, Y Chen, Ray Y Chou, Nathan Liu and Gang Shyy (2005), in their paper “Optimal Hedge Ratio of Commodity Futures Using Bivariate DCC-CARR and DCC-GARCH Models” an attempt has made to compute the Optimal Hedge Ratios (OHRs) between spot and futures using different methods. They have used the Dynamic Conditional Correlation – Conditional Autoregressive Range (DCC-CARR) model, ordinary least squares (OLS) estimator, Constant Conditional Correlation models, and DCC-GARCH model. They used weekly data of closed, highest and lowest prices on spot and futures for Coffee, Corn, Gold and Soybean obtained from Datastream. The time periods of commodities are from January, 1, 1979 to April, 7, 2005. The results show that the DCC-CARR model performs better than other hedge models for the selected commodities. For the out-sample hedge, the DCC-CARR model is the best model for all commodities. DCC-CARR model is the better model for investors to find the minimum-variance of a portfolio.

Floros Christos and Dimitrios V. Vougas (2006), in their paper "Hedging Effectiveness in Greek Stock Index Futures Market, 1999-2001" examined hedging effectiveness in Greek stock index futures market. They measured hedging effectiveness using three different methods: (i) the OLS method, (ii) the method of Ederington (1979), and (iii) the method suggested by Park and Switzer. In both cases for Greek stock index futures, the hedge ratio from MGARCH model provides greater variance reduction, in line with similar findings in the literature.

UNCTAD (2006), in the article "The Overview of the World's Commodity Exchanges", states that the prices affected by speculation for most global agricultural trade are determined at the Chicago Board of Trade, the New York Board of Trade of Trade and the London International Financial Futures Exchange.

Zhong, M., Darrat, A.F., and Otero, R., (2004), in their study "Price discovery and volatility spillovers in index futures markets: some evidence from Mexico", investigated the hypotheses that the recently established Mexican stock index futures markets effectively served the price discovery function, and that the introduction of futures trading led to volatility in the underlying spot market using a total of 799 daily observations which covers the period 15 April 1999 to 24 July 2002. By using VECM and EGARCH models, the empirical evidence showed that the futures price index was a useful price discovery vehicle and future trading had also been a source of instability for the spot market.

Zapata, H., Fortenbery, T.R., and Armstrong, D., (2005), in their paper "Price discovery in the world sugar futures and cash markets: implications for the Dominican Republic", examined the relationship between 11 future prices traded in New York and the World cash prices for exported sugar by considering the observation from January 1990 to January 1995. They found that the future market for sugar leads the cash market in price discovery. However, they also found unidirectional causality from future price to spot but not vice versa. The finding of cointegration between futures and cash prices suggests that sugar future contract is a useful vehicle for reducing overall market price risk faced by cash market participants selling at the world price. Further it was found through impulse response function that a one unit shock in the future price innovation generates a quick (one month) and positive response in futures and cash prices, but not vice versa.

Masters, M.W., and Adam K. White. (2008), in their paper "How Institutional Investors Are Driving Up Food and Energy Prices" pointed out that, the US Commodity Futures Trading Commission (CFTC) regulates the U.S.-based commodity exchanges. CFTC also influences regulation of major commodity exchanges in other countries. Global agricultural prices are influenced by U.S agro-commodity prices. In the U.S., the commodity index funds have become important investors in commodities and they usually bet on commodity prices to increase. In July 2008, $317 billion were invested in commodity invested funds. The main traders of these funds are Goldman Sachs and American Insurance Group, and their products are globally traded. They involve funds in commodity market speculation. The commodity index funds bundle futures contracts according to a formula that weights and tracks the prices of agro- and non-agro-commodities as a single financial instrument. The huge amount of money invested through commodity index funds creates price volatility as a result of index fund “bets.” Since 2003 commodity index speculation has increased by over 1900 per cent. This led to increase in crude oil prices by over $37 per barrel in 2007. During the period March 2003 and March 2008 the prices of commodities coffee, corn, cotton, soya bean oil, soya bean, sugar, wheat, wheat KC, Brent crude oil, gas oil, gasoline, natural gas, aluminum, lead, nickel, zinc, copper, gold and silver increased 167 per cent, 134 per cent, 40 per cent, 199 per cent, 143 per cent, 69 per cent, 314 per cent, 276 per cent, 213 per cent, 192 per cent, 145 per cent, 71 per cent, 120 per cent, 564 per cent, 282 per cent, 225 per cent, 413 per cent, 182 per cent and 331 per cent respectively.

## 2.4 Conclusion

Review of literature on commodity derivative trading in Indian and International context revealed mixed results in relation to economic functions and benefits of futures trading. Most of the commodities traded on multi commodity exchanges and single commodity exchanges have acquired good trading volume within small time span after the starting of the futures trading. But a few commodities showed little interest from market participants. Many commodities are traded on different exchanges; it has adversely affected liquidity of the market and resulted in the poor performance of the exchanges. Spot price volatility of the commodities have either decreased or increased or remained constant over time. Causality of the commodities are either decreased or increased or remained constant over time. Farmers' participation in the futures market is abysmally low because of many reasons. Farmers' awareness about futures trading is poor and farmers are not able to access futures market directly because they lack the critical minimum size to fulfill the contract specifications. Literature review on commodity futures trading in international context revealed that option contract is better risk management tool than futures contract.

Chapter 3

# FUTURES TRADING IN RUBBER – AN OVERVIEW

Contents



## 3.1 Introduction

Though references about 'futures' are found in *Kautilya's Arthashastra* (4th century BC), futures trading as we understand it today appears to have originated in Amsterdam around 17th century in commodities such as grains, brandy, whale oil and coffee. Almost the same time futures trading started in Japan (Rice) and UK (Royal Exchange, Metal Exchange, Baltic Exchange, Wool Exchange). Cotton Brokers Association was formed at Liver pool in 1841 to trade in cotton futures. Chicago Board of Trade was set up in the US in 1848 to trade futures in grains. In this chapter an attempt has been made to study the origin and development of futures trading in commodities in general, and Rubber in particular.

### 3.1.1 Cotton Futures in India

After the outbreak of civil war in the 1860s, when the U.S supplies of cotton to the textile industry in UK was stopped, cotton from India began to sail to the UK. To regulate the cotton buyers cum exporters who were mostly British and Europeans, established 'The Cotton Trade Association' in 1875. Being dissatisfied with the functioning of 'The Cotton Trade Association', leading Indian Cotton merchant and mill owners set up Bombay Cotton Exchange in 1893. These two trade bodies 'The Bombay Cotton Trade Association' and 'Bombay Cotton Exchange' shared between themselves most of the ready, forward and futures business in cotton from 1893 to 1918.During this period Indian merchants invented "Options on futures" (*teji-mandi*) contracts to provide what may be described as hedge within hedge. "Options on futures" was a gift from Indian cotton trade as an effective risk management tool to the commodity derivative markets all over the world.

During World War I (1914-18) there were 8 associations carried on futures business in cotton. There were many futures contracts in cotton as perhaps the number of major varieties or grade in it. The cotton market was in chaotic condition, because settlement were mostly yearly and periodical clearings were absent, manipulations in the form of corners and squeezes were frequent, causing wide price fluctuations, which often resulted in defaults. After the World War 1, the then Government of Bombay enacted the 'Bombay Cotton Contract Control Act' 1919. A Cotton Contracts Control Board was formed under the Act to regulate the cotton trade. At the initiative of the Board in 1922 under Cotton Contract Act 1922 EICA (East India Cotton Association) was formed to regulate and cotton futures trading.

### 3.1.2 Futures Trading in Other Commodities

Before the outbreak of World War II there were as many as 300 futures markets across the country, trading in more than 30 different commodities. During this time there were no restrictions on movement of commodities within the country, but even between countries. The physical markets in commodities were free and flexible. As a result, speculative volumes were large in most exchanges to provide the needed breadth and liquidity. Hence, commodity futures markets then performed effectively the price discovery and risk management. It is therefore a number of foreign firms also operated in major Indian futures markets like cotton, oilseeds, and wheat. The Liverpool cotton exchange had even provided for delivery of Indian cotton against one of its futures contracts. As a result, the commodity prices in India were almost at par with the international prices, facilitating export-import trade.

### 3.1.3 Regulations in Futures Market

Before World War II self- regulation of futures trading was the rule for all the commodity exchanges in the country. EICA was virtually autonomous in regulating futures trading in cotton. EICA recognized option contracts as per the recommendations of Wiles Committee in 1932. The commodity exchanges in north India were largely companies limited by “shares”, the liability of members of the exchanges in western India was limited by “guarantee.” Most north Indian exchanges were profit making companies and western India exchanges were non-profit making organizations. In the absence of statutory regulations, most of these exchanges more often stayed away from taking effective steps against their members to curb manipulative and unhealthy trading practices. In September 1939 Government of Bombay prohibited option contracts to curb speculative business in cotton futures. In 1943, Government of India, under the Defence of India Act banned futures and option contracts in all commodities throughout India. Defence of India Act lapsed in 1945, but has continued even after World War II. During World War II the ban on commodities was to meet the urgent exigencies of the situation caused by commodity shortages stemming from the military requirements as well as the dislocation of both internal and international trades. The ban on derivative trading in most commodities continued even after the War to curb mainly the inflationary strain on the economy. In 1947 Bombay Government enacted Bombay Forward Contracts Control Act, 1947.

### 3.1.4 Forward Contract (Regulations) Act 1952

In 1952 Government of India enacted Forward Contract (Regulations) Act; the Parliament approved it in December 1952. With the enactment of FC(R) Act 1952, the corresponding legislations of state Governments were repealed automatically. Under Section 3 of FC(R) Act 1952 Forward Market Commission (FMC) was set up. FMC is more an advisory and monitoring body than a regulatory organization. The real regulatory powers under the FC(R) Act are vested in the central government, which acts mostly on the recommendation of FMC. FC(R) Act provides for the grant of recognition, either on a permanent basis or for a specific period, to associations selected for the purpose. The recognized associations are required to frame their rules and by-laws in accordance with the guidelines provided by the regulating authorities. Such rules and by-laws need the approval of the central government. FC(R) Act authorizes the central government to nominate 4 directors on the governing bodies of the recognized associations. One of them represents the central government, and the others represent the interests not directly represented through the membership of the association. The central government can supersede the governing body of any recognized association, and order it to suspend its business. While the Act primarily calls for the governing body to regulate trading at the association, FMC is the principal operating arm of the central government in the sphere of regulation. FC(R) Act prohibits option trading is all commodities. This was in harmony with the laws then in force in the UK and the US. Though UK and US lifted ban on options, in the wake of rapidly growing international trade, India is still continuing with ban on option commodities. Since the mid- 1950s, the central government began to allow futures trading on the recommendation of FMC in diverse commodities all over the country. In mid- 1960s central government banned futures trading in almost all commodities alleging that it will cause inflation in the economy.

### 3.1.5 Committees Appointed for Revival of Futures Trading

Forward Market Review Committee appointed under the chair of the renewed agricultural economist, Professor M.L Dantarala in 1966, and recognized the need for futures trading. But the authorities chose to ignore its wise counsel. Another committee appointed under the chair of Professor A.M Khusro, which submitted its report in 1980, also recommended revival of futures trading in most of the major commodities. As a result, futures market in castor seed were reopened in 1985. In June 1993, the government appointed another committee under the chair of Professor K.N Kabra. The committee submitted its report in September 1994 to resume futures trading in commodities. But government ignored this report also. In 1997 World Bank and UNCTAD jointly urged India to re-start futures trading. The report explained at great length the functions of futures markets and their utility for price discovery and risk management, and unequivocally recommended the early revival of commodity futures market in the country to manage price risks in the context of economic and trade liberalization under the charter of WTO, of which India is a member. The World Bank - UNCTAD report had a tonic effect on the authorities. What several noted Indian economists and expert committees could not do, the World Bank- UNCTAD report did. The mindset of the government changed all of a sudden. As a result of the recommendation of World Bank, India Pepper and Spice Trade Association (IPSTA), Kochi started futures trading in pepper in 1997 similar recognition was granted for many other commodities. Subsequently several other single commodity exchanges started in India.

### 3.1.6 Emergence of National Commodity Exchanges

Most of the single commodity exchanges are regional exchanges without proper financial resources, lack of physical infrastructure and skilled workforce. They were not professionally managed, not technologically advanced also. They functioned as private clubs and catered to the interests of their own members. Against this backdrop Dr. Madhoo Parskar proposed the need of starting National level commodity exchanges. A report regarding this was submitted to NSE in 1997. NSE forwarded this report to central government, which therefore invited application for setting up National Commodity Exchanges in the country. As a result 3 national level exchanges were started functioning from 2003. These exchanges are:

1) National Multi Commodity Exchange of India Ltd., Ahmedabd (NMCE)
2) Multi Commodity Exchange of India Ltd., Mumbai (MCX)
3) National Commodity & Derivatives Exchange Ltd., Mumbai (NCDEX)

As on 25$^{th}$ October 2013, there are 22 commodity exchanges in India. Among them 6 are National Multi Commodity Exchanges and remaining 16 are Commodity Specific Regional Exchanges. Under Section 15 of the FC(R)

Act 1952, 110 commodity futures contracts are allowed to trade through the above mentioned 22 commodity exchanges. NMCE, MCX, NCDEX, India Commodity Exchange, New Delhi (ICEX), ACE Derivatives and Commodity Exchange and Regional Commodity Exchanges, are allowed to trade 27, 49, 44, 16, 10 and 16 different commodity futures contracts respectively during 2013-'14.

## 3.2 Futures Contract

The FCRA has left undefined the term "futures contract." In fact, the Act nowhere even makes a mention of "futures contract", though it primarily aimed at regulating such contracts. However, since a futures contract is a "forward contract in that it generally contemplates delivery of goods after 11 days. It may be defined as a "forward contract which is not a specific delivery contract"

A futures contract is a contract to buy or sell a standard amount of a standardized or pre- determined grade(s) of a certain commodity at a pre- determined location(s), on a pre-determined future date at a pre- agreed price. If this definition is studied carefully, the difference from the definition of a forward contract is apparent.

1) There is no reference to an agreement between two parties; this is because futures contracts are often entered into through an intermediary (the exchange or its clearing house) which acts as buyer to each seller and seller to each buyer.

Buyer $\rightleftarrows$ Exchange $\rightleftarrows$ Seller

A commodity exchange is functioning under the frame work of FMC, which formed u/s 3 of the FC (R) Act 1952. FMC was established in 1953, which regulates the functions of commodity exchanges. FMC is functioning under the Ministry of Consumer Affairs and Public Distribution. Rubber futures are traded on NMCE (National Multi Commodity Exchange), NCDEX (National Commodities and Derivatives Exchange) and MCX (Multi Commodity Exchange).

2) There is a standard amount for contracts akin to market lot in the stock exchange, which is fixed by the exchange. For rubber future contract the standard amount/ market lot is 1000 kg.

3) There is standard grade (s) of the commodity, specified by the exchange which can be delivered or taken delivery of when several varieties are available one variety is specified as the basis variety, if any other variety is delivered a premium or discount is charged. For rubber future contract the standard grade is RSS-4 (Ribbed Smoke Sheet of grade 4).

4) The purchase or sale is at a location specified by the exchange. These locations are warehouses, and prescribed by the concerned exchanges. The warehouses in Kerala are located at Ernakulam, Kakkanad, Aluva, Kozhikode, Trichur, Malappuram, Palakkad and Kottayam.

Other features of futures contract are:

5) The seller has generally the option of delivering the goods on any day (or a few specified days) within a specified delivery period.

6) Purchase of the contract can always be effectively offset by sales to the same parties or others, and vice versa.

Therefore a futures contract is standardized forward contract.

## 3.3 Rubber Futures Trading in National Multi Commodity Exchanges

Rubber futures contracts are traded on three National Multi Commodity Exchanges, viz NMCE, NCDEX and MCX. A comparative picture of the contract specification of rubber futures contract on NMCE, NCDEX and MCX shows that rubber futures contract traded on the three National Multi Commodity Exchanges are identical in character. Unit of trading, delivery unit, quotation/ base value, tick size, price band, quality specification etc of the rubber futures contract in these three exchanges are identical. As the futures business in rubber is got divided into among the three exchanges, the liquidity of these market will tend to reduce. Hence, it will adversely affect the price discovery function of the futures market.

### 3.3.1 Impact of Competition among Exchanges

In fact, in the past, the then government of Bombay before independence and subsequently the FMC had consciously adopted the principle of unitary control, which prevents different exchanges from organizing futures trade in the same commodity at the same location. Competition is actually needed in a futures market to create healthy liquidity and facilitate orderly hedging and price making, and not between the exchanges for organizing futures business in the same commodity contract. That way, liquidity tends to be fractured, which does not help to develop a healthy futures market. Exchanges should compete among themselves to build strong and economically useful futures market, in commodities and contracts assigned to them, so as to serve efficiently the commodity market functionaries, and not just enter into cut-throat competition in the identical commodity contract. Such competition is not only wasteful, but also without costs. In fact, it may even destroy the existing futures market in that commodity to the detriment physical trade in it.

## 3.4 Spot Price Trend of Rubber after Delisting and Underlying Fundamentals

Following the economic liberalization futures markets were revised again towards the close of the last century. Government ordered delisting of futures contracts in 2007 for commodities like *urad, tur*, wheat, rice, sugar, oil rice, and potato. In a similar move, the government banned futures trading in *chana*, potato, and soya oil and rubber in May 2008 in an attempt to contain the price rise in essential commodities and curb the spiraling inflation in the country. And finally, sugar was banned in 2009. Spot and futures prices of rubber at NMCE on 7th May 2008 is given in Table 3.1.

**Table 3.1 Spot and futures prices of rubber at NMCE**

| Date | Spot & Futures Prices of Rubber at NMCE | | | |
|---|---|---|---|---|
| | SPOT | Futures Closing Prices for Contract Expiring on | | |
| | | 7-June-08 | 7-July-08 | 7-Aug-08 |
| 7-May-08 | ₹11950 | ₹11729 | ₹11414 | ₹11014 |
| 7-June-08 | ₹12450 | - | - | - |
| 7-July-08 | ₹13200 | - | - | - |
| 7-Aug-08 | ₹13500 | - | - | - |

*Blank spaces indicate absence of futures trading;*
*Source: National Multi Commodity Exchange of India Limited, Ahmadabad*

Table 3.1 shows that on the date of delisting of rubber futures on 7th May 2008, three derivatives months contracts June, July and August 2008 were running. The rubber futures prices as on 7th May 2008 was in contango, predicting a rise in spot price. The outcome of the de-listing was in line with predictions made by futures market on eve of de-listing. The factual position on production, import, export and consumption of rubber during 2002-03 to 2009-10 is given in Table 3.2.

**Table 3.2 Production, Import, Export and Consumption of natural and synthetic rubber from 2002-03 to 2009-10 (Tonnes)**

| Year | Production | | | Import | | | Export | Consumption | | | Excess(+)/ Deficiency(-) compared with demand |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Natural Rubber | Synthetic Rubber | Total | Natural Rubber | Synthetic Rubber | Total | | Natural Rubber | Synthetic Rubber | Total | |
| 2002-03 | 649435 | 80401 | 729836 | 26217 | 129902 | 156119 | 55311 | 695425 | 194850 | 890275 | -59631 |
| 2003-04 | 711650 | 89240 | 800890 | 44199 | 104733 | 148932 | 75905 | 719600 | 210190 | 929790 | -55873 |
| 2004-05 | 749665 | 93854 | 843519 | 72835 | 113095 | 185930 | 46150 | 755405 | 224650 | 980055 | 3244 |
| 2005-06 | 802625 | 97638 | 900263 | 45285 | 132118 | 177403 | 73830 | 801110 | 237495 | 1038605 | -34769 |
| 2006-07 | 852895 | 99513 | 952408 | 89799 | 171998 | 261797 | 56545 | 820305 | 270830 | 1091135 | 66525 |
| 2007-08 | 825345 | 106286 | 931631 | 86394 | 195705 | 282099 | 60353 | 861455 | 297155 | 1158610 | -5233 |
| 2008-09 | 864500 | 96739 | 961239 | 77762 | 190630 | 268392 | 46926 | 871720 | 292950 | 1164670 | 18035 |
| 2009-10 | 831400 | 106743 | 938143 | 177130 | 250210 | 427340 | 25090 | 930565 | 347710 | 1278275 | 62118 |

*Source: Indian Rubber Statistics, Vol.34, 2011, Rubber Board, Kottayam*

Table 3.1 shows that the unusual spot price rise of rubber in 2007-08 was due to mismatch between production and consumption. During 207-08 there was a deficit of 5233 tonnes of rubber compared with demand.

The price rise that occurred in rubber spot price before and after the de-listing can largely be explained by the imbalance in the production and consumption. Production and consumption figures are given in Table 3.3.

**Table 3.3 Production, consumption, domestic price and international prices of rubber**

| Year | Month | | Production (Metric Tonnes) | Consumption (Metric Tonnes) | Excess(+)/ Deficiency(-) compared With demand | RSS-4 Domestic (Rupees per quintal) | RSS-3 International (Rupees per quintal) |
|---|---|---|---|---|---|---|---|
| 2007 | October | * | 89505 | 74430 | 36955 | 9424 | 9130 |
| | November | * | 109480 | 72525 | 38620 | 9603 | 9868 |
| | December | * | 111730 | 73110 | 32505 | 9221 | 9833 |
| 2008 | January | * | 103515 | 71010 | -19350 | 9432 | 10334 |
| | February | * | 54520 | 73870 | -26755 | 9687 | 10994 |
| | March | * | 47250 | 74005 | -12775 | 10354 | 11354 |
| | April | * | 57250 | 70025 | -11100 | 10965 | 11318 |
| | May | x | 60115 | 71215 | -11860 | 12248 | 12755 |
| | June | x | 62200 | 74060 | -14990 | 12708 | 13860 |
| | July | x | 62550 | 77540 | -2600 | 13340 | 13780 |
| | August | x | 73250 | 75850 | 4640 | 13782 | 12720 |
| | September | x | 80500 | 75860 | 8537 | 13536 | 13228 |
| | October | x | 84362 | 75825 | 22210 | 9074 | 9963 |
| | November | x | 95500 | 73290 | 36955 | 7681 | 8599 |

*Domestic price: Kottayam market, International price: Bangkok market,*: Pre suspension period;* x*: Post suspension period; Source: Indian Rubber Statistics, Vol.34, 2011, Rubber Board, Kottayam*

Table 3.3 shows that the consumption exceeded production from January 2008. This trend of demand and supply continued up to July 2008.This was the reason behind the spot price of rubber during January 2008-July 2008. Without seeing this fundamental, authorities suspended rubber futures trading on 7th May 2008.But due to shortage of supply the price rise continued even after suspension of futures trading. From May 2008 to November 2008 there was no futures trading in India, during this period Indian rubber price moved in tandem with international price. But during this period crude oil price also increased considerably. Since crude oil is a source of synthetic rubber, natural rubber price is always a function of crude oil price.

## 3.5 Stabilizing Effect of Futures Trading

The futures market helps to ascertain the underlying fundamental facts about future demand and supply. The earlier disseminated news will be quickly used in futures market and because of this; the amplitude of price fluctuation is reduced. The acting of the well informed speculators and hedgers shift the futures price. This in turn leads to a corresponding change in spot price. The news of a bumper production in rubber may attract professional speculators and hedgers in commodity futures market. To take advantage of this they will sell futures contract and thereby drive down the futures price. When this happens, spot market traders will notice that the attractiveness of holding stocks of the commodity is reduced, because the price which they can expect to get has come down. As a result spot market traders will move to reduce their stock holdings by discharging ready stocks onto the spot market. This will lower the spot price. When this happens demand for the commodity will expand since the price has fallen. Due to the enhanced demand, the surplus at the time of the actual harvest will be less than it would otherwise have been. Accordingly, the post –harvest fall in the price will also be of a lesser magnitude than would have occurred in the absence of futures trading. This mechanism is illustrated in Figure 3.1.

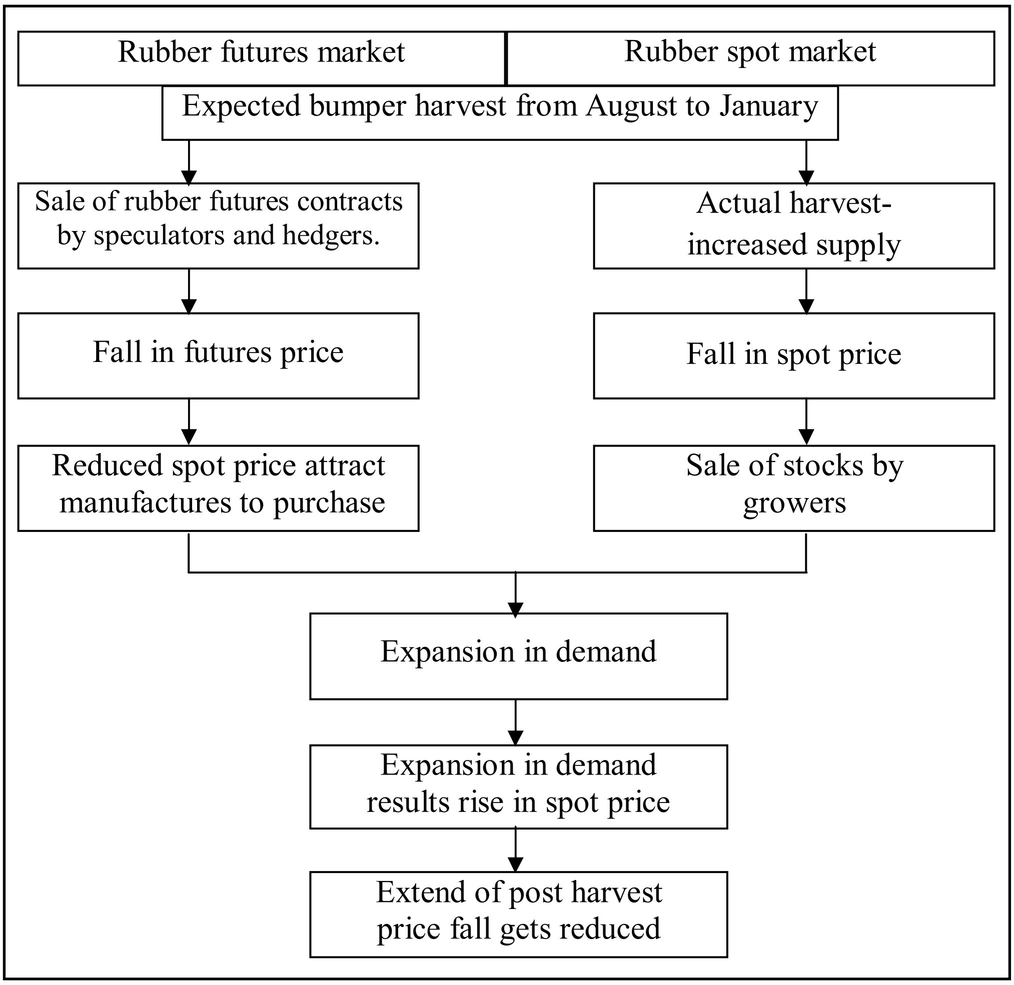


**Figure 3.1 Stabilizing effect of rubber futures trading: in the situation of falling price**

The news of a bad production in rubber may attract professional speculators and hedgers in commodity futures market. To take advantage of this they will buy futures contract and thereby drive up the futures price. When this happens, spot market traders will notice that the attractiveness of holding stocks of the commodity is increased, because the price which they can expect to get has gone up. As a result spot market traders will move to increase their stock holdings by purchasing ready stocks onto the spot market. This will push up the spot price. When this happens demand for the commodity will contract since the price has fallen. Because of the contracted demand, the scarcity of the commodity at the time of the off season will be higher than it would otherwise have been. Accordingly, the off season rise in the price will also be of a higher magnitude than would have occurred in the absence of futures trading. This mechanism is illustrated in Figure 3.2.

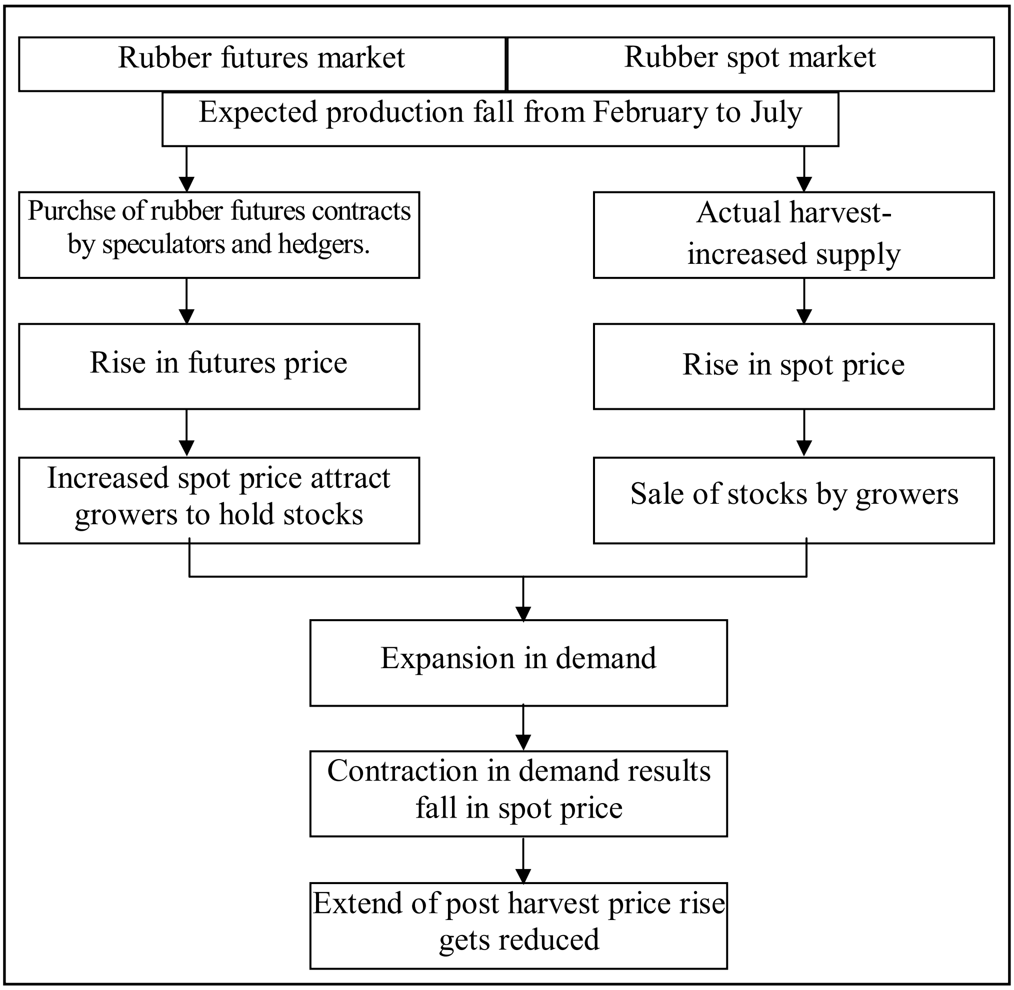


**Figure 3.2 Stabilizing effect of rubber futures trading: in the situation of rising price**

In the absence of futures trading, such self-corrective mechanisms would either not operate at all, or operate in a much smaller way.

### 3.5.1 Destabilization Hypotheses and Increased Spot Market Volatility

There are conflicting claims about the impact of derivative trading on the market volatility. Some researchers argue that derivative trading reduce volatility through better price-discovery. On the other hand, other studies claim that volatility increases after the introduction of derivative trading due to increased speculative activities. Low trading cost and leveraged trading are major attractions for speculators in derivative markets.

One of the most interesting and recurring themes in commodity research is the study of the effect of derivatives trade on the underlying asset. So many research have been conducted to study whether futures markets stabilizes or destabilizes the underlying markets. Many theories have been advanced on how the introduction of Derivatives market might impact the volatility of an underlying asset. The main argument against the introduction of the futures trading is that it destabilizes the associated spot market by increasing the spot price volatility. The traditional view against the Derivatives markets is that due to low transaction cost, futures market may induce more uniformed speculative traders and they give rise to price instability and thus amplify the spot volatility. This is called the Destabilization hypothesis. Destabilization hypothesis is based on the observation that futures markets are likely to attract uninformed traders because of their high degree of leverage.

### 3.5.2 Stabilization Hypotheses and Decreased Spot Market Volatility

Futures trading greatly facilitates speculation and increases its volume. Speculators take efforts to acquire information on market conditions and prospects in their own interests. They then use this information to buy cheap and sell dear, and thereby reducing the extreme of price movements. The price stabilizing influence of futures trading arises from three factors: (1) Increased volume of speculative activity. Speculation is stabilizing in nature. (2) Future price discovery and increased information flow. (3) Avoidance of panics and herd movements by producers and customers, because futures trading provides hedging to market participants, the tendency to panic or follows the herd and produce vicious circles of sharp price rise or falls, is reduced. It is interesting that factors (1), (2) and (3), all seem to imply that the greater the volume of activity (speculative and hedging), the better the price stabilizing influence of futures trading.

## 3.6 Conclusion

Commodity derivative trading in India has a long but chequered history extending over more than a century. Commodity derivative trading underwent ban and suspension in 1939, 1943, 1960 and 2008. Forward Market Commission is the regulatory body of derivatives trading in India. Commodity futures trading in India acquired momentum after the set up of national level multi- commodity exchanges in 2003. Now there are 21 commodity exchanges in India trading about 113 commodities. A futures contract is a standardized forward contract. Rubber futures contracts are traded in three National Multi Commodity Exchanges, viz. NMCE, NCDEX and MCX. Rubber futures trading was suspended on 7$^{th}$ May 2008 to curb the spiraling inflation in the country. But even after suspension price continued its upward trend due to shortage of supply. The fundamental facts about demand and supply will be disseminated quickly in futures market and because of this the amplitude of fluctuation will be reduced. There are two conflicting claims about the impact of derivative trading on the market volatility viz. (1) Stabilization hypotheses and decreased spot market volatility, (2) Destabilization hypotheses and increased spot market volatility. The rubber futures trading volume during 2013-’14 is 1114992 tonnes.

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Chapter 4

# ECONOMIC FUNCTIONS OF FUTURES MARKET: AN ANALYSIS

Contents



## 4.1 Introduction

Price discovery, decreased spot price volatility and hedging are the threefold economic function of futures trading in agricultural commodities. From the point of view of an economic analyst, a futures market would be perfect if it is perfectly efficient on all three criteria: hedging efficiency, price stabilization and absence of bias. It is possible to set the standards for a perfect futures market against which actual market can be measured. A perfect futures market is defined as one where average hedging efficiency is 100 per cent, elasticity of expectation is 1 and index of bias is 0. 'Hedging efficiency is 100 per cent' means that price risks would be fully compensated on the average. 'Elasticity of expectation is 1' means that changes in spot prices are so firmly smoothened by futures trading as there is no change in expected prices. 'Index of bias is 0' means, that upward and downward price risks would be equally compensated.

For the purpose of assessing the Hedging efficiency, Elasticity of expectation and Index of Bias of rubber futures market, contracts for 111 successive delivery months consisting of 358 different hedge periods beginning from May 2003 delivery till December 2012 are considered. For all delivery months put together, the total sample size worked out to be 8604, 5832, 3196, 646 and 230 for 1-month hedges, 2-month hedges, 3-month hedges, 4-month hedges, and 5-month hedges respectively. The total sample size for all months put together is 18508. This sample size is sufficiently large enough and seems fairly significant statistically.

Hedges of 1-month, 2-months, 3-months, 4-months and 5-months durations are simulated by a uniform standardized method throughout starting from opening day of the contract. If the day of lifting of the contract is a holiday, the hedge will be lifted on the succeeding working day. If a 1- month contract is placed on 16$^{th}$ of November, it will be lifted on 15$^{th}$ of December, if 15$^{th}$ December is a holiday, it will be lifted on the next working day.

Howell and Watson (1938), Yamey (1951), Gray(1953), Graf (1960), Working (1960), Heifner (1966), Naik (1970), Tomek (1971), Krishna Dass Miss(1975), Pavskar M.G (1976), Pavskar. R (1976), Somanathan (1993), and Madhoo Pavaskar and Archna Kshirsagar (2009) are the eminent researchers who have examined the attributes of a perfect futures market using the below mentioned methods. This chapter is devoted to analyse the Economic functions of Futures Market in tune with the specific objectives of the study.

## 4.2 Objective No.1

**To Study Hedging Efficiency**

Hedging efficiency is the degree to which hedging in a futures market compensates for spot market price risk. In this study a hedge is regarded as efficient so long as it offsets or reduces either gain or loss in the physical market by corresponding loss or gain in the futures market. Hedging efficiency is calculated as:

$$E = \frac{F_t - F_0}{R_t - R_0 - C_t} \times 100$$

Where, however, such calculation yields a percentage in excess of 100, the formula used is

$$[2 - \frac{F_t - F_0}{R_t - R_0 - C_t}] \times 100$$

where

E – Hedging efficiency, $F_t$ - Futures price at time't', $F_o$ - Futures price at time t = 0, $R_t$- Spot price at time't', $R_o$- Spot price at time t = 0, $C_t$- Carrying for the period '0 - t'. Carrying cost or cost of carrying the commodity in storage is calculated separately for each hedging period of the delivery month. Carrying cost is a function of warehouse rent, insurance, grading charge, handling charge, transportation cost, interest, and trading expenses. Average warehouse rent for 50Kgs of rubber for a particular period is the average of the warehouse rents taken from Ernakulam, Kottayam, Kozhikode and Trichur. Tax @ 10 per cent is added to it. Then warehouse rent for 1000Kgs of rubber for the periods one month, two months, three months, four months and five months is calculated. For the stock stored in the warehouse, insurance is @ 5 paise for ₹100 for 1 month. Then insurance charge is calculated for different hedge periods. Grading charge is ₹50 per ton +10.3 per cent service tax. Handling charge is either for loading or for unloading i.e. for one operation and it is charged at the warehouse. Transportation cost is the average of lorry rent, loading charge and binding charge from 24 different places in Kerala to the nearest warehouse. Interest rate is the average of the short term lending rates of 27 public sector banks, published on the RBI website on a quarterly basis. Then interest rate is calculated for different hedge periods. Trading expense is brokerage @ 0.25 per cent of spot price at time ‘0’ + Tax @ 12.3 per cent of Brokerage + Exchange levy @ ₹4 per ₹100000 of spot price at time ‘0’.

Rubber futures contract began on NMCE, Ahamedabad on 15th March 2003. Minimum duration of a contract on NMCE is 2 months and maximum duration is 12 months. Contracts of different time periods are running concurrently. Contracts are allowed for all the 12 months throughout the year. Trading in any contract will open on the 16th day of the month. Due date is 15th day of the delivery month; if 15th happens to be a holiday the previous working day will be the due date. An open position on NMCE can be squared up by taking an opposite position. Minimum duration of the simulated hedge in this study is one month and maximum duration is 5 months. January contract means contract with due date on 15th January. A snapshot of the hedging efficiency of 1- month, 2- months, 3- months, 4- months and 5-months single simulated hedge made for January 2012 contract is given in Table 4.1.

**Table 4.1 A snapshot of the simulated hedges made for January 2012**

| Duration of the hedge | Starting day of the hedge (0) | Ending day of the hedge(t) | Price at time '0' in rupees: Futures ($F_0$) | Price at time '0' in rupees: Spot ($F_0$) | Price at time 't' in rupees: Futures | Price at time 't' in rupees: Spot | Carrying Cost '$C_t$' in rupees | Hedging efficiency 'E' in per cent |
|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1-month | 29/07/'11 | 29/08/'11 | 212000 | 207330 | 213030 | 208170 | 4253.07 | -30.12 |
| 2-month | 29/07/'11 | 28/09/'11 | 212000 | 207330 | 208500 | 211500 | 7736.99 | 98.12 |
| 3-month | 29/07/'11 | 28/10/'11 | 212000 | 207330 | 213750 | 214500 | 11220.9 | -43.2 |
| 4-month | 29/07/'11 | 29/11/'11 | 212000 | 207330 | 198370 | 194130 | 14704.8 | 48.84 |
| 5-month | 29/07/'11 | 29/12/'11 | 212000 | 207330 | 201000 | 199750 | 18188.6 | 42.41 |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

Hedging efficiency calculated (Table 4.1) shows that hedges are simulated for 1- month, 2- months, 3- months, 4- months and 5-months. Column number 2 shows the starting day of the simulated hedge. All the hedges were started on 29th July 2011. Ending day of the hedge is given in column number 3. One month, 2- months, 3- months, 4- months and 5-months hedges ended on 29/08/'11, 28/09/'11, 28/10/'11, 29/11/'11 and 29/12/'11 respectively. Fourth and fifth columns represent futures price ($F_0$) and spot price ($R_0$) respectively, at the starting of the hedge. $F_0$ is ₹212000 and $R_0$ is ₹207000 for all contract. Sixth column represents futures price at the end of the hedge period. For 1- month, 2- months, 3- months, 4- months and 5-months hedges futures price at the end of the periods are ₹213030, ₹208500, ₹213750, ₹198370 and ₹201000 respectively. Spot price for the above mentioned periods are ₹208170, ₹211500, ₹214500, ₹194130 and ₹199750. Carrying cost is given in 8th column, it is the amount paid to store the commodity from the present time to the maturity date. Carrying cost is the sum of warehouse rent, insurance, grading charge, handling charge, transportation cost, interest and trading expense. Warehouse rent and interest vary with time; hence, carrying cost also varies with time. Hedging efficiency calculated in per cent is given in $9^{th}$ column. Hedging efficiency of the 1- month hedge period is -30.12 per cent. The negative sign shows that it is an ineffective hedge and it is treated as a negative efficiency. That is, gain/loss of the spot market is not offsetted by the futures market and this hedging produced a negative result of -30.12 per cent. Hedging efficiency of the 2- months hedge period is 98.12 per cent, it shows that gain/loss of the spot market is offsetted by the futures market by corresponding loss/gain by 98.12 per cent. Hedging efficiency of the 3- months, 4- month sand 5-months hedges are -43.2 per cent, 48.84 per cent and 42.41 per cent respectively.

For hedging efficiency, the data analysis is done in four categories; hedge period by hedge period figures for each month, month by month figures for the period from May 2003 to December 2012, hedge period by hedge period figures for the period from May 2003 to December 2012 and year by year figures for the period from May 2003 to December 2012.

### 4.2.1 Hedge Efficiency of Hedge Period by Hedge Period Figures for Each Month

Hedging efficiency is calculated for 111 successive delivery months consisting of 357 different hedge periods from May 2003 to December 2012. Hedge periods in this study are of durations one month, two months, three months, four months and five months. Hedging efficiency is divided into effective hedges and ineffective hedges. Effective hedges are further divided into 11 categories depending upon its numerical value, viz $0 \leq E < 10$,

$10\leq E<20$, $20\leq E<30$, $30\leq E<40$, $40\leq E<50$, $50\leq E<60$, $60\leq E<70$, $70\leq E<80$, $80\leq E<100$, $E=100$ and $E>100$. Ineffective hedges are also divided into 11 categories depending upon its numerical value viz $-10\leq E<0$, $-20\leq E<-30$, $-30\leq E<-40$, $-40\leq E<-50$, $-50\leq E<-60$, $-60\leq E<-70$, $-70\leq E<-80$, $-80\leq E<-90$, $-90\leq E<0$ and $E<-100$ (E, being hedging efficiency). A hedge may fall into any one of the above mentioned 22 categories. Month wise analysis of the hedging efficiency is presented in Tables 4.2 to 4.13.

#### 4.2.1.1 Hedging Efficiency for January Delivery Contracts

There are 9 January month delivery contracts in total from May 2003 to December 2012. Out of 27 different hedge periods 9 are one month hedge periods, 8 are two month hedge periods, 8 are three month hedge periods, one is four month hedge period and one is five month hedge period. Out of 1405 January hedges 657 are one month hedges, 438 are two month hedges, 244 are three month hedges, 45 are four month hedges and 21 are five month hedges. The number of one month January hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 76, 73, 73, 75, 77, 13, 73, 77 and 120 respectively. The number of two month January hedges in 2004, 2005, 2006, 2007, 2008, 2010, 2011 and 2012 are 51, 46, 48, 51, 51, 47, 50 and 94 respectively. The numbers of three month hedges during the above mentioned years are 26, 24, 24, 25, 25, 24, 26, and 70. In 2012 there is only one four month hedge and five month hedge. Hedging efficiency calculated generally for all January delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for January contract is presented in Table 4.2.

**Table 4.2 Number of effective and ineffective hedges of January delivery contracts**

| JANUARY | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E = 100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| 1- Month | 28 | 22 | 22 | 33 | 26 | 46 | 52 | 54 | 72 | 91 | 0 | 446 | **67.9** | 14 | 22 | 11 | 7 | 12 | 14 | 11 | 4 | 7 | 8 | 101 | 211 | **32.1** | **657** |
| 2- Month | 11 | 12 | 11 | 18 | 16 | 35 | 31 | 38 | 43 | 60 | 0 | 275 | **62.8** | 2 | 7 | 6 | 6 | 8 | 3 | 7 | 5 | 5 | 5 | 109 | 163 | **37.2** | **438** |
| 3- Month | 11 | 10 | 8 | 16 | 18 | 20 | 16 | 12 | 18 | 35 | 0 | 164 | **67.2** | 8 | 2 | 4 | 3 | 7 | 4 | 1 | 3 | 1 | 0 | 47 | 80 | **32.8** | **244** |
| 4- Month | 7 | 0 | 3 | 0 | 5 | 10 | 14 | 1 | 0 | 0 | 0 | 40 | **88.9** | 1 | 0 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 5 | **11.1** | **45** |
| 5- Month | 0 | 0 | 4 | 3 | 6 | 5 | 2 | 1 | 0 | 0 | 0 | 21 | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0.0** | **21** |
| **Total** | **57** | **44** | **48** | **70** | **71** | **116** | **115** | **106** | **133** | **186** | **0** | **946** | **67.3** | **25** | **31** | **23** | **16** | **28** | **22** | **19** | **12** | **13** | **13** | **257** | **459** | **32.7** | **1405** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all January delivery month contracts (Table 4.2) reveals that 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 4- month, 1- month, 3-month and 2-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 88.9 per cent, 67.9 per cent, 67.2 per cent and 62.8 per cent respectively. Out of 1405 January delivery month hedges 946 (67.3 per cent) are effective hedges and 459(32.7per cent) are ineffective hedges.

**4.2.1.2 Hedging Efficiency for February Delivery Contracts**

There are 9 February delivery contracts in total from May 2003 to December 2012. Out of 28 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 8 are three month hedge periods and one each for four month hedge period and five month hedge period. Out of 1461 February hedges 686 are one month hedges, 459 are two month hedges, 249 are three month hedges, 45 are four month hedges and 22 are five month hedges. The number of one month February hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 75, 73, 75, 77, 79, 37, 73, 76 and 121 respectively. The number of two month February hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 50, 48, 49, 52, 52, 12, 48, 52 and 96 respectively. The number of three month February hedges in 2004, 2005, 2006, 2007, 2008, 2010, 2011 and 2012 are 27, 24, 25, 26, 27, 25, 27 and 68 respectively. In 2012 there is only one four month hedge and five month hedge. Hedging efficiency calculated generally for all February delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for February contract is presented in Table 4.3.

**Table 4.3 Number of effective and ineffective hedges of February delivery contracts**

| FEBRUARY | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 19 | 19 | 21 | 19 | 41 | 58 | 74 | 72 | 93 | 101 | 0 | **517** | **75.4** | 18 | 11 | 11 | 5 | 13 | 9 | 1 | 7 | 3 | 8 | 83 | **169** | **24.6** | **686** |
| **2- Month** | 11 | 15 | 20 | 28 | 23 | 29 | 35 | 46 | 53 | 76 | 0 | **336** | **73.2** | 18 | 7 | 10 | 7 | 5 | 5 | 3 | 3 | 2 | 2 | 61 | **123** | **26.8** | **459** |
| **3- Month** | 7 | 7 | 11 | 10 | 26 | 29 | 35 | 21 | 41 | 33 | 0 | **220** | **88.4** | 2 | 4 | 1 | 1 | 5 | 0 | 1 | 1 | 1 | 2 | 11 | **29** | **11.6** | **249** |
| **4- Month** | 2 | 1 | 1 | 1 | 5 | 11 | 14 | 2 | 3 | 0 | 0 | **40** | **88.9** | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **5** | **11.1** | **45** |
| **5- Month** | 0 | 2 | 3 | 0 | 1 | 3 | 12 | 1 | 0 | 0 | 0 | **22** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **22** |
| **Total** | **39** | **44** | **56** | **58** | **96** | **130** | **170** | **142** | **190** | **210** | **0** | **1135** | **77.7** | **39** | **22** | **23** | **15** | **24** | **14** | **5** | **11** | **6** | **12** | **155** | **326** | **22.3** | **1461** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all February delivery month contracts (Table 4.3) reveals that 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 4- month, 3- month, 1-month and 2-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 88.9 per cent, 88.4 per cent, 75.36 per cent and 73.2 per cent respectively. Out of 1461 February delivery month hedges 1135 (77.7 per cent) are effective hedges and 326(22.3 per cent) are ineffective hedges.

#### 4.2.1.3 Hedging Efficiency for March Delivery Contracts

There are 9 March delivery contracts in total from May 2003 to December 2012. Out of 29 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods and one each for four month hedge period and five month hedge period. Out of 1459 March hedges 699 are one month hedges, 471 are two month hedges, 250 are three month hedges, 31 are four month hedges and 8 are five month hedges. The number of one month March hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 75, 75, 76, 78, 78, 60, 73, 76 and 108 respectively. The number of two month March hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 50, 50, 50, 52, 52, 36, 49, 50 and 82 respectively. The number of three month March hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 25, 27, 25, 27, 26, 11, 26, 26 and 57 respectively. In 2012 there is only one four month hedge and five month hedge. Hedging efficiency calculated generally for all March delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for March contract is presented in Table 4.4.

**Table 4.4 Number of effective and ineffective hedges of March delivery contracts**

| MARCH | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $0 \le E < 10$ | $10 \le E < 20$ | $20 \le E < 30$ | $30 \le E < 40$ | $40 \le E < 50$ | $50 \le E < 60$ | $60 \le E < 70$ | $70 \le E < 80$ | $80 \le E < 90$ | $90 \le E < 100$ | $E = 100$ | Total Effective Hedges | % of Effective Hedges | $(-10 \le E < 0)$ | $(-20 \le E < -10)$ | $(-30 \le E < -20)$ | $(-40 \le E < -30)$ | $(-50 \le E < -40)$ | $(-60 \le E < -50)$ | $(-70 \le E < -60)$ | $(-80 \le E < -70)$ | $(-90 \le E < -80)$ | $(-100 \le E < -90)$ | $E < -100$ | Total Ineffective Hedges | % of Ineffective Hedges | Total |
| **1- Month** | 12 | 20 | 21 | 27 | 38 | 53 | 81 | 86 | 85 | 124 | 0 | **547** | **78.3** | 13 | 18 | 10 | 6 | 4 | 6 | 7 | 8 | 2 | 2 | 76 | **152** | **21.7** | **699** |
| **2- Month** | 13 | 24 | 18 | 20 | 29 | 35 | 40 | 49 | 59 | 72 | 0 | **359** | **76.2** | 11 | 6 | 11 | 5 | 4 | 4 | 3 | 2 | 4 | 1 | 61 | **112** | **23.8** | **471** |
| **3- Month** | 2 | 6 | 5 | 5 | 12 | 17 | 27 | 36 | 40 | 47 | 0 | **197** | **78.8** | 3 | 2 | 0 | 2 | 2 | 0 | 1 | 2 | 1 | 0 | 40 | **53** | **21.2** | **250** |
| **4- Month** | 0 | 1 | 1 | 0 | 1 | 7 | 10 | 7 | 4 | 0 | 0 | **31** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **31** |
| **5- Month** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 3 | 1 | 0 | 0 | **8** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **8** |
| **Total** | **27** | **51** | **45** | **52** | **80** | **112** | **162** | **181** | **189** | **243** | **0** | **1142** | **78.3** | **27** | **26** | **21** | **13** | **10** | **10** | **11** | **12** | **7** | **3** | **177** | **317** | **21.7** | **1459** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad -- Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all March delivery month contracts (Table 4.4) reveals that 4- month and 5- month hedge period are the best hedge periods with an average hedging efficiency of 100 per cent. The hedge periods 3- month, 1- month, and 2-month come 2nd, 3rd, and 4th with average hedging efficiency of 78.8 per cent, 78.25 per cent, and 76.2 per cent respectively. Out of 1459 March delivery month hedges 1142 (78.3 per cent) are effective hedges and 317(21.7 per cent) are ineffective hedges.

#### 4.2.1.4 Hedging Efficiency for April Delivery Contracts

There are 9 April delivery contracts in total from May 2003 to December 2012. Out of 30 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods, 2 are four month hedge periods and one is five month hedge period. Out of 1634 April hedges 732 are one month hedges, 524 are two month hedges, 295 are three month hedges, 65 are four month hedges and 18 are five month hedges. The number of one month April hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 100, 73, 75, 74, 76, 74, 70, 74 and 116 respectively. The number of two month April hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 75, 50, 52, 51, 52, 54, 46, 51 and 93 respectively. The number of three month April hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 48, 24, 26, 25, 26, 29, 24, 25 and 68 respectively. The number of four month April hedges in 2004 and 2012 are 23 and 65 respectively. There is only one five month April hedge in 2012. Hedging efficiency calculated generally for all April delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for April contract is presented in Table 4.5.

**Table 4.5 Number of effective and ineffective hedges of April delivery contracts**

| APRIL | Number of Effective Hedges | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $0 \le E < 10$ | $10 \le E < 20$ | $20 \le E < 30$ | $30 \le E < 40$ | $40 \le E < 50$ | $50 \le E < 60$ | $60 \le E < 70$ | $70 \le E < 80$ | $80 \le E < 90$ | $90 \le E < 100$ | $E = 100$ | Total Effective Hedges | % of Effective Hedges | $(-10 \le E < 0)$ | $(-20 \le E < -10)$ | $(-30 \le E < -20)$ | $(-40 \le E < -30)$ | $(-50 \le E < -40)$ | $(-60 \le E < -50)$ | $(-70 \le E < -60)$ | $(-80 \le E < -70)$ | $(-90 \le E < -80)$ | $(-100 \le E < -90)$ | $E < -100$ | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 14 | 19 | 24 | 44 | 56 | 63 | 66 | 80 | 94 | 98 | 0 | **558** | **76.2** | 12 | 14 | 15 | 10 | 6 | 5 | 8 | 6 | 6 | 6 | 86 | **174** | **23.8** | **732** |
| **2- Month** | 26 | 24 | 17 | 30 | 46 | 30 | 51 | 45 | 52 | 76 | 0 | **397** | **75.8** | 14 | 10 | 12 | 8 | 1 | 3 | 5 | 6 | 2 | 1 | 65 | **127** | **24.2** | **524** |
| **3- Month** | 1 | 13 | 8 | 12 | 29 | 29 | 33 | 36 | 34 | 18 | 0 | **213** | **72.2** | 5 | 5 | 3 | 2 | 2 | 0 | 0 | 1 | 1 | 3 | 60 | **82** | **27.8** | **295** |
| **4- Month** | 0 | 1 | 4 | 1 | 2 | 10 | 8 | 9 | 2 | 3 | 0 | **40** | **61.5** | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | **25** | **38.5** | **65** |
| **5- Month** | 0 | 0 | 1 | 2 | 2 | 5 | 5 | 3 | 0 | 0 | 0 | **18** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **18** |
| **Total** | **41** | **57** | **54** | **89** | **135** | **137** | **163** | **173** | **182** | **195** | **0** | **1226** | **75.0** | **32** | **30** | **30** | **20** | **9** | **8** | **13** | **13** | **9** | **10** | **234** | **408** | **25.0** | **1634** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all April delivery month contracts (Table 4.5) reveals that 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 1- month, 2- month, 3-month and 4-month come $2^{nd}$, $3^{rd}$, $4^{th}$ and $5^{th}$ with average hedging efficiency of 76.23 per cent, 75.8 per cent, 72.2 per cent and 61.5 per cent respectively. Out of 1634 April delivery month hedges 1226 (75 per cent) are effective hedges and 408 (25 per cent) are ineffective hedges.

**4.2.1.5 Hedging Efficiency for May Delivery Contracts**

There are 10 May delivery contracts in total from May 2003 to December 2012. Out of 31 different hedge periods 10 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods, 2 are four month hedge periods and one is five month hedge period. Out of 1632 May hedges 753 are one month hedges, 503 are two month hedges, 291 are three month hedges, 68 are four month hedges and 17 are five month hedges. The number of one month May hedges in 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 26,100, 74, 75, 76, 71, 71, 72, 74 and 114 respectively. The number of two month May hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 74, 49, 50, 50, 46, 47, 48, 48 and 91 respectively. The number of three month May hedges in 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 50, 25, 25, 26, 21, 26, 25, 25 and 68 respectively. The number of four month May hedges in 2004 and 2012 are 26 and 42 respectively. There is only one five month May hedge in 2012. Hedging efficiency calculated generally for all May delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for May contract is presented in Table 4.6.

**Table 4.6 Number of effective and ineffective hedges of May delivery contracts**

| MAY | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 18 | 21 | 21 | 40 | 50 | 71 | 61 | 94 | 99 | 119 | 0 | **594** | **78.9** | 8 | 14 | 9 | 8 | 7 | 5 | 1 | 5 | 10 | 6 | 86 | **159** | **21.1** | **753** |
| **2- Month** | 14 | 11 | 26 | 33 | 41 | 42 | 38 | 46 | 51 | 72 | 0 | **374** | **74.4** | 21 | 5 | 6 | 5 | 7 | 6 | 3 | 3 | 3 | 0 | 70 | **129** | **25.6** | **503** |
| **3- Month** | 9 | 8 | 14 | 16 | 24 | 36 | 36 | 24 | 25 | 34 | 0 | **226** | **77.7** | 7 | 3 | 3 | 1 | 3 | 3 | 2 | 0 | 0 | 0 | 43 | **65** | **22.3** | **291** |
| **4- Month** | 2 | 5 | 4 | 3 | 0 | 1 | 5 | 3 | 6 | 10 | 0 | **39** | **57.4** | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 23 | **29** | **42.6** | **68** |
| **5- Month** | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 4 | 5 | 4 | 0 | **17** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **17** |
| **Total** | **43** | **45** | **65** | **92** | **116** | **151** | **142** | **171** | **186** | **239** | **0** | **1250** | **76.6** | **38** | **22** | **19** | **15** | **17** | **14** | **6** | **10** | **13** | **6** | **222** | **382** | **23.4** | **1632** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all May delivery month contracts (Table 4.6) reveals that 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 1- month, 3- month, 2-month and 4-month come 2$^{nd}$, 3$^{rd}$, 4$^{th}$ and 5$^{th}$ with average hedging efficiency of 78.88 per cent, 77.7 per cent, 74.4 per cent and 57.4 per cent respectively. Out of 1632 May delivery month hedges 1250 (76.6 per cent) are effective hedges and 382 (23.4 per cent) are ineffective hedges.

**4.2.1.6 Hedging Efficiency for June Delivery Contracts**

There are 10 June delivery contracts in total from May 2003 to December 2012. Out of 32 different hedge periods 10 are one month hedge periods, 10 are two month hedge periods, 8 are three month hedge periods, 2 are four month hedge periods and 2 are five month hedge period. Out of 1672 June hedges 753 are one month hedges, 502 are two month hedges, 283 are three month hedges, 90 are four month hedges and 44 are five month hedges. The number of one month June hedges in 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 33,124, 75, 75, 76, 45, 69, 73, 73 and 110 respectively. The number of two month June hedges in 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 7, 99, 50, 49, 50, 20, 46, 48,48 and 85 respectively. The number of three month June hedges in 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 76, 25, 24, 24, 24, 24, 24 and 68 respectively. The number of four month June hedges in 2004 and 2012 are 51 and 39 respectively. The number of five month June hedges in 2004 and 2012 are 25 and 19 respectively. Hedging efficiency calculated generally for all June delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for June contract is presented in Table 4.7.

**Table 4.7 Number of effective and ineffective hedges of June delivery contracts**

| JUNE | Number of Effective Hedges | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 17 | 19 | 30 | 33 | 39 | 65 | 82 | 87 | 116 | 110 | 0 | **598** | **79.4** | 9 | 10 | 7 | 5 | 9 | 7 | 4 | 4 | 4 | 7 | 89 | **155** | **20.6** | **753** |
| **2- Month** | 14 | 15 | 25 | 25 | 41 | 45 | 39 | 54 | 57 | 61 | 0 | **376** | **74.9** | 15 | 5 | 11 | 8 | 12 | 8 | 6 | 1 | 2 | 1 | 57 | **126** | **25.1** | **502** |
| **3- Month** | 9 | 11 | 13 | 16 | 16 | 20 | 14 | 24 | 36 | 42 | 0 | **201** | **71.0** | 10 | 11 | 8 | 4 | 7 | 2 | 2 | 2 | 1 | 4 | 31 | **82** | **29.0** | **283** |
| **4- Month** | 3 | 3 | 0 | 6 | 6 | 9 | 5 | 8 | 6 | 10 | 0 | **56** | **62.2** | 2 | 3 | 1 | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 23 | **34** | **37.8** | **90** |
| **5- Month** | 1 | 0 | 1 | 0 | 0 | 3 | 4 | 5 | 5 | 3 | 0 | **22** | **50.0** | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 16 | **22** | **50.0** | **44** |
| **Total** | **44** | **48** | **69** | **80** | **102** | **142** | **144** | **178** | **220** | **226** | **0** | **1253** | **74.9** | **37** | **30** | **27** | **20** | **29** | **20** | **12** | **8** | **7** | **13** | **216** | **419** | **25.1** | **1672** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all June delivery month contracts (Table 4.7) reveals that 1- month hedge period is the best hedge period with an average hedging efficiency of 79.42 per cent. The hedge periods 2- month, 3- month, 4-month and 5-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 74.9 per cent, 71.0 per cent, 62.2 per cent and 50.0 per cent respectively. Out of 1595 June delivery month hedges 1253 (74.9 per cent) are effective hedges and 419 (25.1 per cent) are ineffective hedges.

**4.2.1.7 Hedging Efficiency for July Delivery Contracts**

There are 11 July delivery contracts in total from May 2003 to December 2012. Out of 31 different hedge periods 10 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods, 2 are four month hedge periods and one is five month hedge period. Out of 1595 July hedges 750 are one month hedges, 490 are two month hedges, 273 are three month hedges, 63 are four month hedges and 19 are five month hedges. The number of one month July hedges in 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011 and 2012 are 61, 75, 77, 79, 79, 19, 73, 76, 97 and 114 respectively. The number of two month July hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 36, 50, 50, 50, 51, 45, 50, 71 and 87 respectively. The number of three month July hedges in 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 10, 26, 26, 26, 26, 24, 26, 47 and 62 respectively. The number of four month July hedges in 2011 and 2012 are 22 and 41 respectively. There is only one July five month hedge in 2012. Hedging efficiency calculated generally for all July delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for July contract is presented in Table 4.8.

**Table 4.8 Number of effective and ineffective hedges of July delivery contracts**

| JULY | Number of Effective Hedges | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 22 | 23 | 36 | 44 | 48 | 51 | 66 | 84 | 96 | 129 | 0 | **599** | **79.9** | 12 | 10 | 11 | 10 | 6 | 7 | 5 | 4 | 9 | 5 | 72 | **151** | **20.1** | **750** |
| **2- Month** | 5 | 17 | 13 | 14 | 20 | 14 | 41 | 71 | 100 | 81 | 0 | **376** | **76.7** | 7 | 4 | 6 | 6 | 9 | 10 | 4 | 4 | 9 | 4 | 51 | **114** | **23.3** | **490** |
| **3- Month** | 5 | 7 | 10 | 6 | 14 | 21 | 17 | 24 | 57 | 79 | 0 | **240** | **87.9** | 2 | 1 | 1 | 4 | 2 | 1 | 0 | 1 | 1 | 0 | 20 | **33** | **12.1** | **273** |
| **4- Month** | 1 | 3 | 1 | 1 | 2 | 3 | 9 | 14 | 10 | 16 | 0 | **60** | **95.2** | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | **3** | **4.8** | **63** |
| **5- Month** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 9 | 4 | 0 | **19** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **19** |
| **Total** | **33** | **50** | **60** | **65** | **84** | **89** | **133** | **199** | **272** | **309** | **0** | **1294** | **81.1** | **21** | **15** | **18** | **20** | **18** | **18** | **9** | **9** | **19** | **9** | **145** | **301** | **18.9** | **1595** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all July delivery month contracts (Table 4.8) reveals that 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 4- month, 3- month, 1-month and 2-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 95.2 per cent, 87.9 per cent, 79.87 per cent and 76.7 per cent respectively. Out of 1595 July delivery month hedges 1096 (75.7 per cent) are effective hedges and 352(24.3 per cent) are ineffective hedges.

### 4.2.1.8 Hedging Efficiency for August Delivery Contracts

There are 9 August delivery contracts in total from May 2003 to December 2012. Out of 29 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods and one each for four month hedge period and five month hedge period. Out of 1448 August hedges 704 are one month hedges, 470 are two month hedges, 240 are three month hedges, 22 are four month hedges and 12 are five month hedges. The number of one month August hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 68, 75, 77, 78, 77, 75, 76, 82 and 96 respectively. The number of two month August hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 42, 50, 51, 52, 51, 48, 49, 56 and 71 respectively. The number of three month August hedges in 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 16, 25, 25, 25, 26, 23, 25, 31 and 44 respectively. In 2012 there is only one four month hedge and five month hedge. Hedging efficiency calculated generally for all August delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for August contract is presented in Table 4.9.

**Table 4.9 Number of effective and ineffective hedges of August delivery contracts**

| AUGUST | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E<10 | 10≤E<20 | 20≤E<30 | 30≤E<40 | 40≤E<50 | 50≤E<60 | 60≤E<70 | 70≤E<80 | 80≤E<90 | 90≤E<100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E<0) | (-20≤E<-10) | (-30≤E<-20) | (-40≤E<-30) | (-50≤E<-40) | (-60≤E<-50) | (-70≤E<-60) | (-80≤E<-70) | (-90≤E<-80) | (-100≤E<-90) | E<-100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| 1- Month | 24 | 27 | 21 | 32 | 34 | 56 | 72 | 72 | 96 | 92 | 0 | 526 | 74.7 | 9 | 14 | 15 | 11 | 4 | 10 | 5 | 11 | 4 | 5 | 90 | 178 | 25.3 | 704 |
| 2- Month | 15 | 9 | 6 | 4 | 15 | 40 | 36 | 62 | 66 | 93 | 0 | 346 | 73.6 | 11 | 7 | 7 | 8 | 7 | 5 | 3 | 4 | 4 | 2 | 66 | 124 | 26.4 | 470 |
| 3- Month | 2 | 6 | 4 | 7 | 16 | 8 | 37 | 29 | 34 | 47 | 0 | 190 | 79.2 | 1 | 1 | 1 | 1 | 2 | 0 | 4 | 3 | 2 | 3 | 32 | 50 | 20.8 | 240 |
| 4- Month | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 8 | 9 | 0 | 22 | 100.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 22 |
| 5- Month | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 5 | 0 | 12 | 100.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 12 |
| Total | 41 | 42 | 31 | 43 | 65 | 104 | 146 | 167 | 211 | 246 | 0 | 1096 | 75.7 | 21 | 22 | 23 | 20 | 13 | 15 | 12 | 18 | 10 | 10 | 188 | 352 | 24.3 | 1448 |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all August delivery month contracts (Table 4.9) reveals that 4- month and 5-month hedge periods are the best hedge periods with an average hedging efficiency of 100 per cent. The hedge periods 3- month, 1- month, and 2-month come 2nd, 3rd, and 5th with average hedging efficiency of 79.2 per cent, 74.72 per cent and 73.6 per cent respectively. Out of 1448 August delivery month hedges 1096 (75.7 per cent) are effective hedges and 352(24.3 per cent) are ineffective hedges.

### 4.2.1.9 Hedging Efficiency for September Delivery Contracts

There are 9 September delivery contracts in total from May 2003 to December 2012. Out of 29 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods, 2 are four month hedge periods and one five month hedge period. Out of 1507 September hedges 716 are one month hedges, 488 are two month hedges, 254 are three month hedges, 45 are four month hedges and 4 are five month hedges. The number of one month September hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 52, 79, 77, 79, 77, 78, 78, 107 and 89 respectively. The number of two month September hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 27, 53, 53, 53, 52, 53, 52, 82 and 63 respectively. The number of three month September hedges in 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 27, 27, 27, 27, 27, 26, 55 and 38 respectively. The number of four month September hedges in 2011 and 2012 are 30 and 15 respectively. There is only one September hedge in 2012. Hedging efficiency calculated generally for all September delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for September contract is presented in Table 4.10.

**Table 4.10 Number of effective and ineffective hedges of September delivery contracts**

| SEPTEMBER | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $0 \le E < 10$ | $10 \le E < 20$ | $20 \le E < 30$ | $30 \le E < 40$ | $40 \le E < 50$ | $50 \le E < 60$ | $60 \le E < 70$ | $70 \le E < 80$ | $80 \le E < 90$ | $90 \le E < 100$ | E = 100 | Total Effective Hedges | % of Effective Hedges | $(-10 \le E < 0)$ | $(-20 \le E < -10)$ | $(-30 \le E < -20)$ | $(-40 \le E < -30)$ | $(-50 \le E < -40)$ | $(-60 \le E < -50)$ | $(-70 \le E < -60)$ | $(-80 \le E < -70)$ | $(-90 \le E < -80)$ | $(-100 \le E < -90)$ | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 36 | 33 | 37 | 43 | 55 | 53 | 63 | 58 | 69 | 63 | 0 | **510** | **71.2** | 14 | 18 | 21 | 8 | 11 | 9 | 10 | 5 | 8 | 2 | 100 | **206** | **28.8** | **716** |
| **2- Month** | 14 | 18 | 15 | 31 | 46 | 35 | 43 | 52 | 48 | 50 | 0 | **352** | **72.1** | 8 | 9 | 12 | 7 | 7 | 9 | 6 | 4 | 7 | 1 | 66 | **136** | **27.9** | **488** |
| **3- Month** | 6 | 8 | 13 | 16 | 17 | 33 | 27 | 26 | 17 | 15 | 0 | **178** | **70.1** | 2 | 0 | 6 | 2 | 2 | 3 | 0 | 1 | 4 | 0 | 56 | **76** | **29.9** | **254** |
| **4- Month** | 0 | 1 | 6 | 4 | 8 | 5 | 6 | 4 | 7 | 4 | 0 | **45** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **45** |
| **5- Month** | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | **4** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **4** |
| **Total** | **56** | **60** | **71** | **94** | **127** | **126** | **140** | **140** | **142** | **133** | **0** | **1089** | **72.3** | **24** | **27** | **39** | **17** | **20** | **21** | **16** | **10** | **19** | **3** | **222** | **418** | **27.7** | **1507** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all September delivery month contracts (Table 4.10) reveals that, 5- month and 4-month hedge periods are the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 2- month, 1- month, and 3-month come 2nd, 3rd, and 5th with average hedging efficiency of 72.1 per cent, 71.23 per cent and 70.1 per cent respectively. Out of 1507 September delivery month hedges 1089 (72.3 per cent) are effective hedges and 418(27.7 per cent) are ineffective hedges.

#### 4.2.1.10 Hedging Efficiency for October Delivery Contracts

There are 9 October delivery contracts in total from May 2003 to December 2012. Out of 30 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 8 are three month hedge periods, two are four month hedge periods and two five month hedge periods. Out of 1521 October hedges 714 are one month hedges, 486 are two month hedges, 257 are three month hedges, 50 are four month hedges and 14 are five month hedges. The number of one month October hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 52, 79, 76, 78, 76, 78, 77, 104 and 94 respectively. The number of two month October hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 26, 53, 51, 51, 52, 52, 53, 79 and 69 respectively. The number of three month October hedges in 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 27, 27, 26, 26, 27, 27, 54 and 43 respectively. The number of four month October hedges in 2011 and 2012 are 28 and 22 respectively. The number of five month October hedges in 2011 and 2012 are 6 and 8 respectively. Hedging efficiency calculated generally for all October delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for October contract is presented in Table 4.11.

**Table 4.11 Number of effective and ineffective hedges of October delivery contracts**

| OCTOBER | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 33 | 28 | 28 | 34 | 45 | 54 | 51 | 69 | 52 | 53 | 0 | **447** | **62.6** | 29 | 28 | 18 | 15 | 15 | 10 | 9 | 11 | 7 | 4 | 121 | **267** | **37.4** | **714** |
| **2- Month** | 24 | 22 | 21 | 31 | 31 | 33 | 32 | 21 | 28 | 24 | 0 | **267** | **54.9** | 24 | 15 | 22 | 20 | 16 | 13 | 9 | 10 | 5 | 3 | 82 | **219** | **45.1** | **486** |
| **3- Month** | 2 | 3 | 25 | 14 | 9 | 14 | 14 | 19 | 23 | 15 | 0 | **138** | **53.7** | 5 | 6 | 2 | 6 | 2 | 6 | 4 | 6 | 4 | 7 | 71 | **119** | **46.3** | **257** |
| **4- Month** | 2 | 4 | 5 | 3 | 3 | 8 | 5 | 4 | 3 | 2 | 0 | **39** | **78.0** | 1 | 2 | 0 | 1 | 0 | 0 | 2 | 2 | 1 | 1 | 1 | **11** | **22.0** | **50** |
| **5- Month** | 0 | 1 | 3 | 2 | 5 | 1 | 1 | 0 | 1 | 0 | 0 | **14** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **14** |
| **Total** | **61** | **58** | **82** | **84** | **93** | **110** | **103** | **113** | **107** | **94** | **0** | **905** | **59.5** | **59** | **51** | **42** | **42** | **33** | **29** | **24** | **29** | **17** | **15** | **275** | **616** | **40.5** | **1521** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all October delivery month contracts (Table 4.11) reveals that, 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 4- month, 1- month, 2-month and 3-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 78.0 per cent, 62.61 per cent, 54.9 per cent and 53.7 per cent respectively. Out of 1521 October delivery month hedges 905 (59.5 per cent) are effective hedges and 616(40.5 per cent) are ineffective hedges.

### 4.2.1.11 Hedging Efficiency for November Delivery Contracts

There are 9 November delivery contracts in total from May 2003 to December 2012. Out of 31 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods, two are four month hedge periods and two five month hedge periods. Out of 1638 November hedges 737 are one month hedges, 521 are two month hedges, 293 are three month hedges, 64 are four month hedges and 23 are five month hedges. The number of one month November hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 76, 74, 74, 77, 76, 75, 77, 113 and 95 respectively. The number of two month November hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 51, 53, 50, 53, 51, 52, 52, 88 and 71 respectively. The number of three month November hedges in 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 25, 27, 25, 26, 27, 26, 27, 64 and 46 respectively. The number of four month November hedges in 2011 and 2012 are 40 and 24 respectively. The number of five month November hedges in 2011 and 2012 are 18 and 5 respectively. Hedging efficiency calculated generally for all November delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedges falling into each category on the basis of hedge periods for November contract is presented in Table 4.12.

**Table 4.12 Number of effective and ineffective hedges of November delivery contracts**

| NOVEMBER | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 41 | 34 | 26 | 39 | 36 | 52 | 55 | 57 | 58 | 65 | 0 | **463** | **62.8** | 28 | 34 | 20 | 17 | 17 | 9 | 5 | 13 | 9 | 6 | 116 | **274** | **37.2** | **737** |
| **2- Month** | 18 | 25 | 22 | 21 | 25 | 39 | 31 | 29 | 26 | 23 | 0 | **259** | **49.7** | 17 | 23 | 16 | 13 | 18 | 13 | 13 | 13 | 10 | 11 | 115 | **262** | **50.3** | **521** |
| **3- Month** | 8 | 26 | 14 | 14 | 13 | 12 | 13 | 9 | 6 | 1 | 0 | **116** | **39.6** | 12 | 17 | 18 | 16 | 9 | 7 | 13 | 5 | 2 | 4 | 74 | **177** | **60.4** | **293** |
| **4- Month** | 5 | 3 | 8 | 11 | 9 | 7 | 9 | 6 | 2 | 0 | 0 | **60** | **93.8** | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | **4** | **6.3** | **64** |
| **5- Month** | 1 | 2 | 1 | 3 | 1 | 5 | 6 | 4 | 0 | 0 | 0 | **23** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **23** |
| **Total** | **73** | **90** | **71** | **88** | **84** | **115** | **114** | **105** | **92** | **89** | **0** | **921** | **56.2** | **57** | **75** | **55** | **46** | **45** | **29** | **32** | **31** | **21** | **21** | **305** | **717** | **43.8** | **1638** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all November delivery month contracts (Table 4.12) reveals that, 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 4- month, 1- month, 2-month and 3-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 93.8 per cent, 62.82 per cent, 49.7 per cent and 39.6 per cent respectively. Out of 1638 November delivery month hedges 921 (56.2 per cent) are effective hedges and 717(43.8 per cent) are ineffective hedges.

### 4.2.1.12 Hedging Efficiency for December Delivery Contracts

There are 9 December delivery contracts in total from May 2003 to December 2012. Out of 31 different hedge periods 9 are one month hedge periods, 9 are two month hedge periods, 9 are three month hedge periods, two are four month hedge periods and two five month hedge periods. Out of 1536 December hedges 703 are one month hedges, 480 are two month hedges, 267 are three month hedges, 58 are four month hedges and 28 are five month hedges. The number of one month December hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 78, 73, 75, 78, 76, 74, 77, 120 and 52 respectively. The number of two month December hedges in 2003, 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 52, 51, 50, 52, 50, 50, 49, 95 and 31 respectively. The number of three month December hedges in 2004, 2005, 2006, 2007, 2009, 2010, 2011 and 2012 are 27, 27, 26, 28, 25, 27, 26, 69 and 12 respectively. The number of four month December hedges in 2011 and 2012 are 47 and 11 respectively. The number of five month December hedges in 2011 and 2012 are 24 and 4 respectively. Hedging efficiency calculated generally for all December delivery month contracts is on the basis of hedge periods. It is further divided into 22 categories. The number of hedge falling into each category on the basis of hedge period for December contract is presented in Table 4.13.

**Table 4.13 Number of effective and ineffective hedges of December delivery contracts**

| DECEMBER | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| **1- Month** | 22 | 18 | 26 | 30 | 41 | 48 | 57 | 55 | 70 | 86 | 0 | **453** | **64.4** | 23 | 16 | 15 | 23 | 11 | 12 | 7 | 7 | 6 | 6 | 124 | **250** | **35.6** | **703** |
| **2- Month** | 10 | 12 | 21 | 11 | 21 | 34 | 41 | 33 | 37 | 49 | 0 | **269** | **56.0** | 12 | 7 | 19 | 8 | 7 | 13 | 7 | 10 | 7 | 4 | 117 | **211** | **44.0** | **480** |
| **3- Month** | 14 | 21 | 13 | 17 | 23 | 24 | 19 | 19 | 5 | 16 | 0 | **171** | **64.0** | 5 | 6 | 7 | 7 | 5 | 6 | 2 | 4 | 1 | 2 | 51 | **96** | **36.0** | **267** |
| **4- Month** | 6 | 2 | 3 | 6 | 12 | 10 | 4 | 8 | 1 | 0 | 0 | **52** | **89.7** | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | **6** | **10.3** | **58** |
| **5- Month** | 0 | 0 | 0 | 0 | 6 | 13 | 8 | 1 | 0 | 0 | 0 | **28** | **100.0** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** | **0.0** | **28** |
| **Total** | **52** | **53** | **63** | **64** | **103** | **129** | **129** | **116** | **113** | **151** | **0** | **973** | **63.3** | **42** | **32** | **41** | **38** | **23** | **32** | **16** | **21** | **14** | **12** | **292** | **563** | **36.7** | **1536** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

An analysis of the number of effective and ineffective hedges of all December delivery month contracts (Table 4.13) reveals that, 5- month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The hedge periods 4- month, 1- month, 3-month and 2-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 89.7 per cent, 64.44 per cent, 64 per cent and 56.0 per cent respectively. Out of 1638 December delivery month hedges 973 (63.3 per cent) are effective hedges and 563(36.7 per cent) are ineffective hedges.

### 4.2.2 Hedging Efficiency for the Period from May 2003 to December 2012 on the Basis of Delivery Months

There are 111 delivery months from May 2003 to December 2012. Out of 18508 hedges 8604 are one month hedges, 5832 are two month hedges, 3196 are three month hedges, 646 are four month hedges and 230 are five month hedges. Generally the number of hedges in January, February, March, April, May, June, July, August, September, October, November and December are 1405, 1461, 1459, 1634, 1632, 1672, 1595, 1448, 1507, 1521, 1638 and 1536 respectively. The total numbers of hedge periods during the above mentioned months are 27, 28, 29, 30, 31, 32, 31, 29, 29, 30, 31 and 31. Hedging efficiency calculated for the period from May 2003 to December 2012, on the basis of delivery months is divided into 22 categories. The number of hedge falling into each category is presented in Table 4.14.

An analysis of the number of effective and ineffective hedges for the period from May 2003 to December 2012, on the basis of delivery months (Table 4.14) reveals that, month July is the best hedge period with an average hedging efficiency of 81.1 per cent.

**Table 4.14 Number of effective and ineffective hedges for the period from May 2003 to December 2012 on the basis of delivery months**

| Month | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| January | 57 | 44 | 48 | 70 | 71 | 116 | 115 | 106 | 133 | 186 | 0 | **946** | **67.3** | 25 | 31 | 23 | 16 | 28 | 22 | 19 | 12 | 13 | 13 | 257 | **459** | **32.7** | **1405** |
| February | 39 | 44 | 56 | 58 | 96 | 130 | 170 | 142 | 190 | 210 | 0 | **1135** | **77.7** | 39 | 22 | 23 | 15 | 24 | 14 | 5 | 11 | 6 | 12 | 155 | **326** | **22.3** | **1461** |
| March | 27 | 51 | 45 | 52 | 80 | 112 | 162 | 181 | 189 | 243 | 0 | **1142** | **78.3** | 27 | 26 | 21 | 13 | 10 | 10 | 11 | 12 | 7 | 3 | 177 | **317** | **21.7** | **1459** |
| April | 41 | 57 | 54 | 89 | 135 | 137 | 163 | 173 | 182 | 195 | 0 | **1226** | **75.0** | 32 | 30 | 30 | 20 | 9 | 8 | 13 | 13 | 9 | 10 | 234 | **408** | **25.0** | **1634** |
| May | 43 | 45 | 65 | 92 | 116 | 151 | 142 | 171 | 186 | 239 | 0 | **1250** | **76.6** | 38 | 22 | 19 | 15 | 17 | 14 | 6 | 10 | 13 | 6 | 222 | **382** | **23.4** | **1632** |
| June | 44 | 48 | 69 | 80 | 102 | 142 | 144 | 178 | 220 | 226 | 0 | **1253** | **74.9** | 37 | 30 | 27 | 20 | 29 | 20 | 12 | 8 | 7 | 13 | 216 | **419** | **25.1** | **1672** |
| July | 33 | 50 | 60 | 65 | 84 | 89 | 133 | 199 | 272 | 309 | 0 | **1294** | **81.1** | 21 | 15 | 18 | 20 | 18 | 18 | 9 | 9 | 19 | 9 | 145 | **301** | **18.9** | **1595** |
| August | 41 | 42 | 31 | 43 | 65 | 104 | 146 | 167 | 211 | 246 | 0 | **1096** | **75.7** | 21 | 22 | 23 | 20 | 13 | 15 | 12 | 18 | 10 | 10 | 188 | **352** | **24.3** | **1448** |
| September | 56 | 60 | 71 | 94 | 127 | 126 | 140 | 140 | 142 | 133 | 0 | **1089** | **72.3** | 24 | 27 | 39 | 17 | 20 | 21 | 16 | 10 | 19 | 3 | 222 | **418** | **27.7** | **1507** |
| October | 61 | 58 | 82 | 84 | 93 | 110 | 103 | 113 | 107 | 94 | 0 | **905** | **59.5** | 59 | 51 | 42 | 42 | 33 | 29 | 24 | 29 | 17 | 15 | 275 | **616** | **40.5** | **1521** |
| November | 73 | 90 | 71 | 88 | 84 | 115 | 114 | 105 | 92 | 89 | 0 | **921** | **56.2** | 57 | 75 | 55 | 46 | 45 | 29 | 32 | 31 | 21 | 21 | 305 | **717** | **43.8** | **1638** |
| December | 52 | 53 | 63 | 64 | 103 | 129 | 129 | 116 | 113 | 151 | 0 | **973** | **63.3** | 42 | 32 | 41 | 38 | 23 | 32 | 16 | 21 | 14 | 12 | 292 | **563** | **36.7** | **1536** |
| **Total** | **567** | **642** | **715** | **879** | **1156** | **1461** | **1661** | **1791** | **2037** | **2321** | **0** | **13230** | **71.5** | **422** | **383** | **361** | **282** | **269** | **232** | **175** | **184** | **155** | **127** | **2688** | **5278** | **28.5** | **18508** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

The months March, January, December, October and November come 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th with average hedging efficiency of 81.1 per cent, 72.7 per cent, 70.5 per cent and 68.3 per cent respectively. Out of 18508 hedges 13230 (71.5 per cent) are effective hedges and 5278(28.5 per cent) are ineffective hedges.

### 4.2.3 Hedging Efficiency for the Period from May 2003 to December 2012 on the Basis of Hedge Periods

Out of 358 different hedge periods 111 are one month hedge periods, 108 are two month hedge periods, 103 are three month hedge periods, 20 are four month hedge periods and 16 are five month hedge periods. The number of one month, two month, three month, four month and five month hedges for the period from May 2003 to December 2012, are 8604, 5832, ,3196, 646 and 230 respectively. The numbers of hedge periods during the above mentioned periods are 111, 108, 103, 20 and 16. Hedging efficiency calculated on the basis of hedge periods are divided into 22 categories. The number of hedges falling into each category is presented in Table 4.15.

An analysis of the number of effective and ineffective hedges for the period from May 2003 to December 2012, on the basis of delivery periods (Table 4.15) reveals that, 5- month hedge period is the best hedge period with an average hedging efficiency of 90.4 per cent. The hedge periods 4- month, 1- month, 3-month and 2-month come 2nd, 3rd, 4th and 5th with average hedging efficiency of 81.1 per cent, 72.7 per cent, 70.5 per cent and 68.3 per cent respectively. Out of 18508 hedges 13230 (71.5 per cent) are effective hedges and 5278(28.5 per cent) are ineffective hedges.

**Table 4.15 Number of effective and ineffective hedges for the period from May 2003 to December 2012 on the basis of hedge periods**

| Duration of Hedge | Number of Effective Hedges | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | Total |
| 1-Month | 286 | 283 | 313 | 418 | 509 | 670 | 780 | 868 | 1000 | 1131 | 0 | **6258** | **72.7** | 189 | 209 | 163 | 125 | 115 | 103 | 73 | 85 | 75 | 65 | 1144 | **2346** | **27.3** | **8604** |
| 2-Month | 175 | 204 | 215 | 266 | 354 | 411 | 458 | 546 | 620 | 737 | 0 | **3986** | **68.3** | 160 | 105 | 138 | 101 | 101 | 92 | 69 | 65 | 60 | 35 | 920 | **1846** | **31.7** | **5832** |
| 3-Month | 76 | 126 | 138 | 149 | 217 | 263 | 288 | 279 | 336 | 382 | 0 | **2254** | **70.5** | 62 | 58 | 54 | 49 | 48 | 32 | 30 | 29 | 19 | 25 | 536 | **942** | **29.5** | **3196** |
| 4-Month | 28 | 24 | 36 | 36 | 53 | 81 | 90 | 70 | 52 | 54 | 0 | **524** | **81.1** | 10 | 10 | 6 | 7 | 4 | 3 | 3 | 4 | 1 | 2 | 72 | **122** | **18.9** | **646** |
| 5-Month | 2 | 5 | 13 | 10 | 23 | 36 | 45 | 28 | 29 | 17 | 0 | **208** | **90.4** | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 16 | **22** | **9.6** | **230** |
| **Total** | **567** | **642** | **715** | **879** | **1156** | **1461** | **1661** | **1791** | **2037** | **2321** | **0** | **13230** | **71.5** | **422** | **383** | **361** | **282** | **269** | **232** | **175** | **184** | **155** | **127** | **2688** | **5278** | **28.5** | **18508** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

### 4.2.4 Hedging Efficiency for the Period from May 2003 to December 2012 on the Basis of Years

The number of hedges in 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011and 2012 are 765, 2250, 1802, 1834, 1840, 843, 1516, 1791, 2531 and 3336 respectively. Hedge periods during the above mentioned years are 19, 40, 36, 36, 36, 17, 34, 36, 44 and 60. Hedging efficiency calculated on the basis of years is divided into 22 categories. The number of hedges falling into each category is presented in Table 4.16.

An analysis of the number of effective and ineffective hedges for the period from May 2003 to December 2012, on the basis of years (Table 4.16) reveals that, the year 2012 is the best year with an average hedging efficiency of 82.9 per cent. The year 2011 comes a close second with a hedging efficiency of 82.3 per cent. The years 2008, 2006, 2005 & 2007, 2010, 2003, 2009 and 2004 come 3rd, 4th, 5th, 6th, 7th 8th and 9th with average hedging efficiency of 78.1 per cent, 78.0 per cent, 70.0 per cent, 69.0 per cent, 63.8 per cent, 54.0 per cent and 53.4 per cent respectively. Out of 18508 hedges 13230 (71.5 per cent) are effective hedges and 5278(28.5 per cent) are ineffective hedges. The average hedging efficiency of the rubber futures market, NMCE Ahamedabad is found to be 71.5 per cent for the whole of the period from May 2003 to December 2012.

**Table 4.16 Number of effective and ineffective hedges for the period from May 2003 to December 2012 on the basis of years**

| Year | Number of Effective Hedges | | | | | | | | | | | | | Number of Ineffective Hedges | | | | | | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0≤E < 10 | 10≤E < 20 | 20≤E < 30 | 30≤E < 40 | 40≤E < 50 | 50≤E < 60 | 60≤E < 70 | 70≤E < 80 | 80≤E < 90 | 90≤E < 100 | E=100 | Total Effective Hedges | % of Effective Hedges | (-10≤E < 0) | (-20≤E < -10) | (-30≤E < -20) | (-40≤E < -30) | (-50≤E < -40) | (-60≤E < -50) | (-70≤E < -60) | (-80≤E < -70) | (-90≤E < -80) | (-100≤E < -90) | E < -100 | Total Ineffective Hedges | % of Ineffective Hedges | |
| 2003 | 21 | 20 | 29 | 26 | 35 | 46 | 59 | 72 | 87 | 93 | 0 | **488** | **63.8** | 17 | 15 | 15 | 18 | 14 | 13 | 11 | 6 | 13 | 4 | 151 | **277** | **36.2** | **765** |
| 2004 | 100 | 106 | 119 | 143 | 147 | 150 | 119 | 118 | 89 | 110 | 0 | **1201** | **53.4** | 100 | 70 | 77 | 43 | 44 | 33 | 21 | 43 | 27 | 29 | 562 | **1049** | **46.6** | **2250** |
| 2005 | 74 | 84 | 109 | 116 | 153 | 182 | 133 | 126 | 137 | 148 | 0 | **1262** | **70.0** | 38 | 42 | 39 | 25 | 25 | 25 | 20 | 14 | 11 | 7 | 294 | **540** | **30.0** | **1802** |
| 2006 | 34 | 55 | 60 | 80 | 99 | 117 | 186 | 253 | 279 | 268 | 0 | **1431** | **78.0** | 27 | 27 | 25 | 21 | 18 | 12 | 11 | 11 | 14 | 9 | 228 | **403** | **22.0** | **1834** |
| 2007 | 62 | 88 | 67 | 88 | 128 | 104 | 141 | 187 | 202 | 221 | 0 | **1288** | **70.0** | 40 | 41 | 31 | 31 | 26 | 22 | 15 | 15 | 10 | 18 | 303 | **552** | **30.0** | **1840** |
| 2008 | 20 | 22 | 39 | 42 | 61 | 79 | 81 | 90 | 105 | 119 | 0 | **658** | **78.1** | 16 | 14 | 9 | 7 | 12 | 7 | 10 | 5 | 3 | 5 | 97 | **185** | **21.9** | **843** |
| 2009 | 38 | 26 | 27 | 23 | 42 | 56 | 87 | 91 | 150 | 279 | 0 | **819** | **54.0** | 22 | 25 | 43 | 28 | 22 | 39 | 32 | 28 | 28 | 23 | 407 | **697** | **46.0** | **1516** |
| 2010 | 63 | 41 | 36 | 49 | 80 | 80 | 120 | 179 | 269 | 319 | 0 | **1236** | **69.0** | 45 | 45 | 44 | 35 | 43 | 31 | 22 | 22 | 25 | 8 | 235 | **555** | **31.0** | **1791** |
| 2011 | 75 | 97 | 112 | 113 | 178 | 255 | 307 | 290 | 309 | 346 | 0 | **2082** | **82.3** | 66 | 41 | 34 | 32 | 23 | 26 | 16 | 15 | 11 | 15 | 170 | **449** | **17.7** | **2531** |
| 2012 | 80 | 103 | 117 | 199 | 233 | 392 | 428 | 385 | 410 | 418 | 0 | **2765** | **82.9** | 51 | 63 | 44 | 42 | 42 | 24 | 17 | 25 | 13 | 9 | 241 | **571** | **17.1** | **3336** |
| **Total** | **567** | **642** | **715** | **879** | **1156** | **1461** | **1661** | **1791** | **2037** | **2321** | **0** | **13230** | **71.5** | **422** | **383** | **361** | **282** | **269** | **232** | **175** | **184** | **155** | **127** | **2688** | **5278** | **28.5** | **18508** |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

### 4.2.5 Consolidated Form of Year by Year and Month by Month Figures of Effective and Ineffective Hedges for the Period from May 2003 to December 2012

The number of effective and ineffective hedges for the period from May 2003 to December 2012, on the basis of year by year and month by month is presented in Table 4.17.

An analysis of the number of effective and ineffective hedges for the period from May 2003 to December 2012, on the basis of year by year and month by month (Table 4.17) reveals that January 2009 is the best delivery month with an average hedging efficiency of 100 per cent. The delivery months July 2006, February 2009, July 2008 & August 2012, June 2006, August 2011, September 2006, march 2012, January 2011 and May 2009 come 2nd, 3rd, 4th, 5th, 6th, 7th 8th, 9th and 10th with average hedging efficiency of 96.1 per cent, 95.6 per cent, 94.7 per cent, 94.7 per cent, 93.9 per cent, 93.5 per cent, 93.1 per cent, 92.7 per cent, 91.5 per cent and 91.0 per cent respectively. The delivery month September 2009 is the worst of the delivery months under this study with average hedging efficiency of 17.1 per cent.

**Table 4.17 Number of effective and ineffective hedges for the period from May 2003 to December 2012 on the basis of year by year and month by month**

| Month | 2003 | | | | | 2004 | | | | | 2005 | | | | | 2006 | | | | | 2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total |
| | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | |
| January | - | - | - | - | - | 48 | 31.4 | 105 | 68.6 | 153 | 102 | 71 | 41 | 28.7 | 143 | 68 | 46.9 | 77 | 53.1 | 145 | 95 | 62.9 | 56 | 37.1 | 151 |
| February | - | - | - | - | - | 97 | 63.8 | 55 | 36.2 | 152 | 112 | 77 | 33 | 22.8 | 145 | 90 | 60.4 | 59 | 39.6 | 149 | 94 | 60.6 | 61 | 39.4 | 155 |
| March | - | - | - | - | - | 78 | 52.0 | 72 | 48.0 | 150 | 96 | 63 | 56 | 36.8 | 152 | 130 | 86.1 | 21 | 13.9 | 151 | 125 | 79.6 | 32 | 20.4 | 157 |
| April | - | - | - | - | - | 104 | 42.3 | 142 | 57.7 | 246 | 124 | 84 | 23 | 15.6 | 147 | 119 | 77.8 | 34 | 22.2 | 153 | 112 | 74.7 | 38 | 25.3 | 150 |
| May | 19 | 73.1 | 7 | 26.9 | **26** | 112 | 44.8 | 138 | 55.2 | 250 | 127 | 86 | 21 | 14.2 | 148 | 118 | 78.7 | 32 | 21.3 | 150 | 135 | 88.8 | 17 | 11.2 | 152 |
| June | 28 | 70.0 | 12 | 30.0 | 40 | 149 | 39.7 | 226 | 60.3 | 375 | 134 | 89 | 16 | 10.7 | 150 | 139 | 93.9 | 9 | 6.1 | 148 | 119 | 79.3 | 31 | 20.7 | 150 |
| July | 91 | 85.0 | 16 | 15.0 | 107 | 100 | 66.2 | 51 | 33.8 | 151 | 100 | 65 | 53 | 34.6 | 153 | 149 | 96.1 | 6 | 3.9 | 155 | 140 | 89.7 | 16 | 10.3 | 156 |
| August | 106 | 84.1 | 20 | 15.9 | 126 | 119 | 79.3 | 31 | 20.7 | 150 | 89 | 58 | 64 | 41.8 | 153 | 129 | 83.2 | 26 | 16.8 | 155 | 134 | 87.0 | 20 | 13.0 | 154 |
| September | 56 | 70.9 | 23 | 29.1 | 79 | 138 | 86.8 | 21 | 13.2 | 159 | 101 | 64 | 56 | 35.7 | 157 | 148 | 93.1 | 11 | 6.9 | 159 | 108 | 69.2 | 48 | 30.8 | 156 |
| October | 47 | 60.3 | 31 | 39.7 | 78 | 118 | 74.2 | 41 | 25.8 | 159 | 93 | 60 | 61 | 39.6 | 154 | 141 | 91.0 | 14 | 9.0 | 155 | 92 | 59.7 | 62 | 40.3 | 154 |
| November | 97 | 63.8 | 55 | 36.2 | 152 | 60 | 39.0 | 94 | 61.0 | 154 | 90 | 60 | 59 | 39.6 | 149 | 102 | 65.4 | 54 | 34.6 | 156 | 69 | 44.8 | 85 | 55.2 | 154 |
| December | 44 | 28.0 | 113 | 72.0 | 157 | 78 | 51.7 | 73 | 48.3 | 151 | 94 | 62 | 57 | 37.7 | 151 | 98 | 62.0 | 60 | 38.0 | 158 | 65 | 43.0 | 86 | 57.0 | 151 |
| Total | 488 | 63.8 | 277 | 36.2 | 765 | 1201 | 53.4 | 1049 | 46.6 | 2250 | 1262 | 70 | 540 | 30.0 | 1802 | 1431 | 78.0 | 403 | 22.0 | 1834 | 1288 | 70.0 | 552 | 30.0 | 1840 |

| Month | 2008 | | | | | 2009 | | | | | 2010 | | | | | 2011 | | | | | 2012 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total | Effective Hedges | | Ineffective Hedges | | Total |
| | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | |
| January | 77 | 50.3 | 76 | 49.7 | 153 | 13 | 100 | 0 | 0 | **13** | 116 | 80.6 | 28 | 19.4 | 144 | 140 | 91.5 | 13 | 8.5 | 153 | 287 | 82 | 63 | 18 | 350 |
| February | 138 | 87.3 | 20 | 12.7 | 158 | 47 | 95.9 | 2 | 4.1 | 49 | 126 | 86.3 | 20 | 13.7 | 146 | 124 | 80.0 | 31 | 20.0 | 155 | 307 | 87.2 | 45 | 12.8 | 352 |
| March | 129 | 82.7 | 27 | 17.3 | 156 | 81 | 75.7 | 26 | 24.3 | 107 | 109 | 73.6 | 39 | 26.4 | 148 | 129 | 84.9 | 23 | 15.1 | 152 | 265 | 92.7 | 21 | 7.3 | 286 |
| April | 129 | 83.8 | 25 | 16.2 | 154 | 129 | 82.2 | 28 | 17.8 | 157 | 116 | 82.9 | 24 | 17.1 | 140 | 124 | 82.7 | 26 | 17.3 | 150 | 269 | 79.8 | 68 | 20.2 | 337 |
| May | 120 | 87.0 | 18 | 13.0 | 138 | 131 | 91.0 | 13 | 9.0 | 144 | 129 | 89.0 | 16 | 11.0 | 145 | 104 | 70.7 | 43 | 29.3 | 147 | 255 | 76.8 | 77 | 23.2 | 332 |
| June | 47 | 72.3 | 18 | 27.7 | 65 | 121 | 87.1 | 18 | 12.9 | 139 | 128 | 88.3 | 17 | 11.7 | 145 | 119 | 82.1 | 26 | 17.9 | 145 | 269 | 85.4 | 46 | 14.6 | 315 |
| July | 18 | 94.7 | 1 | 5.3 | **19** | 78 | 54.9 | 64 | 45.1 | 142 | 129 | 84.9 | 23 | 15.1 | 152 | 200 | 84.4 | 37 | 15.6 | 237 | 289 | 89.5 | 34 | 10.5 | 323 |
| August | - | - | - | - | - | 26 | 17.8 | 120 | 82.2 | 146 | 103 | 68.7 | 47 | 31.3 | 150 | 158 | 93.5 | 11 | 6.5 | 169 | 232 | 94.7 | 13 | 5.3 | 245 |
| September | - | - | - | - | - | 27 | 17.1 | 131 | 82.9 | 158 | 95 | 60.9 | 61 | 39.1 | 156 | 227 | 82.8 | 47 | 17.2 | 274 | 189 | 90.4 | 20 | 9.6 | 209 |
| October | - | - | - | - | - | 27 | 17.2 | 130 | 82.8 | 157 | 34 | 21.7 | 123 | 78.3 | 157 | 197 | 72.7 | 74 | 27.3 | 271 | 156 | 66.1 | 80 | 33.9 | 236 |
| November | - | - | - | - | - | 38 | 24.8 | 115 | 75.2 | 153 | 46 | 29.5 | 110 | 70.5 | 156 | 261 | 80.8 | 62 | 19.2 | 323 | 158 | 65.6 | 83 | 34.4 | 241 |
| December | - | - | - | - | - | 101 | 66.9 | 50 | 33.1 | 151 | 105 | 69.1 | 47 | 30.9 | 152 | 299 | 84.2 | 56 | 15.8 | 355 | 89 | 80.9 | 21 | 19.1 | 110 |
| Total | 658 | 78.1 | 185 | 21.9 | 843 | 819 | 54.0 | 697 | 46 | 1516 | 1236 | 69.0 | 555 | 31.0 | 1791 | 2082 | 82.3 | 449 | 17.7 | 2531 | 2765 | 82.9 | 571 | 17.1 | 3336 |

*Source: NMCE of India Limited, Ahmadabad – Analysis by the researcher;* Note: Blank cells show absence of futures tradings.

## 4.3 Objective No. 2

**To Analyse Elasticity of Expectation**

Elasticity of expectation is the change in futures price for a unit change in spot price. The stabilization or destabilization of spot prices by futures market can be analysed on the basis of elasticity of expectation. Accordingly, in this study the elasticity of expectation is calculated as follows:

$$n = \frac{\frac{(F_t - F_0)}{F_0}}{\frac{(R_t - R_0 - C_t)}{R_0}}$$

Where

n – Elasticity of expectation., $F_t$ - Futures price at time 't' (t > 0), $F_0$- Futures price at time '0', $R_t$- Spot price at time 't', $R_0$- Spot price at time '0', $C_t$ - Carrying cost for time period '0 - t'

Now the following cases arise:

1) 0<n<1: In this case there is clearly a stabilizing influence; the expected price change by proportionately less than spot price.

2) -1<n<0: In this case, a given change in spot price produces a change in expected price of similar magnitude, but opposite in direction.

3) n = -1: 1Absence of both stabilizing and destabilizing influence.

4) n=+1: Absence of both stabilizing and destabilizing influence.

5) n> 1: In this case the given change in spot price produces a change of greater proportionate magnitude. This is regarded as destabilizing case.

6) $n<-1$: In this case the given change in spot price produces a change of greater proportionate magnitude, in the opposite direction. This is regarded as destabilizing case.

Considering (1) to (5) together the following analytical yardsticks become apparent.

i. If $|n|<1$,futures trading has a stabilizing influence

ii. If $|n|>1$, futures trading has a destabilizing influence

iii. If $|n|=1$, futures trading has no influence on spot price.

$|n|$ signifies absolute n or the modulus of ‘n’ meaning value of n ignoring the sign.

For elasticity of expectation, the data analysis is done in four categories, hedge period by hedge period figures for each month, month by month figures for the period from May 2003 to December 2012, hedge period by hedge period figures for the period from May 2003 to December 2012 and year by year figures for the for the period from May 2003 to December 2012.

### 4.3.1 Elasticity of Expectation of Hedge Period by Hedge Period Figures for Each Month

Elasticity of expectation is calculated for 111 successive delivery months consisting of 357 different hedge periods from May 2003 to December 2012. Hedge periods in this study are one month, two months, three months, four months and five months. Elasticity of expectation is divided into stabilizing effects and destabilizing effects. Stabilizing effects are divided into two categories depending upon the values of ‘n’ viz. $-1<n<0$ and $0<n< 1$. Destabilizing effects are also divided into two categories viz. $n<-1$ and $n>1$.

The number of delivery months, hedge periods, number of hedges and length of the hedges of elasticity of expectation for each delivery month is exactly similar to hedging efficiency calculated for corresponding delivery month. The value of elasticity of expectation may fall into any one of the above mentioned 4 categories. Month wise analysis of the Elasticity of expectation is presented in Tables 4.18 to 4.29.

### 4.3.1.1 Elasticity of Expectation for January Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge period of elasticity of expectation for January delivery month is exactly similar to hedging efficiency calculated for January delivery month. Elasticity of expectation calculated generally for all January delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for January contract is presented in Table 4.18.

**Table 4.18 Number of stabilizing and destabilizing effects of January delivery contracts**

| JANUARY | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 48 | 258 | 306 | **46.6** | 41 | 310 | 351 | **53.4** | **657** |
| **2- Month** | 15 | 181 | 196 | **44.7** | 35 | 207 | 242 | **55.3** | **438** |
| **3- Month** | 8 | 94 | 102 | **41.8** | 17 | 125 | 142 | **58.2** | **244** |
| **4- Month** | 5 | 40 | 45 | **100.0** | 0 | 0 | 0 | **0** | **45** |
| **5- Month** | 0 | 21 | 21 | **100.0** | 0 | 0 | 0 | **0** | **21** |
| **Total** | 76 | 594 | 670 | **47.7** | 93 | 642 | 735 | **52.3** | **1405** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing effects of all January delivery month contracts (Table 4.18) reveals that 4-month and 5- month hedge periods are the best hedge period with stabilization effect of 100 per cent. The hedge periods 1- month, 2- month and 3-month come 2nd, 3rd and 4th with stabilization effect of 46.6 per cent, 44.7 per cent and 41.8 per cent respectively. Out of 1405 January delivery month hedges 670 (47.7 per cent) are stabilizing and 735(52.3 per cent) are destabilizing. January contracts as a whole shows a destabilization effect.

### 4.3.1.2 Elasticity of Expectation for February Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for February delivery month is exactly similar to hedging efficiency calculated for February delivery month. Elasticity of expectation calculated generally for all February delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for February contract is presented in Table 4.19.

**Table 4.19 Number of stabilizing and destabilizing effects of February delivery contracts**

| FEBRUARY | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 39 | 299 | 338 | **49.3** | 43 | 305 | 348 | **50.7** | **686** |
| **2- Month** | 8 | 201 | 209 | **45.5** | 27 | 223 | 250 | **54.5** | **459** |
| **3- Month** | 0 | 135 | 135 | **54.2** | 0 | 114 | 114 | **45.8** | **249** |
| **4- Month** | 5 | 40 | 45 | **100.0** | 0 | 0 | 0 | **0** | **45** |
| **5- Month** | 0 | 22 | 22 | **100.0** | 0 | 0 | 0 | **0** | **22** |
| **Total** | 52 | 697 | 749 | **51.3** | 70 | 642 | 712 | **48.7** | **1461** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing effects of all February delivery month contracts (Table 4.19) reveals that 4-month and 5- month hedge periods are the best hedge period with stabilization effect of 100 per cent. The hedge periods 3- month, 1- month and 2-month come 2nd, 3rd and 4th with stabilization effect of 54.2 per cent, 49.3 per cent and 45.5 per cent respectively. Out of 1461 February delivery month hedges 749(51.3 per cent) are stabilizing and 712(48.7 per cent) are destabilizing. February contracts as a whole show a stabilization effect.

### 4.3.1.3 Elasticity of Expectation for March Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for March delivery month is exactly similar to hedging efficiency calculated for March delivery month. Elasticity of expectation calculated generally for all March delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for March contract is presented in Table 4.20.

**Table 4.20 Number of stabilizing and destabilizing effects of March delivery contracts**

| MARCH | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 27 | 281 | 308 | **44.1** | 24 | 367 | 391 | **55.9** | **699** |
| **2- Month** | 22 | 205 | 227 | **48.2** | 31 | 213 | 244 | **51.8** | **471** |
| **3- Month** | 10 | 148 | 158 | **63.2** | 20 | 72 | 92 | **36.8** | **250** |
| **4- Month** | 0 | 30 | 30 | **96.8** | 0 | 1 | 1 | **3.23** | **31** |
| **5- Month** | 0 | 8 | 8 | **100.0** | 0 | 0 | 0 | **0** | **8** |
| **Total** | 59 | 672 | 731 | **50.1** | 75 | 653 | 728 | **49.9** | **1459** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing effects of all March delivery month contracts (Table 4.20) reveals that 5- month hedge period is the best hedge period with stabilization effect of 100 per cent. The hedge periods 4- month, 3- month, 2- month and 1-month comes 2nd, 3rd, 4th and 5th with stabilization effect of 96.8 per cent, 63.2 per cent, 48.2 per cent and 44.1 per cent respectively. Out of 1459 March delivery month hedges 731(50.1 per cent) are stabilizing and 728(49.9 per cent) are destabilizing. March contracts as a whole show a stabilization effect.

### 4.3.1.4 Elasticity of Expectation for April Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for April delivery month is exactly similar to hedging efficiency calculated for April delivery month. Elasticity of expectation calculated generally for all April delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for April contract is presented in Table 4.21.

**Table 4.21 Number of stabilizing and destabilizing effects of April delivery contracts**

| APRIL | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 41 | 331 | 372 | **50.8** | 36 | 324 | 360 | **49.2** | **732** |
| **2- Month** | 39 | 260 | 299 | **57.1** | 38 | 187 | 225 | **42.9** | **524** |
| **3- Month** | 12 | 158 | 170 | **57.6** | 31 | 94 | 125 | **42.4** | **295** |
| **4- Month** | 2 | 37 | 39 | **60.0** | 19 | 7 | 26 | **40** | **65** |
| **5- Month** | 0 | 16 | 16 | **88.9** | 0 | 2 | 2 | **11.1** | **18** |
| **Total** | 94 | 802 | 896 | **54.8** | 124 | 614 | 738 | **45.2** | **1634** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing effects of all April delivery month contracts (Table 4.21) reveals that 5- month hedge period is the best hedge period with stabilization effect of 88.9 per cent. The hedge periods 4- month, 3- month, 2- month and 1-month come 2nd, 3rd, 4th and 5th with stabilization effect of 60.0 per cent, 57.6 per cent, 57.1 per cent and 50.8 per cent respectively. Out of 1634 April delivery month hedges 802(54.8 per cent) are stabilizing and 738(45.2 per cent) are destabilizing. April contracts as a whole show a stabilization effect.

### 4.3.1.5 Elasticity of Expectation for May Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for May delivery month is exactly similar to hedging efficiency calculated for May delivery month. Elasticity of expectation calculated generally for all May delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for May contract is presented in Table 4.22.

**Table 4.22 Number of stabilizing and destabilizing effects of May delivery contracts**

| MAY | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 44 | 355 | 399 | **53.0** | 36 | 318 | 354 | **47** | **753** |
| **2- Month** | 38 | 265 | 303 | **60.2** | 46 | 154 | 200 | **39.8** | **503** |
| **3- Month** | 12 | 171 | 183 | **62.9** | 17 | 91 | 108 | **37.1** | **291** |
| **4- Month** | 6 | 23 | 29 | **42.6** | 21 | 18 | 39 | **57.4** | **68** |
| **5- Month** | 0 | 17 | 17 | **100.0** | 0 | 0 | 0 | **0** | **17** |
| **Total** | 100 | 831 | 931 | **57.0** | 120 | 581 | 701 | **43** | **1632** |

*Source: NMCE Ltd, Ahamedabad – Analysis by the Researcher*

An analysis of the number of stabilizing and destabilizing effects of all May delivery month contracts (Table 4.22) reveals that 5- month hedge period is the best hedge period with stabilization effect of 100 per cent. The hedge periods 3- month, 2- month, 1- month and 4-month come 2nd, 3rd, 4th and 5th with stabilization effect of 62.9 per cent, 60.2 per cent, 53.0 per cent and 42.6 per cent respectively. Out of 1632 May delivery month hedges 831(57.03 per cent) are stabilizing and 701(43.0 per cent) are destabilizing. May contracts as a whole show a stabilization effect.

#### 4.3.1.6 Elasticity of Expectation for June Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for June delivery month is exactly similar to hedging efficiency calculated for June delivery month. Elasticity of expectation calculated generally for all June delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for June contract is presented in Table 4.23.

**Table 4.23 Number of stabilizing and destabilizing effects of June delivery contracts**

| JUNE | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 53 | 368 | 421 | **55.9** | 26 | 306 | 332 | **44.1** | **753** |
| **2- Month** | 57 | 254 | 311 | **62.0** | 34 | 157 | 191 | **38** | **502** |
| **3- Month** | 42 | 129 | 171 | **60.4** | 18 | 94 | 112 | **39.6** | **283** |
| **4- Month** | 15 | 42 | 57 | **63.3** | 19 | 14 | 33 | **36.7** | **90** |
| **5- Month** | 10 | 18 | 28 | **63.6** | 12 | 4 | 16 | **36.4** | **44** |
| **Total** | 177 | 811 | 988 | **59.1** | 109 | 575 | 684 | **40.9** | **1672** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing effects of all June delivery month contracts (Table 4.23) reveals that 5- month hedge period is the best hedge period with stabilization effect of 63.6 per cent. The hedge periods 4- month, 2- month, 3- month and 1-month come 2nd, 3rd, 4th and 5th with stabilization effect of 63.3 per cent, 62.0 per cent, 60.4 per cent and 55.9 per cent respectively. Out of 1672 June delivery month hedges 988 (59.1 per cent) are stabilizing and 684(40.9 per cent) are destabilizing. June contracts as a whole show a stabilization effect.

### 4.3.1.7 Elasticity of Expectation for July Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for July delivery month is exactly similar to hedging efficiency calculated for July delivery month. Elasticity of expectation calculated generally for all July delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for July contract is presented in Table 4.24.

**Table 4.24 Number of stabilizing and destabilizing effects of July delivery contracts**

| JULY | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 54 | 347 | 401 | **53.5** | 34 | 315 | 349 | **46.5** | **750** |
| **2- Month** | 49 | 173 | 222 | **45.3** | 32 | 236 | 268 | **54.7** | **490** |
| **3- Month** | 8 | 130 | 138 | **50.5** | 12 | 123 | 135 | **49.5** | **273** |
| **4- Month** | 1 | 23 | 24 | **38.1** | 1 | 38 | 39 | **61.9** | **63** |
| **5- Month** | 0 | 8 | 8 | **42.1** | 0 | 11 | 11 | **57.9** | **19** |
| **TOTAL** | 112 | 681 | 793 | **49.7** | 79 | 723 | 802 | **50.3** | **1595** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

An analysis of the number of stabilizing and destabilizing effects of all July delivery month contracts (Table 4.24) reveals that 5- month hedge period is the best hedge period with stabilization effect of 53.5 per cent. The hedge periods 3- month, 2- month, 5- month and 4-month come 2nd, 3rd, 4th and 5th with stabilization effect of 50.5 per cent, 45.3 per cent, 42.1 per cent and 38.1 per cent respectively. Out of 1595 July hedges 793(49.7 per cent) are stabilizing and 802(50.3 per cent) are destabilizing. July delivery month contracts as a whole show a slight destabilizing effect.

### 4.3.1.8 Elasticity of Expectation for August Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for August delivery month is exactly similar to hedging efficiency calculated for August delivery month. Elasticity of expectation calculated generally for all August delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for August contract is presented in Table 4.25.

**Table 4.25 Number of stabilizing and destabilizing effects of August delivery contracts**

| AUGUST | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 58 | 332 | 390 | **55.4** | 52 | 262 | 314 | **44.6** | **704** |
| **2- Month** | 27 | 221 | 248 | **52.8** | 52 | 170 | 222 | **47.2** | **470** |
| **3- Month** | 15 | 124 | 139 | **57.9** | 25 | 76 | 101 | **42.1** | **240** |
| **4- Month** | 0 | 14 | 14 | **63.6** | 0 | 8 | 8 | **36.4** | **22** |
| **5- Month** | 0 | 11 | 11 | **91.7** | 0 | 1 | 1 | **8.33** | **12** |
| **Total** | 100 | 702 | 802 | **55.4** | 129 | 517 | 646 | **44.6** | **1448** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

An analysis of the number of stabilizing and destabilizing effects of all August delivery month contracts (Table 4.25) reveals that 5- month hedge period is the best hedge period with stabilization effect of 91.7 per cent. The hedge periods 4- month, 3- month, 1- month and 2-month come 2nd, 3rd, 4th and 5th with stabilization effect of 63.6 per cent, 57.9 per cent, 55.4 per cent and 52.8 per cent respectively. Out of 1448 August delivery month hedges 702(55.4 per cent) are stabilizing and 646(44.6 per cent) are destabilizing. August contracts as a whole show a stabilization effect.

### 4.3.1.9 Elasticity of Expectation for September Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for September delivery month is exactly similar to hedging efficiency calculated for September delivery month. Elasticity of expectation calculated generally for all September delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for September contract is presented in Table 4.26.

**Table 4.26 Number of stabilizing and destabilizing effects of September delivery contracts**

| SEPTEMBER | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 78 | 369 | 447 | **62.4** | 53 | 216 | 269 | **37.6** | **716** |
| **2- Month** | 53 | 272 | 325 | **66.6** | 45 | 118 | 163 | **33.4** | **488** |
| **3- Month** | 19 | 161 | 180 | **70.9** | 31 | 43 | 74 | **29.1** | **254** |
| **4- Month** | 0 | 44 | 44 | **97.8** | 0 | 1 | 1 | **2.22** | **45** |
| **5- Month** | 0 | 4 | 4 | **100.0** | 0 | 0 | 0 | **0** | **4** |
| **Total** | 150 | 850 | 1000 | **66.4** | 129 | 378 | 507 | **33.6** | **1507** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

An analysis of the number of stabilizing and destabilizing effects of all September delivery month contracts (Table 4.26) reveals that 5- month hedge period is the best hedge period with stabilization effect of 100 per cent. The hedge periods 4- month, 3- month, 2- month and 1-month come 2nd, 3rd, 4th and 5th with stabilization effect of 97.8 per cent, 70.9 per cent, 66.6 per cent and 62.4 per cent respectively. Out of 1507 September delivery month hedges 1000(66.43 per cent) are stabilizing and 507(33.6 per cent) are destabilizing. September contracts as a whole show a stabilization effect.

### 4.3.1.10 Elasticity of Expectation for October Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for October delivery month is exactly similar to hedging efficiency calculated for October delivery month delivery month. Elasticity of expectation calculated generally for all October contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for October contract is presented in Table 4.27.

**Table 4.27 Number of stabilizing and destabilizing effects of October delivery contracts**

| OCTOBER | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 103 | 297 | 400 | **56.0** | 47 | 267 | 314 | **44** | **714** |
| **2- Month** | 92 | 216 | 308 | **63.4** | 26 | 152 | 178 | **36.6** | **486** |
| **3- Month** | 40 | 110 | 150 | **58.4** | 41 | 66 | 107 | **41.6** | **257** |
| **4- Month** | 10 | 38 | 48 | **96.0** | 1 | 1 | 2 | **4** | **50** |
| **5- Month** | 0 | 13 | 13 | **92.9** | 0 | 1 | 1 | **7.14** | **14** |
| **Total** | 245 | 674 | 919 | **60.4** | 115 | 487 | 602 | **39.6** | **1521** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing effects of all October delivery month contracts (Table 4.27) reveals that 4- month hedge period is the best hedge period with stabilization effect of 96 per cent. The hedge periods 5- month, 2- month, 3- month and 1-month come 2nd, 3rd, 4th and 5th with stabilization effect of 92.9 per cent, 63.4 per cent, 58.4 per cent and 56.0 per cent respectively. Out of 1521 October delivery month hedges 919(60.4 per cent) are stabilizing and 602(39.9 per cent) are destabilizing. October contracts as a whole show a stabilization effect.

### 4.3.1.11 Elasticity of Expectation for November Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for November delivery month is exactly similar to hedging efficiency calculated for November delivery month. Elasticity of expectation calculated generally for all November delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for November contract is presented in Table 4.28.

**Table 4.28 Number of stabilizing and destabilizing effects of November delivery contracts**

| NOVEMBER | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 91 | 288 | 379 | **51.4** | 41 | 317 | 358 | **48.6** | **737** |
| **2- Month** | 72 | 140 | 212 | **40.7** | 63 | 246 | 309 | **59.3** | **521** |
| **3- Month** | 73 | 78 | 151 | **51.5** | 42 | 100 | 142 | **48.5** | **293** |
| **4- Month** | 4 | 60 | 64 | **100.0** | 0 | 0 | 0 | **0** | **64** |
| **5- Month** | 0 | 23 | 23 | **100.0** | 0 | 0 | 0 | **0** | **23** |
| **Total** | 240 | 589 | 829 | **50.6** | 146 | 663 | 809 | **49.4** | **1638** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing effects of all November delivery month contracts (Table 4.28) reveals that 4-month and 5-month hedge periods are the best hedge period with stabilization effect of 100 per cent. The hedge periods 3- month, 1- month and 2-month come 2nd, 3rd and 4th with stabilization effect of 51.5 per cent, 51.4 per cent and 40.7 per cent respectively. Out of 1638 November delivery month hedges 829(50.6 per cent) are stabilizing and 809(49.4 per cent) are destabilizing. November contracts as a whole show a stabilization effect.

### 4.3.1.12 Elasticity of Expectation for December Delivery Contracts

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for December delivery month is exactly similar to hedging efficiency calculated for December delivery month. Elasticity of expectation calculated generally for all December delivery month contracts is on the basis of hedge periods. It is further divided into 4 categories. The number of hedges falling into each category on the basis of hedge period for December contract is presented in Table 4.29.

**Table 4.29 Number of stabilizing and destabilizing effects of December delivery contracts**

| DECEMBER | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | per cent | n<-1 | n>1 | InI>1 | per cent | |
| **1- Month** | 68 | 286 | 354 | **50.4** | 50 | 299 | 349 | **49.6** | **703** |
| **2- Month** | 33 | 161 | 194 | **40.4** | 56 | 230 | 286 | **59.6** | **480** |
| **3- Month** | 23 | 104 | 127 | **47.6** | 20 | 120 | 140 | **52.4** | **267** |
| **4- Month** | 6 | 52 | 58 | **100.0** | 0 | 0 | 0 | **0** | **58** |
| **5- Month** | 0 | 28 | 28 | **100.0** | 0 | 0 | 0 | **0** | **28** |
| **Total** | 130 | 631 | 761 | **49.5** | 126 | 649 | 775 | **50.5** | **1536** |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

An analysis of the number of stabilizing and destabilizing effects of all December delivery month contracts (Table 4.29) reveals that 4-month and 5- month hedge periods are the best hedge period with stabilization effect of 100 per cent. The hedge periods 1- month, 3- month and 2-month come 2nd, 3rd and 4th with stabilization effect of 50.4 per cent, 47.6 per cent and 40.4 per cent respectively. Out of 1536 December delivery month hedges 761(49.5 per cent) are stabilizing and 775(50.5 per cent) are destabilizing. December contracts as a whole show a slight destabilization effect.

### 4.3.2 Elasticity of Expectation for the Period from May 2003 to December 2012 the Basis of Delivery Months

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for all delivery months is exactly similar to hedging efficiency calculated for all delivery months. Elasticity of expectation calculated for the period from May 2003 to December 2012 on the basis of delivery months is divided into 4 categories. The number of hedges falling into each category is presented in Table 4.30.

**Table 4.30 Number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012 on the basis delivery months**

| Month | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | % | n<-1 | n>1 | InI>1 | % | |
| JANUARY | 76 | 594 | 670 | 47.7 | 93 | 642 | 735 | 52.3 | 1405 |
| FEBRUARY | 52 | 697 | 749 | 51.3 | 70 | 642 | 712 | 48.7 | 1461 |
| MARCH | 59 | 672 | 731 | 50.1 | 75 | 653 | 728 | 49.9 | 1459 |
| APRIL | 94 | 802 | 896 | 54.8 | 124 | 614 | 738 | 45.2 | 1634 |
| MAY | 100 | 831 | 931 | 57.0 | 120 | 581 | 701 | 43.0 | 1632 |
| JUNE | 177 | 811 | 988 | 59.1 | 109 | 575 | 684 | 40.9 | 1672 |
| JULY | 112 | 681 | 793 | 49.7 | 79 | 723 | 802 | 50.3 | 1595 |
| AUGUST | 100 | 702 | 802 | 55.4 | 129 | 517 | 646 | 44.6 | 1448 |
| SEPTEMBER | 150 | 850 | 1000 | 66.4 | 129 | 378 | 507 | 33.6 | 1507 |
| OCTOBER | 245 | 674 | 919 | 60.4 | 115 | 487 | 602 | 39.6 | 1521 |
| NOVEMBER | 240 | 589 | 829 | 50.6 | 146 | 663 | 809 | 49.4 | 1638 |
| DECEMBER | 130 | 631 | 761 | 49.5 | 126 | 649 | 775 | 50.5 | 1536 |
| Total | 1535 | 8534 | 10069 | 54.4 | 1315 | 7124 | 8439 | 45.6 | 18508 |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

An analysis of the number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012, on the basis delivery months (Table 4.30) reveals that September is the best month during which the futures market exhibits a stabilizing influence of 66.4 per cent of the time. October, June, May, August, April, February, November, March, July, December and January come 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th and 12th with stabilizing influence of 60.4 per cent, 59.1 per cent, 57.0 per cent, 55.4 per cent, 54.8 per cent, 51.3 per cent, 50.6 per cent, 50.1 per cent, 49.7 per cent, 47.7 per cent and 49.5 per cent respectively. Out of 18508 hedges 10069 (54.4 per cent) are stabilizing hedges and 8439 (45.6 per cent) are destabilizing hedges. It shows that elasticity of expectation of rubber futures market as a whole for the period from May 2003 to December 2012 is stabilizing.

### 4.3.3 Elasticity of Expectation for the Period from May 2003 to December 2012 on the Basis of Hedge Periods

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for all hedge periods are exactly similar to hedging efficiency calculated for all hedge periods. Elasticity of expectation calculated for the period from May 2003 to December 2012, on the basis of hedge period is divided into 4 categories. The number of hedges falling into each category is presented in Table 4.31.

**Table 4.31 Number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012 on the basis of hedge periods**

| Duration of Hedge | Stabilizing effect | | | | Destabilizing effect | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | % | n<-1 | n>1 | InI>1 | % | |
| 1-Month | 704 | 3811 | 4515 | 52.5 | 483 | 3606 | 4089 | 47.5 | 8604 |
| 2-Month | 505 | 2549 | 3054 | 52.4 | 485 | 2293 | 2778 | 47.6 | 5832 |
| 3-Month | 262 | 1542 | 1804 | 56.4 | 274 | 1118 | 1392 | 43.6 | 3196 |
| 4-Month | 54 | 443 | 497 | 76.9 | 61 | 88 | 149 | 23.1 | 646 |
| 5-Month | 10 | 189 | 199 | 86.5 | 12 | 19 | 31 | 13.5 | 230 |
| **Total** | 1535 | 8534 | 10069 | 54.4 | 1315 | 7124 | 8439 | 45.6 | 18508 |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012, on the basis of hedge periods (Table 4.31) reveals that 5- month hedge period is the best hedge period with a stabilizing influence of 86.5 per cent. The hedge periods 4- month, 3- month, 1-month and 2-month come 2nd, 3rd, 4th and 5th with stabilizing influence of 76.9 per cent, 56.4 per cent, 52.5 per cent, and 52.4 per cent respectively. Out of 18508 hedges 10069 (54.4 per cent) are stabilizing hedges and 8439(45.6 per cent) are destabilizing hedges. It shows that elasticity of expectation of rubber futures market as a whole for the period from May 2003 to December 2012 is stabilizing.

### 4.3.4 Elasticity of Expectation for the Period from May 2003 to December 2012 on the Basis of Years

The number of delivery months, hedge periods, number of hedges and length of the hedge periods of elasticity of expectation for all years are exactly similar to hedging efficiency calculated for all years. Elasticity of expectation calculated for the period from May 2003 to December 2012, on the basis of years is divided into 4 categories. The number of hedges falling into each category is presented in Table 4.32.

**Table 4.32 Number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012 on the basis of years**

| Year | Stabilizing effect | | | | Destabilizing effect | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (-1<n<1) | (0≤n<1) | InI<1 | % | n<-1 | n>1 | InI>1 | % | Total |
| 2003 | 25 | 234 | 259 | 33.9 | 36 | 470 | 506 | 66.1 | 765 |
| 2004 | 380 | 815 | 1195 | 53.1 | 328 | 727 | 1055 | 46.9 | 2250 |
| 2005 | 162 | 888 | 1050 | 58.3 | 179 | 573 | 752 | 41.7 | 1802 |
| 2006 | 82 | 869 | 951 | 51.9 | 114 | 769 | 883 | 48.1 | 1834 |
| 2007 | 88 | 513 | 601 | 32.7 | 121 | 1118 | 1239 | 67.3 | 1840 |
| 2008 | 47 | 514 | 561 | 66.5 | 37 | 245 | 282 | 33.5 | 843 |
| 2009 | 125 | 442 | 567 | 37.4 | 142 | 807 | 949 | 62.6 | 1516 |
| 2010 | 213 | 681 | 894 | 49.9 | 148 | 749 | 897 | 50.1 | 1791 |
| 2011 | 191 | 1544 | 1735 | 68.5 | 88 | 708 | 796 | 31.5 | 2531 |
| 2012 | 222 | 2034 | 2256 | 67.6 | 122 | 958 | 1080 | 32.4 | 3336 |
| **Total** | 1535 | 8534 | 10069 | 54.4 | 1315 | 7124 | 8439 | 45.6 | 18508 |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher*

An analysis of the number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012, on the basis of years (Table 4.32) reveals that 2011 is the best year during which the futures market exhibits a stabilizing influence of 68.5 per cent of the time. The years 2012, 2008, 2005, 2004, 2006, 2010, 2009, 2003 and 2007 come 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th and 10th with stabilizing influence of 67.6 per cent, 66.5 per cent, 58.3 per cent, 53.1 per cent, 51.9 per cent, 49.9 per cent, 37.4 per cent, 33.9 per cent and 32.7 per cent respectively. It can be observed that out of 18508 hedges, on 10069 (54.4 per cent) occasions, the futures market exercised a stabilizing effect on the spot market, since the value of *n* was less than 1. On 8439 occasions (45.6 per cent of the total) futures trading exercised a destabilizing effect on the spot market, since the absolute value of *n* was greater than 1. It is clear that, by and large, the futures market exercised a stabilizing influence on the spot market. Out of 10 years studied, 6 years exhibit a stabilizing influence on the spot market.

### 4.3.5 Consolidated Form of Year by Year and Month by Month Figures of Stabilizing Effects and Destabilizing Effects for the Period from May 2003 to December 2012

The number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012, on the basis of year by year and month by month is presented in Table 4.33.

Table 4.33 Number of stabilizing effects and destabilizing effects for the period from May 2003 to December 2012 on the basis of year by year and month by month

| Month | 2003 | | | | | 2004 | | | | | 2005 | | | | | 2006 | | | | | 2007 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total |
| | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | |
| January | - | - | - | - | - | 21 | 13.7 | 132 | 86.3 | 153 | 82 | 57.3 | 61 | 42.7 | 143 | 19 | 13.1 | 126 | 86.9 | 145 | 62 | 41.1 | 89 | 58.9 | 151 |
| February | - | - | - | - | - | 18 | 11.8 | 134 | 88.2 | 152 | 67 | 46.2 | 78 | 53.8 | 145 | 23 | 15.4 | 126 | 84.6 | 149 | 50 | 32.3 | 105 | 67.7 | 155 |
| March | - | - | - | - | - | 35 | 23.3 | 115 | 76.7 | 150 | 61 | 40.1 | 91 | 59.9 | 152 | 45 | 29.8 | 106 | 70.2 | 151 | 46 | 29.3 | 111 | 70.7 | 157 |
| April | - | - | - | - | - | 77 | 31.3 | 169 | 68.7 | 246 | 116 | 78.9 | 31 | 21.1 | 147 | 79 | 51.6 | 74 | 48.4 | 153 | 20 | 13.3 | 130 | 86.7 | 150 |
| May | 10 | 38.5 | 16 | 61.5 | 26 | 126 | 50.4 | 124 | 49.6 | 250 | 117 | 79.1 | 31 | 20.9 | 148 | 103 | 68.7 | 47 | 31.3 | 150 | 24 | 15.8 | 128 | 84.2 | 152 |
| June | 20 | 50.0 | 20 | 50.0 | 40 | 226 | 60.3 | 149 | 39.7 | 375 | 136 | 90.7 | 14 | 9.3 | 150 | 108 | 73.0 | 40 | 27.0 | 148 | 27 | 18.0 | 123 | 82.0 | 150 |
| July | 49 | 45.8 | 58 | 54.2 | 107 | 74 | 49.0 | 77 | 51.0 | 151 | 104 | 68.0 | 49 | 32.0 | 153 | 74 | 47.7 | 81 | 52.3 | 155 | 61 | 39.1 | 95 | 60.9 | 156 |
| August | 80 | 63.5 | 46 | 36.5 | 126 | 104 | 69.3 | 46 | 30.7 | 150 | 75 | 49.0 | 78 | 51.0 | 153 | 62 | 40.0 | 93 | 60.0 | 155 | 93 | 60.4 | 61 | 39.6 | 154 |
| September | 36 | 45.6 | 43 | 54.4 | 79 | 145 | 91.2 | 14 | 8.8 | 159 | 114 | 72.6 | 43 | 27.4 | 157 | 113 | 71.1 | 46 | 28.9 | 159 | 97 | 62.2 | 59 | 37.8 | 156 |
| October | 16 | 20.5 | 62 | 79.5 | 78 | 147 | 92.5 | 12 | 7.5 | 159 | 88 | 57.1 | 66 | 42.9 | 154 | 127 | 81.9 | 28 | 18.1 | 155 | 64 | 41.6 | 90 | 58.4 | 154 |
| November | 30 | 19.7 | 122 | 80.3 | 152 | 127 | 82.5 | 27 | 17.5 | 154 | 55 | 36.9 | 94 | 63.1 | 149 | 92 | 59.0 | 64 | 41.0 | 156 | 31 | 20.1 | 123 | 79.9 | 154 |
| December | 18 | 11.5 | 139 | 88.5 | 157 | 95 | 62.9 | 56 | 37.1 | 151 | 35 | 23.2 | 116 | 76.8 | 151 | 106 | 67.1 | 52 | 32.9 | 158 | 26 | 17.2 | 125 | 82.8 | 151 |
| Total | 259 | 33.9 | 506 | 66.1 | 765 | 1195 | 53.1 | 1055 | 46.9 | 2250 | 1050 | 58.3 | 752 | 41.7 | 1802 | 951 | 51.9 | 883 | 48.1 | 1834 | 601 | 32.7 | 1239 | 67.3 | 1840 |

| Month | 2008 | | | | | 2009 | | | | | 2010 | | | | | 2011 | | | | | 2012 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilizat ion Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilizatio n Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total | Stabilization Inl < 1 | | Destabilization Inl > 1 | | Total |
| | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | | No | % | No | % | |
| January | 67 | 43.8 | 86 | 56.2 | 153 | 2 | 15.4 | 11 | 84.6 | 13 | 52 | 36.1 | 92 | 63.9 | 144 | 85 | 55.6 | 68 | 44.4 | 153 | 280 | 80.0 | 70 | 20.0 | 350 |
| February | 117 | 74.1 | 41 | 25.9 | 158 | 18 | 36.7 | 31 | 63.3 | 49 | 73 | 50.0 | 73 | 50.0 | 146 | 79 | 51.0 | 76 | 49.0 | 155 | 304 | 86.4 | 48 | 13.6 | 352 |
| March | 105 | 67.3 | 51 | 32.7 | 156 | 43 | 40.2 | 64 | 59.8 | 107 | 78 | 52.7 | 70 | 47.3 | 148 | 82 | 53.9 | 70 | 46.1 | 152 | 236 | 82.5 | 50 | 17.5 | 286 |
| April | 111 | 72.1 | 43 | 27.9 | 154 | 72 | 45.9 | 85 | 54.1 | 157 | 89 | 63.6 | 51 | 36.4 | 140 | 90 | 60.0 | 60 | 40.0 | 150 | 242 | 71.8 | 95 | 28.2 | 337 |
| May | 98 | 71.0 | 40 | 29.0 | 138 | 92 | 63.9 | 52 | 36.1 | 144 | 111 | 76.6 | 34 | 23.4 | 145 | 56 | 38.1 | 91 | 61.9 | 147 | 194 | 58.4 | 138 | 41.6 | 332 |
| June | 46 | 70.8 | 19 | 29.2 | 65 | 94 | 67.6 | 45 | 32.4 | 139 | 99 | 68.3 | 46 | 31.7 | 145 | 66 | 45.5 | 79 | 54.5 | 145 | 166 | 52.7 | 149 | 47.3 | 315 |
| July | 17 | 89.5 | 2 | 10.5 | 19 | 90 | 63.4 | 52 | 36.6 | 142 | 54 | 35.5 | 98 | 64.5 | 152 | 115 | 48.5 | 122 | 51.5 | 237 | 155 | 48.0 | 168 | 52.0 | 323 |
| August | - | - | - | - | - | 52 | 35.6 | 94 | 64.4 | 146 | 31 | 20.7 | 119 | 79.3 | 150 | 152 | 89.9 | 17 | 10.1 | 169 | 153 | 62.4 | 92 | 37.6 | 245 |
| September | - | - | - | - | - | 31 | 19.6 | 127 | 80.4 | 158 | 70 | 44.9 | 86 | 55.1 | 156 | 235 | 85.8 | 39 | 14.2 | 274 | 159 | 76.1 | 50 | 23.9 | 209 |
| October | - | - | - | - | - | 17 | 10.8 | 140 | 89.2 | 157 | 114 | 72.6 | 43 | 27.4 | 157 | 220 | 81.2 | 51 | 18.8 | 271 | 126 | 53.4 | 110 | 46.6 | 236 |
| November | - | - | - | - | - | 18 | 11.8 | 135 | 88.2 | 153 | 66 | 42.3 | 90 | 57.7 | 156 | 261 | 80.8 | 62 | 19.2 | 323 | 149 | 61.8 | 92 | 38.2 | 241 |
| December | - | - | - | - | - | 38 | 25.2 | 113 | 74.8 | 151 | 57 | 37.5 | 95 | 62.5 | 152 | 294 | 82.8 | 61 | 17.2 | 355 | 92 | 83.6 | 18 | 16.4 | 110 |
| Total | 561 | 66.5 | 282 | 33.5 | 843 | 567 | 37.4 | 949 | 62.6 | 1516 | 894 | 49.9 | 897 | 50.1 | 1791 | 1735 | 68.5 | 796 | 31.5 | 2531 | 2256 | 67.6 | 1080 | 32.4 | 3336 |

*Source: NMCE of India Limited, Ahmadabad - Analysis by the researcher; Note*: Blank cells show absence of futures trading.

An analysis of the number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012, on the basis of months and years (Table 4.33) reveals that October 2004 is the best delivery month with a stabilizing effect of 92.5 per cent. The delivery months Sep-04, Jun-05, Aug-11, Jul-08, Feb-12, Sep-11, Dec-12, Dec-11 and Mar-12 come 2nd, 3rd, 4th, 5th, 6th, 7th 8th, 9th and 10th with stabilizing effect of 91.2 per cent, 90.7 per cent, 89.9 per cent, 89.5 per cent, 86.4 per cent, 85.8 per cent, 83.6 per cent, 82.8 per cent and 82.5 per cent and respectively. The delivery month October 2009 is the worst of the delivery month under study with stabilization effect of only 10.8 per cent.

## 4.4 Objective No.3

**To Examine Index of Bias**

There are two types of hedgers, long hedgers and short hedgers. A long hedger sells in the spot market and buys simultaneously in the futures market at the start of the hedging period (time 0). A long hedger buys in the spot market and sells simultaneously in the in the futures market at the start of the hedging period (time 0). Spot market price increases are beneficial to short hedgers and harmful to long hedgers, and vice-versa. If both increases and decreases were compensated for by exactly 100 per cent, net hedging returns would be nil to both classes of hedgers, and there would be no bias .There would be no bias if the compensation for price rises and falls were equal. When the compensation for price increases is more than the compensation for decreases in prices, the market is biased against short (and in favour of long). When compensation for price rises is less than compensation for decline in prices, the market is biased in favour of short (and against long) hedging. These facts enabled the design of an 'Index of Bias' for this study.

$R_t$ - $R_o$ - $C_t$ > 0 is the positive or upward spot market price risk. It is compensated by futures market price $F_t$ - $F_{o.}$ Let *X* be the ratio of compensation for spot market price increases, by the futures market. Then

$$X = \frac{F_t - F_0}{R_t - R_0 - C_t} \qquad \text{where, } R_t - R_o - C_t > 0$$

$R_t$ - Ro - $C_t$ < 0 is the negative or downward spot market price risk. It is compensated by futures market price $F_t$ - $F_{o.}$ Let Y be the ratio of compensation for spot market price decreases, by the futures market. Then

$$Y = \frac{F_t - F_0}{R_t - R_0 - C_t} \qquad \text{where, } R_t - R_o - C_t < 0$$

It should be noted that price 'rises' and 'falls' in this context refer to the 'net' price changes after adjusting for carrying cost, and not the simple market price change.

Then 'Index of Bias'

*B=X – Y*

Now three cases arises,

i) *B* = 0, i.e X = Y

when B = 0, it indicates the absence of bias

ii) B > 0, i.e. X > Y

when *B* is positive, it indicates bias in favour of long hedgers

iii) B < 0, i.e. X < Y

when *B* is negative, it indicates bias in favour of short hedgers.

The greater the magnitude of *B*, the more biased the market is.

For index of bias, the data analysis is done in four categories, hedge period by hedge period figures for each month, month by month figures for the period from May 2003 to December 2012, hedge period by hedge period for the period from May 2003 to December 2012 and year by year figures for the period from May 2003 to December 2012.

### 4.4.1 Index of Bias of Hedge Period by Hedge Period Figures for Each Month

Index of bias is calculated for 111 successive delivery months consisting of 357 different hedge periods from May 2003 to December 2012. Hedge periods in this study are one month, two months, three months, four months and five months. The number of delivery months, hedge periods, number of hedges and length of the hedges of index of bias for each delivery month is exactly similar to hedging efficiency calculated for corresponding delivery month. Month wise analysis of the Index of bias is presented in Tables 4.34 to 4.37. In each table column number 1 represents the ratio of compensation for spot market increase by the futures market for $n_1$ number of upward spot market price risk for the hedge period. Column number 2 represents the ratio of compensation for spot market decrease by the futures market for $n_2$ number of downward spot market price risk for the hedge period. Column number 3 and 4 are number of upward spot market price risk and downward spot market price risk respectively. Average of the ratio of compensation for spot market increase by the futures market for $n_1$ number of upward spot market price risk for the hedge period is (X) obtained by dividing 'U' by $n_1$. Average of the ratio of compensation for spot market decrease by the futures market for $n_2$ number of upward spot market price risk for the hedge period is (Y) obtained by dividing 'D' by $n_2$. Index if bias (B) is the difference between average compensation for upward price risks (X) and average compensation for downward price risks (Y).

### 4.4.1.1 Index of Bias of January Delivery Contracts

January delivery hedges exhibit a bias in favour of long hedgers. One month, two month and three month January delivery hedges too are in favour of long hedgers. But four month and five month January hedges are slightly biased in favour of short hedgers.

### 4.4.1.2 Index of Bias of February Delivery Contracts

February delivery hedges exhibit a slight bias in favour of long hedgers. One month, two month and three month February delivery hedges are in favour of long hedgers. But four month and five month January hedges are slightly biased in favour of short hedgers.

### 4.4.1.3 Index of Bias of March Delivery Contracts

March delivery hedges exhibit bias in favour of short hedgers. One month, two month, three month, four month and five month hedges show bias in favour of short hedgers.

### 4.4.1.4 Index of Bias of April Delivery Contracts

April delivery hedges exhibit bias in favour of short hedgers. One month hedges show bias in favour of long hedgers. Two month, three month, four month and five month hedges are in favour of short hedgers.

### 4.4.1.5 Index of Bias of May Delivery Contracts

May month hedges as a whole and hedges of all time periods are biased in favour of short hedgers.

### 4.4.1.6 Index of Bias of June Delivery Contracts

June delivery hedges exhibit bias in favour of short hedgers. One month, two month, three month, four month and five month hedges are in favor of short hedgers.

#### 4.4.1.7 Index of Bias of July Delivery Contracts

July month hedges are biased in favour of long hedgers. Two month and three month hedges are biased in favour of long hedgers. One month, four month and five month hedges are in favour of short hedgers.

#### 4.4.1.8 Index of Bias of August Delivery Contracts

August month hedges are highly biased in favour of long hedgers. One month, two month and three month hedges are biased in favour of long hedgers. Four month and five month hedges are biased against long hedgers.

#### 4.4.1.9 Index of Bias of September Delivery Contracts

September month hedges are biased in favour of long hedgers. One month, two month and three month hedges are biased in favour of long hedgers. Four month and five month hedges are biased against long hedgers.

#### 4.4.1.10 Index of Bias of October Delivery Contracts

October month hedges are biased in favour of long hedgers. One month, two month and three month hedges are biased against short hedgers. Four month and five month hedges are biased against long hedgers.

#### 4.4.1.11 Index of Bias of November Delivery Contracts

November month hedges are biased in favour of long hedgers. One month, two month and three month hedges are biased in favour of long hedgers. Four month and five month hedges are biased against long hedgers.

#### 4.4.1.12 Index of Bias of December Delivery Contracts

December month hedges are biased in favour of long hedgers. One month, two month and three month hedges are biased in favour of long hedgers. Four month and five month hedges are biased against long hedgers.

### Table 4.34 Index of bias for January, February and March

| Hedge Period | JANUARY | | | | | FEBRUARY | | | | | MARCH | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B |
| 1-Month | 752.35 | -108.90 | 400 | 257 | 2.30 | 445.74 | 218.78 | 309 | 377 | 0.86 | 491.55 | 600.59 | 369 | 330 | -0.49 |
| 2-Month | 1418.08 | -28.39 | 214 | 224 | 6.75 | 106.56 | 23.64 | 219 | 240 | 0.39 | 63.77 | 590.55 | 231 | 240 | -2.18 |
| 3-Month | 2012.39 | -810.60 | 144 | 100 | 22.08 | 167.71 | 140.76 | 103 | 146 | 0.66 | -79.25 | 301.56 | 154 | 96 | -3.66 |
| 4-Month | 0.00 | 16.87 | 0 | 45 | -0.37 | 0.00 | 21.11 | 0 | 45 | -0.47 | 0.00 | 20.43 | 0 | 31 | -0.66 |
| 5-Month | 0.00 | 9.54 | 0 | 21 | -0.45 | 0.00 | 11.97 | 0 | 22 | -0.54 | 0.00 | 5.85 | 0 | 8 | -0.73 |
| Whole period | 4182.82 | -921.47 | 758 | 647 | 6.94 | 720.01 | 416.26 | 631 | 830 | 0.64 | 476.07 | 1518.99 | 754 | 705 | -1.52 |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

### Table 4.35 Index of bias for April, May and June

| Hedge Period | APRIL | | | | | MAY | | | | | JUNE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B |
| 1-Month | 631.31 | 398.45 | 378 | 354 | 0.54 | 386.99 | 539.75 | 422 | 331 | -0.71 | 274.58 | 625.91 | 423 | 330 | -1.25 |
| 2-Month | -14.36 | 377.72 | 279 | 245 | -1.59 | -649.60 | 318.00 | 334 | 169 | -3.83 | -786.78 | 278.71 | 331 | 171 | -4.01 |
| 3-Month | -206.78 | 973.20 | 175 | 120 | -9.29 | -28.50 | 1551.93 | 169 | 122 | -12.89 | 3.94 | 338.38 | 169 | 114 | -2.94 |
| 4-Month | -540.15 | 107.46 | 19 | 46 | -30.76 | -2421.20 | 40.99 | 26 | 42 | -94.10 | -1930.30 | 36.32 | 51 | 39 | -38.78 |
| 5-Month | 0.00 | 11.68 | 0 | 18 | -0.65 | 0.00 | 13.29 | 0 | 17 | -0.78 | -52.96 | 16.02 | 25 | 19 | -2.96 |
| Whole period | -129.97 | 1868.51 | 851 | 783 | -2.54 | -2712.31 | 2463.96 | 951 | 681 | -6.47 | -2491.52 | 1295.34 | 999 | 673 | -4.42 |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

## Table 4.36 Index of bias for July, August and September

| Hedge Period | JULY | | | | | AUGUST | | | | | SEPTEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B |
| 1-Month | 272.01 | 337.77 | 348 | 402 | -0.06 | 551.70 | 38.04 | 266 | 438 | 1.99 | 504.60 | -227.90 | 230 | 486 | 2.66 |
| 2-Month | 1064.15 | 193.97 | 237 | 253 | 3.72 | 5078.99 | -57.33 | 150 | 320 | 34.04 | 509.11 | -1435.99 | 136 | 352 | 7.82 |
| 3-Month | 100.34 | -3710.62 | 129 | 144 | 26.55 | 146.93 | -40.67 | 84 | 156 | 2.01 | 195.42 | -133.93 | 33 | 221 | 6.53 |
| 4-Month | -29.81 | 77.86 | 3 | 60 | -11.24 | 0.00 | 21.53 | 0 | 22 | -0.98 | 0.00 | 26.58 | 0 | 45 | -0.59 |
| 5-Month | 0.00 | 20.16 | 0 | 19 | -1.06 | 0.00 | 10.97 | 0 | 12 | -0.91 | 0.00 | 2.89 | 0 | 4 | -0.72 |
| Whole period | 1406.7 | -3080.86 | 717 | 878 | 5.47 | 5777.62 | -27.46 | 500 | 948 | 11.58 | 1209.13 | -1768.35 | 399 | 1108 | 4.63 |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

## Table 4.37 Index of bias for October, November and December

| Hedge Period | OCTOBER | | | | | NOVEMBER | | | | | DECEMBER | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B | U | D | $n_1$ | $n_2$ | B |
| 1-Month | 636.88 | -387.99 | 271 | 443 | 3.23 | 814.72 | -421.34 | 354 | 383 | 3.40 | 858.70 | -328.73 | 332 | 371 | 3.47 |
| 2-Month | 952.09 | -631.06 | 159 | 327 | 7.92 | 849.73 | -856.46 | 251 | 270 | 6.56 | 883.07 | -111.28 | 260 | 220 | 3.90 |
| 3-Month | 559.82 | -205.14 | 64 | 193 | 9.81 | 575.82 | -390.37 | 100 | 193 | 7.78 | 719.74 | -213.15 | 128 | 139 | 7.16 |
| 4-Month | 0.00 | 13.19 | 0 | 50 | -0.26 | 0.00 | 24.90 | 0 | 64 | -0.39 | 0.00 | 23.18 | 0 | 58 | -0.40 |
| 5-Month | 0.00 | 6.31 | 0 | 14 | -0.45 | 0.00 | 11.73 | 0 | 23 | -0.51 | 0.00 | 15.61 | 0 | 28 | -0.56 |
| Whole period | 2148.79 | -1204.69 | 494 | 1027 | 5.52 | 2240.27 | -1631.53 | 705 | 933 | 4.93 | 2461.52 | -614.37 | 720 | 816 | 4.17 |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

### 4.4.2 Index of Bias for the Period from May 2003 to December 2012 on the Basis of Delivery Months

The number of delivery months, hedge periods, number of hedges and length of the hedges of Index of bias for all delivery months is exactly similar to hedging efficiency calculated on the basis of delivery months. Index of bias calculated for the period from May 2003 to December 2012, on the basis of delivery months is presented in Table 4.38.

**Table 4.38 Index of bias for the period from May 2003 to December 2012 on the basis of delivery months**

| | U | D | $n_1$ | $n_2$ | X | Y | B= X-Y |
|---|---|---|---|---|---|---|---|
| January | 4182.82 | -921.47 | 758 | 647 | 5.518 | -1.424 | 6.94 |
| February | 720.01 | 416.26 | 631 | 830 | 1.141 | 0.502 | 0.64 |
| March | 476.07 | 1518.99 | 754 | 705 | 0.631 | 2.155 | -1.52 |
| April | -129.97 | 1868.51 | 851 | 783 | -0.153 | 2.386 | -2.54 |
| May | -2712.31 | 2463.96 | 951 | 681 | -2.852 | 3.618 | -6.47 |
| June | -2491.52 | 1295.34 | 999 | 673 | -2.494 | 1.925 | -4.42 |
| July | 1406.70 | -3080.86 | 717 | 878 | 1.962 | -3.509 | 5.47 |
| August | 5777.62 | -27.46 | 500 | 948 | 11.56 | -0.029 | 11.58 |
| September | 1209.13 | -1768.35 | 399 | 1108 | 3.03 | -1.596 | 4.63 |
| October | 2148.79 | -1204.69 | 494 | 1027 | 4.35 | -1.173 | 5.52 |
| November | 2240.27 | -1631.53 | 705 | 933 | 3.178 | -1.749 | 4.93 |
| December | 2461.52 | -614.37 | 720 | 816 | 3.419 | -0.753 | 4.17 |
| May 2003 to Dec. 2012 | 15289.12 | -1685.67 | 8479 | 10029 | 1.803 | -0.168 | 1.97 |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

Analysis of the Index of bias for the period from May 2003 to December 2012, on the basis of delivery months (Table 4.38) reveals that, generally January, February, July, August, September, October, November and December months are biased in favour of long hedgers (against short hedgers) and March, April, May and June months are biased in favour of short hedgers (against long hedgers).

### 4.4.3 Index of Bias for the Period from May 2003 to December 2012 on the Basis of Hedge Periods

The number of delivery months, hedge periods, number of hedges and the length of the hedges of Index of bias for all hedge periods are exactly similar to hedging efficiency calculated on the basis of hedge periods. Index of bias calculated for the period from May 2003 to December 2012, on the basis of hedge period is presented in Table 4.39.

**Table 4.39 Index of bias for the period from May 2003 to December 2012 on the basis of hedge periods**

| | U | D | $n_1$ | $n_2$ | X | Y | B=X-Y |
|---|---|---|---|---|---|---|---|
| 1-Month | 6621.13 | 1284.44 | 4102 | 4502 | 1.6141 | 0.2853 | 1.32882 |
| 2-Month | 9474.82 | -1337.9 | 2801 | 3031 | 3.3826 | -0.4414 | 3.82407 |
| 3-Month | 4167.57 | -2198.7 | 1452 | 1744 | 2.8702 | -1.2607 | 4.13093 |
| 4-Month | -4921.46 | 430.43 | 99 | 547 | -49.712 | 0.7869 | -50.499 |
| 5-Month | -52.9579 | 136.02 | 25 | 205 | -2.1183 | 0.6635 | -2.7818 |
| May 2003 to Dec. 2012 | 15289.12 | -1685.67 | 8479 | 10029 | 1.8031 | -0.1681 | 1.97 |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

Analysis of the Index of bias examined on the basis of hedge periods (Table 4.39) reveals that, one month, two months and three months hedge period index of bias are biased in favour of long hedgers. Four months and five months hedge period Index of bias are biased in favour short hedgers.

### 4.4.4 Index of Bias for the Period from May 2003 to December 2012 on the Basis of Years

The number of delivery months, hedge periods, number of hedges and length of the hedges of Index of bias, on the basis of years are exactly similar to hedging efficiency calculated for all years. Index of bias calculated for the period from May 2003 to December 2012, on the basis of years is presented in Table 4.40.

**Table 4.40 Index of bias for the period from May 2003 to December 2012 on the basis of years**

| Year | U | D | $n_1$ | $n_2$ | X | Y | B=X-Y |
|---|---|---|---|---|---|---|---|
| 2003 | 1080.07 | -93.539 | 439 | 326 | 2.460 | -0.286 | 2.74 |
| 2004 | -6129.2 | 2179.52 | 1088 | 1162 | -5.633 | 1.875 | -7.50 |
| 2005 | 6245.8 | 53.299 | 998 | 804 | 6.258 | 0.066 | 6.19 |
| 2006 | 1877.87 | -439.38 | 1071 | 763 | 1.753 | -0.575 | 2.32 |
| 2007 | 2956.67 | 479.164 | 861 | 979 | 3.434 | 0.489 | 2.94 |
| 2008 | 2264.49 | -634.06 | 513 | 330 | 4.414 | -1.921 | 6.33 |
| 2009 | 4089.8 | -5971.9 | 1043 | 473 | 3.921 | -12.626 | 16.54 |
| 2010 | 1282.32 | -1169.9 | 1244 | 547 | 1.030 | -2.138 | 3.16 |
| 2011 | 970.121 | 841.112 | 765 | 1766 | 1.268 | 0.476 | 0.79 |
| 2012 | 651.184 | 3070.04 | 457 | 2879 | 1.424 | 1.066 | 0.35 |
| May 2003 to Dec. 2012 | 15289.12 | -1685.67 | 8479 | 10029 | 1.80 | -0.16 | 1.97 |

*Source: NMCE Ltd, Ahamedabad- Analysis by the researcher.*

Analysis of the Index of bias for the period from May 2003 to December 2012, on the basis of years (Table 4.40) reveals that, all years except the year 2004 exhibit bias in favor of long hedgers. The market as a whole exhibit bias (+1.97) in favour of long hedgers.

## 4.5 Objective No. 4

### To Analyse the Volatility of Spot Price of Rubber

Volatility is the price variability from the trend. Hodgson et al., (1991), Herbst et al. (1992) and Thenmozhi M, (2002) used standard deviation for measuring volatility. GARCH model has also been a preferred measure of volatility by many researchers. Kalok Chan et al. (1991), Antoniou and Holmes, (1995), Gregory et al. (1996), Butterworth, University of Durham) tried to accommodate for heteroskedasticity in the observed returns. The problem of heteroskedasticity does not exist as the data spans for a short period of one year and GARCH is not relevant for measuring volatility for a short time-span. Hence, in this study, spot price volatility has been measured by computing the standard deviation of the daily returns.

The data for studying spot price volatility has been collected from the NMCE (National Multi Commodity Exchange) website and Rubber Board, Kottayam. There are 2955 closing spot rubber price data for the period from 15/3/2003 to 31/03/2013. Futures trading in rubber was suspended from 8/5/2008 to 3/12/2008. (That is there is gap between 8/5/2008 and 3/12/2008 in the data set).The period before 8/5/2008 is pre-suspension period. The period after 3/12/2008 is post suspension period. For studying the spot price volatility of the suspension period, data is taken from Rubber Board, Kottayam. For calculating the volatility of the pre suspension and post suspension period, data is taken from NMCE. Pre suspension period (15/03/2003 to 07/05/2008) consists of 1493 observations. It is further divided into 6 time periods. The pre suspension time periods are 15/03/2003 to 31/03/2004, 1/4/2004 to 31/03/2005, 1/4/2005 to 31/03/2006, 1/4/2006 to 31/03/2007, 2/4/2007 to 31/03/2008 and1/4/2008 to 7/5/2008 consists of 275, 294, 299, 299,297 and 29 observations respectively. Suspension period is from 8/5/2008 to 3/12/2008, consists of 165 observations. Post suspension period (04/12/2008 to 31/03/2013) consists of 1309 observations. It is further divided into 5 time periods. The post suspension time periods are 4/12/2008 to 31/03/2009, 1/4/2009 to 31/03/2010, 1/4/2010 to 31/03/2011, 1/4/2011 to 31/03/2012 and 1/4/2012 to 31/03/2013 consists of 95, 295, 300, 325 and 294observations respectively. Thus there are 12 time periods and volatility is calculated for each period separately.

Volatility is calculated by the formula:

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(u_i - \bar{u})^2}{(n-1)}}$$

Where

$u_i = \ln(\frac{S_t}{S_{t-1}})$ , for t = 1, 2 ……………, n. (It is the Log returns)

n+1: Number of observations.

$S_t$ : Spot price at the end of $t^{th}$ interval, with t=0,1,2……………,n

$S_{t-1}$: Previous day's spot price.

Daily volatility calculated from 15/03/2003 to 31/03/2013 on the basis of 12 time periods are presented in Table 4.41. Analysis of the volatility calculated for different time periods (Table 4.41) reveals that daily volatility for (1).15/03/2003 to 31/03/2004, (2).1/4/2004 to 31/03/2005, (3).1/4/2005 to 31/03/2006, (4).1/4/2006 to 31/03/2007, (5).2/4/2007 to 31/03/2008, (6).1/4/2008 to 7/5/2008, (7).4/12/2008 to 31/03/2009, (8).1/4/2009 to 31/03/2010, (9).1/4/2010 to 31/03/2011, (10).1/4/2011 to 31/03/2012, (11).1/4/2012 to 31/03/2013 and (12).8/5/2008 to 3/12/2008 are 1.49 per cent, 1.02 per cent, 1 per cent, 1.31 per cent, 1.26 per cent, and 0.88 per cent, 1.49 per cent, 1.08 per cent, 1.25 per cent, 0.98 per cent, 0.71 per cent and 1.93 per cent respectively. It can be observed that spot price volatility has increased and decreased at different time periods. Spot price volatility has maximum value in the absence of futures trading. The result shows that rubber futures trading has reduced spot price volatility.

## Table 4.41 Daily volatility of the spot rubber for different periods

| Statistic | Period of Study | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre Suspension period | | | | | | Post Suspension period | | | | | Suspension period |
| | 15/03/2003 to 31/03/2004 | 1/4/2004 to 31/03/2005 | 1/4/2005 to 31/03/2006 | 1/4/2006 to 31/03/2007 | 2/4/2007 to 31/03/2008 | 1/4/2008 to 7/5/2008 | 4/12/2008 to 31/03/2009 | 1/4/2009 to 31/03/2010 | 1/4/2010 to 31/03/2011 | 1/4/2011 to 31/03/2012 | 2/4/2012 to 31/03/2013 | 8/5/2008 to 3/12/2008 |
| N (Count) | 274 | 293 | 298 | 298 | 296 | 28 | 94 | 294 | 299 | 324 | 293 | 164 |
| Near month Futures Trading volume/day | 86 | 1029 | 1310 | 1097 | 1187 | 1181 | 457 | 1196 | 2692 | 1962 | 1495 | No futures trading |
| Range | .158 | .090 | .065 | .103 | .150 | .034 | .102 | .086 | .126 | .104 | .070 | .128 |
| Minimum | -.074 | -.033 | -.030 | -.043 | -.080 | -.014 | -.066 | -.046 | -.066 | -.076 | -.026 | -.088 |
| Maximum | .084 | .057 | .035 | .059 | .070 | .020 | .036 | .040 | .060 | .027 | .043 | .040 |
| Sum | .212 | .009 | .386 | .113 | .093 | .149 | .302 | .625 | .385 | -.147 | -.182 | -.579 |
| Mean | .00077 | .00003 | .00129 | .00038 | .00031 | .00534 | .00321 | .00213 | .00129 | -.00045 | -.0006 | -.00353 |
| Mean Std.Error | .0009 | .0006 | .0006 | .0008 | .0007 | .0017 | .0015 | .0006 | .0007 | .0005 | .0004 | .0015 |
| Std. Deviation | .01494 | .01024 | .01001 | .01313 | .01264 | .00882 | .01489 | .01083 | .01248 | .00984 | .00712 | .01933 |
| **Daily Volatility in per cent** | **1.49** | **1.02** | **1.00** | **1.31** | **1.26** | **.88** | **1.49** | **1.08** | **1.25** | **.98** | **.71** | **1.93** |
| C.V | 1930.1 | 34057.5 | 773.1 | 3452.5 | 4039.4 | 165.2 | 464.2 | 509.7 | 970.2 | -2175 | -1149 | -547.4 |
| Variance | .00022 | .00010 | .00010 | .00017 | .00016 | .00008 | .00022 | .00012 | .00016 | .00010 | .00005 | .00037 |
| Skewness | .14 | .32 | -.19 | .46 | -.68 | -.23 | -1.01 | .00 | -.17 | -1.77 | .93 | -1.57 |
| Skewness Std.Error | .15 | .14 | .14 | .14 | .14 | .44 | .25 | .14 | .14 | .14 | .14 | .19 |
| Kurtosis | 5.94 | 4.26 | .79 | 2.64 | 10.69 | -.58 | 4.26 | 3.51 | 6.53 | 13.19 | 7.73 | 4.41 |
| kurtosis Std. Error | .29 | .28 | .28 | .28 | .28 | .86 | .49 | .28 | .28 | .27 | .28 | .38 |

*Source: National Multi Commodity Exchange of India Limited, Ahmadabad - Analysis by the researcher.*

## 4.6 Objective No. 5

### To Observe whether Futures Trading in Rubber Helps in Price Discovery or Not

The process of gathering and interpreting information on supply and demand, formulating an asking (or bid) price, the give and take during negotiations, and the dynamic adjustments to new information as it becomes available across time is called price discovery. It is, as implied, an ongoing and continuous process.

The futures market provide centralized and highly visible trade within which information can be received, interpreted, and incorporated into a discovered price. By definition, the futures market is an anticipatory or forward – pricing market. It is attempting to "discover" what the price of a commodity will be at some time in the future. The price of a commodity futures contract on a particular day can be meaningfully interpreted as the consensus of those trading on those days as to what the price will be at the future point of time. The consensus is based on the available information and the consensus will change over time as expectations of supply and demand levels for the future time period change. That is cash price is tied directly to the futures price.

Surveys indicate that producers increasingly watch futures prices and use distant futures prices as a source of price expectation. This expectation is an expectation for price in the harvest period. If the projected supplies of the commodity in a later period are small, traders of futures contracts for the later period discover a higher price. If the projected supplies for the distant period appear to be getting too large, the futures contracts for the distant period reflect that in the form of lower prices. Over time, the futures market thus has the capacity to stabilize the commodity supplies and stabilize commodity price. It is clear that the price expectations being reflected by distant futures can and do influence the final supply of product for the later time period. Those distant price expectations have the potential to change producers' decisions. Futures prices must then adjust to the realization that supplies are being changed. This is very logical and legitimate part of the price discovery process.

Futures market is not always accurate predictors of later cash prices, but they are one source of price expectations that are highly visible and available to everyone. This is because the information base has changed over a period of time and the discovered price must change accordingly. Decision makers must be aware of the possibility of a supply response to changed price expectations and seek protection against the risk of falling prices. It is especially important that the individual decision maker keeps in mind that many other producers must be considering the same changes or adjustments and try to anticipate the price implications of those adjustments. Market participants should be aware of a micro-macro trap here. Individual (micro) decisions will not change prices, but add them all together (macro) and a major price change might be coming. Market participants should also build an understanding of how important it is for them to protect themselves against the price changes in the micro- macro trap.

It is primarily in the futures market that the price is being discovered (the opposite can also happen, that is in the spot market also price can be discovered.), and it is the futures market that is recording and interpreting changes in the available body of information that will influence prices for later time periods. Against this backdrop, using Granger causality test an examination is conducted to know whether spot price ‘causes’ (feedback) futures price or the futures price ‘causes’ (feedback) spot price. As a result of the price change in futures market (lead), spot price will also change (lag). Hence, the two price series tend to move together in parallel fashion. In other words markets said to be co-integrated if they move together over long time periods. This long run relationship or co-integration is examined by Johansen Co-integration test. For examining stationarity or unit root of the spot and futures prices Augmented Dickey Fuller test (ADF) is used. Granger Causality test is used for examining causality. Johansen Co-integration test is used for long run association- ship. For examine causality and co-integration closing futures and spot prices were taken from NMCE website from 15/3/2003 to 31/03/2013. There are 2802 closing futures and spot rubber price data sets during this period.

### 4.6.1 Augmented Dickey Fuller Test (ADF)

Unit root is checked for both spot and futures price series separately. A stochastic process (random variable) is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. A non-stationary time series will have a time varying mean or time varying variance or both. Unit root is tested by Augmented Dickey Fuller test (ADF) / tau statistic. If $u_t$ are correlated Dickey and Fuller have developed a test, known as the ADF. It captures the structural breaks also.

Given an observed time series (spot price of rubber) $S_1$, $S_2$…………$S_n$. Dickey and Fuller consider three differential-form autoregressive equations to detect the presence of a unit root.ADF unit root test are based on the following three regression forms:

Without Constant and Trend

$$\mathbf{\Delta S_t = \gamma S_{t-1} + \sum_{i=1}^{k} (\delta_i \, \Delta S_{t-i}) + u_t}$$

With Constant

$$\mathbf{\Delta S_t = \alpha + \gamma S_{t-1} + \sum_{i=1}^{k} (\delta_i \, \Delta S_{t-i}) + u_t}$$

With Constant and Trend

$$\mathbf{\Delta S_t = \alpha + \beta t \quad + \gamma S_{t-1} + \sum_{i=1}^{k} (\delta_i \, \Delta S_{t-i}) + u_t}$$

where

- $\Delta S_{t-1} = (S_{t-1} - S_{t-2})$
- *t* is the time index,
- $\alpha$ is an intercept constant called a drift,
- $\beta$ is the coefficient on a time trend,
- $\gamma$ is the coefficient presenting process root, i.e. the focus of testing,
- *k* is the lag order of the first-differences autoregressive process,
- $u_t$ is an independent identically distributes residual term (pure white noise error term-a series which has zero mean, constant variance and is serially uncorrelated i.e. u ~ IID $(0,\sigma^2)$

The difference between the three equations concerns the presence of the deterministic elements $\alpha$ (a drift term) and $\beta t$ (a linear time trend). The focus of testing is whether the coefficient $\gamma$ equals to zero, what means that the original $S_1$, $S_2$…………$S_n$ process has a unit root; hence, the null hypothesis of $\gamma = 0$ (random walk process) is tested against the alternative hypothesis $\gamma < 0$ of stationarity. ADF testing technique involves Ordinary Least Squares (OLS) method to find the coefficients of the model chosen.

To test the null hypotheses that spot price has a unit root/non-stationary and futures price has a unit root/non-stationary ($\gamma = 0$), the modified T (Student)-statistic (known as Dickey-Fuller statistic) is computed and compared with the relevant critical value for the three regression forms viz. without constant and trend, with constant, and with constant and trend. Lag length was selected by SIC (Schwarz Information Criterion). The level variable unit root results of futures prices series and spot prices series under the three conditions of intercept, trend and intercept and no trend and intercept are presented in Tables 4.42 to 4.47.

**Table 4.42 Level variable ADF test results of futures price with intercept**

Null Hypothesis: F has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.209551 | 0.6726 |
| Test critical values: | 1 per cent level | -3.432493 | |
| | 5 per cent level | -2.862373 | |
| | 10 per cent level | -2.567258 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| F(-1) | -0.000893 | 0.000739 | -1.209551 | 0.2266 |
| C | 14.75293 | 9.638293 | 1.530658 | 0.1260 |

**Table 4.43 Level variable ADF test results of futures price with trend and intercept**

Null Hypothesis: F has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.120605 | 0.5335 |
| Test critical values: | 1 per cent level | -3.961319 | |
| | 5 per cent level | -3.411411 | |
| | 10 per cent level | -3.127557 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| F(-1) | -0.003500 | 0.001650 | -2.120605 | 0.0340 |
| C | 15.81819 | 9.653516 | 1.638594 | 0.1014 |
| @TREND(1) | 0.020967 | 0.011874 | 1.765831 | 0.0775 |

**Table 4.44 Level variable ADF test results of futures price without trend and intercept**

Null Hypothesis: F has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 0.360026 | 0.7886 |
| Test critical values: | 1 per cent level | -2.565788 | |
| | 5 per cent level | -1.940937 | |
| | 10 per cent level | -1.616623 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| F(-1) | 0.000119 | 0.000329 | 0.360026 | 0.7189 |

**Table 4.45 Level variable ADF test results of spot price with intercept**

Null Hypothesis: S(spot price) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.132163 | 0.7052 |
| Test critical values: | 1 per cent level | -3.432494 | |
| | 5 per cent level | -2.862373 | |
| | 10 per cent level | -2.567258 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| S(-1) | -0.000640 | 0.000565 | -1.132163 | 0.2577 |
| D(S(-1)) | 0.169190 | 0.018634 | 9.079783 | 0.0000 |
| C | 11.06097 | 7.350005 | 1.504893 | 0.1325 |

**Table 4.46 Level variable ADF test results of spot price with trend and intercept**

Null Hypothesis: S(spot price) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.940338 | 0.6328 |
| Test critical values: | 1 per cent level | -3.961320 | |
| | 5 per cent level | -3.411412 | |
| | 10 per cent level | -3.127558 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| S(-1) | -0.002458 | 0.001267 | -1.940338 | 0.0524 |
| D(S(-1)) | 0.170316 | 0.018642 | 9.136278 | 0.0000 |
| C | 11.70533 | 7.358921 | 1.590631 | 0.1118 |
| @TREND(1) | 0.014625 | 0.009120 | 1.603562 | 0.1089 |

**Table 4.47 ADF test results of spot price without trend and intercept**

Null Hypothesis: S (spot price) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 0.477016 | 0.8179 |
| Test critical values: | 1 per cent level | -2.565788 | |
| | 5 per cent level | -1.940937 | |
| | 10 per cent level | -1.616623 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| S(-1) | 0.000121 | 0.000253 | 0.477016 | 0.6334 |
| D(S(-1)) | 0.169224 | 0.018638 | 9.079575 | 0.0000 |

The outcome of the level variable unit root results (Tables 4.42 to 4.47) of futures prices series and spot prices series under the three conditions of intercept, trend and intercept and no trend and intercept reveals that in all the cases absolute value of Augmented Dickey-Fuller test statistic is less than the absolute value of test critical values at 5 per cent level of significance. Hence, the null hypothesis is accepted and alternate hypothesis is rejected. That is the first level variables are non- stationary. The level variables (original data) series, spot price ($S_t$) and futures price ($F_t$) were found to be non- stationary.

Unit root is again tested by taking the first difference of spot prices and futures prices under three conditions. The first difference unit root results of futures prices series and spot prices series under the three conditions of intercept, trend and intercept and no trend and intercept are presented in Tables 4.48 to 4.53.

**Table 4.48 First difference ADF test results of futures price with intercept**

Null Hypothesis: D(Futures price) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -52.74238 | 0.0001 |
| Test critical values: | 1 per cent level | -3.432494 | |
| | 5 per cent level | -2.862373 | |
| | 10 per cent level | -2.567258 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(F(-1)) | -0.997073 | 0.018905 | -52.74238 | 0.0000 |
| C | 4.278109 | 4.300532 | 0.994786 | 0.3199 |

**Table 4.49 First difference ADF test results of futures price with trend and intercept**

Null Hypothesis: D(Futures price) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -52.73443 | 0.0000 |
| Test critical values: | 1 per cent level | -3.961320 | |
| | 5 per cent level | -3.411412 | |
| | 10 per cent level | -3.127558 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(F(-1)) | -0.997103 | 0.018908 | -52.73443 | 0.0000 |
| C | 6.367671 | 8.608734 | 0.739676 | 0.4596 |
| @TREND(1) | -0.001491 | 0.005321 | -0.280208 | 0.7793 |

**Table 4.50 First difference ADF test results of futures price without trend and intercept**

Null Hypothesis: D(Futures price) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -52.73309 | 0.0001 |
| Test critical values: | 1 per cent level | -2.565788 | |
| | 5 per cent level | -1.940937 | |
| | 10 per cent level | -1.616623 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(F(-1)) | -0.996717 | 0.018901 | -52.73309 | 0.0000 |

**Table 4.51 First difference ADF test results of spot price with intercept**

Null Hypothesis: D(Spot price) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -44.59926 | 0.0001 |
| Test critical values: | 1 per cent level | -3.432494 | |
| | 5 per cent level | -2.862373 | |
| | 10 per cent level | -2.567258 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(S(-1)) | -0.831041 | 0.018634 | -44.59926 | 0.0000 |
| C | 3.619695 | 3.290043 | 1.100197 | 0.2713 |

**Table 4.52 First difference ADF test results of spot price with trend and intercept**

Null Hypothesis: D(Spot price) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -44.59299 | 0.0000 |
| Test critical values: | 1 per cent level | -3.961320 | |
| | 5 per cent level | -3.411412 | |
| | 10 per cent level | -3.127558 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(S(-1)) | -0.831080 | 0.018637 | -44.59299 | 0.0000 |
| C | 5.320806 | 6.585567 | 0.807950 | 0.4192 |
| @TREND(1) | -0.001214 | 0.004070 | -0.298203 | 0.7656 |

**Table 4.53 First difference ADF test results of spot price without trend and intercept**

Null Hypothesis: D(Spot price) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=27)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -44.58401 | 0.0001 |
| Test critical values: | 1 per cent level | -2.565788 | |
| | 5 per cent level | -1.940937 | |
| | 10 per cent level | -1.616623 | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(S(-1)) | -0.830537 | 0.018629 | -44.58401 | 0.0000 |

The outcome of the first difference unit root results (Tables 4.48 to 4.53) of futures prices series and spot prices series under the three conditions of intercept, trend and intercept and no trend and intercept reveals that in all the cases absolute value of Augmented Dickey-Fuller test statistic is greater than the absolute value of test critical values at 5 per cent level of significance and the coefficients of the first difference are negative. Hence, the null hypothesis is rejected and alternate hypothesis is accepted. At first difference the spot and futures price series were found to be stationary. The variables $S_t$ and $F_t$ were integrated of order one. That is $\Delta S_t \sim I(1)$ and $\Delta F_t \sim I(1)$.

### 4.6.2 Lag Selection

In economics the dependence of a variable Y on X is rarely instantaneous. Very often, Y responds to X with lapse of time, such lapse of time is called lag. Both Granger causality test and Johansen Co-integration test uses optimal lags. What is the optimal lag? How many lags should be used for a particular model? There are many criteria to choose optimal lag. They are sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz criterion (SC) and Hannan-Quinn information criterion (HQ). LR, FPE, AIC, SC and HQ criteria suggesting to choose 313, 26, 26, 4 and 22 lags respectively. Among the above criteria SIC is telling to use 4 lags. Hence, 4 lags are selected.

### 4.6.3 Granger Causality Test

The existence of a relationship between variables does not prove causality or the direction of influence. But in regressions involving time series data, the situation may be somewhat different.

...........time does not run backward. That is, if event A happens before event B, then it is possible that A is causing B. However, it is not possible that B is causing A. In other words, events in the past can cause to happen today. Future events cannot. This is roughly the idea behind the so-called Granger causality test

Whether spot price causes futures price ($S_t \rightarrow F_t$) or the futures price causes spot price ($F_t \rightarrow S_t$)? .Where the arrow points to the direction of causality. Answer to this question is given by Granger causality test. Causality has three forms (1) No causality,

(2) Uni-directional causality
($S_t \rightarrow F_t$) ==> $\sum\alpha_i \neq 0$ and $\sum\delta_j = 0$
Conversely ($F_t \rightarrow S_t$) ==> $\sum\alpha_i = 0$ and $\sum\delta_j \neq 0$

(3) Bi- directional causality. The test involves estimating the following pair of regressions:

$$F_t = \sum_{i=1}^{n} \alpha_i S_{t-i} + \sum_{j=1}^{n} \beta_j F_{t-j} + u_{1t}$$

$$S_t = \sum_{i=1}^{n} \gamma_i S_{t-i} + \sum_{j=1}^{n} \delta_j F_{t-j} + u_{2t}$$

Assumptions of Granger causality test

1) For Granger causality test the variables should be stationary and must be integrated of the same order.
2) Optimum lag should be included
3) Error terms are uncorrelated

To test the null hypotheses that spot price does not Granger cause futures price and futures price does not Granger cause spot price pair wise Granger Causality tests for spot price and futures price was conducted and the result is presented in Table 4.54.

**Table 4.54 Pair wise Granger Causality Tests for spot price and futures price**

Pair wise Granger Causality Tests
Sample: 1 2802
Lags: 4

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| DS does not Granger Cause DF | 2775 | 2.35020 | 0.0001 |
| DF does not Granger Cause DS | | 24.2545 | 1E-103 |

From the outcome of the pair wise Granger Causality test result (Table 4.54) it can be observed that the probabilities corresponding to F-Statistic is less than 5 per cent .So we reject null hypothesis and accept alternate hypothesis. That is there is bidirectional associationship or bidirectional causality or pair wise causality. In other words spot price does Granger cause futures price and futures price does Granger cause spot price.

### 4.6.4 Johansen Co-integration Test

Let there be two variables $S_t$ and $F_t$. Engle and Granger defined the possibility of convergence between these two ($S_t$ & $F_t$), that convergence is called co-integration. Co-integration means long run association between variables. In Johansen Co-integration test the variables used should be non-stationary and the data must be integrated of the same order. The co-integrating regression equation can be written as

$$S_t = \beta_t + \beta_2 F_t + u_t$$

where, the slope parameter $\beta_2$ is known as the co-integrating parameter.

Assumptions of Johansen Co-integration test are:

1) Variables should be stationary.
2) Establish a linear relationship between the variables.
3) Optimum lag should be included
4) Error terms should be stationary in nature.

To test the null hypothesis that there is no co-integration/ association between spot price and futures price, Johansen Co-integration test was conducted and the result is presented in Table 4.55.

**Table 4.55 Johansen Co-integration test results**

Sample (adjusted): 28 2802
Included observations: 2775 after adjustments
Trend assumption: Linear deterministic trend
Series: Futures price, Spot price
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.014369 | 41.09947 | 15.49471 | 0.0000 |
| At most 1 | 0.000337 | 0.935485 | 3.841466 | 0.3334 |

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.014369 | 40.16398 | 14.26460 | 0.0000 |
| At most 1 | 0.000337 | 0.935485 | 3.841466 | 0.3334 |

From the outcome of the Johansen Co-integration test it can be observed that both Trace Statistic and Max-Eigen Statistic are greater than their corresponding critical value at 5 per cent level of significance. Trace Statistic

(41.09947) > Critical Value at 5 per cent level of significance (15.49471) and Max-Eigen Statistic (40.16398) > Critical Value at 5 per cent level of significance (14.26460). Hence, the null hypothesis is rejected and alternate hypothesis is accepted. That is, there is co-integration or long run association between spot price and futures price.

## 4.7 Conclusion

Hedging efficiency calculated on the basis of hedge period by hedge period for each month reveals that generally for January, February, March, April, May, June, July, August, September, October, November and December delivery contracts, on the average reduced the impact of price risks by 67.3 per cent, 77.7 per cent, 78.3 per cent, 75 per cent, 76.6 per cent, 74.9 per cent, 75.7 per cent, 75.7 per cent, 72.3 per cent, 59.5 per cent, 56.2 per cent and 63.3 per cent respectively. Hedging efficiency for the period from May 2003 to December 2012, on the basis of hedge periods shows that 5- month hedge period is the best hedge period with an average hedging efficiency of 90.4 per cent. Hedging efficiency for the period from May 2003 to December 2012, on the basis of years shows that the year 2012 is the best year with an average hedging efficiency of 82.9 per cent. The average hedging efficiency of the rubber futures market is 71.5 per cent for the whole of the period from May 2003 to December 2012. Out of 18508 hedges analysed, 13230 (71.5 per cent) were effective hedges while 5278 (28.5 per cent) were ineffective. It implies that futures market in rubber reduced the impact of price risks by approximately 71.5 per cent.

Elasticity of expectation calculated on the basis of hedge period by hedge period for each month reveals that generally for January, February, March, April, May, June, July, August, September, October, November and

December delivery contracts, as a whole, show a stabilization effect of 47.7 per cent, 51.3 per cent, 50.1 per cent, 54.8 per cent, 57.03 per cent, 9.1 per cent, 49.7 per cent, 55.4 per cent, 66.43 per cent, 60.4 per cent, 50.6 per cent and 49.5 per cent respectively. Elasticity of expectation for the period from May 2003 to December 2012, on the basis of delivery months shows that December is the best month during which the futures market exhibits a stabilizing influence of 66.4 per cent of the time. Elasticity of expectation for the period from May 2003 to December 2012, on the basis of hedge periods shows that 5- month hedge period is the best hedge period with a stabilizing influence of 86.5 per cent. Elasticity of expectation for the period from May 2003 to December 2012, on the basis of years reveals that the year 2011 is the best month during which the futures market exhibits a stabilizing influence 68.5 per cent of the time. It is observed that out of 18508 hedges, on 10069 (54.4 per cent) occasions, the futures market exercised a stabilizing effect on the spot market, and on 8439 occasions (45.6 per cent) futures trading exercised a destabilizing effect on the spot market. It implies that futures market in rubber has predominant stabilizing effect on spot prices.

An analysis of bias between long and short hedgers in the rubber futures market shows that generally March, April, May and June delivery hedges exhibit a bias in favour of short hedgers and the remaining delivery month hedges exhibit a bias in favour of long hedgers. Index of Bias for the period from May 2003 to December 2012, on the basis of hedge periods reveals that one month, two months and three months hedges exhibit a bias in foavor of long hedgers and the remaining hedge periods exhibit a bias in favour of short hedgers. Index of bias for the period from May 2003 to December 2012, on the basis of years shows that all years except the year 2004 is biased in favour of long hedgers. The market as a whole exhibit a bias (+1.97) in favour of long hedges.

Spot price volatility of rubber during futures suspension period is more than that of the pre suspension period and post suspension period. Granger causality test result shows that there is bidirectional associationship or bidirectional causality or pair wise causality between spot price and futures price of rubber. Johansen Co-integration test result shows that there is co-integration or long run association between spot price and futures price.

Futures market in rubber reduced the impact of price risks by approximately 71.5 per cent, volatility has decreased during the period of futures trading and causality is bidirectional. Hence, rubber futures fulfils all the economic functions.

Chapter 5

# AWARENESS AND PERCEPTION OF MARKET PARTICIPANTS: AN ANALYSIS

Contents



## 5.1 Introduction

In this chapter the profile of futures market participants, spot price information sources, motivation for sale/ purchase, awareness of market participants about spot and futures market are presented. Further, it contains a detailed analysis on awareness and perception of rubber futures market participants as stated in Objective No. 6. The data required for the study were collected from 500 growers, 500 dealers, 100 manufacturers and 250 Rubber Marketing Co-operative Societies & RPS from Kerala.

## 5.2 Profile of the Futures Market Participants

The type of product and the deferment of sales/purchase wise classification of market participants are presented in Tables 5.1 and 5.2 respectively. Selling, purchase and turnover/ consumption wise classification of dealers, Rubber Marketing Cooperative Societies & RPS and manufacturers are presented in Tables 5.3 to 5.5. Classification of market participants on the basis of district, educational qualification, profession, category of ownership growers, and area of plantation of growers are presented in Tables 5.6 to 5.10.

### 5.2.1 Type of Product

Type of product wise classification of market participants covered in this study is presented in Table 5.1. It shows that out of 500 growers, 184 (36.8 per cent) are dealing with dry rubber, 314 (62.8 per cent) with latex and 2 (0.4 per cent) are dealing with both latex and dry rubber. All the 500 dealers are dealing with dry rubber. Out of 250 Rubber Marketing Cooperative Societies & RPS, 139 (55.6 per cent) are dealing with dry rubber and 111 (44.4 per cent) with both latex and dry rubber. Out of 100 manufacturers, 70 deal with dry rubber, 21 with latex and 9 with scrap rubber.

**Table 5.1 Product wise classification of market participants**

| Market Participants | Dry Rubber | Latex | Dry Rubber and Latex | Scrap rubber | Total |
|---|---|---|---|---|---|
| Growers | 184(36.8 ) | 314(62.8) | 2(0.4 ) | - | 500( 100) |
| Dealers | 500(100.0 ) | - | - | - | 500(100.0) |
| Rubber Marketing Cooperative Societies & RPS | 139( 55.6) | 111(44.4) | - | - | 250(100.0) |
| Manufacturers | 70(70) | 21(21) | - | 9(9) | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.2 Deferment of the Sales/Purchase

If growers, dealers and Rubber Marketing Cooperative Societies & RPS obtain the information that the future expected price will increase, they will defer the sales for certain period. It is presented in Table 5.2. It shows that out of 500 growers, 8 (1.6 per cent) defer sales by one month, 122(24.4 per cent) by two months, 270 (54 per cent) by three months and 100 (20 per cent) by six months. Out of 500 dealers, 120 (24 per cent) defer sales by one week, 274 (54.8 per cent) by one month and 106 (21.2 per cent) by three months. Out of 250 Rubber Marketing Co-operative Societies & RPS, 1 (0.4 per cent) defer sales by one week, 192 (76.84 per cent) by one month, 1 (0.4 per cent) by two months, 55 (22 per cent) by three months and 1 (0.40 per cent) by six months. Deferment of the purchase wise classification of manufacturers covered in this study shows that out of 100 manufacturers, 46 defer sales by one week, 8 by one month, 17 by two months and 29 by three months.

**Table 5.2 Deferment of the sales/purchase wise classification of market participants**

| Market Participants | One week | One month | Two months | Three months | Six months | Total |
|---|---|---|---|---|---|---|
| Growers | - | 8 (1.6 ) | 122(24.4) | 270(54) | 100(20) | 500(100) |
| Dealers | 120( 24) | 274(54.8) | - | 106(21.2) | - | 500(100) |
| Rubber Marketing Cooperative Societies & RPS | 1(0.4 ) | 192(76.8) | 1(0.4) | 55(22) | 1(0.4) | 250(100) |
| Manufacturers | 46(46) | 8(8) | 17(17) | 29(29) | - | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.3 Sales

Selling wise classification of growers, dealers and Rubber Marketing Cooperative Societies & RPS covered in this study is presented in Table 5.3. It shows that out of 500 growers, 400 (80 per cent) are selling rubber to growers and 100 (20 per cent) to manufacturers. Out of 500 dealers, 140 (28 per cent) are selling rubber to dealers and 360 (72 per cent) to manufacturers. Out of 250 Rubber Marketing Cooperative Societies/RPS, 247 (98.80 per cent) are selling rubber to dealers and 3 (1.20 per cent) to manufacturers.

**Table 5.3 Selling wise classifications of growers, dealers and Rubber Marketing Cooperative Societies & RPS**

| Market Participants | Growers | Dealers | Manufacturers | Total |
|---|---|---|---|---|
| Growers | 400( 80) | - | 100(20 ) | 500( 100) |
| Dealers | - | 140(28 ) | 360( 72) | 500(100 ) |
| Rubber Marketing Cooperative Societies & RPS | - | 247(98.8) | 3(1.2) | 250(1000 |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.4 Purchase

Purchase wise classification of rubber dealers, Rubber Marketing Cooperative Societies & RPS and manufacturers covered in this study is presented in Table 5.4. It shows that out of 500 dealers, 340 (68 per cent) are purchasing rubber from growers and 160 (32 per cent) from other traders. All the Rubber Marketing Cooperative Societies and RPS are purchasing rubber from growers. All manufacturers are purchasing rubber from traders.

**Table 5.4 Purchase wise classification of dealers, Rubber Marketing Cooperative Societies & RPS and manufacturers**

| Market Participants | Growers | Traders | Total |
|---|---|---|---|
| Dealers | 340(68) | 160(32) | 500(100) |
| Rubber Marketing Cooperative Societies & RPS | 250(100) | - | 250(100) |
| Manufacturers | - | 100(100) | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.5 Turnover/ Consumption

Turnover wise classification of dealers and Rubber Marketing Cooperative Societies & RPS covered under the study is presented in Table 5.5. It contains consumption wise classification of manufacturers too. It shows that out of 500 dealers, 40 (8 per cent) have turnover 10 tonnes and below, 160 (32 per cent) have above 10 tonnes and up to and including 50 tonnes, 140 (28 per cent) have above 50 tonnes and up to and including 100 tonnes, 15(3 per cent) have above 100 tonnes and up to and including 500 tonnes, 20 (4 per cent) have above 500 tonnes and up to and including 1000 tonnes and 125 (25 per cent) have above 1000 tonnes. Out of 250 Rubber Marketing Cooperative Societies & RPS, 108 (43.2 per cent) have turnover above 10 tonnes and up to and including 50 tonnes, 135 (54 per cent) have above 50 tonnes and up to and including 100 tonnes, 5 (2 per cent) have above 500 tonnes and up to and including 1000 tonnes and 2 (0.8 per cent) have above 1000 tonnes. Consumption wise classification of manufacturers shows that out of 100 manufacturers, 24 belong to the category of 10 tonnes and below, 30 belong to above 10 tonnes and up to and including 50 tonnes, 30 belong to above 50 tonnes and up to and including 100 tonnes, 10 belong to above 100 tonnes and up to and including 500 tonnes, 3 belong to above 500 tonnes and up to and including 1000 tonnes and 3 belong to above 1000 tonnes.

**Table 5.5 Turnover/ consumption wise classification of dealers, Rubber Marketing Cooperative Societies & RPS and manufacturers**

| Turnover/ Consumption | Dealers | Rubber Marketing Cooperative Societies & RPS | Manufacturers |
|---|---|---|---|
| 10 tonnes and below | 40(8 ) | - | 24(24) |
| Above 10 tonnes and up to and including 50 | 160( 32) | 108( 43.2) | 30(30) |
| Above 50 tonnes and up to and including 100 | 140( 28) | 135(54 ) | 30(30) |
| Above 100 tonnes and up to and including 500 | 15(3 ) | - | 10(10) |
| Above 500 tonnes and up to and including 1000 | 20( 4) | 5(2 ) | 3(3) |
| Above 1000 tonnes | 125( 25) | 2(0.8 ) | 3(3) |
| Total | 500(100 ) | 250(100) | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.6 District

District wise classification of growers and dealers covered under the study is presented in Table 5.6. It shows that out of 500 growers, 89 (17.8 per cent) are from Kottayam district, 135(27 per cent) from Pathanamthitta district, 202 (40.4 per cent) from Ernakulam district, and 74 (14.8 per cent) from and Idukki district. Out of 500 dealers, 143 (28.6 per cent) are from Kottayam district, 50 (10 per cent) from Kollam district, 150 (30 per cent) from Pathanamthitta district, 150 (30 per cent) from Ernakulam district and 7 (28.6 per cent) from major dealers.

**Table 5.6 Classification of growers and dealers with respect to district**

| Market Participants | Kottayam | Pathanamthitta | Ernakulam | Idukki | Kollam | Major dealers | Total |
|---|---|---|---|---|---|---|---|
| Growers | 89(17.4) | 135(27.0) | 202(40.4) | 74(14.8) | - | - | 500 |
| Dealers | 143(28.6) | 150(30.0) | 150(30.0) | - | 50(10.0) | 7(1.4) | 100.0 |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.7 Education

Educational qualification wise classification of growers and dealers covered under the study is presented in Table 5.7. It shows that out of 500 growers, 34 (6.8 per cent) are SSLC, 54 (10.8 per cent) are +2, 288 (24.8 per cent) are graduation and above, and 124 (24.8 per cent) are other qualifications. Out of 500 dealers, 80 (16 per cent) are SSLC, 100 (20 per cent) are +2, and 320 (64 per cent) are graduation and above.

**Table 5.7 Classification of growers and dealers with respect to educational qualification**

| Market Participants | SSLC | +2 | Graduation and above | Others | Total |
|---|---|---|---|---|---|
| Growers | 34( 6.8) | 54( 10.8) | 288(57.6 ) | 124( 24.8) | 500(100 ) |
| Dealers | 80(16 ) | 100(20.0 ) | 320(64 ) | - | 500(100.0 ) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.8 Profession

Profession wise classification of growers and dealers covered under the study is presented in Table 5.8. It shows that out of 500 growers, 56 (11.2 per cent) are farmers, 26 (5.2 per cent) are private employees, 278 (55.6 per cent) are government employees and 140 (28 per cent) are self-employed. Out of 500 dealers, 160 (32 per cent) are farmers, 114 (228 per cent) are private employees, and 226 (45.2 per cent) are self-employed.

**Table 5.8 Classification of growers and dealers with respect to profession**

| Market Participants | Farming | Private | Government job | self employed | Total |
|---|---|---|---|---|---|
| Growers | 56(11.2) | 26(5.2) | 278(55.6) | 140(28) | 500(100) |
| Dealers | 160(32 ) | 114( 22.8) | - | 226(45.2 ) | 500(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

### 5.2.9 Category of Ownership

If area of plantation is more than 10 hectors, then it is an estate. There are different ownership structures for an estate. Classification of growers, dealers and manufacturers on the basis of category of ownership is presented in Table 5.9.

It shows that out of 500 growers, 5 (1 per cent) are Public Limited Companies, 48 (9.6 per cent) are Private Limited Companies, 44 (8.8 per cent) are partnership firms, 2 (0.4 per cent) are government department and corporations, 1 (0.2 per cent) belong to socio – religious trusts and societies, and 400 (80 per cent) belong to none of the above mentioned category. Ownership wise classification of dealers' firms covered under the study shows that out of 500 dealers, 20 (4 per cent) are proprietary ownership firms, and 480 (96 per cent) are partnership firms. Out of 100 manufacturers, 3 (3 per cent) are Public Limited Companies, 52 (52 per cent) are Private Limited Companies, 31 (31 per cent) are partnership firms and 14 (14 per cent) are proprietary ownership firms.

**Table 5.9 Classification of growers, dealers and manufacturers on the basis of category of ownership**

| Category of Ownership | Growers | Dealers | Manufacturers |
|---|---|---|---|
| Public Limited Company | 5( 1) | - | 3(3) |
| Private Limited Company | 48(9.6 ) | - | 52(52) |
| Partnership firm | 44( 8.8) | 480( 96) | 31(31) |
| Proprietary ownership | - | 20( 4) | 14(14) |
| Government department and corporations | 2( 0.4) | - | - |
| Socio – religious trusts and societies | 1(0.2 ) | - | - |
| Not applicable | 400(80 ) | - | - |
| Total | 500(100 ) | 500(100 ) | 100(100) |

*Figures in the parenthesis denote percentage to column total; Source: Field Survey*

### 5.2.10 Area

Area of plantation wise classification of growers covered in this study is presented in Table 5.10. It shows that out of 500 growers, 200 (40 per cent) have area of plantation 2 ha & below, 200 (40 per cent) have above 2 ha & up to & including 4 ha, 44 (8.8 per cent) have above 4 ha & up to & including 10 ha, 28 (5.6 per cent) have above 10 ha & up to & including 20 ha, 9 (1.8 per cent) have above 20 ha & up to & including 40 ha, 12 (2.4 per cent) have above

40 ha & up to & including 200 ha, 2 (0.4 per cent) have above 200 ha & up to & including 400 ha, 2 (0.4 per cent) have above 400 ha & up to & including 600 ha and 3 (0.6 per cent) have above 600 ha.

**Table 5.10 Classification of growers with respect to area of plantation**

| Area of plantation | Frequency | Percent |
|---|---|---|
| 2 ha & below | 200 | 40.0 |
| Above 2 ha &up to& including 4 ha | 200 | 40.0 |
| Above 4 ha &up to& including 10 ha | 44 | 8.8 |
| Above 10 ha &up to& including 20 ha | 28 | 5.6 |
| Above 20 ha &up to& including 40 ha | 9 | 1.8 |
| Above 40 ha &up to& including 200 ha | 12 | 2.4 |
| Above 200 ha &up to& including 400 ha | 2 | .4 |
| Above 400 ha &up to& including 600 ha | 2 | .4 |
| Above 600 ha | 3 | .6 |
| Total | 500 | 100.0 |

*Figures in the parenthesis denote percentage to column total; Source: Field Survey*

## 5.3 Spot Price Information Sources and Motivation for Sale/ Purchase

Spot price information sources of market participants are presented in Table 5. 11. Motivation for sale by growers, dealers and Rubber Marketing Co-operative Societies & RPS are given in Table 5. 12. Motivation for sale by manufacturers is presented in Table 5. 13.

### 5.3.1 Price Information Sources of Market Participants

Market participants considered in the study are growers, dealers, manufactures and Rubber Marketing Cooperative Societies & RPS. Market participants get price information about spot price of rubber from different sources. These sources are newspaper, traders, brokers, tyre manufacturers, television, co-operative societies and other sources like SMS from Rubber Board and commodity exchanges. The market participants were asked to rank these information sources as one, two, three, four, five, six and seven in the order of importance they had given. The ranks given by market participants were analysed in such way that the information source which was given first rank was assigned 7, second rank was assigned 6, third rank was assigned 5, fourth rank was assigned 4, fifth rank was assigned 3, sixth rank was assigned 2 and seventh rank was assigned 1. Then arithmetic mean of each price information source was found out and assigned ranks to these means accordingly. The result, thus, obtained is presented in Table 5.11.

**Table 5.11 Spot rubber price information sources of market participants.**

| Price Information Sources | Market Participants | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Growers | | Dealers | | Cooperative Societies & RPS | | Manufacturers | |
| | Mean | Rank | Mean | Rank | Mean | Rank | Mean | Rank |
| Newspaper | 6.95 | 1 | 5.76 | 2 | 4.01 | 4 | 5.28 | 3 |
| Dealers/other dealers | 6.06 | 2 | 5.80 | 1 | 6.14 | 1 | 6.72 | 1 |
| Brokers | 1.83 | 6 | 5.71 | 3 | 5.31 | 2 | 5.73 | 2 |
| Tyre manufacturers | 1.17 | 7 | 3.58 | 4 | 3.23 | 6 | 3.33 | 5 |
| Television | 3.48 | 5 | 2.79 | 5 | 1.01 | 7 | 3.94 | 4 |
| Co-operative | 4.49 | 3 | 2.30 | 6 | 3.76 | 5 | 1.79 | 6 |
| Others | 4.03 | 4 | 2.07 | 7 | 4.54 | 3 | 1.21 | 7 |

*Source: Field Survey*

Friedman Test Result

| Table | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|
| 5.11 | 0.429 | 3 | 0.934 | Not significant |

The analysis of information sources of growers (Table 5.11) reveals that the most important information source is newspaper; the mean score is 6.95 and is the highest. Similarly, other sources of information are ranked in the order of the mean score. Dealers, co-operative societies, other sources like SMS from Rubber Board and commodity exchanges, television, brokers and tyre manufacturers follows the second, third, fourth, fifth, sixth and seventh information sources respectively. The analysis of information sources of dealers reveals that the most important information source is other dealers. Newspaper, brokers, tyre manufacturers, television, co-operative societies and other sources like SMS from Rubber Board and commodity exchanges follows the second, third, fourth, fifth, sixth and seventh information sources respectively. The most important information source for Rubber Marketing Co-operative Society & RPS is dealers. Brokers, other sources like SMS from Rubber Board and commodity exchanges, newspaper, co-operative societies, tyre manufacturers and television follow the second, third, fourth, fifth, sixth and seventh information sources respectively. As far as manufacturers are concerned their first information source with respect to spot rubber price is dealers. Brokers, newspaper, television, tyre manufacturers, co-operative societies and other sources like SMS from Rubber Board and commodity exchanges come the second, third, fourth, fifth, sixth and seventh information sources respectively.

Friedman test on ranks was conducted to know whether different market participants have the same order of preference to the various information sources, and the result is found to be not significant at 5 percent level of significance. $\chi 2$ (3, n=7) = 0.429, $p>0.05$. This implies that different market participants have the same order of preference to the various information sources.

### 5.3.2 Motivation for Sale by Market Participants

Market participants take sales decision on the basis of various reasons. These reasons are cash needs, target price attained, market trend, declining price, lack of storage options, exceeded carriage life and commitment of produce. The market participants were asked to rank these reasons as one, two, three, four, five, six and seven in the order of importance they had given.

On the basis of ranks assigned by the market participants with regard to motivation for sale, mean ranks are calculated. According to the mean scores, the ranks were finally given and the result, thus, obtained is presented in Table 5.12

**Table 5.12 Motivation for sale by Market participants**

| Motivation for sale | Growers | | Dealers | | Rubber Marketing Cooperative Societies & RPS | |
|---|---|---|---|---|---|---|
| | Mean | Rank | Mean | Rank | Mean | Rank |
| Cash needs | 4.74 | 3 | 5.92 | 2 | 3.76 | 5 |
| Target price attained | 3.08 | 5 | 4.24 | 4 | 3.82 | 4 |
| Market trend | 6.71 | 1 | 6.25 | 1 | 6.89 | 1 |
| Price is declining | 5.75 | 2 | 4.46 | 3 | 5.37 | 2 |
| Lack of storage options | 2.48 | 6 | 3.60 | 5 | 2.09 | 6 |
| Exceeded carriage life | 3.65 | 4. | 1.83 | 6 | 1.11 | 7 |
| Commitment of produce | 1.60 | 7 | 1.69 | 7 | 4.96 | 3 |

*Source: Field Survey*

Friedman Test Result

| Table | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|
| 5.12 | .286 | 2 | .867 | Not significant |

The analysis of motivation for sale by growers, dealers and Rubber Marketing Cooperative Societies & RPS (Table 5.12) reveals that the most important motivation for sale is market trend; the mean score is 6.71 and is the highest. Similarly, other motivations for sale are ranked in the order of the mean score. Declining price trend, cash needs, exceeded carriage life, target price attained, lack of storage options and commitment of produce are ranked second, third, fourth, fifth, sixth and seventh motivation for sale respectively. In the case of dealers, cash needs, declining price, target price attained, lack of storage options, exceeded carriage life and commitment of produce are ranked first, second, third, fourth, fifth, sixth and seventh motivation for sale respectively. In the case of cooperative societies & RPS, declining price, commitment of produce, target price attained, cash needs, lack of storage options and exceeded carriage life are ranked first, second, third, fourth, fifth, sixth and seventh motivation for sale sources respectively.

Friedman test on ranks was conducted to know whether different market participants have the same order of preference to the various motivations for sale, and the result is found to be not significant at 5 percent level of significance. $\chi 2$ (2, n=7) = 0.867, $p>0.05$. This implies that different market participants have the same order of preference to the various motivations for sale.

### 5.3.3 Motivation for Purchase by Manufacturers

Manufacturers make purchase decision motivated by target price attained, market trend, declining price, increasing price, enough storage options and commitment of product. On the basis of ranks assigned by the manufacturers with regard to motivation for purchase, mean ranks are calculated. According to the mean ranks, the ranks were finally given and the result, thus, obtained is presented in Table 5.13.

**Table 5.13 Motivation for purchase by manufacturers**

| Motivation for purchase | Motivation for purchase | | | | | |
|---|---|---|---|---|---|---|
| | Target Price Attained | Market trend | Price is increasing | Price is declining | Enough Storage Options | Commitment of Product |
| Mean Rank | 3.86 | 3.14 | 1.78 | 5.85 | 1.22 | 5.15 |
| Rank | 3 | 4 | 5 | 1 | 6 | 2 |

*Source: Field Survey*

Declining price, commitment of product, target price attained, market trend, increasing price, and enough storage options come the first, second, third, fourth, fifth and sixth motivation for purchase respectively.

## 5.4 Awareness of Market Participants about Spot and Futures Market

Awareness of market participants about ensuring target price, commodity exchanges, lot size of rubber futures contract, basis variety, margin money and use of futures trading are presented in Tables 5.14 to 5.19. Participation in the futures market, hedgers, speculators, loss/ profit in the futures market and given/taken delivery in/from the warehouse are presented in Tables 5.20 to 5.24.

### 5.4.1 Ensuring Target Price

In order to ensure target price, growers, dealers and Rubber Marketing Co-operative Societies & RPS have to sell futures contract. Manufacturers have to buy futures contract. The methods of ensuring target price by market participants are presented in Table 5.14.

**Table 5.14 Methods of ensuring target price by Market Participants**

| Market Participants | Buy futures contract | Sell futures contract | Don't know | Total |
|---|---|---|---|---|
| Growers | 26(5.2) | 100(20.0) | 374(74.8) | 500(100.0 ) |
| Dealers | - | 500(100.0) | - | 500(100.0) |
| RPS & Rubber Marketing Co-operative Societies | - | 250(100.0) | - | 250(100.0) |
| Manufacturers | 50(50.0) | 30( 30.0) | 20(20.0) | 100( 100.0) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.14 shows that out of 500 growers, 26 (5.2 per cent) have the opinion that they will buy futures contract, 100 (20 per cent) sell futures contract and 374 (74.8 per cent) are unaware to get the target price. All the dealers and RPS & Rubber Marketing Co-operative Societies have pointed out that by selling futures contract, target price can be ensured. Out of 100 manufacturers, 50 have the opinion that futures contracts are to be purchased, 30 have the opinion that futures contracts are to be sold and remaining 20 are unaware of getting the target price.

### 5.4.2 Commodity Exchange

All the dealers, manufacturers and Rubber Marketing Co-operative Societies & RPS have given the answer that BSE is not a commodity exchange. Only 38 (7.6 per cent) growers have given the answer that BSE is not a commodity exchange. The awareness of market participants about commodity exchange is presented in Table 5.15.

**Table 5.15 Awareness of Market Participants about commodity exchange**

| Market Participants | BSE | Don't know | Total |
|---|---|---|---|
| Growers | 38(7.6) | 462(92.4) | 500(100.00 |
| Dealers | 500(100) | - | 500(500) |
| RPS & Rubber Marketing Co-operative Societies | 250(100.0) | - | 250(100.0) |
| Manufacturers | 100(100.0) | - | 100(100.0) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.15 shows that out of 500 growers, 38 (7.6) have the opinion that BSE is not a commodity exchange and remaining 462 (92.4 per cent) are unaware about commodity exchanges. All the dealers, RPS & Rubber Marketing Co-operative Societies and manufacturers have pointed out that BSE is not a commodity exchange.

### 5.4.3 Lot Size of Rubber Futures Contract

Lot size of rubber is 1000 Kg. in all the commodity exchanges. The awareness of market participants about lot size of rubber futures contract on NMCE is presented in Table 5.16.

**Table 5.16 Awareness of Market Participants about Lot size of rubber futures contract on NMCE**

| Market Participants | 1000 Kgs | Don't know | Total |
|---|---|---|---|
| Growers | 126(25.2) | 374(74.80 | 500(100) |
| Dealers | 500(100) | - | 500(100) |
| RPS & Rubber Marketing Co-operative Societies | 250(100) | - | 250(100) |
| Manufacturers | 80(80.0) | 20(20.0) | 100(100.0) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.16 shows that out of 500 growers, 126 (25.2 per cent) know that the lot size of rubber on NMCE is 1000 Kgs and the remaining 374 (74.8 per cent) are unaware of the lot size. All the dealers and RPS & Rubber Marketing Co-operative Societies know that the lot size of rubber futures contract on NMCE is 1000 Kg. Out of 100 manufacturers, 80 know that the lot size of rubber on NMCE is 1000 Kg and remaining 20 are unaware of the lot size.

### 5.4.4 Basis Variety

Basis variety of rubber futures contract is RSS-4. The awareness of market participants about the basis variety of spot rubber is presented in Table 5.17.

**Table 5.17 Awareness of Market Participants about Basis Variety of Spot rubber**

| Market Participants | RSS-4 | Don't know | Total |
|---|---|---|---|
| Growers | 126(25.2) | 374(74.8) | 500(100.0) |
| Dealers | 500(100) | - | 500(100) |
| RPS & Rubber Marketing Co-operative Societies | 250(100) | - | 250(100) |
| Manufacturers | 100(100) | - | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.17 shows that out of 500 growers, 126 (25.2 per cent) know that futures trading is based on RSS-4 variety and the remaining 377 (74.8 per cent) are unaware of the variety of rubber used for futures trading. All the dealers and RPS & Rubber Marketing Co-operative Societies know that futures contract in rubber futures is based on RSS-4 variety of rubber. Out of 100 manufacturers, 80 know that futures trading is based on RSS-4 variety and remaining 20 are unaware of the variety of rubber used for futures trading.

### 5.4.5 Margin Money

Margin money required for rubber futures contract is 10 per cent of the spot price. The awareness of market participants about initial margin money requirement for rubber futures contract is presented in Table 5.18.

**Table 5.18 Awareness of Market Participants about Initial margin money requirement for rubber futures contract**

| Market Participants | 10 per cent | Don't know | Total |
|---|---|---|---|
| Growers | 126(25.2) | 374(74.8) | 500(100.0) |
| Dealers | 500(100) | - | 500(100) |
| RPS & Rubber Marketing Co-operative Societies | 500(100) | - | 500(100) |
| Manufacturers | 80(80) | 20(20) | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.18 shows that out of 500 growers, 126 (25.2 per cent) know that initial margin money requirement for futures trading is 10 per cent and remaining 374 (74.8 per cent) are unaware of the initial margin money requirement. All the dealers and RPS & Rubber Marketing Co-operative Societies know that initial margin money requirement for rubber futures contract is 10 per cent. Out of 100 manufacturers, 80 know that initial margin money requirement for futures trading is 10 per cent and remaining 20 are unaware of the initial margin money requirement.

### 5.4.6 Awareness about Usage of Futures Trading

Derivative instruments are not for profit making, it is for managing risk. But there is a misconception among market participants that futures market is for profit making. The awareness of market participants about the usage of futures trading is presented in Table 5.19.

**Table 5.19 Awareness about Usage of futures trading**

| Market Participants | Risk management | Profit making | Total |
|---|---|---|---|
| Growers | 100(20.00 | 400(80.0) | 500(100.0) |
| Dealers | 240(48.0) | 260(52.0) | 500(100.0) |
| RPS & Rubber Marketing Co-operative Societies | 4(1.6) | 246(98.4) | 250(100.0) |
| Manufacturers | 59(59) | 41(41) | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.19 shows that out of 500 growers, 10 (20 per cent) have the opinion that futures market is for risk management and 400 (80 per cent) have the opinion that futures market is for profit making. Out of 500 dealers, 240 (48 per cent) have the opinion of risk management and 260 (52 per cent) have the opinion of profit making. Out of 250 RPS & Rubber Marketing Co-operative Societies, 4 (1.6 per cent) have the opinion of risk management and 246 (98.4 per cent) have the opinion of profit making. Out of 100 manufacturers, 59 have the opinion risk of management and 41 have the opinion of profit making.

### 5.4.7 Participation in the Futures Market

Participation market participants in the futures market is presented in Table 5.20.

**Table 5.20 Participation of Market Participants in futures market**

| Market Participants | Participation in the futures market | | |
|---|---|---|---|
| | Yes | No | Total |
| Growers | 26(5.2) | 474(94.8) | 500(100.0) |
| Dealers | 420(84.0) | 80(16.0) | 500(100.0) |
| RPS & Rubber Marketing Co-operative Societies | 4(1.6) | 246(98.4) | 250(100.0) |
| Manufacturers | 3(3) | 97(97) | 100(100) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.20 shows that out of 500 growers, 26 (5.2 per cent) have participated in the futures market and 474 (94.8 per cent) have not yet participated in the futures market. Out of 500 dealers, 420 (84 per cent) have participated in the futures market and 80 (16 per cent) have not participated in the futures market. Out of 250 RPS & Rubber Marketing Co-operative Societies, 4 (1.6 per cent) have participated in the futures market and 240 (98.4 per cent) have not participated in the futures market. Out of 100 manufacturers, 3 have participated in the futures market and 97 have not participated in the futures market.

### 5.4.8 Hedgers

If market participants have taken equal position of that of physical market stock, then they are hedgers. Participation in the futures market by market participants with an exactly equal and opposite position of that of physical market is presented in Table 5.21.

**Table 5.21 Participation in the futures market with an exactly equal and opposite position of that of physical market**

| Market Participants | Participation in the futures market with an exactly equal and opposite position of that of physical market (hedgers) | | | Non-participants | Total |
|---|---|---|---|---|---|
| | Yes | No | Total | | |
| Growers | - | 26(5.2) | 26(5.2) | 474(94.8) | 500(100.0) |
| Dealers | 199(39.8 ) | 221( 44.2) | 420(84) | 80(16 ) | 500( 100.0) |
| RPS & Rubber Marketing Co-operative Societies | - | 4(1.6) | 4(1.6) | 246(98.4) | 250(100.0) |
| Manufacturers | 3(3.0) | - | 3(3.0) | 97(97) | 100(100.0) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.21 shows that out of 26 (5.2 per cent of the total) of the participants in the futures market no grower has participated in the futures market with an exactly equal and opposite position of that of physical market. Out of 500 dealers, 420 (84 per cent) have participated in the futures market and 80 (16 per cent) have not participated in the futures market. Out of 420 participants, 199 (39.8 per cent) have participated in the futures market with an exactly equal and opposite position of that of physical market. Out of 4 (1.6 per cent of the total) of the participants in the futures market no Rubber Marketing Cooperative Societies & RPS has participated in the futures market with an exactly equal and opposite position of that of physical market. Out of 100 manufacturers, 3 have participated in the futures market with an exactly equal and opposite position of that of physical market and 97 have not participated in the futures market.

### 5.4.9 Speculators

If market participants have taken more positions than physical market stock, then they are speculators. The description of speculators and non-speculators in the futures market is given in Table 5.22.

**Table 5. 22 Description of Speculators/ non- speculators in Futures Market**

| Market Participants | Participation in the futures market with more position of that of physical market (speculators) | | | Non-participants | Total |
|---|---|---|---|---|---|
| | Yes | No | Total | | |
| Growers | 26( 5.2) | - | - | 474( 94.8) | 500(100.0) |
| Dealers | 213( 42.6) | 207(41.4) | 420( 84) | 80(16 ) | 500( 100.0) |
| RPS & Rubber Marketing Co-operative Societies | - | 4(1.6) | 4(1.6) | 246(98.4) | 250(100.0) |
| Manufacturers | - | 3(3) | 3(3) | 97(97) | 100(100.0) |

*Figures in the parenthesis denote percentage to row total; Source: Field Survey*

Analysis given in Table 5.22 shows that all grower participants, i.e. 26 (5.2 per cent of the total) in the futures market, have hedged more than their physical market position. It indicates that the growers who participated in the futures market are speculators. Out of 420 dealer participants in the futures market, 213 (42.6 per cent) dealers have hedged more than their physical market position. It indicates that 213 (42.6 per cent) dealers are speculators, 199 (39.8 per cent) are hedgers and remaining 8 (1.6 per cent) have hedged less than their physical market position. All the Rubber Marketing Cooperative Societies & RPS participants, 4 (100 per cent) in the futures market, have hedged more than their physical market position. It indicates that all the futures market participants are speculators. All the manufacturer participants, 3 (100 per cent) in the futures market, have hedged more than their physical market position. It indicates that the manufacturers who participated in the futures market are speculators.

### 5.4.10 Loss/Profit in the Futures Market

Hedging is a zero sum game. Profit made by one participant is equal to the loss made by the other participant. Loss/ profit made by market participants in the futures market is given in Table 5.23.

**Table 5.23 Loss/profit in the futures market made by Market Participants**

| Market Participants | Profit from futures market | | | Non-participants | Total |
|---|---|---|---|---|---|
| | Yes | No | Total | | |
| Growers | 6(1.2) | 20(4.0) | 26(5.2) | 474( 94.8) | 500(100.0) |
| Dealers | 180( 36) | 240(48) | 420(84) | 80( 16) | 500( 100.0) |
| RPS & Rubber Marketing Co-operative Societies | 4(1.6) | - | 4(1.6) | 246(98.4) | 250(100.0) |
| Manufacturers | 3( 3) | - | 3( 3) | 97(97) | 100(100.0) |

*Figures in the parenthesis denote percentage to row total;* Source: *Field Survey*

Analysis given in Table 5.23 shows that out of 26 (5.2 per cent of the total) participants in the futures market, 6 (1.2 per cent) growers have made profit from futures market and the remaining 20 (4 per cent) have suffered loss from futures market. Out of 420 participants in the futures market, 180 (36 per cent) dealers have made profit from futures market and the remaining 240 (48 per cent) have incurred loss from futures market. All the participant manufacturers and RPS & Rubber Marketing Co-operative Societies have made profit from futures trading.

### 5.4.11 Delivery from and to the Warehouse

In futures market delivery is not compulsory. A futures market position can be squared up by taking an opposite position before the due date. Delivery from and to the warehouse is given in Table 5.24.

**Table 5.24 Delivery from and to Warehouse**

| Market Participants | Participation in the futures market | | | | | Non-participants | Total |
|---|---|---|---|---|---|---|---|
| | Given delivery | | Taken delivery | | Total | | |
| | Yes | No | Yes | No | | | |
| Growers | - | 26(5.2) | - | - | 26(5.2) | 474(94.8) | 500(100.0) |
| Dealers | 165(33) | 255(51) | 118(23.6) | 302(60.4) | 420(84) | 80(16) | 500(100.0) |
| RPS & Rubber Marketing Co-operative Societies | 4(1.6) | - | 4(1.6) | - | 4(1.6) | 246(98.4) | 250(100.0) |
| Manufacturers | - | - | 6(6) | - | - | 94(94) | 100(100.0) |

*Figures in the parenthesis denote percentage to row total;* Source: *Field Survey*

Analysis given in Table 5.24 shows that among the futures market participant growers nobody has given delivery in the warehouse. Out of 420 participant dealers, 165 dealers have given delivery in the warehouse and 118 dealers have taken delivery from warehouse. The entire participant RPS &

Rubber Marketing Co-operative Societies have given and taken delivery from warehouse. Six manufacturers have taken delivery from warehouse and they have the opinion that delivered rubber is of low quality.

## 5.5 Objective No. 6

**Market Participant's Awareness and Perception about Futures Trading**

From the review of literature and discussion with experts in the field, 5 statements were developed to measure the awareness about futures trading and 16 statements were developed to measure the perception about futures trading. Primary data were collected using four separate sets of interview schedules developed after pilot study. The interview schedules developed for collecting data were finalized after a pilot study among 50 dealers, 50 growers, 50 manufacturers and 50 RPS & Rubber Marketing Cooperative Societies. Data were collected in five points Likert scale as strongly disagree, disagree, neither agree nor disagree (neutral), agree and strongly agree. Futures market participants were asked to rate these statements as 1 strongly disagree, 2 is disagree, 3 is neither agree nor disagree (neutral), 4 is agree and 5 is strongly agree. The reliability of the instrument was assessed by using Chronbach's Alpha, the most commonly used index for assessing reliability. The Chronbach's Alpha coefficient calculated was 0.97 and 0.73 for awareness and perception respectively in the case of schedules used for collecting data from growers. The Chronbach's Alpha coefficient calculated was 0.72 and 0.751 for awareness and perception respectively in the case of schedules used for collecting data from dealer. The Chronbach's Alpha coefficient calculated was 0.96 and 0.76 for awareness and perception respectively in the case of schedules used for collecting data from manufacturers. The Chronbach's Alpha coefficient calculated was 0.83 and 0.74 for awareness and perception respectively in the case of schedules used for collecting data from RPS and Rubber Marketing Co-operative Societies. The Chronbach's Alpha coefficient obtained are above the minimum acceptable level, thereby confirmed the reliability of the instruments used for collecting primary data. A group of professionals in the field of futures trading, large estate owners, big dealers, big manufacturers, leading Rubber Marketing Co-operative Societies and RPS and academicians have been interviewed and their suggestions were incorporated while finalizing the schedule to ensure content validity. The interview schedule for collecting data was administered to 500 growers, 500 dealers, 100 manufacturers and 250 Rubber Marketing Co-operative Societies and RPS. The normality of the collected data for measuring awareness and perception about futures trading was examined separately for each category of participants using Kolmogorov – Smirnov statistic. As the significance level was less than 0.05 natural logarithmic transformations of the data was done and normality was again checked using Kolmogorov – Smirnov statistic. The data collected for measuring awareness and perception from growers, dealers, manufacturers and Rubber Marketing Co-operative Societies & RPS were found to be not normal.

## 5.6 Hypothesis Testing

Market Participant's awareness and perception about futures trading has been analysed by framing hypotheses and its results are presents below. Further, it contains the level of awareness/ perception of market participants and non- participants with respect to selected variables such as educational qualification, profession, deferment of sales/ purchase, area of plantation, compensation of loss from futures market, hedgers, speculators, turnover, consumption category and ownership structure.

### 5.6.1 Awareness and Perception of Rubber Growers with respect to Participation

Awareness and perception of rubber growers with respect to participation/ non- participation is presented in paragraphs 5.6.1.1 and 5.6.1.2 respectively.

#### 5.6.1.1 Hypothesis No. 1

H1: There exists significant difference in the awareness about futures trading of participant and non-participant growers.

Out of 500 growers, 473 growers have never taken a position in futures market. Only 26 growers have participated in rubber futures market. The mean score ranks assigned to participant and non-participant growers of rubber futures market, on the basis of their awareness on futures trading is presented in Table 5.25.

**Table 5.25 Mean score ranks assigned to participant and non-participant growers of futures market on the basis of Awareness.**

| Participation in the futures market | Awareness on futures trading | | |
|---|---|---|---|
| | N | Mean Rank | Sum of Ranks |
| Yes | 26 | 476.54 | 12390.00 |
| No | 474 | 238.10 | 112860.00 |
| Total | 500 | | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.25 | Awareness | 285.000 | 112860.000 | -8.683 | .000 | Significant |

Mean ranks assigned to participants and non-participant growers of futures market on the basis of their awareness on futures trading (Table 5.25) reveals that participant growers have high awareness on futures trading compared to non-participants. It can be concluded that participation of growers in the futures market has direct bearing on awareness on futures trading.

Mann-Whitney U Test was conducted to know whether participant and non- participant growers of futures market have the same level of awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -8.683$, $p < 0.05$. This implies that significant difference in awareness exists between participants and non-participant growers of futures market.

The data (Table 5.25) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant growers of futures market with awareness on futures trading, supported and proved the first hypothesis.

#### 5.6.1.2 Hypothesis No. 2

H2: There exists significant difference in the perception about futures trading of participant and non-participant growers.

The mean score ranks assigned to participant and non-participant growers of rubber futures market, on the basis of their perception on futures trading is presented in Table 5.26.

**Table 5.26 Mean score ranks assigned to participant and non-participant growers of futures market on the basis of Perception.**

| Participation in the futures market | Awareness on futures trading | | |
|---|---|---|---|
| | N | Mean Rank | Sum of Ranks |
| Yes | 26 | 338.19 | 8793.00 |
| No | 474 | 245.69 | 116457.00 |
| Total | 500 | | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.26 | Perception | 3882.000 | 116457.000 | -3.198 | .001 | Significant |

Mean ranks assigned to participants and non-participant growers of futures market on the basis of their perception on futures trading (Table 5.26) reveals that participant growers have high perception on futures trading compared to non-participants. It can be concluded that participation of growers in the futures market has direct bearing on perception on futures trading.

Mann-Whitney U Test was conducted to know whether participant and non- participant growers of futures market have the same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -3.198$, $p< 0.05$. This implies that significant difference in perception exists between participant and non-participant growers of futures market.

The data (Table 5.26) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant growers of futures market with perception on futures trading, supported and proved the second hypothesis.

### 5.6.2 Awareness and Perception of Growers with respect to Compensation of Loss from Futures Market

Out of 26 growers who have participated in futures market, 6 participants have compensated their physical market loss from futures market; remaining 20 growers have not compensated their physical market loss from futures market. The awareness mean score ranks assigned to growers who have compensated their loss from futures market and those who have not compensated their loss from futures market is presented in Table 5.27.

**Table 5.27 Awareness mean score ranks assigned to growers who have compensated /not compensated loss from futures market**

| Compensation of loss from futures market | Awareness on futures trading | | |
|---|---|---|---|
| | N | Mean Rank | Sum of Ranks |
| Yes | 6 | 10.83 | 65.00 |
| No | 20 | 14.30 | 286.00 |
| Total | 26 | | |

Source: *Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.27 | Awareness | 44.000 | 65.000 | -1.041 | .298 | Not significant |

Mann-Whitney U Test was conducted to know whether growers who have compensated their loss and not have the same awareness on futures trading, and the result is found to be not significant at 5 percent level of significance, $z = -1.041$, $p > 0.05$. This implies that no significant difference in awareness exists between growers who have compensated their loss or not from futures market.

The perception mean score ranks assigned to growers who have compensated their loss from futures market and those who have not compensated their loss from futures market is presented in Table 5.28.

**Table 5.28 Perception mean score ranks assigned to growers who have compensated/ not compensated loss from futures market**

| Compensation of loss from futures market | Perception on futures trading | | |
|---|---|---|---|
| | N | Mean Rank | Sum of Ranks |
| Yes | 6 | 9.83 | 59.00 |
| No | 20 | 14.60 | 292.00 |
| Total | 26 | | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.28 | Perception | 8.0030 | 59.000 | -1.382 | .167 | Not significant |

Mann-Whitney U Test was conducted to know whether growers who have compensated their loss and not compensated their loss from futures market have the same perception about future trading, and the result is found to be not significant at 5 percent level of significance, $z = -1.382$, $p > 0.05$. This implies that no significant difference in perception exists between growers who have compensated their loss or not from futures market.

### 5.6.3 Awareness and Perception of Growers with respect to Educational Qualification

Out of 500 growers 34 are SSLC, 54 are +2, 288 are graduates and remaining 124 are with other educational qualifications. Mean score assigned to growers on the basis of their awareness on futures trading with respect to their educational qualification is presented in Table 5.29.

**Table 5.29 Mean score ranks assigned to growers on the basis of Awareness with respect to educational qualification.**

| Educational qualification | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| SSLC | 34 | 141.74 |
| +2 | 54 | 223.04 |
| Graduation and above | 288 | 292.14 |
| Others specify | 124 | 195.57 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.29 | Awareness | 70.827 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether growers across different educational qualifications have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=500) = 70.827, p< 0.05. This implies that significant difference in awareness exists across educational qualifications.

Mean score assigned to growers on the basis of their perception on futures trading with respect to their educational qualification is presented in Table 5.30.

**Table 5.30 Mean score ranks assigned to growers on Perception basis with respect to educational qualification.**

| Educational qualification | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| SSLC | 34 | 275.50 |
| +2 | 54 | 251.17 |
| Graduation and above | 288 | 259.18 |
| Others specify | 124 | 223.19 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.30 | Perception | 6.569 | 3 | .087 | Not significant |

Kruskal Wallis test was conducted to know whether growers across different educational qualifications have same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, $\chi^2$ (3, n=500) = 6.569, p> 0.05. This implies that no significant difference in perception exists across educational qualifications.

### 5.6.4 Awareness and Perception of Growers with respect to Profession

Out of 500 growers, 56 are farmers, 26 are private employed, 278 are government employees and 140 are self employees. Mean score ranks assigned to growers on the basis of their awareness on futures trading with respect to their profession are presented in Table 5.31.

**Table 5.31 Mean score ranks assigned to growers on the basis of Awareness with respect to profession**

| Profession | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Farming | 56 | 200.64 |
| Private | 26 | 196.81 |
| Government job | 278 | 290.91 |
| Self employed | 140 | 200.18 |
| Total | 500 | |

Source: Field Survey

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.31 | Awareness | 55.018 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether growers across different professions have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=500) = 55.018, $p< 0.05$. This implies that significant difference in awareness exists across different professions.

Mean score ranks assigned to growers on the basis of their perception on futures trading with respect to their profession are presented in Table 5.32.

**Table 5.32 Mean score ranks assigned to growers on the basis of Perception with respect to Profession**

| Profession | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Farming | 56 | 187.75 |
| Private | 26 | 330.19 |
| Government job | 278 | 262.93 |
| Self employed | 140 | 236.11 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.32 | Perception | 22.194 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether growers across different professions have the same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=500) = 22.194, p< 0.05. This implies that significant difference in perception exists across different professions.

### 5.6.5 Awareness and Perception of Growers with respect to Deferment of Sales

If growers get the information that future spot price of rubber will increase, they may defer the sales by certain period. Eight growers may defer the sales by one month, 122 growers may defer the sales by two months, 270 by three months and 100 by six months. Mean score ranks assigned to growers on the basis of their awareness on futures trading with respect to deferment of sales is presented in Table 5.33.

**Table 5.33 Awareness mean score ranks assigned to growers on the basis deferment of sales.**

| Deferment of sales | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| One month | 8 | 307.38 |
| Two months | 122 | 188.86 |
| Three months | 270 | 211.17 |
| Six months | 100 | 427.35 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.33 | Awareness | 217.085 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether growers across varying deferment of sales have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=500) = 217.085, p< 0.05. This implies that significant difference in awareness exists across varying deferment of sales.

Mean score ranks assigned to growers on the basis of their and perception on futures trading with respect to deferment of sales is presented in Table 5.34.

**Table 5.34 Perception mean score ranks assigned to growers on the basis of deferment of sales.**

| Deferment of sales | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| One month | 8 | 143.50 |
| Two months | 122 | 222.93 |
| Three months | 270 | 277.78 |
| Six months | 100 | 219.04 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.34 | Perception | 23.490 | 3 | .000 | Significant |

Kruskal Wallis test was conducted To know whether growers across varying deferment of sales have same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=500) = 23.490, p< 0.05. This implies that significant difference in perception exists across varying deferment of sales.

### 5.6.6 Awareness and Perception of Growers vis-à-vis Area of Plantation

Out of 500 growers 200 have area of plantation 2 ha & below, 200 have above 2 ha & up to & including 4 ha, 44 have above 4 ha & up to & including 10 ha, 28 have above 10 ha & up to & including 20 ha, 9 have above 20 ha & up to & including 40 ha, 12 have above 40 ha & up to & including 200 ha, 2 have above 200 ha & up to & including 400 ha, 2 have above 400 ha & up to & including 600 ha and 3 have above 600 ha. Awareness mean score ranks assigned to growers on the basis of area of plantation is presented in Table 5.35.

**Table 5.35 Mean score ranks assigned to growers on the basis of Awareness and area of plantation.**

| Area of plantation | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| 2 ha & below | 200 | 182.97 |
| Above 2 ha &up to& including 4 ha | 200 | 229.61 |
| Above 4 ha &up to& including 10 ha | 44 | 427.25 |
| Above 10 ha &up to& including 20 ha | 28 | 427.43 |
| Above 20 ha &up to& including 40 ha | 9 | 426.56 |
| Above 40 ha &up to& including 200 ha | 12 | 428.08 |
| Above 200 ha &up to& including 400 ha | 2 | 423.50 |
| Above 400 ha &up to& including 600 ha | 2 | 423.50 |
| Above 600 ha | 3 | 432.67 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.35 | Awareness | 222.062 | 8 | .000 | Significant |

Kruskal Wallis test was conducted to know whether growers across different area of plantation have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (8, n=500) = 222.062, $p< 0.05$. This implies that significant difference in awareness exists across different area of plantation.

Mean score ranks assigned to growers on the basis of their perception on futures trading and area of plantation is presented in Table 5.36.

**Table 5.36 Mean score ranks assigned to growers on the basis of Perception and area of plantation.**

| Area of plantation | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| 2 ha & below | 200 | 276.45 |
| Above 2 ha &up to& including 4 ha | 200 | 240.28 |
| Above 4 ha &up to& including 10 ha | 44 | 219.45 |
| Above 10 ha &up to& including 20 ha | 28 | 218.71 |
| Above 20 ha &up to& including 40 ha | 9 | 222.33 |
| Above 40 ha &up to& including 200 ha | 12 | 216.00 |
| Above 200 ha &up to& including 400 ha | 2 | 235.00 |
| Above 400 ha &up to& including 600 ha | 2 | 235.00 |
| Above 600 ha | 3 | 197.00 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.36 | Perception | 12.478 | 8 | .131 | Not significant |

Kruskal Wallis test was conducted to know whether growers across different area of plantation have same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, $\chi^2$ (8, n=500) = 12.478, p> 0.05. This implies that no significant difference in perception exists across different area of plantation.

### 5.6.7 Awareness and Perception of Growers and the Category of Ownership

Out of 500 growers 5 are Public Limited Companies, 48 are Private Limited Companies, 44 are partnership firms, 2 are government department and corporations, 1 belongs to Socio – religious trusts and societies and 400 belong to none of the above mentioned categories. Mean score ranks assigned to growers on the basis of their awareness on futures trading and the category of ownership is presented in Table 5.37.

**Table 5.37 Mean score ranks assigned to growers on the basis of Awareness and the Category of Ownership**

| Category of Ownership | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Public Limited Company | 5 | 440.00 |
| Private Limited Company | 48 | 426.94 |
| Partnership firm | 44 | 427.25 |
| Government department and corporations | 2 | 423.50 |
| Socio – religious trusts and societies | 1 | 396.00 |
| Not applicable | 400 | 206.29 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.37 | Awareness | 210.445 | 5 | .000 | Significant |

Kruskal Wallis test was conducted to know whether growers across different category of ownership of plantation have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (5, n=500) = 210.445, p< 0.05. This implies that significant difference in awareness exists across different category of ownership of plantation.

Mean score ranks assigned to growers on the basis of their perception on futures trading and the category of ownership is presented in Table 5.38.

**Table 5.38 Mean score ranks assigned to growers on the basis of Perception and the Category of Ownership**

| Category of Ownership | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Public Limited Company | 5 | 166.60 |
| Private Limited Company | 48 | 220.75 |
| Partnership firm | 44 | 219.45 |
| Government department and corporations | 2 | 235.00 |
| Socio – religious trusts and societies | 1 | 349.00 |
| Not applicable | 400 | 258.37 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.38 | Perception | 7.519 | 5 | .185 | Not significant |

Kruskal Wallis test was conducted to know whether growers across different type of ownership of plantation have the same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, $\chi^2$ (5, n=500) = 7.519, p> 0.05. This implies that no significant difference in perception exists across different category of ownership of plantation.

### 5.6.8 Awareness and Perception of Participant and Non-Participant Dealers

Awareness and perception of rubber dealers with respect to participation/ non- participation is presented in paragraphs 5.6.8.1 and 5.6.8.2 respectively.

### 5.6.8.1 Hypothesis No. 3

H3: There exists significant difference in the awareness about futures trading of participant and non-participant dealers.

Out of 500 dealers, 420 dealers have taken position in futures market and 20 dealers have not participated in rubber futures market. The mean score ranks assigned to participant and non-participant dealers of rubber futures market, on the basis of their awareness on futures trading is presented in Table 5.39.

**Table 5.39 Mean score ranks assigned to participant and non-participant dealers of futures market on the basis of Awareness.**

| Participation in the futures market | | Awareness on futures trading |
|---|---|---|
| | N | Mean Rank |
| Yes | 420 | 274.31 |
| No | 80 | 125.50 |
| Total | 500 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.39 | Awareness | 6800.000 | 10040.000 | -8.695 | .000 | Significant |

Mann-Whitney U Test was conducted to know whether participant and non- participant dealers have the same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -8.695$, $p < 0.05$. This implies that significant difference in awareness exists between participant and non-participant dealers of futures market.

The data (Table 5.39) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant dealers of futures market with awareness on futures trading, supported and proved the third hypothesis.

### 5.6.8.2 Hypothesis No. 4

H4: There exists significant difference in the perception about futures trading of participant and non-participant dealers.

The mean score ranks assigned to participant and non-participant dealers of rubber futures market, on the basis of their perception on futures trading is presented in Table 5.40.

**Table 5.40 Mean score ranks assigned to participant and non-participant dealers of futures market on the basis of Perception.**

| Participation in the futures market | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 420 | 265.26 |
| No | 80 | 173.00 |
| Total | 500 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.40 | Perception | 10600.000 | 13840.000 | -5.262 | .000 | Significant |

Mann-Whitney U Test was conducted to know whether participant and non- participant dealers have the same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -5.262$, $p < 0.05$. This implies that significant difference in perception exists between participant and non-participant dealers of futures market.

The data (Table 5.40) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant dealers of futures market with perception on futures trading, supported and proved the fourth hypothesis.

### 5.6.9 Awareness and Perception of Hedger and Non- Hedger Dealers

If market participants have taken equal position of that of physical market stock, then they are hedgers. Out of 420 dealer participants, 199 have participated in the futures market with an exactly equal and opposite position of that of physical market. The mean score ranks assigned to hedger and non-hedger dealers of rubber futures market, on the basis of their awareness on futures trading is presented in Table 5.41.

**Table 5.41 Mean score ranks assigned to hedger and non-hedger dealers of rubber futures market on the basis of Awareness**

| Participation in the futures market with an exactly equal and opposite position of that of physical market. | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 199 | 210.15 |
| No | 221 | 210.82 |
| Total | 420 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.41 | Awareness | 21919.000 | 41819.000 | -.058 | .953 | Not Significant |

Mann-Whitney U Test was conducted to know whether hedger and non-hedger dealers have the same awareness on futures trading, and the result is found to be not significant at 5 percent level of significance, $z = -0.058$, $p > 0.05$.

This implies that no significant difference in awareness exists between hedger and non-hedger dealers of futures market.

The mean score ranks assigned to hedger and non-hedger dealers of rubber futures market, on the basis of their perception on futures trading is presented in Table 5.42.

**Table 5.42 Mean score ranks assigned to hedger and non-hedger dealers of rubber futures market on the basis of Perception**

| Participation in the futures market with an exactly equal and opposite position of that of physical market. | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 199 | 150.65 |
| No | 221 | 264.39 |
| Total | 420 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.42 | Perception | 10080.000 | 29980.000 | -9.650 | .000 | Significant |

Mann-Whitney U Test was conducted to know whether hedger and non- hedger dealers have the same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -9.650$, $p < 0.05$. This implies that significant difference in perception exists between hedger and non-hedger dealers of futures market.

### 5.6.10 Awareness and Perception of Speculator and Non-Speculator Dealers

If market participants have taken more positions than physical market stock, then they are speculators. Out of 420 dealer participants in the futures market, 213 dealers have hedged more than their physical market position. It indicates that 213 dealers are speculators and remaining 207 are non- speculators. The mean score ranks assigned to speculator and non- speculator dealers of rubber futures market, on the basis of their awareness on futures trading is presented in Table 5.43.

**Table 5.43 Mean score ranks assigned to speculator and non- speculator dealers of rubber futures market on the basis of Awareness**

| Quantity hedged is more than physical market position | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 213 | 208.61 |
| No | 207 | 212.44 |
| Total | 420 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.43 | Awareness | 21643.000 | 44434.000 | -.333 | .739 | Not Significant |

Mann-Whitney U Test was conducted to know whether speculator and non- speculator dealers have the same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -0.333$, $p > 0.05$. This implies that no significant difference in awareness exists between speculator and non- speculator dealers of futures market.

The mean score ranks assigned to speculator and non- speculator dealers of rubber futures market, on the basis of their perception on futures trading is presented in Table 5.44.

**Table 5.44 Mean score ranks assigned to speculator and non- speculator dealers of rubber futures market on the basis of Perception**

| Quantity hedged is more than physical market position | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 213 | 156.19 |
| No | 207 | 266.38 |
| Total | 420 | |

Source: *Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.44 | Perception | 10478.000 | 33269.000 | -9.361 | .000 | Significant |

Mann-Whitney U Test was conducted to know whether speculator and non- speculator dealers have the same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -9.361$, $p < 0.05$. This implies that significant difference in perception exists between speculator and non- speculator dealers of futures market.

### 5.6.11 Awareness and Perception of Dealers with respect to Compensation of Loss from Futures Market

Out of 420 dealers who have participated in futures market, 180 participants have compensated their physical market loss from futures market; remaining 240 dealers have not compensated their physical market loss from futures market. The mean score ranks assigned to dealers who have compensated their loss from futures market and those who are not compensated their loss from futures market on the basis of their awareness on futures trading is presented in Table 5.45.

**Table 5.45 Awareness mean score ranks assigned to dealers who have compensated/ not compensated loss from futures market**

| Compensation of loss from futures market | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 180 | 245.00 |
| No | 240 | 184.63 |
| Total | 420 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.45 | Awareness | 15390.0 | 44310.000 | -5.186 | .000 | Significant |

Mann-Whitney U Test was conducted to know whether dealers who have compensated their loss and not compensated their loss from futures market have the same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $z = -5.186$, $p < 0.05$. This implies that significant difference in awareness exists between dealers who have compensated their loss from futures market and not compensated their loss from futures market.

The mean score ranks assigned to dealers who have compensated their loss from futures market and those who are not compensated their loss from futures market on the basis of their perception on futures trading is presented in Table 5.46.

**Table 5.46 Perception mean score ranks assigned to dealers who have compensated/ not compensated loss from futures market**

| Compensation of loss from futures market | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 180 | 266.44 |
| No | 240 | 168.54 |
| Total | 420 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.46 | Perception | 11530.0 | 40450.000 | -8.232 | .000 | Significant |

Mann-Whitney U Test was conducted to know whether dealers who have compensated their loss and not compensated their loss from futures market have the same perception about future trading, and the result is found to be significant at 5 percent level of significance, $z = -1.382$, $p > 0.05$. This implies that significant difference in perception exists between dealers who have compensated their loss from futures market and not compensated their loss from futures market.

### 5.6.12 Awareness and Perception of Dealers vis-a-vis Educational Qualification

Out of 500 dealers, 80 are SSLC, 100 are +2 and 320 are graduates. Mean score assigned to dealers on the basis of their awareness on futures trading with respect to their educational qualification is presented in Table 5.47.

**Table 5.47 Mean score ranks assigned to dealers on the basis of Awareness vis-a-vis educational qualification.**

| Educational qualification | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| SSLC | 80 | 280.75 |
| +2 | 100 | 189.90 |
| Graduation and above | 320 | 261.88 |
| Total | 500 | |

Source: *Field Survey*

Kruskal Wallis Test Result

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.47 | Awareness | 24.480 | 2 | .000 | Significant |

Kruskal Wallis test was conducted to know whether dealers across different educational qualifications have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (2, n=500) = 24.480, $p< 0.05$. This implies that significant difference in awareness exists across educational qualifications.

Mean score assigned to dealers on the basis of their perception on futures trading with respect to their educational qualification is presented in Table 5.48.

**Table 5.48 Mean score ranks assigned to dealers on the basis of Perception vis-a-vis educational qualification.**

| Educational qualification | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| SSLC | 80 | 193.00 |
| +2 | 100 | 212.50 |
| Graduation and above | 320 | 276.75 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test Result

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.48 | Perception | 30.471 | 2 | .000 | Significant |

Kruskal Wallis test was conducted to know whether dealers across different educational qualifications have same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi 2$ (2, n=500) = 30.471, $p< 0.05$. This implies that significant difference in perception exists across educational qualifications.

### 5.6.13 Awareness and Perception of Dealers with respect to Deferment of Sales

If dealers get the information that future spot price of rubber will increase, they may defer the sales by certain period. One hundred and twenty dealers may defer the sales by one week, 274 dealers may defer the sales by one month and 106 dealers may defer the sales by three months. Mean score ranks assigned to dealers on the basis of their awareness on futures trading with respect to deferment of sales is presented in Table 5.49.

**Table 5.49 Mean score ranks assigned to dealers on the basis of Awareness with respect to deferment of sales.**

| Deferment of sales | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| One week | 120 | 269.08 |
| One month | 274 | 195.13 |
| Three months | 106 | 372.59 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.49 | Awareness | 125.065 | 2 | .000 | Significant |

Kruskal Wallis test was conducted to know whether dealers across varying deferment of sales have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (2, n=500) = 125.065, p< 0.05. This implies that significant difference in awareness exists across varying deferment of sales.

Mean score ranks assigned to dealers on the basis of their perception on futures trading with respect to deferment of sales is presented in Table 5.49.

**Table 5.50 Mean score ranks assigned to dealers on the basis of Perception with respect to deferment of sales.**

| Deferment of sales | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| One week | 120 | 233.83 |
| One month | 274 | 193.73 |
| Three months | 106 | 416.12 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.50 | Perception | 185.141 | 2 | .000 | Significant |

Kruskal Wallis test was conducted to know whether dealers across varying deferment of sales have same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (2, n=500) = 185.141, p< 0.05. This implies that significant difference in perception exists across varying deferment of sales.

### 5.6.14 Awareness and Perception of Dealers with respect to Turnover

Out of 500 dealers, 40 have turnover of 10 tonnes and below, 160 have above 10 tonnes and up to and including 50, 140 have above 50 tonnes and up to and including 100, 15 have above 100 tonnes and up to and including 500, 20 have above 500 tonnes and up to and including 1000 and 125 have above 1000 tonnes. Mean score ranks assigned to dealers on the basis of their awareness on futures trading with respect to turnover is presented in Table 5.51.

**Table 5.51 Mean score ranks assigned to dealers on the basis of Awareness with respect to turnover**

| Turnover | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| 10 tonnes and below | 40 | 471.00 |
| Above 10 tonnes and up to and including 50 | 160 | 167.25 |
| Above 50 tonnes and up to and including 100 | 140 | 168.21 |
| Above 100 tonnes and up to and including 500 | 15 | 408.00 |
| Above 500 tonnes and up to and including 1000 | 20 | 307.50 |
| Above 1000 tonnes | 125 | 350.64 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.51 | Awareness | 289.189 | 5 | .000 | Significant |

Kruskal Wallis test was conducted to know whether dealers across different turnover have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (5, n=500) = 289.189, p< 0.05. This implies that significant difference in awareness exists across different turnover.

Mean score ranks assigned to dealers on the basis of their perception on futures trading with respect to turnover is presented in Table 5.52.

**Table 5.52 Mean score ranks assigned to dealers on the basis of Perception with respect to turnover**

| Turnover | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| 10 tonnes and below | 40 | 265.50 |
| Above 10 tonnes and up to and including 50 | 160 | 153.00 |
| Above 50 tonnes and up to and including 100 | 140 | 174.79 |
| Above 100 tonnes and up to and including 500 | 15 | 467.00 |
| Above 500 tonnes and up to and including 1000 | 20 | 370.50 |
| Above 1000 tonnes | 125 | 410.12 |
| Total | 500 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.52 | Perception | 315.097 | 5 | .000 | Significant |

Kruskal Wallis test was conducted to know whether dealers across different turnover have same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (5, n=500) = 315.097, $p< 0.05$. This implies that significant difference in perception exists across different turnover.

### 5.6.15 Awareness and Perception of Participant and Non-Participant Rubber Product Manufacturers

Awareness and perception of rubber manufacturers with respect to participation/ non- participation is presented in paragraphs 5.6.15.1 and 5.6.15.2 respectively.

### 5.6.15.1 Hypothesis No. 5

H5: There exists no significant difference in the awareness about futures trading of participant and non-participant rubber product manufacturers.

Out of 100manufacturers, 3 manufacturers have taken a position in futures market and 97 manufacturers have not participated in rubber futures market. The mean score ranks assigned to participant and non-participant manufacturers of rubber futures market, on the basis of their awareness on futures trading is presented in Table 5.53.

**Table 5.53 Mean score ranks assigned to participants and non-participants of futures market on the basis of Awareness**

| Participation in the futures market | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 3 | 79.83 |
| No | 97 | 49.59 |
| Total | 100 | |

Source: Field Survey

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.53 | Awareness | 57.500 | 4810.500 | -1.810 | .070 | Not significant |

Mann-Whitney U Test was conducted to know whether participant and non- participant manufacturers have the same awareness on futures trading, and the result is found to be not significant at 5 percent level of significance, $z = -1.810$, $p > 0.05$. This implies that no significant difference in awareness exists between participant and non-participant manufacturers of futures market.

The data (Table 5.53) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant manufacturers of futures market with awareness on futures trading, supported and proved the fifth hypothesis.

### 5.6.15.2 Hypothesis No. 6

H6: There exists no significant difference in the perception about futures trading of participant and non-participant rubber product manufacturers.

The mean score ranks assigned to participant and non-participant manufacturers of rubber futures market, on the basis of their perception on futures trading is presented in Table 5.54.

**Table 5.54 Mean score ranks assigned to participants and non-participants of futures market on the basis of Perception.**

| Participation in the futures market | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 3 | 37.50 |
| No | 97 | 50.90 |
| Total | 100 | |

Source: Field Survey

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.54 | Perception | 106.500 | 112.500 | -.796 | .426 | Not significant |

Mann-Whitney U Test was conducted to know whether participant and non- participant manufacturers have the same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, z =-5.262, p> 0.05. This implies that no significant difference in perception exists between participant and non-participant manufacturers of futures market.

The data (Table 5.54) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant manufacturers of futures market with perception on futures trading, supported and proved the sixth hypothesis stated.

### 5.6.16 Awareness and Perception of Manufacturers on the Basis of Consumption Category

Out of 100 manufacturers, 24 belong to the category A (10 tonnes and below), 30 to B (above 10 tonnes and up to and including 50), 30 to C (above 50 tonnes and up to and including 100), 10 to D (Above 100 tonnes and up to and including 500), 3 to E (above 500 tonnes and up to and including 1000) and 3 to F (above 1000 tonnes). Mean score ranks assigned to manufacturers on the basis of their awareness on futures trading and consumption category is presented in Table 5.55.

**Table 5.55 Mean score ranks assigned to manufacturers on the basis of Awareness and consumption**

| Consumption category of manufacturers | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| A (10 tonnes and below) | 24 | 13.33 |
| B (Above 10 tonnes and up to and including 50) | 30 | 56.35 |
| C (Above 50 tonnes and up to and including 100) | 30 | 65.17 |
| D (Above 100 tonnes and up to and including 500) | 10 | 69.80 |
| E (Above 500 tonnes and up to and including 1000) | 3 | 49.00 |
| F (above 1000 tonnes) | 3 | 79.83 |
| Total | 100 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.55 | Awareness | 57.814 | 5 | .000 | Significant |

Kruskal Wallis test was conducted to know whether different consumption category of manufacturers have the same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (5, n=100) = 57.814, p< 0.05. This implies that significant difference in awareness exists across different consumption categories of manufacturers.

Mean score ranks assigned to manufacturers on the basis of their perception on futures trading and consumption category is presented in Table 5.56.

**Table 5.56 Mean score ranks assigned to manufacturers on the basis of Perception and consumption.**

| Consumption category of manufacturers | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| A (10 tonnes and below) | 24 | 76.40 |
| B (Above 10 tonnes and up to and including 50) | 30 | 68.23 |
| C (Above 50 tonnes and up to and including 100) | 30 | 24.67 |
| D (Above 100 tonnes and up to and including 500) | 10 | 28.70 |
| E (Above 500 tonnes and up to and including 1000) | 3 | 10.00 |
| F (Above 1000 tonnes) | 3 | 37.50 |
| Total | 100 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.56 | Perception | 67.562 | 5 | .000 | Significant |

Kruskal Wallis test was conducted to know whether different category of manufacturers have the same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (5, n=100) = 67.562, p< 0.05. This implies that significant difference in perception exists between different categories of manufacturers.

### 5.6.17 Awareness and Perception of Manufacturers with respect to Ownership Category

Out of 100 manufacturers, 14 are proprietary ownership firms, 31 are partnership firms, 52 are Private Limited Companies and 3 are Public Limited Companies. Mean score ranks assigned to manufacturers on the basis of their awareness on futures trading with respect to ownership category is presented in Table 5.57.

**Table 5.57 Mean score ranks assigned to manufacturers on the basis of Awareness and ownership category.**

| Ownership Category | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Proprietary ownership | 14 | 11.21 |
| Partnership firm | 31 | 43.95 |
| Private Limited Company | 52 | 63.29 |
| Public Limited Company | 3 | 79.83 |
| Total | 100 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.57 | Awareness | 41.898 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether different ownership category of manufacturers have the same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=100) = 41.898, $p< 0.05$. This implies that significant difference in awareness exists across different ownership categories.

Mean score ranks assigned to manufacturers on the basis of their perception on futures trading with respect to ownership category is presented in Table 5.58.

**Table 5.58 Mean score ranks assigned to manufacturers on the basis of Perception and ownership category.**

| Ownership Category | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Proprietary ownership | 14 | 79.75 |
| Partnership firm | 31 | 72.02 |
| Private Limited Company | 52 | 30.55 |
| Public Limited Company | 3 | 37.50 |
| Total | 100 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.58 | Perception | 57.629 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether different ownership structure of manufacturers have the same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=100) = 57.629, $p< 0.05$.This implies that significant difference in perception exists between different ownership structures of manufacturers.

### 5.6.18 Awareness and Perception of Manufacturers with respect to Deferment of Purchase

If manufacturers get the information that future spot price of rubber will decrease, they may defer the purchase by a certain period. Forty six manufacturers may defer the purchase by one week, 8 by one month, 17 by two months and 29 by three months. Mean score ranks assigned to manufacturers on the basis of their awareness on futures trading with respect to deferment of purchase is presented in Table 5.59.

**Table 5.59 Mean score ranks assigned to manufacturers on the basis of Awareness with respect to deferment of purchase**

| Deferment of purchase | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| One week | 46 | 66.08 |
| One month | 8 | 49.44 |
| Two months | 17 | 36.44 |
| Three months | 29 | 34.33 |
| Total | 100 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.59 | Awareness | 27.234 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether manufacturers across varying deferment of purchase have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=100) = 27.234, $p< 0.05$. This implies that significant difference in awareness exists across varying deferment of purchase.

Mean score ranks assigned to manufacturers on the basis of their perception on futures trading with respect to deferment of purchase is presented in Table 5.60.

**Table 5.60 Mean score ranks assigned to manufacturers on the basis of Perception with respect to deferment of purchase.**

| Deferment of purchase | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| One week | 46 | 25.42 |
| One month | 8 | 56.38 |
| Two months | 17 | 66.82 |
| Three months | 29 | 79.09 |
| Total | 100 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.60 | Perception | 69.622 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether manufacturers across varying deferment of purchase have same perception on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi^2$ (3, n=100) = 69.622, $p< 0.05$. This implies that significant difference in perception exists across varying deferment of purchase.

### 5.6.19 Awareness and Perception of Rubber Marketing Cooperative Societies and RPS

The researcher has collected data from 4 Rubber Marketing Co-operative Societies and 246 RPS. The mean score ranks assigned to Rubber Marketing Co-operative Societies and RPS, on the basis of their awareness on futures trading is presented in Table 5.61.

**Table 5.61 Mean score ranks assigned to Rubber Marketing Co-operative Societies and RPS on the basis of Awareness.**

| Name | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Rubber Marketing Cooperative Societies | 4 | 167.93 |
| RPS | 246 | 124.28 |
| Total | 250 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.61 | Awareness | 553.500 | 30199.500 | -1.639 | .101 | Not significant |

Mann-Whitney U Test was conducted to know whether Rubber Marketing Co-operative Societies and RPS same awareness on futures trading, and the result is found to be not significant at 5 percent level of significance, z =-1.639, p> 0.05. This implies that no significant difference in awareness exists between Rubber Marketing Co-operative Societies and RPS.

The mean score ranks assigned to Rubber Marketing Co-operative Societies and RPS; on the basis of their perception on futures trading is presented in Table 5.62.

**Table 5.62 Mean score ranks assigned to Rubber Marketing Co-operative Societies and RPS on the basis of Perception.**

| Name | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Rubber Marketing Cooperative Societies | 4 | 101.79 |
| RPS | 246 | 126.18 |
| Total | 250 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.62 | Perception | 684.500 | 712.500 | -.884 | .376 | Not significant |

Mann-Whitney U Test was conducted to know whether Rubber Marketing Co-operative Societies and RPS have the same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, $z = -0.884$, $p > 0.05$. This implies that no significant difference in perception exists between Rubber Marketing Co-operative Societies and RPS.

### 5.6.20 Awareness and Perception of Participant and Non-Participant Rubber Marketing Co-operative Societies & RPS

Awareness and perception of Rubber Marketing Co-operative Societies & RPS with respect to participation/ non- participation is presented in paragraphs 5.6.20.1 and 5.6.20.2 respectively.

#### 5.6.20.1 Hypothesis No. 7

H7: There exists no significant difference in the awareness about futures trading of participant and non-participant Rubber Marketing Co-operative Societies & RPS.

Out of 250 Rubber Marketing Co-operative Societies & RPS, 4 Rubber Marketing Co-operative Societies & RPS have taken a position in futures market and 96 have not participated in rubber futures market. The mean score ranks assigned to participant and non-participant Rubber Marketing Co-operative Societies & RPS of rubber futures market, on the basis of their awareness on futures trading is presented in Table 5.63.

**Table 5.63 Awareness mean score ranks assigned to participant and non-participant Rubber Marketing Co-operative Societies & RPS**

| Participation in the futures market | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 4 | 188.88 |
| No | 246 | 124.47 |
| Total | 250 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.63 | Awareness | 238.500 | 30619.500 | -1.839 | .066 | Not significant |

Mann-Whitney U Test was conducted to know whether participant and non- participant Rubber Marketing Co-operative Societies & RPS have the same awareness on futures trading, and the result is found to be not significant at 5 percent level of significance, z = -1.839, p> 0.05. This implies that no significant difference in awareness exists between participant and non-participant Rubber Marketing Co-operative Societies & RPS.

The data (Table 5.63) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant Rubber Marketing Co-operative Societies & RPS of futures market with awareness on futures trading, supported and proved the seventh hypothesis.

### 5.6.20.2 Hypothesis No. 8

H8: There exists no significant difference in the perception about futures trading of participant and non-participant Rubber Marketing Co-operative Societies & RPS.

The mean score ranks assigned to participant and non-participant Rubber Marketing Co-operative Societies & RPS of rubber futures market, on the basis of their perception on futures trading is presented in Table 5.64.

**Table 5.64 Perception mean score ranks assigned to participant and non-participant Rubber Marketing Co-operative Societies & RPS**

| Participation in the futures market | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Yes | 4 | 79.00 |
| No | 246 | 126.26 |
| Total | 250 | |

*Source: Field Survey*

Mann-Whitney U Test Result

| Table | Variable | Mann-Whitney U | Wilcoxon W | Z | Asymp. Sig. (2-tailed) | Conclusion |
|---|---|---|---|---|---|---|
| 5.64 | Perception | 306.000 | 316.000 | -1.303 | .193 | Not significant |

Mann-Whitney U Test was conducted to know whether participant and non- participant Rubber Marketing Co-operative Societies & RPS have the same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, $z = -1.303$, $p > 0.05$. This implies that no significant difference in perception exists between participant and non-participant Rubber Marketing Co-operative Societies & RPS.

The data (Table 5.64) analysed with the help of Mann-Whitney U test at five per cent level of significance to test the difference between participant and non- participant Rubber Marketing Co-operative Societies & RPS of futures market with perception on futures trading, supported and proved the eighth hypothesis.

### 5.6.21 Awareness and Perception of Rubber Marketing Co-operative Societies & RPS with respect to Deferment of Sales

If Rubber Marketing Co-operative Societies & RPS get the information that future spot price of rubber will increase, they may defer the sales by a certain period. One rubber Marketing co-operative society & RPS may defer the sales by one week, 192 by one month, one by two months, 55 by three months and one by six months. Mean score ranks assigned to Rubber Marketing Co-operative Societies & RPS on the basis of their awareness on futures trading with respect to deferment of sales is presented in Table 5.65.

**Table 5.65 Awareness Mean score ranks assigned to Rubber Marketing Co-operative Societies & RPS on the basis of deferment of sales**

| | Awareness on futures trading | |
|---|---|---|
| **Deferment of sales** | **N** | **Mean Rank** |
| One week | 1 | 194.00 |
| One month | 192 | 138.27 |
| Two months | 1 | 193.00 |
| Three months | 55 | 76.20 |
| Six months | 1 | 250.00 |
| Total | 250 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.65 | Awareness | 39.297 | 4 | .000 | Significant |

Kruskal Wallis test was conducted to know whether Rubber Marketing Co-operative Societies & RPS across varying deferment of sales have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi 2$ (4, n=250) = 39.297, $p < 0.05$. This implies that significant difference in awareness exists across varying deferment of sales.

Mean score ranks assigned to Rubber Marketing Co-operative Societies & RPS on the basis of their perception on futures trading with respect to deferment of sales is presented in Table 5.66.

**Table 5.66 Perception Mean score ranks assigned to Rubber Marketing Co-operative Societies & RPS on the basis of deferment of sales.**

| Deferment of sales | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| One week | 1 | 1.00 |
| One month | 192 | 126.43 |
| Two months | 1 | 78.00 |
| Three months | 55 | 124.48 |
| Six months | 1 | 175.00 |
| Total | 250 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.66 | Perception | 3.946 | 4 | .413 | Not significant |

Kruskal Wallis test was conducted to know whether Rubber Marketing Co-operative Societies & RPS across varying deferment of sales have same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, $\chi 2$ (4, n=250) = 3.946, $p > 0.05$. This implies that no significant difference in perception exists across varying deferment of sales.

### 5.6.22 Awareness and Perception of Rubber Marketing Co-operative Societies & RPS with respect to Turnover

Out of 250 Rubber Marketing Co-operative Societies & RPS, 108 have turnover above 10 tonnes and up to and including 50, 135 have above 50 tonnes and up to and including 100, 5 have above 500 tonnes and up to and including 1000 and 2 have above 1000 tonnes. Mean score ranks assigned to Rubber Marketing Co-operative Societies & RPS on the basis of their awareness on futures trading with respect to turnover is presented in Table 5.67.

**Table 5.67 Awareness mean score ranks assigned to Rubber Marketing Cooperative Societies & RPS on the basis of turnover**

| Turnover | Awareness on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Above 10 tonnes and up to and including 50 | 108 | 147.75 |
| Above 50 tonnes and up to and including 100 | 135 | 105.50 |
| Above 500 tonnes and up to and including 1000 | 5 | 140.70 |
| Above 1000 tonnes | 2 | 236.00 |
| Total | 250 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.67 | Awareness | 27.558 | 3 | .000 | Significant |

Kruskal Wallis test was conducted to know whether Rubber Marketing Co-operative Societies & RPS across different turnover have same awareness on futures trading, and the result is found to be significant at 5 percent level of significance, $\chi2$ (3, n=250) = 27.558, p< 0.05. This implies that significant difference in awareness exists across different turnover.

Mean score ranks assigned to Rubber Marketing Co-operative Societies & RPS on the basis of their perception on futures trading with respect to turnover is presented in Table 5.68.

**Table 5.68 Perception mean score ranks assigned to Rubber Marketing Co-operative Societies & RPS on the basis of turnover**

| Turnover | Perception on futures trading | |
|---|---|---|
| | N | Mean Rank |
| Above 10 tonnes and up to and including 50 | 108 | 121.10 |
| Above 50 tonnes and up to and including 100 | 135 | 130.25 |
| Above 500 tonnes and up to and including 1000 | 5 | 72.50 |
| Above 1000 tonnes | 2 | 175.00 |
| Total | 250 | |

*Source: Field Survey*

Kruskal Wallis Test

| Table | Variable | Chi-Square | df | Asymp. Sig. | Conclusion |
|---|---|---|---|---|---|
| 5.68 | Perception | 4.650 | 3 | .199 | Not significant |

Kruskal Wallis test was conducted to know whether Rubber Marketing Co-operative Societies & RPS across different turnover have same perception on futures trading, and the result is found to be not significant at 5 percent level of significance, $\chi2$ (3, n=250) = 4.650, p> 0.05. This implies that no significant difference in perception exists across different turnover.

## 5.7 Conclusion

The analysis shows that there exists considerable difference in awareness and perception among participant and non- participant rubber growers about futures trading. As in the case of growers there exists significant difference in awareness and perception among participant and non- participant rubber dealers in futures market. No significant difference in awareness and perception among participant and non- participant rubber product manufactures in futures market. Awareness and perception of both participants and non- participants are same in the case of Rubber Producers' Societies and Rubber Marketing Co-operative Societies.

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Chapter 6

# SUMMARY OF FINDINGS, SUGGESTIONS AND CONCLUSION

Contents



## 6.1 Introduction

The present study entitled ‘A Study on Futures Trading in Commodities with Special Reference to Rubber’ has examined in detail the economic functions of rubber futures market with the specific focus on hedging efficiency, elasticity of expectation, index of bias, volatility of spot price of rubber, price discovery and also the awareness and perception of rubber futures market participants viz. rubber growers, rubber dealers, rubber product manufacturers, Rubber Producers’ Societies and Rubber Marketing Co-operative Societies. Hedging efficiency, elasticity of expectation and index of bias have been analysed, taking 111 successive delivery months consisting of 358 different hedge periods such as one month, two months, three months, four months and five months. Volatility of the spot rubber price was evaluated using data from the NMCE (National Multi Commodity Exchange) and the Rubber Board. Closing futures and spot rubber price data sets taken from NMCE was used for testing causality. Primary data collected from rubber growers, rubber dealers, rubber product manufacturers, Rubber Producers’ Societies and Rubber Marketing Co-operative Societies form the basis for analysing the awareness and perception of futures market participants. This chapter provides a summary of major findings of the study, suggestions and conclusions.

## 6.2 Findings of the Study

The important inferences and findings obtained from the analysis of both primary and secondary data are presented here in accordance with the objectives listed in Chapter 1 of the thesis.

### 6.2.1 Objective No.1. Hedging Efficiency

There are 111 delivery months from May 2003 to December 2012. Out of 18508 hedges, 8604 are of one month period, 5832 are of two months period, 3196 are of three months period, 646 are of four months period and 230 are of five months period. Hedging efficiency calculated for the period from May 2003 to December 2012 on the basis of delivery months and hedge periods are summarized in Table 6.1.

**Table 6.1 Number of effective and ineffective hedges from May 2003 to December 2012 – based on delivery months and hedge periods**

| Delivery Months | Number of Effective hedges | | | | | | Number of Ineffective hedges | | | | | | Total | Total Hedge Periods |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1- Month | 2- Month | 3- Month | 4- Month | 5- Month | Total Effective Hedges | 1- Month | 2- Month | 3- Month | 4- Month | 5- Month | Total Ineffective Hedges | | |
| JANUARY | 446 | 275 | 164 | 40 | 21 | 946(67.3) | 211 | 163 | 80 | 5 | 0 | 459(32.7) | 1405 | 27 |
| FEBRUARY | 517 | 336 | 220 | 40 | 22 | 1135(77.7) | 169 | 123 | 29 | 5 | 0 | 326(22.3) | 1461 | 28 |
| MARCH | 547 | 359 | 197 | 31 | 8 | 1142(78.3) | 152 | 112 | 53 | 0 | 0 | 317(21.7) | 1459 | 29 |
| APRIL | 558 | 397 | 213 | 40 | 18 | 1226(75) | 174 | 127 | 82 | 25 | 0 | 408(25) | 1634 | 30 |
| MAY | 594 | 374 | 226 | 39 | 17 | 1250(76.6) | 159 | 129 | 65 | 29 | 0 | 382(23.4) | 1632 | 31 |
| JUNE | 598 | 376 | 201 | 56 | 22 | 1253(74.9) | 155 | 126 | 82 | 34 | 22 | 419(25.1) | 1672 | 32 |
| JULY | 599 | 376 | 240 | 60 | 19 | 1294(81.1) | 151 | 114 | 33 | 3 | 0 | 301(18.9) | 1595 | 31 |
| AUGUST | 526 | 346 | 190 | 22 | 12 | 1096(75.7) | 178 | 124 | 50 | 0 | 0 | 352(24.3) | 1448 | 29 |
| SEPTEMBER | 510 | 352 | 178 | 45 | 4 | 1089(72.3) | 206 | 136 | 76 | 0 | 0 | 418(27.7) | 1507 | 29 |
| OCTOBER | 447 | 267 | 138 | 39 | 14 | 905(59.5) | 267 | 219 | 119 | 11 | 0 | 616(40.5) | 1521 | 30 |
| NOVEMBER | 463 | 259 | 116 | 60 | 23 | 921(56.2) | 274 | 262 | 177 | 4 | 0 | 717(43.8) | 1638 | 31 |
| DECEMBER | 453 | 269 | 171 | 52 | 28 | 973(63.3) | 250 | 211 | 96 | 6 | 0 | 563(36.7) | 1536 | 31 |
| Total | 6258 (72.7) | 3986 (68.3) | 2254 (70.5) | 524 (81) | 208 (90.4) | 13230 (71.5) | 2346 (27.3) | 1846 (31.7) | 942 (29) | 122 (18.9) | 22 ( 9.6) | 5278 (28.5) | 18508 | 358 |

*Note: Figures in the parenthesis denote percentage to total*

Hedging efficiency calculated on the basis of delivery months of all the years under the study reveals that, it is hovering between 56.2 per cent and 81.1 per cent. Generally July and February are the best delivery months with average hedging efficiency of 81.1 per cent and 77.7 per cent respectively, while November and October are the worst delivery months with average hedging efficiency of 56.2 per cent and 59.5 per cent respectively. Further, from July to January one can find a decline in the proportion of effective hedges: 81.1 per cent in July, 75.7 per cent in August, 72.3 per cent in September, 59.5 per cent in October, 56.2 per cent in November, 63.3 per cent in December and 67.3 per cent in January. The production of natural rubber slowly increases from August and attains peak production in November, every year; thereafter the production decreases. The decline in effective hedges during the period from July to January is due to the increasing influence of expectation about new crop on the prices of futures, which might diminish the degree of correlation between spot and futures prices. But from January to August the quantum of production of natural rubber is abysmally low and the total crop available in the market is accurately known to the market participants.

On the basis of delivery periods, 5-month hedge period is the best hedge period with an average hedging efficiency of 90.4 per cent. When hedge is held till maturity, hedging efficiency is 100 per cent. Hence, hedging efficiency increases with duration of the hedge period. For January, February, March, April, May, July, August, September, October, November and December delivery months of every year , 5-month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. For the delivery month of June, 1-month hedge period is the best hedge period with an average hedging efficiency of 100 per cent. The year 2012 is the best year with an average hedging efficiency 82.9 per cent. Year by year and month by month figures of the hedging efficiency shows that January 2009 is the best delivery month with an average hedging efficiency of 100 per cent. Out of 18508 hedges 13230 (71.5 per cent) are effective hedges and 5278 (28.5 per cent) are ineffective hedges. The average hedging efficiency of the rubber futures market, NMCE Ahamedabad works out to 71.5 per cent for the whole of the period May 2003 to December 2012. It implies that futures market in rubber for the period from March 2003 to December 2012, on the average, reduced the impact of price risks by 71.5 per cent.

### 6.2.2 Objective No.2. Elasticity of Expectation

The number of delivery months, hedge periods, number of hedges and the length of the hedges of elasticity of expectation for all delivery months are exactly similar to hedging efficiency calculated for all delivery months. Elasticity of expectation calculated for the period from May 2003 to December 2012, on the basis of delivery months and hedge periods is summarized in Table 6.2.

**Table 6.2 Number of stabilizing and destabilizing hedges for the period from May 2003 to December 2012 - based on delivery months and hedge periods**

| Month | Stabilizing effect | | | | | | Destabilizing effect | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1- Month | 2- Month | 3- Month | 4- Month | 5- Month | Total Stabilizing effect | 1- Month | 2- Month | 3- Month | 4- Month | 5- Month | Total Destabilizing effect | |
| January | 306 | 196 | 102 | 45 | 21 | 670(47.7) | 351 | 242 | 142 | 0 | 0 | 735(52.3) | 1405 |
| February | 338 | 209 | 135 | 45 | 22 | 749(51.3) | 348 | 250 | 114 | 0 | 0 | 712(48.7) | 1461 |
| March | 308 | 227 | 158 | 30 | 8 | 731(50.1) | 391 | 244 | 92 | 1 | 0 | 728(49.9) | 1459 |
| April | 372 | 299 | 170 | 39 | 16 | 896(54.8) | 360 | 225 | 125 | 26 | 2 | 738(45.2) | 1634 |
| May | 399 | 303 | 183 | 29 | 17 | 931(57) | 354 | 200 | 108 | 39 | 0 | 701(43) | 1632 |
| June | 421 | 311 | 171 | 57 | 28 | 988(59.1) | 332 | 191 | 112 | 33 | 16 | 684(40.9) | 1672 |
| July | 401 | 222 | 138 | 24 | 8 | 793(49.7) | 349 | 268 | 135 | 39 | 11 | 802(50.3) | 1595 |
| August | 390 | 248 | 139 | 14 | 11 | 802(55.4) | 314 | 222 | 101 | 8 | 1 | 646(44.6) | 1448 |
| September | 447 | 325 | 180 | 44 | 4 | 1000(66.4) | 269 | 163 | 74 | 1 | 0 | 507(33.6) | 1507 |
| October | 400 | 308 | 150 | 48 | 13 | 919(60.4) | 314 | 178 | 107 | 2 | 1 | 602(39.6) | 1521 |
| November | 379 | 212 | 151 | 64 | 23 | 829(50.6) | 358 | 309 | 142 | 0 | 0 | 809(49.4) | 1638 |
| December | 354 | 194 | 127 | 58 | 28 | 761(49.5) | 349 | 286 | 140 | 0 | 0 | 775(50.5) | 1536 |
| Total | 4515 (52.5) | 3054 (52.4) | 1804 (56.4) | 497 (76.9) | 199 (86.5) | 10069 (54.4) | 4089 (47.5) | 2778 (47.6) | 1392 (43.6) | 149 (23.1) | 31 (13.5) | 8439 (45.6) | 18508 |

*Figures in the parenthesis denote percentage to total*

Elasticity of expectation calculated on the basis of delivery months of all the years under the study reveals that it oscillates between 47.7 per cent and 66.4 per cent. Generally September and October are the best delivery months with stabilizing influence of 66.4 per cent and 60.4 per cent respectively, while January and December are the worst delivery months with stabilizing influence of 47.7 per cent and 49.5 per cent respectively. On the basis of delivery periods, 5-month hedge period is the best hedge period with an average stabilizing influence of 86.5 per cent. For January, February, November and December delivery months of every year, 4-month and 5-month hedge period are the best hedge periods with an average stabilizing effect of 100 per cent. For March, April, May, June, July, August and September delivery months of every year, 5-month hedge period is the best hedge period with an stabilizing effect of 100 per cent, 88.9 per cent, 100 per cent, 63.6 per cent, 53.3 per cent, 91.7 per cent and 100 per cent respectively. For the delivery month of October, 4-month hedge period is the best hedge period with an average stabilizing effect of 96 per cent. The year 2011 is the best year with an average stabilizing effect of 68.5 per cent. Year by year and month by month figures of the elasticity of expectation shows that October 2004 is the best delivery month with stabilizing effect of 92.5 per cent. Out of 18508 hedges 10069 (54.4 per cent) are stabilizing hedges and 8439(45.6 per cent) are destabilizing hedges. It shows that elasticity of expectation of rubber futures market as a whole, for the period from May 2003 to December 2012 is stabilizing effect on spot prices.

### 6.2.3 Objective No.3. Index of Bias

The number of delivery months, hedge periods, number of hedges and the length of the hedges of Index of bias for all delivery months are exactly similar to hedging efficiency calculated for the period from May 2003 to

December 2012 on the basis of delivery months. Index of bias calculated for the period from May 2003 to December 2012 on the basis of delivery months and hedge periods is summarized in Table 6.3.

**Table 6.3 Index of bias for the period from May 2003 to December 2012 - based on delivery months and hedge periods**

| Month | 1-Month | 2-Month | 3-Month | 4-Month | 5-Month | Index of Bias |
|---|---|---|---|---|---|---|
| January | 2.30 | 6.75 | 22.08 | -0.37 | -0.45 | 6.94 |
| February | 0.86 | 0.39 | 0.66 | -0.47 | -0.54 | 0.64 |
| March | -0.49 | -2.18 | -3.66 | -0.66 | -0.73 | -1.52 |
| April | 0.54 | -1.59 | -9.29 | -30.76 | -0.65 | -2.54 |
| May | -0.71 | -3.83 | -12.89 | -94.10 | -0.78 | -6.47 |
| June | -1.25 | -4.01 | -2.94 | -38.78 | -2.96 | -4.42 |
| July | -0.06 | 3.72 | 26.55 | -11.24 | -1.06 | 5.47 |
| August | 1.99 | 34.04 | 2.01 | -0.98 | -0.91 | 11.58 |
| September | 2.66 | 7.82 | 6.53 | -0.59 | -0.72 | 4.63 |
| October | 3.23 | 7.92 | 9.81 | -0.26 | -0.45 | 5.52 |
| November | 3.40 | 6.56 | 7.78 | -0.39 | -0.51 | 4.93 |
| December | 3.47 | 3.90 | 7.16 | -0.40 | -0.56 | 4.17 |
| May 2003 to December 2012 | 1.33 | 3.82 | 4.13 | -50.50 | -2.78 | 1.97 |

Index of bias for the period from May 2003 to December 2012 on the basis of delivery months reveals that, January, February, July, August, September, October, November and December months are generally biased in favour of long hedges (against short hedges) and March, April, May and June months are biased in favour of short hedges (against long hedges). Index of bias for the period from May 2003 to December 2012 on the basis of hedge periods reveals that, one month, two months and three months hedge period index of bias are biased in favour of long hedges. Four months and five months hedge period Index of bias are biased in favour short hedges. Index of bias for the period from May 2003 to December 2012 on the basis of years reveals that, all years except the year 2004, exhibit bias in favor of long hedges. The market as a whole exhibit bias (+1.97) in favour of long hedges.

### 6.2.4 Objective No.4. Volatility of Spot Price of Rubber

The daily volatility calculated from 15/03/2003 to 31/03/2013 is divided into 12 time periods. It is observed that spot price volatility has both increased and decreased at different time periods. Spot price volatility has maximum value in the absence of futures trading. The result shows that rubber futures trading has reduced spot price volatility.

### 6.2.5 Objective No. 5. Testing whether Futures Trading in Rubber Helps in Price Discovery or Not;

#### 6.2.5.1 Unit Root Test Results.

1) The outcome of the level variable unit root results of futures prices series and spot prices series under the three conditions of intercept, trend and intercept and no trend and intercept reveals that the first level variables are non-stationary. The level variables (original data) series, spot price ($S_t$) and futures price ($F_t$) were found to be non- stationary.

2) The outcome of the first difference unit root results of futures prices series and spot prices series under the three conditions of intercept, trend and intercept and no trend and intercept reveals that the spot and futures price series were found to be stationary. The variables $S_t$ and $F_t$ were integrated of order one. That is $\Delta S_t \sim I(1)$ and $\Delta F_t \sim I(1)$. As per Schwarz criterion (SC), 4 lags are selected for Granger causality test and Johansen Co-integration test.

#### 6.2.5.2 Granger Causality Test

From the outcome of the pair wise Granger Causality test result it can be observed that the probabilities corresponding to F-Statistic is less than 5 per cent. So we reject null hypothesis and accept alternate hypothesis. That is there is bi-directional association-ship or bidirectional causality or pair-wise causality. In other words, spot price does Granger cause futures price and futures price does Granger cause spot price.

### 6.2.6 Objective No.6. The Awareness and Perception of Rubber Futures Market Participants viz. (i) Rubber Growers, (ii) Rubber Dealers, (iii) Rubber Product Manufacturers (iv) Rubber Producers' Societies and Rubber Marketing Co-operative Societies

#### 6.2.6.1 Awareness of Market Participants about Spot and Futures Market

1) All dealers and all RPS, Rubber Marketing Co-operative Societies and 20 per cent of the growers have pointed out that by selling futures contract, target price can be ensured. 50 per cent of the manufacturers have the opinion that futures contracts are to be purchased for ensuring target price.

2) All dealers, all RPS, Rubber Marketing Co-operative Societies and all manufacturers 20 per cent of the growers have pointed out that BSE is not a commodity exchange.

3) All dealers and RPS & Rubber Marketing Co-operative Societies have pointed out that lot size of rubber futures contract on NMCE is 1000Kg. 25.2 per cent of the growers and 80 per cent of the manufacturers have the above mentioned opinion.

4) All the dealers and RPS & Rubber Marketing Co-operative Societies, 25.2 per cent of the growers and 80 percent of the manufacturers have the opinion that futures trading is based on RSS-4 variety of rubber.

5) All the dealers and RPS & Rubber Marketing Co-operative Societies, 25.2 per cent of the growers and 80 per cent of the manufacturers have the opinion that initial margin money requirement for futures trading is 10 per cent.

6) 20 per cent of the growers, 48 per cent of the dealers, 1.6 per cent of the RPS & Rubber Marketing Co-operative Societies and 59 per cent of the manufacturers have the opinion that futures market is for risk management.

7) 5.2 per cent of the growers, 84 per cent of the dealers, 1.6 per cent of the RPS & Rubber Marketing Co-operative Societies and 3 per cent of the manufacturers have participated in the futures market. 39.8 per cent of the dealers and 3 per cent of the manufactures are hedgers. 5.2 per cent of the growers and 42.6 per cent of the dealers are speculators. 1.2 per cent of the growers, 36 per cent of the dealers, 1.6 per cent of the RPS & Rubber Marketing Co-operative Societies and 35 of the manufacturers have made profit from futures market.

8) 33 per cent of the dealers and 1.6 of the RPS & Rubber Marketing Co-operative Societies have given and taken delivery from warehouse. 23.6 per cent of the dealers, 1.6 of the RPS & Rubber Marketing Co-operative Societies and 6 per cent manufacturers have taken delivery from warehouse.

#### 6.2.6.2 Hypothesis Testing

Hypotheses framed for the study in relation to awareness and perception of rubber futures market participants viz. (i) growers, (ii) rubber dealers, (iii) rubber product manufacturers (iv) Rubber Producers' Societies and Rubber Marketing Co-operative Societies about futures trading are given in Table 6.4.

**Table 6.4 Details of hypotheses framed for the study in relation to awareness and perception of market participants on futures trading.**

| No | | Hypothesis | Test Applied | Test Result | Result |
|---|---|---|---|---|---|
| 1 | H0: | There exists no significant difference in the awareness about futures trading of participant and non-participant growers. | Mann-Whitney U test | z = -8.683 Sig= .000 | H0 Rejected |
| 2 | H0: | There exists no significant difference in the perception about futures trading of participant and non-participant growers. | Mann-Whitney U test | z = 3.198 Sig= .001 | H0 Rejected |
| 3 | H0: | There exists no significant difference in the awareness about futures trading of participant and non-participant dealers | Mann-Whitney U test | z = -8.695 Sig= .000 | H0 Rejected |
| 4 | H0: | There exists no significant difference in the perception about futures trading of participant and non-participant dealers | Mann-Whitney U test | z = -5.262 Sig= .000 | H0 Rejected |
| 5 | H0: | There exists no significant difference in the awareness about futures trading of participant and non-participant rubber product manufacturers | Mann-Whitney U test | z = -1.81 Sig= .07 | H0 Accepted |
| 6 | H0: | There exists no significant difference in the perception about futures trading of participant and non-participant rubber product manufacturers. | Mann-Whitney U test | z = -.796 Sig= .426 | H0 Accepted |
| 7 | H0: | There exists no significant difference in the awareness about futures trading of participant and non-participant rubber marketing co-operative societies & RPS. | Mann-Whitney U test | z = -1.839 Sig= .066 | H0 Accepted |
| 8 | H0: | There exists no significant difference in the perception about futures trading of participant and non-participant rubber marketing co-operative societies & RPS | Mann-Whitney U test | z = -1.303 Sig= .193 | H0 Accepted |

The hypothesis testing result shows that the awareness of growers about futures trading varies with participants and non-participants. The perception of growers with regard to futures trading also found to be varying with participants and non-participants. It is also found that the awareness of dealers about futures trading varies with participants and non-participants. The perception of dealers about futures trading is also varying with both participants and non-participants. However, the awareness of manufacturers about futures trading does not vary with participants and non-participants. The perception among manufacturers about futures trading is also found to be not varying with participants and non-participants. The awareness of both participants and non-participants are same in the case of Rubber Producers' Societies and Rubber Marketing Co-operative Societies. Perception of both participating and non-participating Rubber Producers' Societies and Rubber Marketing Co-operative Societies about futures trading do not vary.

## 6.3 Suggestions

1) Participation of growers, both small growers and large estates, in futures market is abysmally low. The study reveals that growers' awareness on futures trading is poor. Out of 500 small growers examined, only 26 have participation in the futures market. These 26 are speculators too. Hence, it is suggested that the farmers need to be educated about the benefits and risks of futures markets to help them take better informed decisions.

2) Small and marginal growers cannot hold their produce for long time. They are forced to sell their produce whenever they need cash. Majority of the rubber growers belong to small and marginal category and producing less than 1000 Kg. which is the minimum size to fulfil the

contract specification. The market lot is prohibitive for them and at present there is no mechanism to pool the produce. There are 34 rubber marketing societies and 2400 rubber producers' societies registered under the Rubber Board. These institutions can act as aggregators on behalf of farmers. Aggregators will collect retail produce of the farmers and hedge it on the platform of exchanges on behalf of the farmers. Farmers Groups, Co-operative institutions, CCBs (Commodity Control Boards), NGOs (Non- Government Organizations), State Agricultural Marketing Boards, Warehousing Corporations, Commodity Development Boards can also act as aggregators. The rules and procedures of futures trade in commodity exchanges should clearly lay down conditions to enable these entities to access the markets on behalf of the farmers. But these institutions have no support from the government side. With support from the government, these institutions can act as aggregators.

3) At present there is no futures market for higher grades of dry rubber like '1x' and centrifugal latex. Large estates are producing higher grades of dry rubber like '1x' and centrifugal latex. Hence it is suggested that large estates may be brought to futures trading by starting new contracts for '1x' and centrifugal latex.

4) Rubber goods manufacturers are not taking delivery from futures market for the rubber delivered from the warehouse are of poor quality. Hence, commodity exchanges should take urgent steps to ensure that the quality of rubber delivered is as per the contract.

5) Hedging using futures contract may not be always 100 per cent effective. If price moves in the opposite direction either of the contracting parties may suffer loss. Option contract is the remedy and a better risk

management tool than futures contract. In India there is no Option trading in commodities. It requires amendment to FC(R) (Forward Contract (Regulations) Act 1952) Act to introduce option trading.

6) Rubber futures contracts are traded on three National Multi Commodity Exchanges, viz. NMCE, NCDEX and MCX. A comparative picture of the contract specifications of rubber futures contract on the above mentioned three National Multi Commodity Exchanges shows that they are identical in character. Unit of trading, delivery unit, quotation/base value, tick size, price band, quality specification etc of the rubber futures contract in these three exchanges are identical. As the futures business in rubber gets divided into the three exchanges, the liquidity of these markets will tend to reduce. Hence, it will adversely affect the price discovery function of the futures market. Exchanges should compete among themselves to create liquidity and price discovery. There should not be competition between exchanges having the identical contract specifications. In such a situation liquidity tends to be fractured, which does not help to develop a healthy futures market. In fact, it may even destroy the existing futures market and become detriment to the physical trade in it. In the light of the above, it is suggested that contract having identical characters should not be allowed to trade in different commodity exchanges.

7) The suspension of futures trading in rubber from May 2008 to December 2008 has created anxiety among futures market participants and led to a negative impression about futures trading. The outcome after de- listing was in tune with predictions made by futures market on the eve of de-listing. The price rise that occurred in spot rubber before de-listing

can largely be explained by demand supply factors. The futures contract is designed in such a way that it neither depresses nor increases prices of commodities. Futures trading has nothing to do with inflation. The price rise or price fall in commodities is the manifestation of the overall demand and supply; and not due to futures trading. Hence, both the regulatory authorities and government should take care not to ban futures trading in order to arrest inflation or spot price rise and price falls.

8) There are differences in rates of tax applicable on sale of rubber in different states in India. Further, there is 2 per cent CST on inter-state transfer of rubber goods. Hence, the Central Government should take immediate step to make it uniform/ avoid tax structure on rubber.

9) At present Banks and Financial Institutions are not permitted to trade on Commodity Markets under the Baking Regulation Act 1949. So Banking Regulation Act needs to be amended to permit banks and financial institutions to trade in commodity futures market. It will increase liquidity of the market.

## 6.4 Scope for Further Research

In the present study, hedging efficiency, elasticity of expectation and index of bias are studied, taking simulated hedges of duration one month, two months, three months four months and five months. Hedging efficiency, elasticity of expectation and index of bias can be studied taking simulated hedges of other durations also. Further, economic functions of futures market can be studied for other commodities too.

## 6.5 Conclusion

The present study found that 71.5 per cent of the total hedges are effective and 28.5 per cent are ineffective during the period under study. It implies that futures market in rubber reduced the impact of price risks by approximately 71.5 per cent. Further, it is observed that, on 54.4 per cent occasions, the futures market exercised a stabilizing effect on the spot market, and on 45.6 per cent occasions futures trading exercised a destabilizing effect on the spot market. It implies that elasticity of expectation of futures market in rubber has a predominant stabilizing effect on spot prices. The market, as a whole, exhibits a bias in favour of long hedges. Spot price volatility of rubber during futures suspension period is more than that of the pre suspension period and post suspension period. There is a bi-directional association-ship or bi-directional causality or pair- wise causality between spot price and futures price of rubber. Analysis of the hedging efficiency, spot price volatility, and price discovery indicates that the rubber futures market fulfils all the economic functions expected from a commodity futures market. Thus it can be concluded that, in India, the Future of Rubber Futures is Bright…!!!

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# Appendix

## QUESTIONNAIRE

### (A) QUESTIONNAIRE FOR RUBBER GROWERS

1. Basic Information

   Name: ………………………………Address: …………………
   District: a) Kottayam ☐ b) Pathanamthitta ☐ c) Ernakulam ☐
   d) Idukki ☐
   Contact Number: *Landline* ………………*Mobile* ………………………………
   Dealer license No: ……………………KGST No:………………………………

2. Educational qualification

   (a) SSLC ☐ (b) +2 ☐ (c) Graduation and above ☐
   (d) others specify… ☐

3. Profession:

   a) Farming ☐ (b) Private ☐ (c) Government job ☐ (d) self employed ☐

4. You are producing

   (a) Dry rubber ☐ (b) latex ☐ (c) Scrap rubber ☐ (d) All the above ☐

5. Market & Price Information Sources:

   (Please rank the following information sources from 1-7 availed by you for getting price information on rubber)

| | **Sources** | **Rank** |
|---|---|---|
| (a) | Newspaper | |
| (b) | Traders | |
| (c ) | Brokers | |
| (d) | Tyre manufactures | |
| (e) | Television | |
| (f) | Coop. Society | |
| (g) | Others (specify) | |

6. Motivation for Sale
(Please rank the following reasons for sale of your stock from 1-7)

| | **Motivation for sale** | **Rank** |
|---|---|---|
| (a) | Cash Needs | |
| (b) | Target Price Attained | |
| (c ) | Market trend | |
| (d) | Price is declining | |
| (e) | Lack of Storage Options | |
| (f) | Exceeded Carriage life (shelf life period) | |
| (g) | Commitment of Produce | |

7. How long you will defer the sales if you obtain information that the future expected price will increase
(a) One week ☐ (b) one month☐ (c) two month ☐
(d) three months☐ (d) six months ☐

8. Area of your plantation
(a) 2 ha & below ☐
(b) Above 2 ha & upto & including 4 ha ☐
(c) Above 4 ha & upto & including 10 ha ☐
(d) Above 10 ha & upto & including 20 ha ☐
(e) Above 20 ha & upto & including 40 ha ☐
(f) Above 40 ha & upto & including 200 ha ☐
(g) Above 200 ha & upto & including 400 ha ☐
(h) Above 400 ha & upto & including 600 ha ☐
(i) Above 600 ha ☐

9. If your area of plantation is more than 25 acres it is registered as
(a) Public limited company☐ (b) private limited company☐
(c) partnership firm ☐ (d) Proprietary ownership ☐
(e) government department and corporations☐
(f) Socio – religious trusts and societies ☐ (g) Not applicable☐

10. You are selling rubber to
(a) Dealers ☐ (b) middlemen/Agent ☐
(c) co- operative societies ☐ (d) Manufactures ☐

11. How will you ensure that you are able to get your target price?
(a) Buy futures contract ☐ (b) sell futures contract ☐
(c) others specify… ☐ (d) Don't know ☐

12. Which of the following is not a commodity exchange?
(a) MCX ☐ (b) NMCE☐ (c) NCDEX☐ (d) BSE ☐
(e) Don't know☐

13. What is the lot size of rubber futures contract on NMCE?
    (a.) 50Kgs ☐ (b) 1000 Kgs ☐ (c) 5000Kgs ☐ (d) Don't know ☐

14. The futures contract in rubber is based on which variety of rubber?
    (a) RSS-3 (b) RSS-4 ☐ (c) RSS-5 ☐ (d) Don't know ☐

15. What is the initial margin money requirement for rubber futures contract?
    (a) 10% ☐ (b) 20% ☐ (c) 30% ☐ (d) Don't know ☐

16. Futures trading is for
    (a) Risk management ☐ (b) Profit making ☐ (c) Don't know ☐

17. (i.) Have you ever participated in the futures market?
    (a) Yes ☐ (b) No ☐

    (ii.) Did you participate in the futures market with an exactly equal and opposite position of that of physical market?
    (a) Yes ☐ (b) No ☐

    (iii.) Is quantity hedged is more than physical market position?
    (a) Yes ☐ (b) No ☐

    (iv.) Have you covered your loss, in the futures market during adverse conditions in physical market?
    (a) Yes ☐ (b) No ☐

    (v.) Have you given delivery in the warehouse?
    (a) Yes ☐ (b) No ☐

18. Please express your awareness about futures trading
    Please rate the following statements on a scale from 1 to 5
    (1- Disagree strongly, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Agree strongly)

| | | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | I am aware of the possibility of getting loan against my produce stored in warehouse | | | | | |
| 2 | I am aware of the Commodity Exchanges in India | | | | | |
| 3 | I am aware of the mechanisms to lock my target price for rubber | | | | | |
| 4 | I am aware of the institutions/ organizations which help me to know the market outlook for rubber | | | | | |
| 5 | I am aware of the risk management using futures | | | | | |

19. Please express your perception about futures trading
Please rate the following statements on a scale from 1 to 5
(1- Strongly Disagree, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Agree strongly)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Futures trading gives early signals of the expected price scenario. | | | | | |
| 2 | Futures prices are unbiased predictors of future spot price. | | | | | |
| 3 | Futures trading increases demand for rubber. | | | | | |
| 4 | Futures trading in rubber will increase spot price. | | | | | |
| 5 | The present price hike in rubber is due to futures trading. | | | | | |
| 6 | Futures trading in rubber will increase spot price volatility (price fluctuation) | | | | | |
| 7 | The price volatility is due to excessive speculative activity in futures market. | | | | | |
| 8 | The price volatility is due to excessive speculative activity in physical market. | | | | | |
| 9 | Futures market is dominated by speculators. | | | | | |
| 10 | Futures market participants should be hedgers. | | | | | |
| 11 | The futures market performs the function of price discovery. | | | | | |
| 12 | Futures trading provide the primary function of price risk management. | | | | | |
| 13 | Futures trading provide the function of integration of geographically separated markets. | | | | | |
| 14 | After the introduction of futures trading in rubber, the domestic price is moving in tandem with international price. | | | | | |
| 15 | The recent suspension of futures trading in rubber created negative sentiments among market participants. | | | | | |
| 16 | ‘Futures trading has brought better price for domestic rubber.’ | | | | | |

## (B) QUESTIONNAIRE FOR RUBBER DEALERS

1. BASIC INFORMATION
   Name: ………………………… Address: ………………………………………
   District: a) Kottayam ☐ b) Kollam ☐ c) Pathanamthitta ☐
   d) Ernakulam ☐
   Contact Number: *Landline* ……………………*Mobile* …………………………
   Dealer license No: ………………………….. KGST No:………………

2. Educational qualification
   a) SSLC☐ (b) +2☐ (c) Graduation and above☐ (d) others specify..☐

3. Profession:
   (a) Farming☐ (b) Private☐ (c) Government job☐ (d) self employed☐

4. You are dealing with:
   (a) Dry rubber☐ (b) latex ☐ (c) Scrap rubber☐ (d) All the above☐

5. Market & Price Information Sources:
   (Please rank the following information sources from 1- 7 availed by you for getting price information on rubber)

| | **Sources** | **Rank** |
|---|---|---|
| (a) | Newspaper | |
| (b) | Other traders | |
| (c ) | Brokers | |
| (d) | Tyre manufactures | |
| (e) | Television | |
| (f) | Coop. Society | |
| (g) | Others (specify) | |

6. Motivation for Sale
   (Please rank the following reasons for sale of your stock from 1-7)

| | **Motivation for sale** | **Rank** |
|---|---|---|
| (a) | Cash Needs | |
| (b) | Target Price Attained | |
| (c ) | Market trend | |
| (d) | Price is declining | |
| (e) | Lack of Storage Options | |
| (f) | Exceeded Carriage life (shelf life period) | |
| (g) | Commitment of Produce | |

7. How long you will defer the sales if you obtain information that the future expected price will increase
   (a) One week ☐ (b) one month ☐ (c) two months ☐
   (d) three months ☐ (e) Six months ☐
8. You are purchasing rubber from
   (a) Growers ☐ (b) Middlemen or intermediaries ☐ (c) Other traders ☐
   (d) Estates ☐ (e) Co-operative societies ☐
9. Your turnover per year
   (a) 10 tonnes and below ☐ (b) above 10 tonnes and upto and including 50 ☐
   (c) Above 50 tonnes and upto and including 100 ☐
   (d) above 100 tonnes and upto and including 500 ☐
   (e) above 500 tonnes and upto and including 1000 ☐ (f) above 1000 tonnes ☐
10. Your firm is registered as
   (a) Proprietary ownership ☐ (b) partnership firm ☐
   (c) private limited company ☐ (d) Public limited company ☐
   (e) government department and corporations ☐
   (f) Socio – religious trusts and societies ☐
11. You are selling rubber to
   (a) Dealers ☐ (b) middlemen/Agent ☐ (c) co- operative societies ☐
   (d) Manufactures ☐

   Awareness of futures trading

12. How will you ensure that you are able to get your target price?
   (a) Buy futures contract ☐ (b) sell futures contract ☐
   (c) others specify………… ☐ (d) Don't know ☐
13. Which of the following is not a commodity exchange?
   (a) MCX ☐ (b) NMCE ☐ (c) NCDEX ☐ (d) BSE ☐
   (e) Don't know ☐
14. What is the lot size of rubber futures contract on NMCE?
   (a.) 50Kgs ☐ (b) 1000 Kgs ☐ (c) 5000Kgs ☐ (d) Don't know ☐
15. The futures contract in rubber is based on which variety of rubber?
   (a) RSS-3 ☐ (b) RSS-4 ☐ (c) RSS-5 ☐ (d) Don't know ☐
16. What is the initial margin money requirement for rubber futures contract?
   (a) 10% ☐ (b) 20% ☐ (c) 30% ☐ (d) Don't know ☐
17. Futures trading is for
   (a) Risk management ☐ (b) Profit making ☐ (c) Don't know ☐

18. (i.) Have you ever participated in the futures market?
    (a) Yes ☐ (b) No ☐

    (ii.) Did you participate in the futures market with an exactly equal and opposite position of that of physical market?
    (a) Yes ☐ (b) No ☐

    (iii.) Is quantity hedged is more than physical market position?
    (a) Yes ☐ (b) No ☐

    (iv.) Have you covered your loss, in the futures market during adverse conditions in physical market?
    (a) Yes ☐ (b) No ☐

    (v.) Have you given delivery in the warehouse?
    (a) Yes ☐ (b) No ☐

    (vi.) Have you taken delivery from warehouse?
    (a) Yes ☐ (b) No ☐

19. Please express your awareness about futures trading
    Please rate the following statements on a scale from 1 to 5
    (1- Disagree strongly, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Agree strongly)

| | | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | I am aware of the possibility of getting loan against my produce stored in warehouse | | | | | |
| 2 | I am aware of the Commodity Exchanges in India | | | | | |
| 3 | I am aware of the mechanisms to lock my target price for rubber | | | | | |
| 4 | I am aware of the institutions/ organizations which help me to know the market outlook for rubber | | | | | |
| 5 | I am aware of the risk management using futures | | | | | |

20. Please express your perspective about futures trading
    Please rate the following statements on a scale from 1 to 5
    (1- Strongly Disagree, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5-Agree strongly)

| | | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|---|
| 1 | Futures trading gives early signals of the expected price scenario. | | | | | |
| 2 | Futures prices are unbiased predictors of future spot price. | | | | | |
| 3 | Futures trading increases demand for rubber. | | | | | |
| 4 | Futures trading in rubber will increase spot price. | | | | | |
| 5 | The present price hike in rubber is due to futures trading. | | | | | |
| 6 | Futures trading in rubber will increase spot price volatility (price fluctuation) | | | | | |
| 7 | The price volatility is due to excessive speculative activity in futures market. | | | | | |
| 8 | The price volatility is due to excessive speculative activity in physical market. | | | | | |
| 9 | Futures market is dominated by speculators. | | | | | |
| 10 | Futures market participants should be hedgers. | | | | | |
| 11 | The futures market performs the function of price discovery. | | | | | |
| 12 | Futures trading provide the primary function of price risk management. | | | | | |
| 13 | Futures trading provide the function of integration of geographically separated markets. | | | | | |
| 14 | After the introduction of futures trading in rubber, the domestic price is moving in tandem with international price. | | | | | |
| 15 | The recent suspension of futures trading in rubber created negative sentiments among market participants. | | | | | |
| 16 | ‘Futures trading has brought better price for domestic rubber.’ | | | | | |

## (C) QUESTIONNAIRE FOR RUBBER PRODUCT MANUFACTURES

1. BASIC INFORMATION
   Name: ………………………………Address: ………………………………….
   District: ……………
   Contact Number: *Landline* ……………………….*Mobile* ………………………
   Dealer license No: …………………………. KGST
   No:…………………………
   Category of manufacturer : (a) A☐ (b) B☐ (c)C☐ (d)D☐ (e) E (f) F

2. Type of ownership
   (a) Proprietary ownership ☐ (b) partnership firm ☐
   (c) private limited company ☐ (d) Public limited company ☐

3. You are dealing with:
   (a) Dry rubber ☐ (b) latex ☐ (c) Scrap rubber ☐ (d) All the above ☐

4. Market & Price Information Sources:
   (Please rank the following information sources from 1- 7 availed by you for getting price information on rubber)

| | Sources | Rank |
|---|---|---|
| (a) | Newspaper | |
| (b) | Traders | |
| (c ) | Brokers | |
| (d) | Tyre manufactures | |
| (e) | Television | |
| (f) | Coop. Society | |
| (g) | Others (specify) | |

5. Motivation for purchase
   (Please rank the following reasons for sale of your stock from 1-5)

| | Motivation for purchase | Rank |
|---|---|---|
| (a) | Target Price Attained | |
| (b) | Market trend | |
| (c ) | Price is increasing | |
| (d) | Price is declining | |
| (e) | Enough Storage Options | |
| (d) | Commitment of Product | |

6. How long you will defer the purchase if you obtain information that the future expected price will decrease
   (a) One week ☐ (b) one month ☐ (c) two months ☐
   (d) three months ☐ (e) Six months ☐

7. You are purchasing rubber from
   (a) Growers ☐ (b) Middlemen or intermediaries ☐ (c) Estates ☐
   (d) Traders ☐ (d) Co-operative societies ☐

8. Quantity of rubber consumption per year
   (a) 10 tonnes and below ☐
   (b) above 10 tonnes and upto and including 50 ☐
   (c) above 50 tonnes and upto and including 100 ☐
   (d) above 100 tonnes and upto and including 500 ☐
   (e ) above 500 tonnes and upto and including 1000 ☐
   (f ) above 1000 tonnes ☐

9. How will you able to get rubber at your target price?
   (a) Buy futures contract ☐ (b) sell futures contract ☐
   (c) others specify……………. ☐ (d) Don't know ☐

10. Which of the following is not a commodity exchange?
    (a) MCX ☐ (b) NMCE ☐ (c) NCDEX ☐ (d) BSE ☐
    (e) Don't know ☐
11. What is the lot size of rubber futures contract on NMCE?
    (a) 50Kgs ☐ (b) 1000 Kgs ☐ (c) 5000Kgs ☐ d) Don't know ☐
12. The futures contract in rubber is based on which variety of rubber?
    (a) RSS-3 ☐ (b) RSS-4 ☐ (c) RSS-5 ☐
    (d) Don't know ☐
13. What is the initial margin money requirement for rubber futures contract?
    (a) 10% ☐ (b) 20% ☐ (c) 30% ☐ (d) Don't know ☐
14. Futures trading is for
    (a) Risk management ☐ (b) Profit making ☐ (c) Don't know ☐

15. (i). Have you ever participated in the futures market?
    (a) Yes ☐ (b) No ☐

    (ii.) Did you participate in the futures market with an exactly equal and opposite position of that of physical market (rubber requirement)?
    (a) Yes ☐ (b) No ☐
    (iii.) Is quantity hedged is more than physical market position (rubber requirement)?
    (a) Yes ☐ (b) No ☐
    (iv.) Have you covered your loss, in the futures market during adverse conditions in physical market?
    (a) Yes ☐ (b) No ☐
    (v.) Have you taken delivery from warehouse?
    (a) Yes ☐ (b) No ☐
    (vi.) If you are not taken delivery from warehouse what is the reason
    (a) Delivered rubber is of low quality ☐ (b) Settlement difficulties ☐

16. Please express your awareness about futures trading
Please rate the following statements on a scale from 1 to 5
(1- Disagree strongly, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Agree strongly)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | I am aware of the possibility of getting loan against my produce stored in warehouse | | | | | |
| 2 | I am aware of the Commodity Exchanges in India | | | | | |
| 3 | I am aware of the mechanisms to lock my target price for rubber | | | | | |
| 4 | I am aware of the institutions/ organizations which help me to know the market outlook for rubber? | | | | | |
| 5 | I am aware of the risk management using futures | | | | | |

17. Please express your perspective about futures trading
Please rate the following statements on a scale from 1 to 5
(1- Strongly Disagree, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Agree strongly)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Futures trading gives early signals of the expected price scenario. | | | | | |
| 2 | Futures prices are unbiased predictors of future spot price. | | | | | |
| 3 | Futures trading increases demand for rubber. | | | | | |
| 4 | Futures trading in rubber will increase spot price. | | | | | |
| 5 | The present price hike in rubber is due to futures trading. | | | | | |
| 6 | Futures trading in rubber will increase spot price volatility (price fluctuation) | | | | | |
| 7 | The price volatility is due to excessive speculative activity in futures market. | | | | | |
| 8 | The price volatility is due to excessive speculative activity in physical market. | | | | | |
| 9 | Futures market is dominated by speculators. | | | | | |
| 10 | Futures market participants should be hedgers. | | | | | |
| 11 | The futures market performs the function of price discovery. | | | | | |
| 12 | Futures trading provide the primary function of price risk management. | | | | | |
| 13 | Futures trading provide the function of integration of geographically separated markets. | | | | | |
| 14 | After the introduction of futures trading in rubber, the domestic price is moving in tandem with international price. | | | | | |
| 15 | The recent suspension of futures trading in rubber created negative sentiments among market participants. | | | | | |
| 16 | ‘Futures trading has brought better price for domestic rubber.’ | | | | | |

## (D) QUESTIONNAIRE FOR RUBBER MARKETING CO-OPERATIVE SOCIETIES AND RPS

1. BASIC INFORMATION
   Name: ……………………………………Address: ……………………………
   District: ……………
   Contact Number: *Landline* ………………………*Mobile* ………………………
   Dealer license No:…………………………. KGST No:…………………………….
   Register No. of co-operative rubber marketing society/ RPSs..............................

2. You are dealing with:
   (a) Dry rubber (b) latex (c) Scrap rubber (d) All the above

3. Market & Price Information Sources:
   (Please rank the following information sources from 1- 7 availed by you for getting price information on rubber)

| | **Sources** | **Rank** |
|---|---|---|
| (a) | Newspaper | |
| (b) | Traders | |
| (c ) | Brokers | |
| (d) | Tyre manufactures | |
| (e) | Television | |
| (f) | Coop. Society | |
| (g) | Others (specify) | |

4. Motivation for Sale
   (Please rank the following reasons for sale of your stock from 1-7)

| | **Motivation for sale** | **Rank** |
|---|---|---|
| (a) | Cash Needs | |
| (b) | Target Price Attained | |
| (c ) | Market trend | |
| (d) | Price is declining | |
| (e) | Lack of Storage Options | |
| (f) | Exceeded Carriage life (shelf life period) | |
| (g) | Commitment of Produce | |

5. How long you will defer the sales if you obtain information that the future expected price will increase
   (a) One week ☐ (b) one month ☐ (c) two months ☐
   (d) three months ☐ (e) Six months ☐

6. You are purchasing rubber from
   (a) Growers ☐ (b) Middlemen or intermediaries ☐ (c) Traders ☐
   (d) Estates ☐

7. Your turnover per year
   (a) 10 tonnes and below ☐ (b) above 10 tonnes and upto and including 50 ☐
   (c) Above 50 tonnes and upto and including 100 ☐
   (d) above 100 tonnes and upto and including 500 ☐
   (e) above 500 tonnes and upto and including 1000 ☐
   (f) above 1000 tonnes ☐
8. You are selling rubber to
   (a) Dealers ☐ (b) middlemen/Agent ☐ (d) manufactures ☐
9. Why can't you act as an 'aggregator' for rubber farmers' in Kerala?
   (a) Lack of fund ☐ (b) Lack of support from government ☐
   (c ) Our institution is not willing to act as aggregator ☐
   Awareness of futures trading

10. How will you ensure that you are able to get your target price?
    (a) Buy futures contract ☐ (b) sell futures contract ☐ (c) others ☐
    specify…………….
11. Which of the following is not a commodity exchange?
    (a) MCX ☐ (b) NMCE ☐ (c) NCDEX ☐ (d) BSE ☐
12. What is the lot size of rubber futures contract on NMCE?
    (a) 50Kgs ☐ (b) 1000 Kgs ☐ (c) 5000Kgs ☐
13. The futures contract in rubber is based on which variety of rubber?
    (a) RSS-3 ☐ (b) RSS-4 ☐ (c) RSS-5 ☐
14. What is the initial margin money requirement for rubber futures contract?
    (a) 10% ☐ (b) 20% ☐ (c) 30% ☐
15. Futures trading is for
    (a) Risk management ☐ (b) Profit making ☐ (c) Don't know ☐
16. (i). Have you ever participated in the futures market?
    (a) Yes ☐ (b) No ☐
    (ii.) Did you participate in the futures market with an exactly equal and opposite position of that of physical market?
    (a) Yes ☐ (b) No ☐
    (iii.) Is quantity hedged is more than physical market position?
    (a) Yes ☐ (b) No ☐
    (iv.) Have you covered your loss, in the futures market during adverse conditions in physical market?
    (a) Yes ☐ (b) No ☐
    (v.) Have you given delivery in the warehouse?
    (a) Yes ☐ (b) No ☐
    (vi.) Have you taken delivery from warehouse?
    (a) Yes ☐ (b) No ☐

17. Please express your awareness about futures trading
Please rate the following statements on a scale from 1 to 5
(1- Disagree strongly, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Agree strongly)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | I am aware of the possibility of getting loan against my produce stored in warehouse | | | | | |
| 2 | I am aware of the Commodity Exchanges in India | | | | | |
| 3 | I am aware of the mechanisms to lock my target price for rubber | | | | | |
| 4 | I am aware of the institutions/ organizations which help me to know the market outlook for rubber? | | | | | |
| 5 | I am aware of the risk management using futures | | | | | |

18. Please express your perception about futures trading
Please rate the following statements on a scale from 1 to 5
(1- Strongly Disagree, 2- Disagree, 3- Neither Agree nor Disagree, 4- Agree, 5- Agree strongly)

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 1 | Futures trading gives early signals of the expected price scenario. | | | | | |
| 2 | Futures prices are unbiased predictors of future spot price. | | | | | |
| 3 | Futures trading increases demand for rubber. | | | | | |
| 4 | Futures trading in rubber will increase spot price. | | | | | |
| 5 | The present price hike in rubber is due to futures trading. | | | | | |
| 6 | Futures trading in rubber will increase spot price volatility (price fluctuation) | | | | | |
| 7 | The price volatility is due to excessive speculative activity in futures market. | | | | | |
| 8 | The price volatility is due to excessive speculative activity in physical market. | | | | | |
| 9 | Futures market is dominated by speculators. | | | | | |
| 10 | Futures market participants should be hedgers. | | | | | |
| 11 | The futures market performs the function of price discovery. | | | | | |
| 12 | Futures trading provide the primary function of price risk management. | | | | | |
| 13 | Futures trading provide the function of integration of geographically separated markets. | | | | | |
| 14 | After the introduction of futures trading in rubber, the domestic price is moving in tandem with international price. | | | | | |
| 15 | The recent suspension of futures trading in rubber created negative sentiments among market participants. | | | | | |
| 16 | ‘Futures trading has brought better price for domestic rubber.’ | | | | | |

# Publications

1. Peter Thenankal and Sudarsanan Pillai. P., (2011). “Hedging Efficiency of Short Hedges of a Commodity Futures Market.’’ Journal of Science Technology and Management, Thiruvalla, Vol.04 No.01, April-June.2011, ISS No: 0974-8334, pp 49-56.
2. Peter Thenankal and Sudarsanan Pillai. P., (2011). ‘‘Impact of Commodity Futures on Volatility of Underlying Asset Price’’ Organizational Management, Palakkad, Vol. XXVII.No.3, Oct- Dec. 2011, ISSN 0975 – 699X, pp 5-10.
3. Peter Thenankal, Sudarsanan Pillai. P and Rajithakumar. S., (2014). “Price Discovery and Cointegration of Rubber Futures Market.” Explorations in Time Series Econometrics: Theory and Evidence, Department of Economics, Panampilly Memorial Government College, Chalakudy, June 2014, pp 26-39.