Futures Trading in Agricultural Commodities in India: Some Issues

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RUCHITA MANGHNANI

CENTRE FOR ECONOMIC STUDIES AND PLANNING
SCHOOL OF SOCIAL SCIENCES
JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI 110067
2008

CENTRE FOR ECONOMIC STUDIES & PLANNING
SCHOOL OF SOCIAL SCIENCES
JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI- 110 067 (INDIA)

Phone: 91-11-26742575, 26741557,
26742676 Ext. 4421
Direct: 26704421
Cable : JAYENU
Fax : 91-11-26741504, 26741586

CERTIFICATE

This is to certify that the dissertation entitled **'Futures Trading in Agricultural Commodities in India: Some Issues'** submitted by me in partial fulfillment of the requirement for the award of **MASTER OF PHILOSOPHY** has not been previously submitted for any other degree of this or any other university.

Ruchita Manghnani

RUCHITA MANGHNANI

We recommend that this dissertation be placed before the examiners for the evaluation.

PROF. C. P. CHANDRASEKHAR
(Supervisor)

Pradipta Chaudhury

PROF. PRADIPTA CHAUDHURY
(Chairperson)

CHAIRPERSON
Centre for Economic Studies & Planning
SSS/JNU/New Delhi-110067

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Ruchita Manghnani

Jawaharlal Nehru University

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Introduction

Commodity price volatility and its repercussions is an issue that governments have grappled with for decades. The short run price elasticities of demand and supply of agricultural commodities are low. So when there is any disturbance in demand or supply, the prices of these commodities tend to fluctuate widely. Given that agriculture is exposed to relatively more risks and uncertainties as compared to industry, it is not surprising that that the variations in prices of agricultural commodities are much higher than industrial products. This has been confirmed by several studies.[1]

The governments and marketing boards of several developing countries regulate supply by maintaining buffer stocks. Even in India, the Food Corporation of India maintains a buffer stock. It procures food grains from farmers and releases supplies through the public distribution system.

There have also been several international agreements to regulate prices of primary commodities. The International Sugar Agreement and the International Coffee agreement set permissible limits of price fluctuations and kept international prices within this range through the adjustment of export quotas. In May 1976, the UNCTAD Resolution for an Integrated Programme for Commodities called for the setting up of a Commodity Fund to finance buffer stocks. None of these international agreements on specific commodities are currently active.

There has been a shift in emphasis from commodity price stabilisation to actually managing risks arising out of these unstable prices. This concept is however not new. Several countries offer its producers some sort of a minimum guarantee price for agricultural products. In India, we have policy of a Minimum Support Price where the government offers to buy crops from farmers at the price announced by it.

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[1] See Ghosh *et al* (1987)

Futures Markets present a market based approach for managing price risks. Price risk management is done through hedging in futures markets. Organised futures trading began way back in 1865 in the U.S. The first futures market was established in India just about a decade later. However, scepticism about this institution, particularly with respect to speculation in these markets and its impact on price stability has always existed.

The Administrator of the Commodity Exchange Authority, Kauffman remarked in 1957, *Wide and rapid price swings attract speculation which at times further widens the swings, thus attracting more speculation.....* (U.S 85th Congress, 1957)

In 1973, Congressman Conte commented, *Both producers and consumers have suffered as a result of huge price fluctuation..... I suspect that in some cases at least, the people responsible for price fluctuations are among those benefiting from them.* (U.S 93rd Congress, 1973)[2]

Closer home, In India, the FMC issued a Press Note in November 1960 questioning speculative activity in Indian futures markets. *The removal of the special margin with regard to castorseed has been misused, and rampant speculation is pushing up prices, particularly when no demand has developed for the new crop.*[3]

The Parliamentary Standing Committee on Consumer Affairs, Food and Public Distribution (2006-07) observed that..... *This trading has not produced any positive results except introducing an additional element of instability and marginalisation of the impact of the real factors...*

In India, futures markets were banned for several decades. The government liberalised futures markets by lifting the ban on futures trading in 2003. Since then, these markets have grown by leaps and bounds. There was a sixty fold increase in the turnover of these markets over five years (between 2002-03 and 2007-08). However, in 2007, trade in four commodities – rice, wheat, urad and tur was banned. This was because there was some apprehension that futures markets were responsible for the price increases observed in

[2] U.S 85th Congress and U.S 93rd Congress *quoted* in Rutledge (1986)

[3] Press Note dated November 8, 1960 *quoted* in Pavaskar, M.G (1970)

several commodities in 2006-07. The government set up an Expert Committee chaired by Prof. Abhijit Sen to investigate the matter. Four additional commodities – chana, potato, rubber and soy oil were delisted in May this year.

Given the history of futures markets in India and the recent events, there has been a growing interest in present times to understand the impact these markets have on the economy. This dissertation is a modest attempt to explore answers to a few questions on futures markets. How do futures markets actually work? To what extent do these markets provide effective hedging opportunities? Does speculation in futures markets have a destabilising influence on prices?

The Dissertation is organised into four chapters. The first chapter examines price risk management through various derivatives; hedging, speculation and manipulation in futures markets and the theories of formulation of futures prices. The second chapter is on commodity derivative markets in India. It looks at how suitable these markets are for hedging by examining the basis risk of some important commodities traded in futures exchanges in India. The third chapter is on speculation and prices. It reviews theoretical and empirical studies on the impact of speculation on prices and examines whether futures trading was in any way linked to the recent price increases seen in India. The fourth and final chapter concludes the dissertation, while highlighting some important issues such as the participation of farmers in futures trading and the suitability of commodities for trading in futures markets.

Chapter 1

Futures Trading

Futures markets have witnessed a dramatic growth since organised futures trading began in 1865 at the Chicago Board of Trade. Not only has the volume of trade, the number of futures exchanges and the variety of commodities under the purview of futures trading grown, futures markets have also expanded to several countries in the world. However, more often than not, these markets have remained in the eye of controversy. A thorough understanding of futures markets is essential to critically evaluate the usefulness of these markets and the impact of futures trading on the economy.

The first chapter is a modest overview of how these markets work. The first section describes how price risk management is done through forwards, futures, options and swaps. The second section examines why futures markets exist for some commodities and not for others. The third section discusses the theory of hedging in futures markets. The fourth section is on speculation in futures markets. The fifth section discusses manipulation. The two main theories of commodity price behaviour – the theory of normal backwardation and the theory of the price of storage are explained in the sixth section.

Price Risk Management through Derivatives

Risk is inherent in every economic activity. Protection against risks such as fire, theft, natural disasters etc. is attained through insurance. Insurance works on the principle of pooling of risks and is applied when only a small proportion of the population is usually affected. Volatility of prices will affect all persons handling the commodity in that period. The principle of insurance through risk pooling cannot work in this scenario. One way of dealing with price risks is through market based price risk management instruments called derivatives.

Trading of commodities occurs in two types of markets – spot markets and derivatives markets. Spot markets, also known as cash, prompt, physical or ready markets, are markets where transactions involve buying and selling of goods for immediate delivery. A derivative is a price risk hedging instrument whose price is derived from the price of an underlying asset. The underlying asset could be a commodity, stock, currency, bonds, or an index. Derivatives could be over the counter derivatives like forward contracts and swaps, which are negotiated directly between two parties or exchange traded derivatives, where the derivatives are traded in exchanges and the exchange acts as an intermediary in all transactions.

Forward Trade

Forward trading can be traced back to the twelfth century in Europe (Bakken, 1960).[4] Forward markets are similar to spot markets except for one important difference. While delivery in spot markets is immediate, in forward markets, delivery takes place in the distant future. A forward contract is an agreement between a buyer and seller to deliver a specified quantity of goods in the future at an agreed upon price. The quality of the goods and time and place of delivery is decided in advance while drawing up the contract. The contract is specific to the two parties and the goods are delivered on maturity of the contract. There is no initial cash transfer while entering into the contract. The payment is made on contract maturity when the physical delivery of goods takes place. There are several types of forward contracts, including the fixed price forward contract, the minimum price forward contracts, the reference price forward contracts, price-to-be-fixed contracts, the hedge to arrive contracts and the customised min-max contracts. (Annexure 1.1)

Forward contracts help in managing price risks by locking in a price in advance. For example, a stockist enters into a forward contact with a buyer to deliver 100 quintals of sugar on May 14th at the price of Rs.1700 per quintal. The contract was entered into on February 14th when the prevailing price in the physical market was Rs.1650 per quintal.

[4] Bakken, H.H, 1960, 'Historical Evolution, Theory and Legal Status of Futures Trading in American Agricultural Commodities', Futures Trading Seminar: History and Development, Vol.I, Mimir publishers, Madison, Wisconsin quoted in (Naik, 1970)

The price of sugar in the spot markets falls and is Rs.1640 per quintal on May 14th. The stockist is thus protected from the adverse fall in price. In the absence of the forward contract, he would have made a loss of Rs.1000 on his sales by selling in the spot market at Rs.1640 per quintal.[5] By entering into the forward contract, the amount of revenue from the future sale is fixed at Rs.170,000 and he remains unaffected by the fall in the sugar prices.

Forward trading, however, suffers from some serious limitations. There is an inherent risk of default in a forward contract. There is no guarantee that the seller will make delivery or the buyer will take delivery and make the payment. Continuing with the previous example, the buyer may choose not to take delivery and make the payment as it would be cheaper for him to buy from the spot market in May at Rs.1640 per quintal instead of paying Rs.1700 as agreed upon in the forward contract. The buyer has the incentive to default on the purchase as he will make a loss of Rs.60 per quintal on 100 quintals or a total loss of Rs.6000 if he honours the contract. On the other hand, if the price had not fallen to Rs.1640 but had risen to Rs.1720 in May, the stockist would have the incentive to default. He would make more money by selling in the spot market in May (Rs.172,000) rather than as per the forward contract (Rs.170,000).

The lack of liquidity is another problem with forward markets. The number of buyers may not equal the number of sellers. Since the contracts are for physical delivery of goods, speculators do not participate in these markets. Buyers (with their individual requirements of quantity, quality and time and place of delivery) have to find sellers looking to supply at the same terms and sellers have to find buyers who are interested in buying at terms agreeable to them. Transaction costs are high because of the search, inspection and negotiations involved. These contracts are not easily tradable because the terms are specific to each contract.

[5] (1650-1640)*100 = 1000. This loss is gross of the cost of storage as the storage costs have not been deducted.

Futures Trade

Futures markets provide an alternative mechanism of dealing with the risk associated with price fluctuations and makes up for some of the shortcomings of forward markets. Organised futures trading in its modern form can be traced to the New York Produce Exchanges, which first appeared in 1752. Futures markets developed because they were a more efficient means of dealing with price risk (Veljanovski, 1986). Futures trading is believed to have grown out of merchandizing trade already in existence. It was organised by traders, merchants and processors to better facilitate the existing trade by providing some uniformity in rules, delivery terms, quality standards and clearing arrangements etc. Futures trade did not completely replace forward trade and is in fact a complement to forward trade. While forward trade continues to be better suited for actual delivery of goods, futures markets serve as *temporary substitutes* for merchandising contracts and are used for hedging purposes (Gray and Rutledge, 1971).

Futures contracts are standardised forward contracts that are traded in commodity exchanges. The quality, quality, delivery point, delivery date and the unit of price quotation are fixed by the commodity exchange. The contracting parties accept the terms of contract as set by the exchange and can only negotiate the price. These contracts are usually for a standard variety and are traded through brokers. The grade specified in the futures contract is usually one for which there is a large supply of the commodity in the physical market to reduce possibility of cornering of supplies. Actual delivery of goods rarely takes place and most contracts are squared by entering into offsetting contracts and settling the money difference before the expiry of the contract. (Buyers of futures close their positions by selling futures contracts of the same amount and delivery date and vice versa). The standardisation of contracts makes futures markets unsuitable for delivery.[6] If contracts are not squared or closed, they are settled on expiry through physical settlement or cash settlement. Sometimes, for settlement through physical delivery, a grade other than the contract grade may be tendered. In this case, there will be a price differential which may need to be settled and this is done either through the fixed

[6] Veljanovski (1986) estimates that less than 1 percent of futures contracts actually result in physical delivery.

difference system (where the terminal market association lays down the difference) or through commercial difference (the differential established in the physical market).

Box 1.1

	Forward Trade	Futures Trade
Trading mode	Contracts are usually negotiated over the counter between the two parties	Contracts are traded in commodity exchanges
Liquidity	These markets suffer from a lack of liquidity	Speculators operating in these markets provide the necessary liquidity
Standardization	Contracts are tailor made to fit the needs of the contracting parties and there can be as many variants of contracts as there are contracts entered into	Contract terms are standardized for each contract in an exchange and are for delivery of uniform quantity, quality of goods at specified place and time
Payment	Payment is made on expiry of the contract	Payment is made over the life of the contract through the margin mechanism
Contract Settlement	Contracts are settled through physical delivery of goods at contract expiry	Physical delivery rarely takes place. Contracts are usually closed by entering into an offsetting transaction
Default Risk	There is a risk of default by the contracting parties	There is no risk default because the clearing house guarantees all contracts
Transaction Costs	Are high because of search, inspection, grading and negotiations involved	Much lower. Include brokerage fees and margin payment costs

As an example of how a standard futures contract is designed, the Cashew Contract traded in NCDEX sets the basis as W 320, specifies that the unit of trading and delivery unit is 50 cartons and that the price is to be quoted in rupees per carton where each carton weighs 22.68 Kg. It lays down quality specifications in terms of colour, brokens allowed, moisture content, size description etc. It sets the delivery centre as Kollam. Delivery is at the seller's option and the expiry date is on the 20th of the month. It lays down that outstanding contracts not intended for delivery will be settled at a final settlement price announced by the exchange. It specifies position limits for members and clients and sets lower position limits for the nearby month. It gives a daily price fluctuation limit and

allows for the imposition of special margins in case of additional volatility. (Annexure 1.2)

Settlements are made through the clearing house, which guarantees all contracts. [7] The Clearing house becomes the intermediary between all contracting parties. For every transaction in the futures market, there is a buyer (referred to as the long) and a seller (also called the short). The seller incurs a liability to the clearing house and the buyer acquires an asset from the clearing house. The risk of default by contracting parties is avoided through the payment of margins to the clearing house. An *initial margin* is deposited by the participant with the clearing house before they can buy or sell a futures contract and is maintained until the contract is open. It is returned at the time of delivery, expiry or closing of the contract. In addition, a *market to market margin* is collected daily, based on each day's closing price, to reduce the accumulation of loss and thereby the risk of default.[8]

Price risk management or hedging is done in the futures market by taking an opposite position to the one taken in the spot market. To illustrate, we use the example of a stockist who has purchased 10 tonnes of chilli on 10th January 2008 in the physical market at Rs.3,000 per quintal. At the same time, he sells two futures contracts of 5 tonnes each in the futures market at Rs.3,200 per quintal, which is the prevailing price of the April 2008 contract in the futures market. The stockist sells his stock in March 2008 when the prevailing spot price is Rs.2,900. The stockist incurs a loss of Rs.100 per quintal, which amounts to a total loss of Rs.10,000 in the physical market. In the futures market, he liquidates his contracts by buying two futures contracts at Rs.3,100 per quintal. He makes a profit of Rs.100 per quintal, which amounts to a total profit of Rs.10,000 in the futures market.

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[7] The first clearing house for modern futures markets was started in 1925 at the Chicago Board of Trade. (Chance D.M, 2004)

[8] Market-to-Market (MTM) margins are payable based on closing prices at the end of each trading day. If the contract is entered into that day, the MTM margin is the difference between the closing price of the day and the rate of the contract. If the contract was entered into on an earlier day, the MTM margin is the difference between the closing price of the day and the closing price of the previous day. When prices decline, the margins are collected from the buyers and paid to the sellers. When prices rise, the exchange collects the margin from the sellers and pays it to the buyers.

Thus, the loss the stockist makes in the ready market is offset by the profit he makes in the futures market and he is protected from an unfavourable change in price. However, if there is a favourable rise in price, any profit he could have made from this is offset by the loss he makes in the futures market. Continuing the example, if the price has risen to Rs.3,100 per quintal in the spot market in March, he would have made a total profit of Rs.10,000 in the physical market. In March, the price of the futures contract would have also risen to say about Rs.3,300. So when the stockist purchases two futures contracts, he would have made a loss of Rs.10,000 in the futures market.

In the above example, there is perfect symmetry in the movement of the spot and futures prices and it is a perfect hedge. Hedging is done in futures markets because it is expected that ready and futures prices in tandem and converge at the expiry of contract. However, there may be cases where the spot and futures prices do not move together and the differences between them may increase or decrease sharply. This is the basis risk.[9] Hedging, in this case, will not ensure that the profit or loss made in the futures market will fully offset the loss or profit made in the physical market.

Continuing with the first scenario in the previous example where the spot price of chilli falls to Rs.2,900, the stockist makes a loss of Rs.100 per quintal or a total loss of Rs.10,000 in the physical market. If the prevailing price of the futures contract is Rs.3,125 per quintal in March 2008 when he liquidates his futures contracts by purchasing two futures contracts which he had sold at Rs.3,200 per quintal, he makes a profit of Rs.75 per quintal or a total profit of Rs.7,500 in the futures market. He therefore makes a net loss of Rs.2,500 in his transactions in both the markets. This is however less than the loss he would have made if he had not participated in the futures market, which would have amounted to Rs.10,000. Thus, by hedging in the futures market, the participant substitutes a smaller basis risk for a much larger commodity price risk.[10]

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[9] Basis is the difference between the spot and the futures price. The June 2008 Guarseed contract in NCDEX closed at Rs.1896 on May 12th. The spot price in Jodhpur on that day was Rs.1859.20. The basis would be the cash minus the futures price which is -36.80. The basis risk is the risk that the final basis differs from the initial estimated basis.

[10] The above example is an illustration of the traditional risk avoidance technique of hedging. Other approaches to hedging are discussed in the section on Hedging.

The threat of delivery ensures that the spot and futures prices converge at expiry. If the spot price is lower than the futures price at the time of expiry of contract, sellers will prefer to make delivery rather than close out their contracts by buying futures contracts. On the other hand, if the spot price is higher than the futures price, buyers will demand delivery rather than close their positions by selling futures contracts. The actions of arbitrageurs in these markets work to reduce the differences between spot and futures prices. If futures prices are greater than the spot price and the cost of carrying, arbitragers will enter these markets. They will buy in the spot markets, sell futures and make delivery on maturity. This will tend to raise spot prices, lower futures prices and thereby the difference between spot and futures prices. If spot prices exceed futures prices, prices are not necessarily equalised through arbitrage. Arbitrageurs will have to buy futures and sell in the physical market. Their ability to do so will depend on the stock held by traders and their willingness to take advantage of the difference in the two prices.

In addition to facilitating price risk management through hedging, futures markets perform an additional function of price discovery. Futures markets are an efficient collector, processor and disseminator of information (Edwards, 1981).[11] They are able to perform the price discovery function because prices in these markets are considered as an indication of the collective expectations of traders of future supply and demand conditions. Also, since these markets are paper markets, prices react quickly and costlessly to changes in information (Morgan *et al*, 1994). They provide price signals which can be used by producers, distributors and processors to allocate real resources. Farmers can make production decision on which crops to grow and how much to invest depending on the futures prices of various crops. Futures prices are used as reference prices for forward contracts. They also signal whether storage will be profitable or not. Falling futures prices indicate lower future demand and/ or higher future supply and will serve as an indication to inventory holders to reduce stocks.

[11] Edward, F.R. (1981), 'The Regulation of Futures Markets: A Conceptual Framework', Journal of Futures markets, 1, supplement *quoted* in Yamey, B.S. (1983)

Options

In an options contract, the buyer of the options contract has the right to buy (or sell) the specific quantity of a commodity at a specified price (the strike price) before a specified date. Since the buyer of the option has the right but not the obligation, he is required to pay a premium. The seller of the option contract, on the other hand, has an obligation to sell (or buy) the commodity and so receives a fee. Options may be call options or put options. In a call option, the option buyer has the right but not the obligation to buy the commodity while in a put option, the option buyer has the right but not the obligation to sell a commodity.

Thus, options do not lock in a price. They protect the option buyer from unfavourable movements in price by giving them the option of buying (or selling) at a specified price and at the same time allowing them the possibility of profiting from favourable changes in prices. For example, a stockist may want to protect himself from a decrease in prices. He purchases a put option. This gives him the right to sell at the strike price. If the market price falls below the strike price, the stockist will exercise his option to sell to the option seller at the strike price. If the market price is above the strike price, the stockist will prefer to sell at the market price.

Similarly, a trader who wants to protect himself from a rise in price will purchase a call option. This gives him the right to buy at the strike price. If the market price rises above the strike price, the trader will exercise his option to buy at the strike price. If the market price is below the strike price, the trader will find it more profitable to buy at the prevailing market rate and will hence not exercise his option.

Options may be over the counter i.e., negotiated between buyers and sellers or exchange traded.[12] The price of an option is determined by the price of the underlying commodity, the strike price, time until maturity and market volatility. While option buyers pay a premium, option sellers of exchange traded options have to maintain margin

[12] The first exchange traded commodity option was introduced in 1982 for sugar in the New York CSCE (UNCTAD, 1998)

requirements. Options serve as price risk management instruments because they limit the option buyer's loss while allowing him to benefit from favourable movements in prices.

Swaps

Swaps are over the counter derivatives developed to fulfil the long term price risk management needs of producers and users of commodities. The producer locks in the price he will receive and the consumer fixes the price he will pay. In a swap agreement, a specific volume of the commodity is covered and there are two prices involved. The reference price is variable and based on an agreed upon futures price or price index. The second price is fixed and decided at the time of the swap agreement by the bank or any other financial institution. The banks or financial institutions act as intermediaries and usually enter into offsetting swaps to mitigate their risk (a swap with a consumer is usually offset with one with a producer).

To illustrate how a producer swap works, we use the example of a farmer who would like to receive a fixed price for 10 tonnes of chilli over the next year. He enters into a swap agreement with the bank. The bank calculates the fixed price to be paid to the farmer as Rs.2,900 per quintal. The variable price is based on the closing price of the futures contract trading on NCDEX on the pricing date. If the reference price falls to Rs.2,800, on the payment date, the bank pays the farmer Rs.100 per quintal or a total of Rs.10,000 to compensate the farmer for the loss in selling the chilli at the reduced price in the spot market. If the reference price rises to Rs.2,950, the farmer pays the bank the difference of Rs.50 per quintal or Rs.5,000 for 10 tonnes. In both cases, the farmer receives Rs.2,900 per quintal or Rs.290,000 on his produce of 10 tonnes.[13]

Similarly, a consumer who would like to pay a fixed price for his purchase enters into a swap agreement with a bank. If the reference price rises above the fixed price, the bank compensates the consumer for the difference and if the reference price falls below the fixed price, the consumer pays the bank the difference. In both cases, the consumer pays a fixed amount for his purchase.

[13] This is a purely hypothetical example used to explain swap agreements. Commodity swaps are currently not in use in India.

Swaps are a purely financial transaction with no delivery of goods involved. It allows the participant to hedge their price exposure without affecting their activities in the physical market. In this instrument, the price risk is completely separated from the physical risk.

Feasibility of Futures Trading

Why are there futures markets only for certain commodities? Why are some contracts more actively traded than others and why does trading tend to concentrate in one exchange? These questions have generated considerable discussion in the literature. Working (1953a) believed that futures trading tends to emerge and persist in commodities which are subject to exceptionally large price fluctuations, arising from unpredictable variations in production, from other supply uncertainties, and from the relative inelasticity of consumption demand.

Goss (1972) lays down five preconditions for feasibility of futures trading - (1) the commodity must be homogeneous, (2) delivery must be possible, (3) storage must be possible, (4) speculative element must be present and (5) there must be sufficient liquid assets to facilitate market settlement. Telser and Higginbotham (1977) argue that futures trading is most active in contracts which yield the largest net benefits. They find that the most actively traded commodities have the most variable prices. Larger the turnover, lower are the margins and commission costs and turnover is also inversely related to the standard deviation of market clearing prices.

Atkin (1989) lists three conditions that may need to be satisfied for a futures market to exist. (1) The price of the commodity must be volatile because without volatility, there is little prospect for speculative profit and no need for hedging. (2) The commodity must be homogenous to allow for a standardized contract to be defined. (3) The market structure should be competitive with a large number of participants since there would be greater possibility for manipulation in a monopoly or monopsony.

Veljanovski (1986) asserts that the commodity approach to futures trading has proved unsatisfactory. Futures trading has expanded over the years and several of the contracts traded in futures markets do not fulfil the preconditions. For example, trading in

financial futures implies that futures trading is not necessarily only for physical commodities.[14] The storability precondition is rejected with trade in non storable commodities like live hogs and live cattle.[15] Trade in index based futures has become quite popular in recent years and these contracts do not fulfil the criteria that delivery should be possible.[16]

He argues that it is not the physical commodity but the transaction that ought to be the basic unit of analysis. The feasibility conditions provide a guide since they are correlated with factors that economise transaction costs. Transaction costs are the costs of defining, transferring and enforcing contracts. Market liquidity is desirable because competitive pressures keep waiting costs to a minimum and weeds out participants with excessive search costs and poor forecasting ability. Commodity heterogeneity increases transaction costs of trading in futures and therefore, futures contracts are usually for homogeneous commodities. Similarly, possibility of physical delivery is not a precondition for futures trade. Spot and futures markets perform different functions. While spot markets are for delivery, futures markets are side markets which provide valuable services such as priced insurance, price determination or an aid to business planning.

Since the contract assumes importance, contract design is critical for the success of futures trading. Stein (1986) found that the success ratio of new contracts is only about 25 percent. Silber (1981) found that a new contract's success is very sensitive to minor changes in contract specifications.[17] Designing a contract is a complex and costly process and requires considerable research. This has lead Pavaskar (2005) to argue for granting of Intellectual Property Rights and copyrights in futures contracts to commodity exchanges.

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[14] In October 1975, the CFTC approved an application by the CBOT to trade futures on a financial product – mortgage-backed certificates known as GNMA (Millo, 2007).

[15] Trading in non storables began with trading in live beef futures in 1964 in the United States.

[16] The first index based future was the Value Line Index of 1,700 stocks. It was introduced in the Kansas City Board of Trade in February 1982.

[17] Silber, W.L. (1981), Innovation, Competition and new Contract Design in Futures Markets, Journal of Futures Markets, 1 *quoted* in Veljanovski (1986)

Futures trade in a commodity tends to concentrate in one contract and in one exchange. Telser (1981) believes that this happens because there are increasing returns to market liquidity. Market liquidity lowers transaction costs and improves the ease with which large hedges can be placed without unduly affecting the futures prices. Thus, there has been a shift in the approach of looking at feasibility of futures trading, with transaction costs assuming importance as the determining criterion.

Hedging

The risk elimination or risk avoidance view of hedging was the traditional approach of viewing hedging. It was expounded by several of the leading economists working in this area prior to the Second World War, including Alfred Marshall, J.M Keynes, Charles O. Hardy, John Hicks, Kaldor etc. Futures Markets exist because hedgers are risk averse and wish to avoid risk arising out of price fluctuations. They transfer this risk to speculators who do not have an interest in the underlying physical commodity. Risk avoidance hedging is done by entering into an equal and opposite position in the futures market to that held in the physical market. (The technique of risk avoidance hedging has already been described in some detail in the section on Price Risk Management through Derivatives.)

Working (1953a, 1953b, 1962) presented a departure from this view of hedging and advocated the multipurpose concept of hedging. He believed that risk reduction was only incidental and that the more important aspect of hedging was the pursuit of profit. In his words '*Hedging is done for a variety of different purposes and must be defined as the use of futures contracts as a temporary substitute for a merchandising contract, without specifying the purpose*'.

Yamey (1983) succinctly sums up this radical departure in viewing hedging.

'*Hedging had been transformed. They were not the timid risk averse characters typified in the traditional approach. Instead, they were, in their hedging operations, entrepreneurs on the look out for opportunities to make profits. The lambs were not lambs. They were lions, or at least mini-lions.*'

Working (1953b) discusses three economic effects of hedging. (1) Hedging helps bring about a reduction in business risks and this reduces margins between the price received by the producer and that paid by the consumer. Hedging also reduces the number of business failures. (2) Hedging also tends to diminish the vagaries of spot prices. A hedger is in a better position to judge the price he can afford to pay as compared to a buyer who does not operate in the futures market. Thus, the uncertainty faced by the producer is reduced through hedging. (3) Hedging promotes the stockpiling of commodities in private hands during times of surplus and facilitates their release at appropriate times.

The new categories of hedging introduced by Working are briefly discussed.

Carrying Charge Hedging

Carrying charge hedging is done by merchants. They accumulate stocks to profit from storage. The merchant seeks to make profits by anticipating change in price relations. He observes the ready futures price spread. If the futures prices are at a premium over spot prices such that he could earn returns from storage, he purchases goods in the physical market and stores them to sell at a later date at a profit. In the absence of futures trading and hedging, accumulation of stocks is done by the merchant on the basis of highly uncertain expectations that the price will advance. In the presence of futures trading and hedging, the accumulation is done based on reliable evidence that the relation between spot and future prices will change to the advantage of the stockholder.

As Working (1962) puts it, '*Whereas the traditional hedging concept represents the hedger as thinking in terms of possible loss from his stockholding being offset by gain on the futures contracts held as a hedge, the carrying-charge hedger thinks rather in terms of change in "basis"-that is, change in the spot-future price relation. And the decision that he makes is not primarily whether to hedge or not, but whether to store or not.*'

Operational Hedging

Operational hedging is usually practiced by those involved in the merchandizing or processing business. A processor who usually matches his forward sale with actual

stocks or forward purchases of raw materials might, if a futures market exists, prefer to match their forward sales by purchasing futures contracts instead of forward buying or immediately buying physical goods. He prefers to do so because large purchases in the futures market can be transacted easily at the ruling market price. In contrast, he would not be able to transact at such a large scale in the physical market without affecting the ruling price. He would have to spread his purchase over days and weeks if he is to transact without affecting the price.

Similarly, any unmatched purchase in the ready market is matched by sales in the futures markets. Processors prefer to do so because these hedges give them the freedom to make matching forward sales at prices they feel are appropriate. The advantages of operational hedging depend on the existence of a high degree of correlation between changes in spot and changes in futures prices over short intervals – between days or even within a day.

Since operational hedges are carried out over very short intervals of time, the accompanying risk reduction tends to be small. Thus, simple risk reduction is inadequate to explain the existence of hedging. In addition to reducing risks, operational hedging leads to business economies by simplifying operations and facilitating efficient decision making. Working believes that the operational advantages of these hedges outweigh any gains of risk reduction, which, if occur, are merely incidental.

Selective or Discretionary Hedging

The traditional concept of hedging portrays hedgers as businessmen who are allergic to risks and are satisfied with the normal profits they make in their business. They hedge to avoid any possible risk arising out of price fluctuations. In this process, they forgo any possibility of making speculative profits by not hedging. Hedging is done uniformly through out the year as a matter of policy and the businessman makes no attempt to form expectations about prices.

In actual practice however, hedging is selective. Studies indicate that businessmen do not use futures markets for hedging through out the year and when they do hedge, they cover

only a part of their risks.[18] The decision of whether or not to hedge is based on the businessman's expectations of changes in prices. If a trader expects prices to rise, he will not hedge his stocks. He will hedge only if he expects prices to decline. Similarly, manufactures, importers and exporters will hedge only if they expect prices to move unfavourably. If they expect that prices will move in a favourable direction, they will prefer not to hedge. If the businessman is uncertain about his expectations, he might choose to hedge only a part of his commitment.

Thus, if a stockist / processing or trading firm is able to anticipate prices reasonably well, he will make a larger profit through selective hedging then he would make through pure risk avoidance hedging.

Anticipatory Hedging

Anticipatory hedge is also guided by price expectations of the businessman. However, while the selective hedge is matched by either a stock of goods or a formal merchandizing commitment, this is not the case for an anticipatory hedge. An anticipatory hedge is done without a corresponding stock or goods or buying and selling commitments in the physical market.

Anticipatory hedge purchases of futures contracts are made by processors and manufacturers to cover raw material requirements. Anticipatory hedge purchases are also made by shippers while negotiating export business. For example, in 1967, prospects of castor oil exports from India were bright when the Brazilian castor bean crop was destroyed. Several exporters purchased futures contracts. This was done in anticipation of doing export business. After the export deals would be finalised, domestic prices were expected to rise since the demand was expected to be huge. So they preferred to hedge prior to finalising their export business (Pavaskar, 1977)

Anticipatory hedge sales are made by producers before completing production. They may also be made by growers before their crops are harvested. Both anticipatory

[18] 'The Cotton Seeds oil futures Markets', June 1948, Commodity Exchange Authority, United States Department of Agriculture *quoted* in Pavaskar, R. (1977)

purchases and anticipatory sales serve as temporary substitutes for merchandizing contracts that will be made later. The hedge is usually placed to take advantage of a current price.

Thus, Working's hedger, in stark contrast to the traditional hedger, hedged in the futures markets for a variety of reasons, the most important of which was to make profits. Working later modified his position in 1967. He examined the activities of floor traders and found that hedging orders affect the price. Short hedgers tend to sell on price dips and buy on price bulges and thus incur substantial costs, which he called execution costs. There is a flow of income from hedgers to speculators and hedgers are willing to pay this price for the prompt execution of their market orders. This revision in position brings Working's hedgers closer to the cautious hedgers of the traditional risk avoidance view of hedging (Yamey, 1986).

Portfolio Theory Approach to Hedging

The risk shifting element in hedging has been restored with the portfolio theory of hedging. This approach emphasises both risk and return and thus links the pre Working and the Working notion of hedging (Yamey, 1983).[19] It provides an explanation of why not all stocks are hedged. The approach involves the construction of an optimal hedge ratio.

Gray and Rutledge (1971) explain this approach by using the framework provided by Markowitz.[20] In this approach, a hedger can hold different combinations of assets – unhedged stocks, stocks hedged in futures markets and stocks hedged through forward sales. The return on each asset is a random variable and each hedger has a subjective probability distribution over these variables. Each hedger has a cardinal utility function whose argument is the net value of his assets at the end of the period under consideration. A concave utility function implies that he is risk averse. The hedger chooses among alternative portfolios on the basis of the means and variance of returns. This implies the

[19] The Working notion of hedging refers to Working's multipurpose view of hedging.

[20] Markowitz, H.M (1959), 'Portfolio selection: Efficient Diversification of Investments', John Wiley and Sons, New York.

existence of mean-variance indifference curves. Every portfolio will have an expected return and risk. The hedger will select a portfolio which maximizes his expected return for a given fixed value of risk. This gives rise to an efficient set of portfolios and the hedger chooses the portfolio which allows him to attain his highest indifference curve.

Johnson (1960) was among the first to present a portfolio explanation of hedging. In his model, the merchant holds a certain level of stock. He takes a position in the futures market (given his position in the spot market) in order to minimize his subjective price risk in both the markets. Thus, while his position in the physical market is based on expected merchandising profits, his position in the futures market is based on the minimum price risk of holding the spot position. Using the mean-variance model, he found that some of the stocks will remain unhedged.

Danthine (1978) and Holthausen (1979) incorporated trade in futures contracts in the model of the competitive firm under price uncertainty. There is a separation in the production decision and the futures position. Planned production is based on the input prices and the current futures price of the commodity and is independent of the producer's degree of risk aversion and his price expectations. The firm deals with price uncertainty by participating in the futures market. The optimal hedge depends on the degree of risk aversion of the producer and the probability distribution of the futures price.

Several empirical studies have been carried out to estimate optimal hedge ratios. Peck (1975) attempted to calculate the optimal hedge ration of the egg producer between June 1971 and December 1973 on the basis of shell egg contracts traded in the Chicago Mercantile Exchange. For risk aversion parameters between 0.001 and 0.1, she found the optimal hedge ratios to be between 75-95 % of the output. Rolfo (1980) derived the optimal hedging strategy of the producing country which is subject to variability in both price and output. He found the optimal anticipatory hedge ratio of cocoa producers in Ghana to be 15 % of output. In Nigeria, it was 13% of output. Ivory Coast and Brazil had higher optimal anticipatory hedge ratios of 30 % and 45 % of output respectively.

Dynamic Hedging Models

Anderson and Danthine (1983), Marcus and Modest (1984) and Ho (1984) developed dynamic hedging models. In these models, it is assumed that the producer can revise his hedge position in the growing season. When there is long gap between planting and harvest, there is plenty of opportunity for the produce to update his hedging decision. Anderson and Danthine assume that the hedge is adjusted at discrete points in time. They find that higher the correlation between spot and futures price at harvest, higher is the optimal hedge ratio. At any time, the producer's optimal hedge ratio can be decomposed into a pure hedge and a pure speculation and if the rate of interest is positive, the pure hedge increases in absolute value as the delivery date approaches.

Ho assumes that the farmer faces both price and output risk and allows for the hedge positions to be adjusted continuously over time. He argues that in the presence of output certainty, futures contracts cannot be perfect hedging instruments for farmers. However, they can be used to partially hedge his intertemporal consumption over the production period. The hedge ratio is less than one and increases as harvest time approaches.

Since most futures contracts expire within one to two years, firms hedge long term risks by entering into sequential short term hedges or roll over hedging. Firms trade in futures contracts that are active and then roll over to distant contracts when current contracts expire. There is considerable debate on whether roll over hedging serves as effective mechanism for long term price risk management (Carter, 1999).[21]

Speculation

Speculators are people who do not have an interest in the underlying physical commodity. They participate in futures markets to profit from changes in prices. They assume the risk that hedgers wish to avoid and provide the necessary liquidity to futures markets. Atkin (1989) lists three reasons why speculators prefer to operate in futures

[21] Despite using the technique of roll over hedging, the German firm Metalgsellschaft incurred huge losses in the oil market. A study by Gardner (1989) however found that this technique helped reduce risk for commodity firms in the case of cotton, soybean and corn.

markets. (1) It is relatively easy to operate in these markets. Obligations are held towards clearing houses and can be cancelled by simply entering into offsetting transactions. The quality of information is better for commodities traded in futures markets. (2) Futures can be controlled by margins, which are much lower than the total value of the contract. There is potential to make high levels of profits by not investing too much. Also, with the system of credit margins, interim profits can be withdrawn when prices move in a favourable direction. (3) Profits can be made with both increases and decreases in prices. Also, there is no limit to the number of futures contracts that can be traded as long as one can find someone willing to enter into the opposite side of transactions.

Speculation can be classified into three distinct trading styles and most speculators employ any or all of these practices. *Scalpers* attempt to profit from small changes in prices. They buy on dips and sell on bulges. These dips and bulges largely arise due to hedging done through market orders for immediate execution. Since they are not associated with an underlying economic condition, they rarely last for more than a few minutes and are reversed almost immediately. *Day traders* also try to profit from short term movements in prices. They hold their positions for no longer than a day and are unwilling to assume the risk of holding their positions overnight or on weekends. *Position traders* hold their positions over much longer periods than do scalpers and day traders in the hope of profiting from major market movements. They hold their positions based on current and prospective demand and supply, which helps them judge whether the current price level is equal to, higher than or lower than the level warranted.

Working (1967) describes two other categories of speculative trade in addition to the above - News trading and Other trading.[22] *News trading* is based on information providing early indication of change in prospective demand and supply. This information is acquired some weeks earlier than these changes would have been recognised by position or price level traders. News traders publicise the information once they have made their move and thus rarely have to wait to realise their profits. *Other trading*

[22] Working, H. (1967), 'Test of a Theory Concerning Floor Trading on Commodity Exchanges', Food research Institute Studies, 7, Supplement *quoted* in Kamara (1982)

largely involves trend trading where speculators seek to make profits from 'riding' price trends.

Do Speculators Make Money?

Keynes (1923, 1930) and Hicks (1946) viewed futures markets as an insurance scheme where speculators earn a risk premium. Hedgers use futures markets to avoid risks since they are risk averse. They transfer risks to speculators who earn an economic return for bearing these risks. This implies that if speculators are long in the market, futures price tend to rise until expiry, providing a return to speculators.

Hardy (1940) was of the view that speculators lose money by speculating in futures markets. He saw speculators as gamblers who do not seek a reward for bearing risks since their reward is the thrill they experience from gambling. In fact, they are willing to pay for the privilege of gambling in this *socially acceptable* form. They make losses at least to the tune of the commissions they pay. There is always a steady flow of new entrants in futures markets who replace speculators who have lost all they can afford to lose.

Atkin (1989) provides three reasons why it is not irrational of speculators to participate in futures markets even if speculators as a class lose money over time. (1) There will be times when investments in commodities make more money compared to other investments. (2) If speculating in futures markets is like a lottery, there is a possibility of making huge profit even if the probability of winning the lottery is small and it is not irrational to participate in the lottery. (3) If speculators derive utility from the excitement of participating in futures markets, then the issue of financial return is redundant.

There have been several empirical studies to test whether speculators earn profits or not. Telser (1958) studied the wheat and cottons futures data between 1926 and 1954 in the United States. He found no evidence of an upward trend in futures prices. His findings reject the view that speculators earn an economic return for risk bearing. He argues that competition and free entry would bring down the speculators profit to zero. Cootner (1960) claims that it is not true that futures prices rise over the life of the contract. They

rise after the peak of hedging has passed. The prices fall until hedged inventories reach a peak (at the peak of harvest) and rise only after hedge lifting exceeds new hedging. She studied the wheat futures contract and found that declines in prices are heavily weighted in the pre harvest period and rise in prices in the post harvest months. She asserts that while this behaviour is compatible with speculators making profit, it does not prove that they do.

The Commodity Futures Trading Commission and the Commodity Exchange Authority collate information on positions held by hedgers and speculators in American Futures Markets. Houthakker (1957) studied the wheat, cotton and corn markets between 1937 and 1952. He found that while small speculators rarely make profits, large speculators normally make substantial profits.

Dusak (1973) examined whether speculators earn a risk premium within the framework of the Capital Assets Pricing Model (CAPM).[23] She viewed futures prices as comprising of two components – an expected risk premium and a forecast of forthcoming prices. The risk premium required on a futures contract does not depend on the variability of futures prices. It depends on the degree to which variations in futures prices are systematically related to variations in the return on total wealth. If the CAPM model applies and if the risk of futures contract is independent of the risk of changes in all assets taken together, then investors will not have to be paid a risk premium since they can diversify it away. Using Standard and Poor's semi-monthly observations as the market portfolio, she studied a sample of wheat, cotton and soybean futures contracts between 1952 and 1967. She found that for routine long speculation, both the systematic risk and the average realised returns (before commissions) to speculators were close to zero.

Fama and French (1987) studied samples of monthly returns on twenty one commodities between 1966 and 1984. While they found instances of large risk premiums, high variation in the risk premium did not allow them to infer that expected risk premiums were non zero for individual commodities. The evidence was insufficient to either prove or disprove the existence of risk premiums to speculators.

[23] The CAPM model was developed by Sharpe (1964) and Lintner (1965)

The empirical evidence on whether speculators earn returns or not is mixed with different studies arriving at different conclusions. The question of whether speculation in futures markets has a stabilising or destabilising effect on spot prices is discussed in Chapter 3.

Manipulation

Gemmill (1983) defines manipulation as *the use of a dominant position in the markets to distort prices from the equilibrium that otherwise would have resulted.* While speculators operate in the market in anticipation of an impending change in the market price, manipulators attempt to change the price in the desired direction.

A Bear raid is an attempt to depress prices through the pressure of huge sellers. In this type of manipulation, the seller threatens to deliver large quantities of commodities to the buyers. This triggers a nervous liquidation of contracts by the buyers at prices dictated by the sellers. Bear raids cannot happen unless the supply of the commodity is very large in the market.

A corner aims at raising prices through huge purchases in the futures markets, while controlling a large portion of the deliverable supplies in the physical market. Sellers in futures markets are thus unable to fulfil contracts through delivery and are forced to settle at prices dictated by the operators behind the corner. Manipulation through corners can be attempted only if the supply of the commodity is very scarce.

A squeeze is a relatively small corner occurring in or near the delivery month. It can be engineered in a situation when the supply of the deliverable commodity is scarce. The longs in the market, despite not having an interest in the underlying commodity, may hold out for delivery. They do so to profit from the temporary price rise which occurs when the shorts attempt to obtain the commodity. At the end of the delivery month, the longs dispose off the unwanted supplies and prices return to normal. While in a corner, the manipulators contributes to the shortage by cornering deliverable supplies in the physical market, in a squeeze, the manipulator takes advantage of the scarce supply situation in the spot market (Netz, 1995).

McDermott (1979) defines a squeeze as 'A trader's buying or threatening to take delivery of what he has already bought or owned'.[24] Gemmill (1983) talks of two kinds of squeezes – The general squeeze and the futures market squeeze. In the general squeeze, there is an attempt to manipulate the cash market and while a futures market is not necessary, its existence facilitates the process. Futures markets aid the general squeeze by providing a means through which cash purchases may be made without the identity of the purchaser or his intention to take delivery being revealed. In a futures squeeze, the operator holds futures contracts and deliverable stocks such that delivery can happen only with his stocks. In some sense, he has bought, or threatens to buy the same commodity twice. The demand curve of the shorts is perfectly inelastic and the squeezer can choose the price at which he settles.

Operators may even attempt manipulation during non delivery months through intensive buying or selling in the futures markets with the aim of either increasing or decreasing prices and then squaring up contracts later at a profit after the market has moved in the desired direction. Manipulators sometimes even resort to spreading false reports weather, crops or other factors that influence prices.

Manipulations are illegal and there are regulatory structures in place in most countries to prevent their occurrence. The regulatory provisions include allowing for a large number of tenderable varieties and delivery centres, powers to the exchanges to allow alteration of deliverable varieties and delivery centres, restrictions on trading and open positions, limits on speculative holdings, raising margins etc.

[24] McDermott, E.T. (1979), Defining Manipulation in Commodity Futures Trading: The Futures Squeeze', Northwestern University Law Review, 74 *quoted* in Gemmill (1983)

Futures Price Formulation

The two most important theories of commodity price behaviour are the Theory of Normal Backwardation and the Theory of Price of Storage. Several papers in the literature of futures markets have debated the validity of these theories.

The Theory of Normal Backwardation

The theory of normal backwardation was first proposed by Keynes in 1923 and later developed by Hicks. This theory splits futures prices into a risk premium and a forecast of future spot prices. It argues that speculators *sell* insurance to hedgers and so these markets are *normally inefficient* i.e., futures prices are biased estimators of expected spot prices (Carter, 1999).

The theory assumes that speculators are rational, homogeneous, and more risk tolerant than hedgers. Hedgers as a group will be either long or short and a net shot or long position for speculators will emerge only if the futures price deviates from the expected spot price. If a hedger wants to sell futures to a speculator, the price for this purpose must be less than the expected spot price in future. On the other hand, if a hedger wants to buy futures from a speculator, the price must be higher than the expected spot price in the future.

Thus, if hedgers are net short (it is assumed that hedgers are mostly producers), the futures price will tend to be lower than the expected spot price in the future. This excess of the expected spot price over the futures price is termed *normal backwardation.*[25] The backwardation occurs because hedgers pay the speculators a risk premium to assume the risk and the price will be lower by an amount equalling the speculators reward for carrying risk. Since speculators earn a profit by holding the contract, the futures price is expected to rise over the life of a contract.

There are several empirical studies which have attempted to test the validity of the Theory of Normal Backwardation. These have already been discussed earlier in the

[25] Keynes (1930) estimated this backwardation to be to the tune of 10 percent.

chapter in the section on speculation. The findings are contradictory with some studies supporting the theory and others refuting it.

Theory of the Price of Storage

Working (1948, 1949b) presented an alternative formulation of the theory of futures prices. He rejected the view that the sole purpose behind the existence of futures markets was to transfer risk from the hedger to the speculator. According to him, inter-temporal price relationships are determined by the net cost of carrying stocks i.e., futures price equals the current spot price plus the cost of storage.

The equilibrium relationship between futures and spot prices is given by

$$F(t, T) = St(1+R(t, T)) + W(t, T) + C(t, T)$$

F (t, T) is the futures price at time t for delivery at time T, St is the spot price at time t, R (t, T) is the opportunity cost of tying up inventory from time t to time T, W (t, T) is the cost of carrying inventory and C (t, T) is the convenience yield of holding inventory from time t through time T. The cost of carrying inventory includes warehousing costs, insurance and spoilage.

If $F(t, T) >= St(1+R(t, T)) + W(t, T) + C(t, T)$, then there is an opportunity for arbitrage.

If $F(t, T) < St(1+R(t, T)) + W(t, T)$, then the futures price contains an implicit convenience yield C (t, T).

$$C(t, T) = St(1+R(t, T)) + W(t, T) - F(t, T)$$

The convenience yield is a negative cost. It is the return to the inventory holder derived from the flow of services from a unit of inventory held over time. Carter (1999) compares it to the liquidity premium arising out of holding cash in the pocketbook as opposed to money sitting in the bank.

Kaldor (1939) was the first to introduce the concept of convenience yield. Like money, stocks are held for transactions, precautionary and speculative purposes. Even if there is a negative expected returns to pure speculators from holding stocks, producers, traders and consumers sometimes hold transaction and precautionary stocks. Often, there is uncertainty surrounding demands that might be made on producers/ traders/ consumers stocks. Therefore, holding these stocks yield a convenience yield to users because the stocks can be used whenever they are wanted. The marginal convenience yield is a declining function of the stock level and tends to zero at very high levels of stocks (Ghosh *et al*, 1987).

The difference between cash and futures prices is viewed as costs of storage, which could be positive or negative.[26] For commodities that cannot be stored, futures markets are pure forecasts of future spot prices as they cannot provide inventory guidance role. Fama and French (1987) found the price behaviour of the sample of twenty one commodities they studied to be more or less compatible with the storage cost model. They found that the convenience yield varies seasonally for most agricultural commodities and not for metals. Gray and Rutledge (1971) believe that the theory accounts for the entire range of observed price behaviour, from full carrying charges to steep inversions, which is not the case for the Theory of Normal Backwardation.

There has been considerable debate on which of these two theories better explains futures price behaviour. Carter (1999) argues that the two theories are not necessarily mutually exclusive. The Keynesian notion of a risk premium paid out to speculators can be incorporated as one component of the cost of holding stocks in the Theory of the Price of Storage.

While this chapter was an overview of how futures markets function, the next chapter looks at commodity derivative markets in India.

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[26] The extent to which a forward price contract can exceed spot prices (contango) is limited by arbitrage. Maximum difference cannot exceed marginal cost of storage until delivery plus the cost of delivery. If futures prices are too high, arbitrageurs will sell futures contracts, buy the commodity in the spot market, store it and deliver it against the futures contract. And if they are too low, they buy futures, take delivery and sell in the spot market.

Chapter 2

Commodity Derivative Markets in India

Agricultural markets have existed in India for centuries and have played an extremely important role in the economy. Marketed surplus as a proportion of total output is as high as 60 percent for food grains, 83 percent for oilseeds, 82 percent for sugarcane and 100 percent for cotton and jute.[27] In India, the government sets a Minimum Support Price (MSP) for certain commodities and the farmer has the choice of selling his produce to the government at this price. Around 10 percent of the total marketed surplus of agricultural commodities is handled by government agencies while almost 80 percent is handled by the private sector.[28] The spot markets for agricultural commodities in India include primary rural markets, wholesale or secondary markets (which may be regulated under the Agricultural Produce Marketing Acts or unregulated markets), and direct markets (like Apni Mandi in Punjab, Rayathu Bazars in Andhra Pradesh and Uzhavar Santhaigal in Tamil Nadu).

After being banned for several decades, the government issued a notification in April 2003 permitting futures trading. This chapter is a brief overview of commodity derivative markets in India. The first section traces the evolution of these markets in the country. The second section discusses the regulation of futures markets. The third section looks at the present status of these markets and the last section is on the basis risk of some important agricultural commodities traded in Indian commodity exchanges.

Evolution of Futures Markets in India

Futures markets have had a long and rather eventful history in India. Periods when futures trade have flourished have been interspersed by periods where futures markets were banned in several commodities. The first futures exchange was established in India soon after futures trading began in the U.S.A and U.K.

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[27] Figures taken from Acharya (2004)

[28] Figures taken from Acharya (1994) *quoted* in Acharya (2004)

Box 2.1
History of Commodity Derivative Markets in India

1875	Bombay Cotton Trade Association Ltd. set up
1893	The Bombay Cotton Exchange Ltd constituted
1900	Futures trading in oilseeds started with the establishment of the Gujarat Vyapari Mandali
1913	Chamber of Commerce at Hapur established for futures trading in Wheat
1919	Futures trading in raw jute and jute goods began with the establishment of the Calcutta Hessian Exchange Ltd.
1920	Futures market in bullion started in Bombay
1927	East India Jute Association Ltd set up
1939	Trading in Cotton Options banned by the Provincial Government of Bombay
1943	Prohibition of forward trading in oilseeds, foodgrains, spices, vegetable oils, sugar and cloth
1945	Calcutta Hessian Exchange Ltd and East India Jute Association Ltd merged to form the East India Jute and Hessian Ltd.
1952	Enactment of the Forward Contract (Regulation) Act
1953	Forward Market Commission set up
1957	Futures trading in spices began at the Indian Pepper and Spices Trade Association
1966	Futures trading banned in most commodities
1977	Supension of futures trading in castor seed and linseed
1980	Khusro Committee recommended the reintroduction of futures trading in some major commodities like cotton, jute, kapas etc.
1994	Kabra Committee submitted report recommending resumption of futures trading in 17 selected commodities and the continuation of the ban in wheat, pulses, non basmati rice, maize, chilli, sugar, tea, coffee and vanaspati
2003	Government gave mandates to four entities to set up national multi commodity exchanges, expanded the permitted list of commodities under the FCRA and removed the ban on futures trading in all commodities
2007	Futures trading suspended in urad and tur in January and wheat and rice in February. A five member committee chaired by Prof. Abhijit Sen was constituted in March to study the impact of futures trading in agricultural commodities
2008	The Forward Contract Regulation Amendment Ordinance was enacted in January providing for greater powers to the FMC, demutualisation of existing exchanges and allowing trade in options, index futures etc. It was allowed to lapse in April without converting it into a law. The Expert Committee submitted its report in April stating that the current evidence available does not provide conclusive evidence on whether futures markets caused the price rise. Futures trading in potato, soya oil, rubber and chana prohibited in May for four months.

The Bombay Cotton Trade Association Ltd was established in 1875 for trading in cotton. Soon after that, several futures exchanges emerged in different parts of the country for trading in wheat, jute and oilseeds. Futures trading in bullion began in 1920 in Bombay. With the outbreak of the Second World War in 1939, the economy faced shortages in

several essential commodities. The government banned futures and options trading in cotton, oilseeds, food grains and vegetable oils.

After independence, futures markets were placed in the Union list of the seventh schedule of the Indian Constitution and the Forward Contract Regulation Act (FCRA) was enacted in 1952.[29] The Forward Market Commission was established in 1953. Futures trading in spices began at the Indian Pepper and Spice Trade Association in 1957. Following shortages in several agricultural and essential commodities, futures trading was either banned or suspended for most commodities in the sixties and seventies. The Khusro Committee and the Kabra Committee constituted by the Government of India recommended the reintroduction of futures trading in some commodities. Finally in 2003, the government issued notifications lifting the ban on futures trading.[30] Futures trading was permitted in all commodities. This liberal period for futures markets did not last very long. Futures trading in wheat, urad, tur and rice was prohibited in early 2007 because it was feared that futures markets were in some way related to the price rise. In May 2008, futures trading in potato, soy oil, rubber and chana was suspended for an initial period of five months.

Regulation of Commodity Derivative Markets

The Forward Contract Regulation Act (FCRA), 1952 provides the legal framework for the regulation of commodity derivative markets in the country. The FCRA classifies contracts into spot or ready delivery contracts and forward contracts. Spot or ready delivery contracts are contracts where the delivery of goods and payment for the goods is done within eleven days of entering into the contract. These contracts are outside the purview of the FCRA. All other contracts are forward contracts.

Forward contracts could be Non Transferable Specific delivery (NTSD) Contracts, Transferable Specific Delivery (TSD) Contracts and Hedge Contracts. NTSD Contracts are forward contracts between two parties. Transfer of contracts to a third party,

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[29] Act No. 74 of 1952

[30] Ministry of Consumer Affairs, Food and Public Distribution notification S.O 369 (E) dated April 1, 2003

renegotiation of terms after signing of contract and financial settlement of the contract are not allowed for NTSD contracts. In TSD contracts, the buyer can transfer the contract to other parties up to a predetermined number of times. Financial closing of the contract is possible by transferring the contract back to the original seller. Hedge contracts are transferable. Both buyers and sellers can close out their positions and delivery is not compulsory.

Option contracts are explicitly prohibited under the FCRA. There was an attempt to allow trade in options by introducing the Forward Contract Regulation Amendment Bill, 2006. The Bill was referred to the Parliamentary Standing Committee of Food, Consumer Affairs and Public Distribution which recommended that trade in options not be allowed for agricultural commodities.[31] The government attempted to introduce trade in options through the ordinance route. It promulgated an ordinance in January 2008 permitting trade in option contracts.[32] The ordinance was allowed to lapse in April 2008 without converting it into a law.

Regulation of futures trading in commodities is through a three tier system - (1) the commodity exchange or association, (2) the Forward Market Commission (FMC) and (3) the Government of India. All futures trading can be done only through recognized commodity exchanges or associations and these exchanges are regulated by the government and the FMC. The exchanges are responsible for the day to day operations of the futures markets. The commodity exchange designs the futures contract, which is standardized for all participants. It provides a trading platform and facilities for clearing, settlement and arbitration. It may also guarantee the contracts.

The FMC is a statutory body under the Ministry of Consumer Affairs and Public Distribution.[33] It advises the central government on recognition/ derecognition of exchanges. It keeps the futures market under observation and takes necessary action as and when needed. It is responsible for information dissemination and has the power to

[31] Parliamentary Standing Committee on Consumer Affairs, Food and Public Distribution (2006-07) of the Fourteenth Lok Sabha, Report Number 17, December 2006

[32] The Forward Contracts (Regulation) Amendment Ordinance, 2008. (No.3 of 2008) promulgated by the President on 31st. January

[33] This is unlike the securities market, where SEBI is an independent regulator

inspect the accounts or papers of any exchange or member of any exchange if it deems it necessary. Its approval is required by the exchange to conduct trading, declare dividend, and alter the security deposit or other fees to be paid by members etc. The byelaws of most exchanges stipulate that the authorization of the FMC is necessary before the exchange can commence trading in any new delivery, alter the ordinary margin, suspend trading beyond a specified time etc.

The overall regulation and control of the futures market and the commodity exchanges is the responsibility of the central government. It notifies commodities for which futures trading is permitted, prohibits futures/ forward trading, recognizes and derecognizes exchanges, appoints directors to the exchanges and approves amendments to the byelaws of exchanges etc.

The exchanges, FMC and the government are empowered with several instruments of regulation that they can employ to avoid risk of default by any party to the contract and curb unhealthy speculation and manipulation in the futures market. These measures include (1) limits on open position, (2) limits on price fluctuation imposed on a daily or weekly basis, (3) special margin deposits levied on outstanding purchases or sales to curb excessive speculative activity through financial restraints, (4) prescribing maximum and minimum prices, (5) skipping trading on certain deliveries, (6) closure of contracts, (7) suspension of trading at the exchange (8) prohibition of futures trading in the commodity.

Present Status of Futures Markets

Ever since the ban on futures trading was removed in 2003, futures markets have witnessed a spectacular growth. The turnover of futures markets has expanded over 60 times over the last six years. In 2007-08, the value of trade (in rupees) in commodity exchanges was over forty lakh crores. Indian commodity exchanges experienced the highest growth rates in their turnover between 2004 and 2006, right after the shift in government policy. If we look at the value of futures trade relative to GDP, this proportion was less than 3 percent in 2002-03. It swiftly increased to 66 percent in 2005-06 and 97 percent in 2006-07. The growth rate of the total turnover of commodity

exchanges declined in the past year since bans were imposed on trade in several commodities. The value of futures trade relative to GDP tapered to 95 percent in 2007-08. (Table 2.1)

Table 2.1
Turnover of Commodity Futures Markets in India

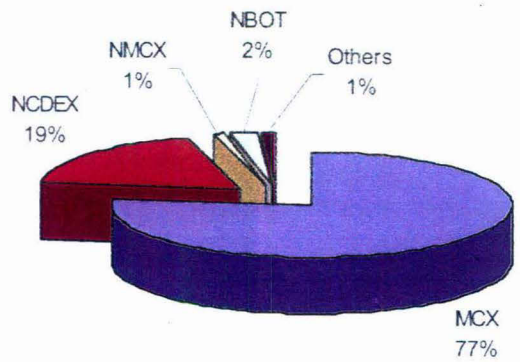
	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Value (Rs. Crores)	66530	129364	571759	2155122	3676927	4065989
Growth Over Previous Year (%)		94.4	342.0	276.9	70.6	10.6
Value of futures trading as a percentage of GDP	2.95	5.10	19.87	65.79	97.02	94.93

Source: Economic Survey 2004-05 and 2006-07, Ministry of Consumer Affairs Annual Report 2006-07, Fortnightly Market Review Reports of FMC, Author Estimates
Note: 2007-08 GDP - advanced estimates and 2006-07 GDP - quick estimates (GDP at current prices)

At present, futures trading is allowed for around hundred commodities. There are three national and nineteen regional commodity exchanges in the country. (Annexure 2.1) A national commodity exchange is granted recognition for all permitted commodities while other commodity exchanges have to seek permission from the government for each futures contract separately. Also, a national commodity exchange adopts the best international practices for trading, clearing, settlement and governance. The three national commodity exchanges in India are the Multi Commodity exchange of India Ltd, Mumbai, the National Commodities and Derivatives Exchange Ltd, Mumbai and the National Multi Commodity Exchange of India Ltd in Ahmedabad.

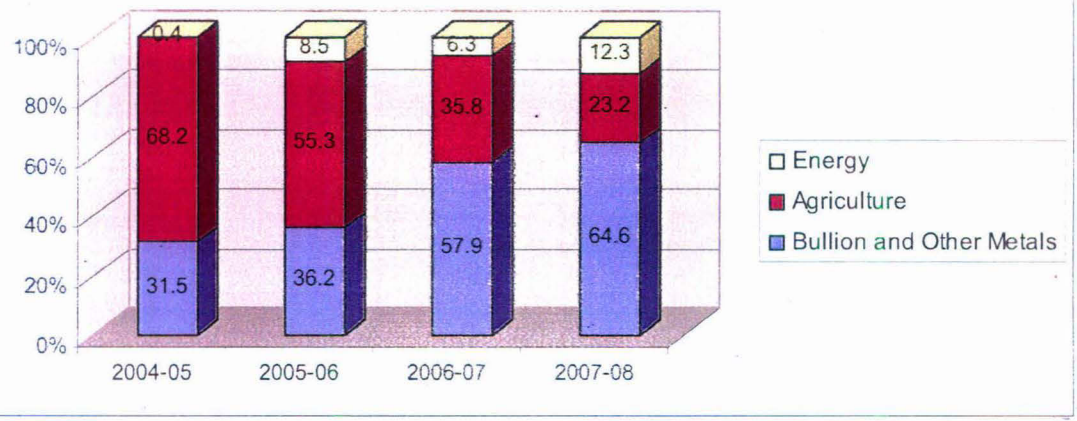
Futures trading is heavily concentrated in two of the national commodity exchanges. In 2007-08, 77 percent of the total value of futures trade took place in MCX. NCDEX accounted for 19 percent of the value of futures trade. Only 1 percent of the total value of futures trade took place in the eighteen regional exchanges. (Graph 2.1)

Graph 2.1: Share of the Various Commodity Exchanges in Value of Trade (2007- 08)



Source: Fortnightly Market Review Reports of the Forward Market Commission, Author Estimates

Graph 2.2: Proportion of various Commodity Groups in the Value of Futures Trade



Source: Expert Committee Report (2008), Author Estimates

There has been a drastic shift in the composition of futures trade over the last four years. In 2004-05, agricultural commodities accounted for almost 70 percent of the value of futures trade and bullion and other metals accounted for the remaining trade. The share of energy was negligible. Over the years, the share of agricultural commodities has declined considerably while the share of bullion and other metals and of energy has increased. In 2007-08, the share of agricultural commodities in the value of futures trade

was around 23 percent while the share of energy was 12 percent. Bullion and other metals accounted for the largest share of the value of futures trade at 65 percent. (Graph 2.2)

Table 2.2
Share of various Agricultural Commodities in the Value of Futures Trade in Agricultural Commodities (%)

	2004-05	2005-06	2006-07	2007-08
Guar seed	33.2	27.7	24.7	13.1
Chana/Gram	4.3	19.7	23.3	9.9
Soy Oil	26.0	9.2	13.4	25.7
Pepper	2.1	0.7	6.9	11.2
Jeera (Cumin seed)	0.8	1.0	5.1	7.7
Urad	2.6	16.5	4.1	0.0
Mentha Oil	0.0	3.5	4.0	1.1
Chillis	0.0	0.6	2.9	1.3
Soy seed	2.5	1.2	2.0	6.5
Mustard Seed	5.0	1.4	1.7	9.4
Wheat	0.7	1.3	1.7	0.0
Potato	0.0	0.0	1.1	0.6
Turmeric	0.3	0.3	1.1	3.0
Castor seed	3.7	1.0	1.1	2.1
Sugar	2.0	2.2	1.0	2.6
Guar Gum	3.4	3.1	1.0	0.5
Gur	2.0	1.4	0.8	0.7
Tur	0.0	3.5	0.8	0.0
Kapas	8.5	2.6	0.6	1.0
Rubber	0.7	0.4	0.6	0.5
Cardamom	0.1	0.0	0.6	0.4
Maize	0.0	0.1	0.4	0.2
Raw jute	1.0	0.5	0.1	0.2
Rice	0.1	0.1	0.0	0.0
Other Agri-Commodities	0.9	1.9	0.9	2.2

Source: Expert Committee Report (2008), Author Estimates

Even within agricultural commodities, there has been a considerable shift in the relative importance of the different agricultural commodities in the value of futures trade. The share of guar seed and chana has declined while the share of soy oil, pepper and jeera has increased. In 2007-0, soy oil accounted for over 25 percent of the value of futures trade

in agricultural commodities followed by guar seed at 13 percent, pepper at 11 percent and mustard seed at 9 percent of the value of trade in agricultural futures contracts. (Table 2.2)

Basis Risk of Commodities

Price risk management is touted as the most important function of commodity derivative markets. Since participants are exposed to commodity price risks in physical markets, they hedge in futures markets. Hedging in futures markets is not absolutely risk free. There is a basis risk involved. When the basis risk is low, hedging in futures market would be an effective means of managing price risks. If the basis risk is high when compared to the spot price risk, the very purpose of hedging would be defeated as there would be no reduction in business risks by trading in futures. The basis risk and spot price risks are usually estimated by the standard deviation of the basis and spot prices.

Naik and Jain (2002) use the ratio of the basis to spot price risk (i.e. ratio of the standard deviation of the basis to standard deviation of the spot price) to examine the effectiveness of commodity derivative markets for price risk management. A ratio greater than one implies that business risk would actually increase by trading in futures markets since the basis risk would be greater than the price risk in physical markets. They use 0.5 as a benchmark for examining the effectiveness of futures markets in price risk management. If the ratio of the basis to the spot price risk is less than 0.5, they believe that hedgers would be attracted to participate in futures markets.

They examined six commodities traded in seven regional exchanges between 1989 and 1997. They found that except for castor seed traded at ACEL and pepper traded at IPSTA, the basis risk was larger than the spot risk in a substantial proportion of cases for the other commodities. If the benchmark of 0.5 for the ratio of basis to spot risk was adopted to examine the effectiveness of these markets for price risk management, the results were even more discouraging. For gur and hessian, the ratio of basis to spot risk was lower than 0.5 in less than 10 percent of the cases. The ratio was lower than 0.5 for less than 20 percent of the cases for turmeric traded at Sangli and castor seed traded in

BCEL. For none of the commodities was the ratio of basis to price risk less than 0.5 in more 40 percent of the cases. (Table 2.3)

Table 2.3
Ratio of Standard Deviation of Basis to Standard Deviation of Spot Prices (Summary Statistics)

Commodity	Percent of Times the Ratio was		
	>1.0	0.5 - 0.1	< 0.5
Castor seed traded at ACEL	16.29	53.93	29.78
Castor seed traded at BCEL	35.47	46.51	18.02
Gur traded at COC, Hapur	43.75	49.22	7.03
Gur traded at VBCL, Muzaffarnagar	31.19	59.63	9.17
Pepper traded at IPSTA	14.84	47.00	38.16
Potato traded at COC, Hapur	44.19	20.93	34.88
Turmeric traded at Sangli	25.00	59.17	15.83
Hessian traded EIJHAL, Calcutta	60.56	35.21	4.23

Source: Naik and Jain (2002), Author Estimates
Note : The ratios were calculated contract wise and month wise for the period between 1989 and 1997 and then counted

Lokare (2007) adopted the method used by Naik and Jain to examine the effectiveness of futures markets for hedgers. He studied thirteen commodities in the post 1997 period. He found that the basis risk exceeded the spot price risk in more than half the contracts for gur, sesame seed, safflower oil, wheat, cotton grade S- 06 and mustard. For about half of the castor seed contracts and 45 percent of the sugar M' grade contracts, the ratio of basis to spot risk was less than the benchmark of 0.5. There was no instance where the ratio of the basis to spot price risk was less than the benchmark for gur, sugar S' grade, rice, wheat, cotton grade S- 06 and safflower oil. (Table 2.4)

Table 2.4
Ratio of Standard Deviation of Basis to Standard Deviation of Spot Prices (Summary Statistics)

Commodity and Period of Trading	Percent of times the ratio was		
	>1.0	0.5 - 0.1	< 0.5
Pepper traded at Kochi (1997-2004)	23.26	38.37	38.37
Gur traded at Muzaffarnagar (1997-2004)	52.00	48.00	0.00
Castorseed at Mumbai (1997-2004)	12.50	37.50	50.00
Potato at Hapur (1997-2002)	37.5	56.25	6.25
Sugar M' Grade traded at E-sugarindia Ltd (2003-04)	9.09	45.45	45.45
Sugar S' Grade traded at NMCEIL (2003-04)	0.00	100.00	0.00
Rubber at NMCEIL (2003-04)	42.86	35.71	21.43
Sesame Oil (2003)	17.00	83.00	0.00
Sesame Seed (2003)	20.00	50.00	30.00
Safflower Oil (2003)	60.00	40.00	0.00
Cotton Grade J-34 traded at NCDEX (2004)	20.00	60.00	20.00
Cotton Grade S-06 traded at NCDEX (2004)	60.00	40.00	0.00
Mustard traded at Hapur (2003-04)	67.00	16.50	16.50
Rice (2004)	0.00	100.00	0.00
Wheat (2004)	50.00	50.00	0.00

Source: Lokare. S.M (2007), Author Estimates
Note : The ratios were calculated contract wise and then counted

Table 2.5
Basis Risk of some Commodities Traded in National Commodity Exchanges

Commodity	Basis Risk > Spot Risk
Wheat	14 out of 26 cases
Chana	5 out of 26 cases
Tur	0 out of 12 cases
Tur Desi	0 out of 4 cases
Urad	4 out of 17 cases
Urad Desi	4 out of 4 cases
Sugar	13 out of 26 cases
Guar	1 out of 26 cases

Source : IIM Bangalore Summary Report 2008

The IIM Bangalore Study (2008) on the Impact of Futures Trading in wheat, sugar, pulses and guar seeds on farmers measured the basis and spot risk by the variance of the basis and spot prices respectively. The study found that the basis risk exceeded the spot price risk in all the contracts of Urad desi and for more than half the wheat and sugar contracts. The basis risk was higher than the spot price risk for around quarter of the urad contracts and a fifth of the chana contracts. It was only in the case of tur and tur desi that the basis risk was lower than the spot price risk for all contracts. (Table 2.5)

Table 2.6
Ratio of Standard Deviation of Basis Risk to Standard Deviation of Spot Price Risk of Refined Soy Oil

Contract ending in	2004	2005	2006	2007	2008
January	0.83	0.31	0.99	0.53	0.13
February	0.37	0.17	0.99	0.90	0.86
March	0.37	0.43	0.72	0.96	0.63
April	0.21	1.03	0.34	0.57	0.73
May	0.37	1.04	0.33	0.50	0.77
June	0.75	1.04	0.39	0.75	
July	0.79	0.70	0.90	0.85	
August	0.46	0.90	0.50	0.69	
September	0.51	0.91	3.13	0.46	
October	0.59	0.83	0.99	0.42	
November	0.67	0.38	0.72	0.34	
December	0.64	0.93	0.49	0.11	

Source: NCDEX futures price data for refined soy oil, Spot Prices from Indore Market as reported by NCDEX, Author Estimates

The share of soy oil in the value of futures trade has been consistently increasing over the last five years and it currently accounts for over 25 percent of the total value of futures trade in agricultural commodities in India. The ratio of the basis risk to the spot price risk has been estimated for the refined soy oil contract traded at NCDEX. Standard deviation of the basis and the spot price has been used as an estimate of the basis risk and spot price risk respectively. The average of the high and low price of the soy futures contract recorded at NCDEX is taken as the futures price for the day. Indore is an important centre of trade for refined soy oil. It is also the delivery centre for the refined soy oil contract traded at NCDEX. The price in the physical market in Indore is taken as the spot

price. The spot price data from Indore is reported at NCDEX. It is usually recorded thrice a day at regular intervals. The average of the three prices is taken as the spot price of the day. The basis risk was estimated for all the contracts traded at NCDEX until the May 2008 contract (a total of 53 contracts) and the ratio of the basis risk to the spot price risk was calculated. (Table 2.6)

The basis risk was lower than the spot price risk for over 90 percent of the refined soy oil contracts. However, if the benchmark value of 0.5 is adopted to test the attractiveness of the soy oil futures contract for hedgers, then the results are not as promising. Only 34 percent of the contracts had a basis to spot price risk ratio of less than 0.5.

Most contracts traded in commodity exchanges show relatively high basis risk as compared to the spot price risk. Hedgers would find that their business risks do not decrease and in some cases may even increase with futures trading. Despite their spectacular growth in recent years, futures markets do not appear to be a very effective means of price risk management. It is unlikely that these markets are able to attract genuine hedgers to participate in futures trading.

Chapter 3

Futures Markets, Speculation and Prices

While there is a general consensus that futures markets facilitate speculation, there is less agreement on the impact of this speculation on spot prices. This debate on whether speculation in futures markets has a stabilising or destabilising effect on spot prices is as old as the institution of futures markets. This chapter aims to understand the possible impact of futures trading on spot prices. The first section reviews the theoretical literature on the subject. The second section examines the empirical evidence (both international and from India) on the effect of futures trading on spot prices. There has been extensive discussion in policy, media and academic circles on whether futures markets had anything to do with the recent price rise in several agricultural and essential commodities in India. The third section attempts to examine this very question.

Theoretical Studies

Friedman (1953) argues that speculation must be net stabilising. Speculation can be destabilising only if it is unprofitable. Speculators have the incentive to buy when prices are low and sell when prices are high. Thus, they reduce price variability by taking the top off every peak and the bottom off every trough. Speculators who are unable to predict the peaks and troughs will lose money and eventually exit from the market.

Baumol (1957) criticises the proposition that profitable speculation is always price stabilising. He does this by presenting a counter example where speculators earn profits and yet destabilise prices. Speculators buy after the upturn in prices has begun and sell after the downswing has set in. This is because speculators know they cannot foretell the future with accuracy. They can hope to identify price peaks and troughs in retrospect after the price trend has been well established. The speculation will be profitable since it will involve higher price sales than purchases. However, since the sales occur when prices are falling and purchases occur when prices have begun to rise, speculative activity will accelerate the upward and downward movement in prices and thus be destabilising.

Stein (1961) and Kemp (1963) also present models where speculation can be both profitable and destabilising. Kemp's example is based on a perverse non speculative demand curve characterised by multiple equilibria. He constructs another counter example where he shows that unprofitable speculation is not necessarily destabilising. Hart (1977) shows that there is no general presumption that profitable speculation is always stabilising. His paper yields several results of profitable yet destabilising speculation. A sophisticated speculator can make money by exploiting the naive forecasting rules of less sophisticated agents and profitably destabilise prices.

Telser (1959) presents a model where positive speculators' profits imply that they have stabilised prices. Even if they suffer a loss, they may still stabilise prices. He criticises Baumol's proposition that speculators make their purchases and sales after the turning points have occurred. He argues that it is plausible that speculators concentrate their purchases just before the price reaches its minimum and their sales just before the price reaches its maximum. For this, they must be able to predict the turning points. They would make larger profits if they could predict when the turning points occur rather than making their purchases and sales after the turning points have occurred. Speculators would thus employ their technical knowledge and skills and acquire specialisation in predicting the turning points.

Glahe (1966) constructs a model where there are two groups of speculators – professional and non professional speculators and their aggregate expectations of prices vary. If both groups make positive profits, prices will tend to be stabilised. If one group makes positive profits and the other negative profits, the overall stabilising or destabilising influence cannot be determined without knowing the magnitude of profit and loss of both groups.

Farrell (1966) argues that the impact of speculation on prices must be analysed in two parts. The first question is on whether profitability of speculation implies stabilisation. The second question that needs to be studied is whether there is a selection process for speculators which will always ensure that speculation is profitable. He presents necessary and sufficient conditions for the basic proposition that profitability implies

stabilisation to be valid. He believes that be second proposition is statistical in nature and must be phrased in terms of probabilities.

Schimmler (1973) sets out to prove Friedman's theorem- profitable speculation is always price stabilising. He shows that the presence of any temporal dependence of non speculative excess demand implies that Friedman's theorem is invalid. The papers of both Farrell and Schimmler suggest that the formal conditions under which the proposition that *profitable speculation is price stabilising* is valid are very restrictive.

Most of the examples developed by Baumol, Telser, Farrell etc. rely on there being a small number of imperfectly competitive speculators having irrational expectations. Hart and Kreps (1977) show that speculation can be destabilising even when speculators are competitive and both speculators and non speculators have rational expectations. Their paper demonstrates that speculative activity can destabilise prices in reasonable circumstances, not that it necessarily always will. In fact, they present sufficient conditions for speculation to be stabilising (in the weak sense). The conditions are that consumption demand is independently and identically distributed over time and that speculators either have absolutely no foresight about future demand at all, or that speculators have a great deal of foresight. Either way, the conditions are extremely restrictive for speculation to be stabilising.

Peck (1976) studies the effects of futures markets on long run stability (she ignores the potential effects of futures markets on intra year price stability). She argues that futures markets dampen price fluctuations by facilitating the storage decision. Producers use futures prices in production decisions and this creates convergent price fluctuations.

Turnovsky (1983) analyses the impact of futures markets on long run mean and variance of the spot price and finds that it is difficult to draw definite conclusions in the general case. He considers several special cases. (1) The presence of risk neutral speculators with risk averse producers ensures that futures markets has a stabilising influence on spot prices, while reducing its mean. (2) Even when producers are risk neutral, futures markets stabilises prices, although its long run mean remains unchanged. (3) If both producers and speculators are risk neutral, the introduction of futures markets will leave

the long run mean and variance of spot price unchanged. (4) In the case of pure production, where inventories are infinitely costly to store and are not held, futures markets leave the variance of spot price unchanged. (5) In the pure inventory holding case, when production costs are infinitely large that no production takes place, long run mean and variance of spot prices are reduced with futures trading.

Kawai (1983) demonstrates that it is not possible to make a general comparison between spot price volatility when there is no futures market and when a futures market exists. He compares price volatility in three special cases, all of which assume the existence of a rational expectations solution and finds that the origin of random disturbances in the commodity market is critically important in determining whether a futures market is stabilizing or destabilizing.[34] Turnovsky and Campbell (1985), on the other hand, argue, in their rational expectations model, that futures markets always improve the stability of spot prices.

Newbery (1986) argues that futures markets offer insurance and thus encourage participants to make riskier decisions than they otherwise would. Whether this has a stabilising or destabilising effect on spot prices depends on whether the risky activity tends to stabilize or destabilize spot prices. Storage is an example of a risky activity which tends to reduce price instability. However, if the risky activity increases price risk, then speculators will tend to increase price instability. He demonstrates this for a case where producers were encouraged to change to a more risky but also more profitable mode of production.

Streit (1980) gives five reasons why futures trade has a stabilising effect on spot price volatility.[35] (1) Futures markets increase the speed with which information is diffused. This allows the market to adjust rapidly and thus reduces the size of price changes needed for equilibrium. (2) Futures markets reduce the price forecast errors by broadening the

[34] The first case is when either producers or inventory holding dealers are risk neutral. The second case is when dealers are infinitely risk averse and the third case is when the marginal cost of holding inventory is infinitely large. The source of disturbance could be a consumption demand shock, an inventory demand shock or a production disturbance.

[35] Streit, M.E (1980), On the Use of Futures Markets for Stabilisation Purposes, Review of World Economics, Vol. 116, No. 3 *quoted* in Newbery (1983)

market for information. (3) Futures markets provide traders the choice of whether to buy in the spot or futures markets. When spot prices rise relative to forecast prices, traders shift to futures markets and thus reduce pressure on the spot markets. (4) Futures markets reduce the possibility of intertemporal arbitrage via storage. Price disturbances are not concentrated in the present but spread over current and future periods. (5) Futures markets reduce endogenous price fluctuations by eliminating cobwebs caused by inefficient or adaptive forecasting methods.

Stein (1987) argues that poorly informed speculators could cause volatility to increase. He builds a model where introducing additional speculators in the futures market for a commodity would improve risk sharing but could also change the informational content of prices. Traders already operating in the market may find that their ability to make inferences based on current prices is negatively affected i.e., it is lowered. Even if the agents are rational, risk averse and make the best possible use of available information, the end result could be that prices are destabilised and welfare is reduced.

Jacks (2006) finds that even under the assumption of rational expectations both before and after the introduction of futures trading, price volatility will always be less with futures markets than without it. He believes that while existing models do provide some insight on the behaviour of commodity price volatility, the theory is not unambiguous in its predictions. It does not provide conclusive answers to questions such as what are reasonable values for the model parameters, whether the results will be invariant to the type of commodity and whether the parameter values in the model remain constant before and after the introduction of futures markets.

Theoretical models to resolve whether speculation has a stabilising or destabilising effect on prices have proved to be inconclusive because different models rely on different assumptions. Baumol (1959) stated sometime in the beginning of the debate itself that the effect of speculation on stability is in part an empirical question. It is difficult not to agree with him.

Empirical Evidence

Empirical studies examining the impact of futures markets on spot prices usually adopt one of the three methods – (1) Comparison of price fluctuations in periods of futures trading with periods when there was no futures trading, (2) Kaldor's formula for elasticity of futures price and (3) the Granger causality test. This section reviews studies which have empirically tested the stabilising/ destabilising influence of futures markets using these methods.

Comparing Price Variations

A common method used to study the impact of futures trading on prices is to compare the variation in prices in periods when futures trading existed with periods when there was no futures trading. Kamara (1982) surveyed several papers that had adopted this method. He found that weekly, monthly and seasonal price variations were lower for onions, Maine potatoes, live cattle and pork bellies in the United States when active futures markets existed as compared to periods when there was no futures trading.

Pavaskar, M.G. (1970) studied variations in spot prices of groundnut over fifteen years (between 1951-52 and 1965-66) to assess the effects of futures trading on price variability. He used the spot price data obtained from the Bombay Oilseeds and Oil Exchange Association (BOOA). He used price range as a measure of price fluctuation and analysed both intra month and intra fortnight price variations. All range values were deflated by their respective month/ fortnight average price. He found that the magnitude of short term price variations was greater in periods without futures trading than in periods with futures trading.

Naik (1970) analysed the seasonal price variations, the intra- seasonal and short term price fluctuations for linseed, groundnut and hessian between 1951-52 and 1965-66 and compared the price variations in years with futures trading and years with little or no futures trading. Monthly and weekly price ranges and coefficient of variation were largely used as measures of price variations and the ready prices were deflated by the All India Wholesale Price Index of the relevant period. She found that for groundnut and

hessian, the amplitude of seasonal fluctuations was smaller in years with futures trading than in years with little or no futures trading. For linseed, price fluctuations tended to increase with futures trading. The intra- seasonal and short term price fluctuations for groundnut and linseed were more stable during years of futures trading than for years with little or no futures trading while the price fluctuations in hessian appeared unaffected by futures trading.

Ranjan (2005) compared price variations in refined soybean oil when there was no futures trading (November 1997 to February 2000) with price variations when there was active futures trading (March 2000 to September 2004). With the exception of 2001-02, the monthly price variations (as measured by the monthly price range) in the period with active futures markets was lower than in the pre-futures trading period. The seasonal price volatility as measured by the standard deviation of monthly price from annual mean price declined sharply after active futures trading began.

Jacks (2006) examined the monthly price volatility in sixteen markets (fourteen in the United States, one in India and one in Indonesia) before and after the establishment of futures markets. He found that all sixteen commodity futures markets were associated with a considerable and significant dampening of seasonal price fluctuations.

Pavaskar, R (1977) questions the validity of this method since this method assumes that all other factors affecting supply and demand in the two periods are unchanged. She argues that factors such as stocks, market arrivals, weather, imports etc. vary and thus may influence price fluctuations. So unless price fluctuations due to these other reasons are isolated, it is not appropriate to attribute the differences in price variations to futures markets.

Kaldor's Formula

Pavaskar, M.G (1964) and Pavaskar, R (1977) adopted Kaldor's formula for assessing the price stabilising influence of speculation. Kaldor (1939) states that the degree of price stabilising influence of speculation is determined by the elasticity of expectations and the elasticity of speculative stocks. If S is the degree of price stabilising influence, e the

elasticity of speculative stocks and n the elasticity of expectations, the relation is as follows

$S = - e (n-1)$

Since e cannot be negative, the value of n assumes importance. If $n > 1$, S is negative (i.e., speculation will destabilise price) and if $n < 1$, S is positive (i.e., speculation will stabilise price). When $n = 1$, speculation will have no influence on price variations.[36]

Two modifications were made to Kaldor's formula before using it to study the price stabilising / destabilising influence of futures markets. The elasticity of expectations was measured by substituting the concept of futures price for the concept of expected price.[37] Kaldor's formula of elasticity of expectations aims to measure a change in the expected price as a proportion of a given change in the ready price. The change in the ready price includes a change due to carrying costs. A change in the ready price due to carrying costs should not be regarded as a destabilising influence of speculation and hence, this change is excluded from the change in the ready price to estimate the elasticity of expectations.

$n = [(Ft - Fo) / Fo] / [(Rt - Ro - c) / Ro]$

Where n is the elasticity of expectations, Ro the current ready price, Fo the current futures price, Ft the futures price at time t, Rt the ready price at time t and c the cost of carrying stocks in the time interval t – o. Futures trading will be destabilising when $n > 1$ and stabilising when $n < 1$.

Pavaskar, M.G (1964) estimated elasticity of futures prices for four week periods for groundnut, castorseed and rapeseed / mustardseed and raw jute and jute goods between 1957-58 and 1963-64. He found that futures markets had a stabilising influence in the majority of the four week periods under study. However, there were a large number of instances when futures markets had a destabilising influence. (Table 3.1)

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[36] The elasticity of expectations is unity when a change in the current price causes an equiproportionate change in the expected price.

[37] The actual futures price differs from the expected price by the marginal risk premium. Given a marginal risk premium, any change in futures price will always be equiproportionate to a change in the expected price.

Table 3.1
Elasticity of Futures Price (Summary Statistics)

Commodity	Period	No. of four week periods when.		Total No. of four week periods
		e < 1	e > 1	
Groundnut	1957-58 to 1962-63	43	17	60
Castorseed	1957-58 to 1962-63	47	30	77
Mustardseed	1958-59 to 1963-64	45	30	75
Raw Jute	1958-59 to 1962-63	45	11	56
Hessian	1958-59 to 1962-63	47	17	54
Twirls	1958-59 to 1962-63	36	17	53

Source: Pavaskar (1964), Author Estimates

Pavaskar, R (1977) calculated the elasticity of futures price for one month periods for eight years (1956-57 to 1963-64) for groundnut and for fifteen years (1951-52 to 1965-66) for castorseed. Groundnut futures markets had a stabilising influence on groundnut spot prices 67 % of the times and a destabilising influence 33 % of the times. Castorseed futures markets had a stabilising influence on castorseed spot prices 60 % of the times and a destabilising influence in the remaining 40 % of the times.

Granger Causality Test

Rutledge (1986) was unconvinced of the usual method of comparing price variability. Correlation between trading volume and price variability could be considered evidence in support of the hypothesis that speculation destabilises prices. However, it is also possible that volume of trade is a response to rather than a cause for increased price variability. Thus, the direction of causality underlying the correlation between trading volume and price variability assumes importance.[38] If the direction ran from trading volume to price variability, then this would imply that speculation could be price destabilising. He adopted the Granger – Sims procedure to test the causality between two time series.[39]

[38] He used the absolute value of the percentage change in daily closing prices as the measure of price variability. He found that the results would not be significantly altered if he used range as the measure.

[39] Granger, C.W.J (1969), Investigating Causal Relations by Econometric Models and Cross-Spectral Models, Econometricia, 37(3)

Sims, C.A (1972), Money, Income and Causality, American Economic Review, 62 (4)

He analysed 136 contracts in 13 commodities traded between 1973 and 1976 at the Chicago Board of Trade, the Chicago Mercantile Exchange and the International Monetary Market. While he could not provide direct evidence that speculative activity stabilises prices, his findings rejected the alternate view that speculative activity destabilises prices. Of the 136 contracts analysed, 23 cases showed a weak relationship. In 80 cases, he was unable to identify the direction of the causality and for 31 of the remaining 33 cases, the evidence showed that trading volume was caused by high cash price volatility rather than causing it. Only two cases showed causality running from trading volume to price variability.

Yang *et al* (2005) examined the lead-lag relationship between unexpected futures trading activity and cash price volatility using two econometric methods - the Granger causality test and the forecast error variance decompositions. The forecast error variance decomposition provides insights on the strength of a causal relationship between economic variables, in addition to the direction of such a casual relationship, which is provided by the Granger causality tests. They studied seven commodities (corn, soybean, sugar, wheat, cotton, hog and cattle) in the U.S from 1992 to 2001. The whole sample period was divided into two sub periods (January 1, 1992 to December 31, 1995 and January 1, 1997 to December 31, 2001).

The study used 100-day and 21-day moving averages of volume as the expected component and the difference between actual volume and the expected component as the unexpected component. They found that an increase in unexpected futures volume caused an increase in cash price volatility for most of the commodities. The percentage of variation in cash price volatility explained by unexpected trading volume was higher than 5% for five of the seven commodities under consideration in the first sub period (i.e., corn (6 %), soybeans (15 %), sugar (15 %), wheat (9 %) and cotton (7 %)) and six of the seven commodities in the second sub period (i.e., corn (10 %), soybeans (10 %), wheat (7 %), cotton (10 %), hog (6 %) and live cattle (8 %)).

The influence of futures price volatility on cash price volatility was evident for most commodities and was particularly significant for corn (12 % in the first sub period and 11

% in the second sub period), wheat (10 % in the first sub period and 8 % in the second sub period) and soybeans (25 % in the first sub period and 27 % in the second sub period). They found that unexpected trading volume has considerable influence on cash price volatility for most commodities and the sign of the causality was usually positive. This led them to conclude that an unexpected increase in futures trading volume unidirectionally causes an increase in cash price volatility for most commodities. Their findings indicate that futures markets have a destabilising effect on prices.

Studies which compared price variations in periods with little or no futures trading with price variations in periods with active futures markets have largely found that futures trading has a stabilising effect on spot prices. However, this method does not establish causation between futures markets and price fluctuations and does not take into account other variables which might have influenced the price variations. Studies that employed other methods have yielded mixed results. The empirical evidence again does not resolve the question. The debate on whether futures markets stabilises or destabilises spot prices is yet to be concluded.

Recent Concerns in India

The government's announcement of its decision to liberalise futures markets had received a mixed response. In 2006-07, there was a noticeable increase in the prices of several agricultural commodities, particularly wheat, potato, urad, chana. (Table 3.2) Futures trading in these commodities had begun only a little over a couple of years prior to that. The price rise gave sceptics even more reason to be wary of futures markets. The government delisted futures trade in rice, wheat, urad and tur in early 2007 and constituted an Expert Committee to investigate the impact of futures markets on spot prices.

Table 3.2
Monthly Wholesale Price Index (WPI) of Some Commodities (1993-94 = 100)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wheat												
2007	234.5	232.1	224.5	218.5	217	217.1	222.6	224.3	224.2	227.1	230.2	229.8
2006	205.5	209	209.4	198.9	199.2	200	201.1	207.4	216.8	221.2	228.4	233.7
2005	188.5	189.6	187.2	180.9	180	183.6	186.1	184.8	184.9	187	191	196.2
2004	190.9	192.6	188.6	180.3	178	179.4	179.8	183.9	183.7	184.6	186.7	187.7
Rice												
2007	181.1	181.9	183.7	185.5	186	186.5	188.4	190.6	192.6	193.2	194.1	193.1
2006	173	173.3	173.6	174.6	176.4	177.3	177.3	178.3	179.7	181.5	182	181.1
2005	168.5	170.2	170.3	170.9	170.5	173.7	175.8	177.5	177.8	178.1	176.8	173.5
2004	164.4	165.5	164.5	163.3	164.9	166.6	167.1	169	170.2	170.1	169.1	168.7
Urad												
2007	401.8	407.1	378.5	380.5	368.1	362.9	362.6	360.7	354.4	344.2	313.9	303.1
2006	313.7	340.9	335.9	381	385.5	396.4	396.2	387.6	403.2	450.5	433.8	423.7
2005	219.2	215.3	210.5	217.2	229.8	234.7	242.2	244.5	248.9	254.4	282.9	299.5
2004	212.2	216	216.3	211.8	207.8	206.9	215.6	218.8	220.8	222.7	225.1	220.6
Chana												
2007	224.2	217.9	200.7	199.3	196.4	196.2	199.9	200.1	200.3	203	204.1	199.7
2006	172.1	169.1	170.1	174.4	183.3	187.8	189.4	196.7	217	237.4	240.1	235.6
2005	136.8	135.9	135.8	136.9	139.8	143.3	148.9	152.5	156.1	158.3	164.7	172.4
2004	140.1	139.6	137	137.1	136.8	136.3	136.4	138.7	139.1	138.6	137.6	136.1
Tur												
2007	185.6	191.7	189.6	194	195.4	196	204.8	211.8	206.1	208.1	210.5	212.4
2006	171.1	164.5	171.3	179.2	179.1	176.9	175.1	175	182.9	185.4	182.2	181.6
2005	171.3	165.8	161.1	165.4	167.2	169.1	174.7	174.7	172.4	174.1	174.9	170.3
2004	181.4	177.7	174.1	173	175.8	179.7	184.6	188.1	197.1	193	182.7	179.1
Potato												
2007	166.3	162.7	190.2	202.7	227.4	257.5	279.2	289.5	291.3	296.3	285.4	260.2
2006	200.3	178.6	194.2	192.7	202.4	244.4	255.1	262.4	293.8	325.7	314.3	209.8
2005	127.7	138.3	141.5	174.2	192.1	194.7	201.2	198.4	193.8	196.2	238.1	232.9
2004	96.6	91	100.8	128.2	163.1	184.7	183	200.6	223	229.1	191.5	126.7

Source: Office of the Economic Advisor, Ministry of Commerce and Industry, GOI

Price Levels

The annualised growth trend in prices (both monthly and weekly) was lower in the post futures trade period as compared to the pre futures period for soy oil, soy bean, mustard seed, potato, turmeric, castor seed, and gur. For the remaining fourteen commodities

studied (chana, pepper, jeera, urad, chillies, wheat, sugar, tur, raw cotton, rubber, cardamom, maize, raw jute and rice), the post futures trade period witnessed a higher growth in prices as compared to the pre futures trade period. (Table 3.3)

Table 3.3
Annualised Trend Growth Rate and volatility of WPI of Selected Agricultural Commodities (pre and post futures trade)

Commodity	Monthly Data				Weekly Data			
	WPI Trend Growth Rate (%)		WPI Volatility (%)		WPI Trend Growth Rate (%)		WPI Volatility (%)	
	Pre-FT	Post-FT	Pre-FT	Post-FT	Pre-FT	Post-FT	Pre-FT	Post-FT
Chana	-9.2	20.9	10.6	11.3	-9.1	20.8	9.2	9.7
Soy Oil	21.8	-1.6	14.1	6.1	21.4	-0.9	17.0	7.0
Pepper	-22.5	8.9	27.4	30.9	-22.3	9.0	26.1	30.6
Jeera	-5.0	8.1	12.9	16.1	-5.0	8.8	17.7	17.7
Urad	-7.9	32.9	9.0	15.7	-7.7	32.7	10.9	18.4
Chillis	-16.4	42.9	15.0	17.1	-16.3	42.3	15.1	21.5
Soybean	12.2	-11.3	15.1	21.5	12.1	-11.4	3.6	4.0
Mustardseed	18.3	0.1	12.6	9.4	18.2	0.2	11.5	8.6
Wheat	2.3	9.6	5.3	7.3	2.3	9.5	4.9	6.1
Potato	28.9	11.7	49.6	47.5	29.0	11.3	44.8	41.5
Turmeric	20.2	-8.2	13.7	8.5	20.2	-8.2	18.5	16.6
Castor Seed	2.5	-2.2	13.5	12.7	2.4	-1.5	21.0	14.0
Sugar	1.2	3.2	7.7	7.6	1.3	3.0	5.9	6.0
Gur	25.4	-0.6	9.6	11.6	21.6	-0.6	17.0	12.0
Tur	2.8	5.8	9.0	7.7	2.9	5.8	9.1	10.0
Raw Cotton	-21.7	5.2	12.9	10.6	-21.4	5.2	9.5	15.9
Rubber	10.5	20.1	16.0	21.1	10.4	19.9	16.5	21.0
Cardamom	-20.3	4.6	11.7	19.5	-20.2	4.7	25.7	29.9
Maize	-2.4	9.6	11.4	6.8	-2.3	9.7	10.4	9.2
Raw Jute	-11.4	10.8	13.4	13.6	-11.3	10.7	17.5	13.9
Rice	-0.4	3.0	3.6	2.5	-0.4	2.9	3.1	2.3

Source: Expert Committee Report (2008)

The Expert Committee Report (2008) argues that some commodities had experienced negative inflation earlier and the increase in annualised growth trend of prices could be considered as a case of catching up with normal level of inflation for these commodities. For wheat, chana, chillis, urad and rubber, there is clear evidence of acceleration of inflation with the introduction of futures trading.

Nath and Lingareddy (2008) studied average change in prices of urad over three periods- the pre futures trade period, the period when futures trade was active and the period after delisting of urad. They found that there was a distinct increase in urad prices in the period of futures trading as compared to the other two periods. The Expert Committee (2008) was also of a similar opinion. They found that urad inflation was unusually high in the period of active futures trading. WPI urad inflation was -10.2%, -4.1%, 35.8%, 41.5% and -28.5% in 2003, 2004, 2005, 2006 and 2007 respectively; and the real WPI of urad averaged 126.6, 116.9, 124.7, 190.8 and 169.9 during these years.

The Committee also studied production and import data for tur and concluded that the price movements were largely in tandem with the supply situation. In fact, real prices of tur were lower in 2005 and 2006 when futures markets were active than in either 2003 (before futures trading began) or 2007 (after de-listing of tur).[40]

For rice, they found that while the WPI inflation rates were higher in 2006 and 2007 as compared to the preceding two years, the real WPI had declined in the period of futures trading and increased only after rice was delisted. The real WPI of rice (1993-94=100) averaged 97.7 in 2003, 90.3 in 2004, 89.6 in 2005, 87.4 in 2006 and 88.3 in 2007. This led them to conclude that futures trading in rice could not have exerted an upward pressure on prices.

Chand (2007) argues that real prices of wheat increased by 7.2 % during 2006-07 over 2005-06 while they had declined in the preceding five years. Production declined from 72 million tonnes in 2004-05 to 68.6 million tonnes in 2005-06 and 69.5 million tonnes in 2006-07. After taking into account exports, imports, change in stock and population growth, the shortfall in supply was estimated to be 1 %. Using acceptable estimates of price elasticities of wheat (-0.5), he estimated that the price rise should not have been

[40] Real WPI of tur (WPI tur relative to WPI all commodity, 1993-94=100) was 96.7 in 2003, 98.5 in 2004, 87.8 in 2005, 87.2 in 2006 and 94.1 in 2007.

more than 2 %.[41] Thus, of the 7.2 % increase in real prices, 2 % has been explained by real factors of availability.

Sen (2008) suggests that other factors also might have played a role in the rise in wheat prices.[42] One possible influence could have been that of world prices. World prices rose in 2005 – 06 and peaked in October 2006. Domestic prices followed world prices and rose despite the relatively large availability in the domestic market and the announcement of large imports by the government. According to him, the rising world prices were influencing expectations (as could be observed in domestic wheat futures), and government stocks were too low to mitigate these inflationary expectations. Wheat was delisted in February 2006. Domestic inflation was controlled in 2007-08, despite rising world wheat prices. The high output of wheat in 2006-07 was definitely one important reason for this. Although it cannot be established irrefutably, it appears that the transmission of international price pressures on domestic wheat prices was much lower after wheat futures were de-listed. He believes that is likely that the reference price role of futures markets may have facilitated the transmission of international inflationary pressures on domestic prices since the national commodity exchanges are quite prompt in capturing international price movements.

Price Volatilities

Price volatility measured for both weekly and monthly data declined with the introduction of futures trade for soy oil, mustardseed, potato, turmeric, castorseed, maize and rice. Price volatility increased for chana, pepper, urad, chillis, soybean, wheat, rubber and cardamom in the post futures trade period. Price volatility as measured for weekly and monthly data yielded conflicting results for jeera, sugar, gur, tur, raw cotton and raw jute. (Table 3.3)

Sahi (2007) studied the impact of introducing futures trading on the spot price volatility for six commodities. He found that futures market had a weak destabilising effect on the

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[41] Radhakrishanan and Ravi (1992), Effects of Growth, Relative Prices and Preferences on Nutrition, Centre for Economic and Social Studies, Hyderabad, Mimeo

[42] Abhijit Sen supplementary note in the Expert Committee Report (2008)

spot prices of wheat and raw jute. He employed the Granger Causality Test to study the impact of unexpected increase in futures trade volume on cash volatility. He found that unexpected futures trade activity unidirectionally caused an increase in the spot price volatility of wheat, turmeric, sugar and soybean oil. However, these results were not supported by the forecast error variance decompositions.

Nath and Lingareddy (2008) found that futures activity (in terms of volume) has a positive and significant causal effect on volatilities in spot prices of urad. This was not established in case of gram. The IIM Bangalore Study (2008) found that futures trade did not have any impact on the spot price volatility of chana, tur and sugar. The price volatility of guar reduced after the introduction of futures trade. There was however, an increase in spot price volatilities of urad and wheat after futures trade began.

The various studies on futures trade and its effect on prices have yielded mixed results. While it cannot be established beyond doubt that futures trade caused inflation or greater price volatilities, it is also a fact that real factors do not entirely explain price behaviour of certain commodities in recent years. It is possible that futures trading may have facilitated the transmission of international price pressures on domestic prices.

Chapter 4

Conclusion

One of the most important issues that has emerged is that there is an urgent need to critically evaluate the tangible benefits and costs of futures trading in agricultural commodities in India. This chapter concludes the study by highlighting some issues of concern.

Participation of Farmers

Farmers in India rarely directly participate in futures trading. The Khusro Committee (1980) observed that except for the large growers of the Saurashtra Region, cultivators in India are incapable of taking advantage of futures trading. Two and a half decades later, the Parliamentary Standing Committee on Food, Consumer Affairs and Public Distribution (2006-07) expressed a similar opinion. It remarked that it was unrealistic to expect that farmers can hedge in futures markets. The small land holdings and low income levels of farmers do not allow them to fulfil the margin requirements of commodity exchanges. The large size of contracts is another deterrent and farmers lack the expertise to participate in these markets.

World Bank and UNCTAD (1996) conducted a field survey on user composition of commodity exchanges in India and found that half of the users in futures markets were hedgers and half were speculators. Among the hedgers, traders as a group dominated. The IIM Bangalore Study (2008) found in their survey of farmers that the awareness of farmers about futures trade is abysmally low.[43]

It is often argued that the participation of farmers in futures markets is low not only in India, but also in countries with well developed futures markets like the United States. If farmers in their individual capacity don't hedge in futures markets, they may participate

[43] Of the farmers surveyed, 11 of the 781 wheat farmers, 5 of the 424 chana farmers, 6 of the 384 tur farmers, 5 of the 384 urad farmers, 10 of the 486 sugarcane farmers and none of the 275 guar farmers surveyed were aware of futures trading.

in futures markets through farmers associations and cooperatives. Even if farmers do not directly participate in futures trading, they can still benefit from the price discovery function of futures markets. There is some anecdotal evidence of farmers in India using futures markets for information on prices. However, there is no systematic evidence of such use.

In addition to the common problems farmers face in participating in futures markets, such as the lack of literacy and awareness, limited access to telecommunications facilities, insufficient financial resources etc, most farmers lack access to decent warehousing facilities. Sen (2008) argues for the strengthening of rural infrastructure and the extension of lending facilities by banks against warehouse receipts so that farmers are not forced to sell their output at low prices if they expect prices to increase (as indicated by futures prices).[44]

Effectiveness of Futures Markets for Hedging

Price Risk Management through hedging is considered the *reason d'etre* of futures markets. The question of farmers' participation in hedging operations above would be a moot point if futures markets prove to be unattractive to hedgers. The basis risk of several futures contracts for agricultural commodities was found to be very high, as discussed in Chapter 2. A high basis risk renders futures contracts ineffective as price risk management instruments. There were some instances where basis risk even exceeded spot price risks for a majority of the contracts in the commodity (like in the case of urad desi, wheat, safflower oil etc.). Higher basis risk as compared to spot price risk implies that hedgers would actually lose by hedging in futures markets. It is evident that futures markets, as they currently operate, are not conducive for hedging operations.

Speculation and its Impact on Prices

It is apparent from the discussion above that the spectacular growth of futures markets in recent years could not have been on account of hedging. The growth has been largely speculation driven. The FCRA (Amendment) Bill, 2006 had an enabling provision which

[44] Abhijit Sen's Supplementary Note to the Expert Committee Report (2008)

would allow foreign institutional investors and hedge funds to participate in commodity futures markets. Maizels (1994) had, over a decade and a half ago, expressed concern about how these speculative funds accentuated commodity price cycles. The repercussions of the influx of hedge and index funds in futures markets on commodity prices is an issue which is being widely debated in the United States at present. In India, the FCRA Amendment Bill has been put on hold because of a lack of political consensus on this issue.

The various studies on the impact of speculation on prices in India have yielded mixed results and no unambiguous conclusion can be drawn from them. The possibility of futures trading destabilising spot prices in some commodities cannot be ruled out.

Suitability of Commodities for Futures Trading

Most of the literature on futures trading lays down a set of feasibility conditions for futures trading in commodities. The Kabra Committee (1994) had done a case by case study of the suitability of various commodities for futures trading in India. The Committee recommended that futures trading be resumed in seventeen commodities and that certain commodities like wheat, non basmati rice, chillies, maize, sugar and pulses be kept outside the purview of futures markets since these commodities do not satisfy the feasibility criteria.

The circumstances have not changed greatly since the Committee submitted its report. Substantial government intervention in wheat and rice markets and the narrow market size of pulses render these commodities unsuitable for futures trading. These factors combined with the fact that the destabilising effect of speculation cannot be entirely ruled out provides enough reason to be circumspect about futures trading in essential commodities.

Annexure 1.1: Types of Forward Contracts

Fixed price contract: In A fixed price (or *flat price*) contract, the seller commits himself to delivering at an agreed time, a certain quantity of commodities of a specified quality.

Price-to-be-fixed contract: Price-to-be-fixed (PTBF) contracts are also called executable orders or on call contracts. While in other forward contracts, the reference prices are usually futures market prices, in this case, the seller (or the buyer, in case of processors, importers or end-users) has the ability to fix the prices at the moment deemed most opportune.

Deferred pricing contract: In a deferred pricing contract, the seller delivers the commodity and transfers ownership on the contract date but maintains control over when it is priced. This allows the seller to separate the pricing decision from the delivery decision. The risks of storage are passed to the buyer at the time of delivery and the contract may also be used as a substitute for storage when unavailable. The price may equal the elevator's bid price or an adjusted futures price at a time selected by the farmer. While this gives the farmer the opportunity to benefit from price rises, he also retains the risk that prices will fall between the time the contract is entered and the date on which the sales price is determined.

Deferred payment contract: A deferred payment contract specifies the price to be paid and transfers ownership upon delivery, while postponing payment.

Minimum price contract: This forward contract is similar to a fixed-price forward contract, except that it guarantees a minimum price with an opportunity to participate in future price gains.

Reference price forward contract: These contracts are priced using reference prices, which could be futures prices, or average export prices of a country.

Basis contract: A basis contract is a variant of the deferred pricing contract. There are two elements to this contract - futures value of the commodity and a pre-determined basis. The price of this contract is determined by applying a specified fixed basis to a

particular futures price, usually when desired by the farmer. Thus, while the basis part of price risk has been eliminated, the risk of futures prices still remains.

Hedge-to-arrive contract: A hedge-to-arrive (HTA) contract is opposite to the basis contract. It fixes the futures price but leaves the basis level to be determined at a later date (usually no later than the date of delivery). When a HTA contract is agreed, the buyer of the commodity immediately sells futures consistent with the time that the seller agrees to make delivery of the physical commodity. The futures price is thus locked in. Whether prices subsequently rise or fall, the seller's cash price will be based upon the price of the futures position initiated by the buyer. When the seller delivers the physical, the buyer will determine the cash price by adjusting the locked-in futures price by the basis that prevails at that particular time. The seller eliminates futures price risk with a HTA contract but assumes basis risk.

Source: Kang and Mahajan (2006)

Annexure 1.2: An Example of the Cashew Contract at NCDEX

Futures Contract Specifications (Applicable for contracts expiring in July 2007 and thereafter)	
Type of Contract	Futures Contract Specifications
Name of Commodity	Cashew
Ticker symbol	CSHW320KLM
Trading System	NCDEX Trading System
Basis	W 320 Ex-warehouse Kollam exclusive of all taxes.
Unit of trading	50 cartons
Delivery unit	50 cartons
Quotation/base value	Rs per carton The price quote would be on net basis and the net weight of each carton would be 22.68 kg.
Tick size	Re. 1
Quality specification	• Color and characteristics o White Wholes o White/pale ivory/light ash and Characteristic shape • Count/454 gm size description o 300-320 • Moisture - 4% maximum • Brokens allowed - 5% maximum • Next lower size grade and next lower grade - o 5 % (Next lower size grade & Scorched wholes together) • Kernels shall be completely free from infestation, insect damage, mould rancidity, adhering testa and objectionable extraneous matter. • Scraped and partially shriveled kernels also permitted provided such scraping/shriveling does not affect the characteristic shape of the kernel
Quantity variation	+/- 1%
Delivery center	Kollam (up to the radius of 50 Km from the municipal limits)
Additional delivery centres	Mangalore (up to the radius of 50 Km from the municipal limits) with location wise premium/discount shall be notified by the Exchange before launch of the contract.
Hours of Trading	As per directions of the Forward Markets Commission from time to time, currently **Mondays through Fridays :** 10:00 AM to 5:00 PM **Saturdays :**10.00 AM to 2.00 PM The Exchange may vary the above timing with due notice.
Delivery specification	The sellers would be required to give their intentions to give delivery at least five days before the maturity of the contract. Sellers giving intention for delivery shall not be allowed to square off

	their positions. If the buyer with an outstanding position at maturity or the seller who has given an option to delivery fails to meet their respective obligations, the penalty structure will be as per circular no. NCDEX/TRADING-091/2007/235 dated October 4, 2007.
Delivery Logic	Seller's Option
No. of active contracts	As per calendar below July 2007 and September 2007 contracts to be launched in May 2007 November 2007 contract to be launched in July 2007
Opening of contracts	Trading in any contract month will open on the 10th of the month. If the 10th day happens to be a non-trading day, contracts would open on the next trading day
Due date/Expiry date	20th day of the delivery month If 20th happens to be a holiday, a Saturday or a Sunday then the due date shall be the immediately preceding trading day (other than a Saturday) of the Exchange
Closing of contract	On the expiry of the contract, all outstanding positions, which are not intended for giving/taking of physical delivery of commodity shall be closed out at the final settlement price announced by the Exchange.
Price band	Daily price fluctuation limit is (+/-) 5%. If the trade hits the prescribed daily price limit there will be a cooling off period for 15 minutes. Trade will be allowed during this cooling off period within the price band. Thereafter the price band shall be raised by another 50 % of the existing limit i.e. (+/-) 2.5% and trade will be resumed. If the price hits the revised price band again during the day, trade will only be allowed within the revised price band. No trade/order shall be permitted during the day beyond the revised limit of (+/-) 7.5%.
Position Limits	**Member:** 2,00,000 cartons for all contracts **Client:** 50,000 cartons for all contracts The above limits will not apply to bona fide hedgers. For bona fide hedgers, the Exchange will, on a case to case basis, decide the hedge limits. **For near month contracts:** The following limits would be applicable from one month prior to expiry date of a contract **Member:** Maximum of 40,000 cartons **Client:** Maximum of 10,000 cartons
Special Margins	In case of additional volatility, a special margin at such percentage, as deemed fit, will be imposed in respect of outstanding positions, which will remain in force as long as the volatility exists, after which the special margin may be relaxed

Source: NCDEX website accessed on May 29, 2008.
http://www.ncdex.com/product/Agro_product.aspx?comm=CSHW

Annexure 2.1: Commodity Exchanges in India

1. Rajdhani Oils and Oilseeds Exchange Ltd., Delhi
2. Ahmedabad Commodity Exchange Ltd
3. Bhatinda Om & Oil Exchange Ltd., Batinda.
4. Bikaner Commodity Exchange Ltd.,Bikaner
5. First Commodity Exchange of India Ltd, Kochi
6. Haryana Commodities Ltd., Sirsa
7. India Pepper & Spice Trade Association.Kochi
8. Multi Commodity Exchange of India Ltd,Andheri,Mumbai
9. National Board of Trade. Indore
10. National Commodity & Derivatives Exchange Ltd.
11. National Multi Commodity Exchange of India Limited,Ahemadabad
12. Surendranagar Cotton oil & Oilseeds Association Ltd,
13. The Bombay Commodity Exchange Ltd.Mumbai
14. The Bullion Association Limited,Jaipur
15. The Central India Commercial Exchange Ltd, Gwaliar
16. The Chamber Of Commerce.,Hapur
17. The Cotton Association of India Mumbai
18. The East India Jute & Hessian Exchange Ltd, Kolkata
19. The Meerut Agro Commodities Exchange Co. Ltd., Meerut
20. The Rajkot Commody Exchange Ltd.
21. The Spices and Oilseeds Exchange Ltd,Sangli
22. Vijay Beopar Chamber Ltd.,Muzaffarnagar

Bibliography

Acharya S.S (2004), Agricultural Marketing, State of the Indian Farmer; A Millennium Study, Volume 17, Academic Foundation and Ministry of Agriculture, GOI

Ahuja, N.L. (2006), Commodity Derivatives Market in India: Development, Regulation and Future Prospects, *International Research Journal of Finance and Economics*, Issue 2

Atkin, M. (1989), Agricultural Commodity Markets: A Guide to Futures Trading, Routledge

Aliber, R.Z. (1964), Speculation and Price Stability Once Again, *The Journal of Political Economy*, Vol. 72, No. 6

Anderson, R.W. and Danthine, J.P. (1983), The Time Pattern of Hedging and the Volatility of Futures Prices, *The Review of Economic Studies*, Vol. 50, No. 2

Anderson, R.W. and Danthine, J.P. (1981), Cross Hedging, *The Journal of Political Economy*, Vol. 89, No.6

Baumol, W.J. (1957), Speculation, Profitability, and Stability, *The Review of Economics and Statistics*, Vol. 39, No. 3

Baumol, W.J. (1959), A Theory of Speculation Relating Profitability and Stability: Reply, *The Review of Economics and Statistics*, Vol. 41, No. 3

Berck, P. (1981), Portfolio Theory and the Demand for Futures: The Case of California Cotton, *American Journal of Agricultural Economics*, Vol. 63, No. 3

Bhattacharya, H. (2007), Commodity Derivatives Market in India, *Economic and Political Weekly*, March 31

Bond, G.E. (1984), The Effects of Supply and Interest Rate Shocks in Commodity Futures Markets, *American Journal of Agricultural Economics*, Vol. 66, No. 3

Brannen, P.P. and Ulveling, E.F. (1984), Considering an Informational Role for a Futures Markets, *The Review of Economic Studies*, Vol. 51, No. 1

Brown, S.L. (1985), A Reformulation of the Portfolio Model of Hedging, *American Journal of Agricultural Economics*, vol. 67, No. 3

Burns, J.M. (1983), Futures Markets and Market Efficiency in Streit, M.E (ed.) *Futures Markets: Modelling, Managing and Monitoring Futures Trading*, Basil Blackwell and European University Institute

Carter. C.A. (1999), Commodity Futures Markets: A Survey, the Australian *Journal of Agricultural and Resource Economics*, 43:2

Cecchetti, S.G, Cumby, R.E. and Figlewski, S. (1988), Estimation of the Optimal Futures Hedge, *The Review of Economics and Statistics*, Vol. 70, No. 4

Chance, D.M. (2004), An Introduction to Derivatives and Risk Management, South-Western

Chand, R. (2007), Wheat Supply, Price Prospects, and Food Security, *Economic and Political Weekly*, May 12

Collins, R.A. (1997), Towards a Positive Theory of Hedging, *American Journal of Agricultural Economics*, Vol. 79, No. 2

Cootner, P.H. (1960), Returns to Speculators: Telser versus Keynes, *The Journal of Political Economy*, Vol. 68, No. 4

Cootner, P.H. (1960), Returns to Speculators: Rejoinder, *The Journal of Political Economy*, Vol. 68, No. 4

Cootner, P.H. (1961), Common Elements in Futures Markets for Commodities and Bonds, *The American Economic Review*, Vol. 51, No. 2, Papers and Proceedings of the Seventy -Third Annual Meeting of the American Economic Association

Cox, C.C. (1976), Futures Trading and Market Information, *The Journal of Political Economy*, Vol. 84, No. 6

Dahl, R.P. (1980), Futures Markets: The Interaction of Economic Analyses and Regulation: Discussion, *American Journal of Agricultural Economics*, Vol. 62, No. 5, Proceedings Issue

Danthine, J.P, 1978, Information, Futures Prices and Stabilising Speculation', *Journal of Economic Theory*, Vol. 17, No. 1

Dusak, K. (1973), Futures Trading and Investor Returns: An Investigation of Commodity Market Risk Premiums, *The Journal of Political Economy*, Vol. 81, No. 6

Fama, E.F. (1970), Efficient Capital Markets: A Review of Theory and Empirical Work, *The Journal of Finance*, Vol. 25, No. 2

Fama, E.F (1991), Efficient Capital Markets II, *Journal of Finance*, Vol. 60, No. 5

Fama, E.F. and Farrel, M.J. (1987), Commodity Futures Prices: Some Evidence on Forecast Powers, Premiums and the Theory of Storage, *The Journal of Business*, Vol. 60, No. 1

Farrell, M.J. (1966), Profitable Speculation, *Economica*, New Series, Vol. 33, No. 130, pp. 183-193

Feiger, G. (1976), What is Speculation?, *The Quarterly Journal of Economics*, Vol. 90, No. 4

Forward Market Commission, Fortnightly Market Review Reports available at www.fmc.gov.in

Frechette, D.L. (2000), The Demand for Hedging and the Value of Hedging Opportunities, *American Journal of Agricultural Economics*, Vol. 82, No. 4, pp. 897-907

Gardner, B.L (1989), Roll Over Hedging and Missing Long Term Futures Markets, American Journal of Agricultural Economics, Vol. 71, No.2

Gemmill, G.T. (1983), Regulating Futures Markets, A Review in the Practice of British and American Practice in Streit, M.E (ed.) *Futures Markets: Modelling, Managing and Monitoring Futures Trading*, Basil Blackwell and European University Institute

Glahe, F.R. (1966), Professional and Non Professional Speculation, Profitability, and Stability, *Southern Economic Journal*, Vol. 33, No. 1, pp. 43-48

Ghosh, S, Gilbert, C.I and Hallett, A.J.H. (1987), Stabilizing Speculative Commodity Markets, Clarendon Press

Goss, A.B. (1986), Feasibility and Consequences of Using Information in Futures Markets in Goss, A.B. (ed.) *Futures Markets: Their Establishment and Performance*, Croom Helm

GoI (1952), The Forward Contract Regulation Act, Act No. 74 of 1952

GoI, (1980), Report of the Committee on Forward Markets (*Chairman: A M Khusro*), Ministry of Civil Supplies

GoI (1994), Report of the Committee on Forward Markets (*Chairman: Kabra, K.N*), Ministry of Consumer Affairs, Food and Public Distribution

Standing Committee on Food, Consumer Affairs and Public Distribution, Fourteenth Lok Sabha (2006), Forward Contracts (Regulation) Amendment Bill, Lok Sabha Secretariat, GoI

GoI, (2007), Economic Survey 2006-07, Ministry of Finance

GoI, (2005), Economic Survey 2004-05, Ministry of Finance.

GoI, (2007), Annual Report 2006-07, Ministry of Consumer Affairs

GoI (2008), Report of the Expert Committee to Study the Impact of Futures Trading on Agricultural Commodity Prices (*Chairman: Prof. Abhijit Sen*), Ministry of Consumer Affairs, Food and Public Distribution

GoI, Office of the Economic Advisor, Ministry of Commerce and Industry, www.eaindustry.nic.in

Gray, R.W. and Rutledge, D.J.S. (1971), The Economics of Commodity Futures Markets – A Survey, *Review of Marketing and Agricultural Economics*, Vol 39, No. 4

Hardy, C.O (1923), Risk and Risk Bearing, The University of Chicago Press. Chicago

Hardy, C.O. and Lyon, L.S. (1923), A Theory of Hedging, *The Journal of Political Economy*, Vol. 31, No. 2

Hart, O.D. (1977), On the Profitability of Speculation, *The Quarterly Journal of Economics*, Vol. 91, No. 4

Hart, O.D. and Kreps, D.M. (1986), Price Destabilizing Speculation, *The Journal of Political Economy*, Vol. 94, No. 5

Hawtrey, R.G. (1940), Mr. Kaldor on the Forward Market, *The Review of Economic Studies*, Vol. 7, No. 3

Hicks, J.R (1946), Value and Capital, Oxford, Clarendon Press

Hirshleifer, D. (1988), Risk, Futures Pricing, and the Organization of Production in Commodity Markets, *The Journal of Political Economy*, Vol. 96, No. 6.

Hirshleifer, D. (1989), Determinants of Hedging and Risk Premia in Commodity Futures Markets, *The Journal of Financial and Quantitative Analysis*, Vol. 24, No. 3

Hirshleifer, D. (1989), Futures Trading, Storage, and the Division of Risk: A Multiperiod Analysis, *The Economic Journal*, Vol. 99, No. 397

Ho, T.S.Y. (1984), Intertemporal Commodity Futures Hedging and the Production Decision, *The Journal of Finance*, Vol. 39, No. 2

Hong, H. (2000), A Model of Returns and Trading in Futures Markets, *The Journal of Finance*, Vol. 55, No. 2

Holthausen, D.M. (1979), Hedging and the Competitive Firm under Price Uncertainty, *The American Economic Review*, Vol. 69, No. 5

Houthakker, H.S. (1957), Can Speculators Forecast Prices?, *Review of Economics and Statistics*, Vol. 39, No.2

Jacks, D.S. (2007), Populists versus Theorists: Futures Markets and the Volatility of Prices, *Explorations in Economic History*, 44

Johnson, H.G. (1976), Destabilizing Speculation: A General Equilibrium Approach, *The Journal of Political Economy*, Vol. 84, No. 1

Johnson, L.L. (1960), The Theory of Hedging and Speculation in Commodity Futures, *The Review of Economic Studies*, Vol. 27, No. 3

Kaldor, N. (1940), A Note on the Theory of the Forward Market, *The Review of Economic Studies*, Vol. 7, No. 3

Kaldor, N. (1939), Speculation and Economic Stability, *The Review of Economic Studies*, Vol. 7, No. 1

Kamara, A. (1982), Issues in Futures Markets: A Survey, *The Journal of Futures Markets*, Vol 2

Kabra, K.N. (2007), Commodity Futures in India, *Economic and Political Weekly*, March 31

Kaminsky, G. and Kumar, M.S. (1990), Efficiency in Commodity Futures Markets, Staff Papers - *International Monetary Fund*, Vol. 37, No. 3

Kang, M.G and Mahajan, N. (2006), An Introduction to Market-Based Instruments for Agricultural Price Risk Management, Agricultural Management, Marketing and Finance Working Document 12, FAO

Kawai, M. (1983), Price Volatility of Storable Commodities under Rational Expectations in Spot and Futures Markets, *International Economic Review*, Vol. 24, No. 2

Kawai, M. (1983), Spot and Futures Prices of Nonstorable Commodities Under Rational Expectations, *The Quarterly Journal of Economics*, Vol. 98, No. 2

Kemp, M. C. (1963), Speculation, Profitability, and Price Stability, *The Review of Economics and Statistics*, Vol. 45, No. 2

Keynes, J.M (1923), Some Aspects of Commodity Market, Manchester Guardian

Keynes, J.M. (1930), A Treatise on Money, Harcourt, Brace and Company, New York

Kohn, M. (1978), Competitive Speculation, *Econometrica*, Vol. 46, No. 5

Lapan, H. and Moschini, G. (1994), Futures Hedging under Price, Basis, and Production Risk, *American Journal of Agricultural Economics*, Vol. 76, No. 3

Lee, C.F. and Leuthold, R. M. (1986), An Analysis of Investment Horizon and alternative Risk- Return Measures for Commodity Futures Markets in Goss, A.B. (ed.) *Futures Markets: Their Establishment and Performance*, Croom Helm

Lingareddy, J. (2007), Futures: A Partial Picture, *Economic and Political Weekly*, July 28

Lintner, J. (1965), Security Prices, Risk, and Maximal Gains From Diversification, *The Journal of Finance*, Vol. 20, No. 4

Lokare, S.M. (2007), Commodity Derivatives and Price Risk Management: An Empirical Anecdote from India, *Reserve Bank of India Occasional Papers*, Vol. 28, No. 2, RBI

Marcus, A.J. and Modest, D.M. (1984), Futures Markets and Production Decisions, *The Journal of Political Economy*, Vol. 92, No. 3

Maizels, A. (1994), The Continuing Commodity Crisis of Developing Countries, *World Development*, Vol. 22, No. 11

McKinnon, R.I. (1967), Futures Markets, Buffer Stocks and Income Stability for Primary Producers, *The Journal of Political Economy*, Vol. 75, No. 6

Meade, J.E. (1949), Degrees of Competitive Speculation, *The Review of Economic Studies*, Vol. 17, No. 3

Morgan, C.W, Rayner, A.J. and Ennew, C.T. (1994), Price Instability and Commodity Futures Markets, *World Development*, Vol. 22, No. 11

Naik, A.S. (1970), Effects of Futures Trading on Prices, Somaiya Publication Pvt. Ltd

Naik, G. and Jain, S.K (2002), Indian Agricultural Commodity Futures Markets: A Performance Survey, *Economic and Political Weekly*, July 27

Nath, G.C and Lingareddy, T. (2008), Impact of Futures Trading on Commodity Prices, *Economic and Political Weekly*, January 19

Nelson, R.D. (1985), Forward and Futures Contracts as Preharvest Commodity Marketing Instruments, *American Journal of Agricultural Economics*, Vol. 67, No. 1

National Commodities and Derivatives Exchange, www.ncdex.com

Netz, J.S. (1995), The Effect of Futures Markets and Corners on Storage and Spot Price, *American Journal of Agricultural Economics*, Vol. 77, No. 1

Newbery, D.N. (1983), Futures Trading, Risk Reduction and Price Stabilisation in Streit, M.E (ed.) *Futures Markets: Modelling, Managing and Monitoring Futures Trading*, Basil Blackwell and European University Institute

Newbery, D.M. (1987), When Do Futures Destabilize Spot Prices? *International Economic Review*, Vol. 28, No. 2

Newbery, D.M. (1989), The Theory of Food Price Stabilisation, *The Economic Journal*, Vol. 99, No. 398

Pavaskar, M.G. (1964), Futures Markets Stabilise Prices, *Economic and Political Weekly*, June 27

Pavaskar, M.G. (1970), Futures Trading and Price Variations, *Economic and Political Weekly*, February 28

Pavaskar, R. (1977), Efficiency of Futures Trading, Popular Prakashan

Pavaskar, M. (2005), Death Trap for Commodity Futures, *Economic and Political Weekly*, January 1

Pavaskar, M. (2005), IPR in Commodity Futures Contracts, *Economic and Political Weekly*, October 15

Pavaskar, M. (2006), Futures and Prices, *Economic and Political Weekly*, September 9

Pavaskar, M. and Ghosh, N. (2008), More on Futures Trading and Commodity Prices, *Economic and Political Weekly*, March 8

Peck, A.E. (1975), Hedging and Income Stability: Concepts, Implications, and an Example, *American Journal of Agricultural Economics*, Vol. 57, No. 3

Peck, A.E. (1976), Futures Markets, Supply Response and Price Stability, *The Quarterly Journal of Economics*, Vol. 90, No. 3

Poole, W. (1970), McKinnon on Futures Markets and Buffer Stocks, *The Journal of Political Economy*, Vol. 78, No. 5

Raipura, K. (2002), Futures Trading: 'Locking In' Profitable Prices, *Economic and Political Weekly*, May 18

Raipura, K. (2003), Price Stability and Futures Trading: Need for Macro-Development Framework, *Economic and Political Weekly*, December 27

Ranjan, N. (2005), Role of Commodity Exchanges, Futures and Options (A Case Study on Soya Oil, Occasional Paper 46, *NABARD*

Rees, G.L. (1972), Britain's Commodity Markets, (Monographs on British Economic Institution Series Edited by Victor Morgan, Paul Eleck Books Ltd

Rolfo, J. (1980), Optimal Hedging under Price and Quantity Uncertainty: The Case of a Cocoa Producer, *The Journal of Political Economy*, Vol. 88, No. 1

Routledge, B.R, Seppi, D.J. and Spat, C.S. (2000), Equilibrium Forward Curves for Commodities, *The Journal of Finance*, Vol. 55, No. 3

Rutledge, D.J.S. (1986), Trading Volumes and price Variability: New Evidence on the Price Effects of Speculation in Goss, A.B. (ed.) *Futures Markets: Their Establishment and Performance*, Croom Helm

Sabnavis, M. and Jain, S. (2007), Working of Commodity Futures Markets, *Economic and Political Weekly*, May 5

Sahadevan, K.G. (2002), Sagging Agricultural Commodity Exchanges: Growth Constraints and Revival Policy Options, *Economic and Political Weekly*, July 27

Sahi, G.S. (2007), Influence of Commodity Derivatives on Volatility of Underlying Asset, *The ICFAI Journal of Derivatives Markets*, Vol. 4, No. 3

Schimmler, J. (1973), Speculation, Profitability, and Price Stability--A Formal Approach, *The Review of Economics and Statistics*, Vol. 55, No. 1

Sharpe, W.F. (1964), Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk, *The Journal of Finance*, Vol. 19, No. 3

Stein, J.L. (1986), Real Effects of Futures Speculation: Asymptotically Rational Expectations, *Economica*, New Series, Vol. 53, No. 210

Stein, J.L. (1986), The Economics of Futures Markets, Basil Blackwell Ltd, U.K

Stein, J.C (1987), Informational Externality and Welfare- reducing Speculation, *Journal of Political Economy*, Vol. 95

Stiglitz, J.E. (1983), Futures Markets and Risk: A General Equilibrium Approach in Streit, M.E (ed.) *Futures Markets: Modelling, Managing and Monitoring Futures Trading*, Basil Blackwell and European University Institute

Streit, M.E. (1983), Modelling, Managing and Monitoring Futures Trading: Frontiers of Analytical Enquiry in Streit, M.E (ed.) *Futures Markets: Modelling, Managing and Monitoring Futures Trading*, Basil Blackwell and European University Institute

Stoll, H.R. (1979), Commodity Futures and Spot Price Determination and Hedging in Capital Market Equilibrium, *The Journal of Financial and Quantitative Analysis*, Vol. 14, No. 4

Telser, L.G. (1958), Futures Trading and the Storage of Cotton and Wheat, *The Journal of Political Economy*, Vol. 66, No. 3

Telser, L.G. (1959), A Theory of Speculation Relating Profitability and Stability, *The Review of Economics and Statistics*, Vol. 41, No. 3

Telser, L.G. (1960), Returns to Speculators: Reply, *The Journal of Political Economy*, Vol. 68, No. 4

Telser, L.G. (1981), Why There Are Organized Futures Markets, *Journal of Law and Economics*, Vol. 24, No. 1

Telser, L.G. (1986), Futures and Actual Markets: How they are Related, The *Journal of Business*, Vol. 59, No. 2

Telser, L.G and Higinbotham, H.N. (1977), Organised Futures Markets: Costs and Benefits, *The Journal of Political Economy*, Vol. 85, No. 5

Telser, L.G. and Yamey, B.S. (1965), Speculation and Margins, *The Journal of Political Economy*, Vol. 73, No. 6

Thompson, S. (1985), Use of Futures Markets for Exports by Less Developed Countries, *American Journal of Agricultural Economics*, Vol. 67, No. 5, Proceedings Issue

Tirole, J. (1982), On the Possibility of Speculation under Rational Expectations, *Econometrica*, Vol. 50, No. 5

Turnovsky, S.J. (1983), The Determination of Spot and Futures Prices with Storable Commodities, *Econometrica*, Vol. 51, No. 5

Turnovsky, S.J and Campbell, R.E. (1985), The Stabilizing and Welfare Properties of Futures Markets: A Simulation Approach, *International Economic Review*, Vol. 26, No. 2

Tsiang, S.C. (1943), A Note on Speculation and Income Stability, *Economica*, New Series, Vol. 10, No. 40

UNCTAD Secretariat. (2002), Farmers and Farmers' Associations in Developing Countries and their Use of Modern Financial Instruments, UNCTAD/ITCD/COM/35, UNCTAD

UNCTAD Secretariat. (1998), A Survey of Commodity Risk Management Instruments, UNCTAD/COM/15/Rev.2, UNCTAD

UNCTAD. (2006), UNCTAD Survey of the World's Commodity Exchanges 2005, UNCTAD and Swiss Futures and Options Association

UNCTAD Secretariat. (2006), The World's Commodity Exchanges: Past-Present- Future, prepared for the 27th International SFOA Bürgenstock Conference September 6 - 10, 2006, UNCTAD and Swiss Futures and Options Association.

Veljanovski, C.G. (1986), An Institutional Analysis of Futures Contracting in Goss, A.B. (ed.) *Futures Markets: Their Establishment and Performance*, Croom Helm

Weller, P. and Yano, M. (1987), Forward Exchange, Futures Trading, and Spot Price Variability: A General Equilibrium Approach, *Econometrica*, Vol. 55, No. 6

Working, H. (1958), A Theory of Anticipatory Prices, *The American Economic Review*, Vol. 48, No. 2, Papers and Proceedings of the Seventieth Annual Meeting of the American Economic Association

Working, H. (1935), Differential Price Behavior as a Subject for Commodity Price Analysis, *Econometrica*, Vol. 3, No. 4

Working, H. (1937), [Past and Present Theory regarding Futures Trading]: Discussion, *Journal of Farm Economics*, Vol. 19, No. 1, Proceedings Number

Working, H. (1942), Quotations on Commodity Futures as Price Forecasts, *Econometrica*, Vol. 10, No. 1

Working, H. (1949b), The Theory of Price of Storage, *The American Economic Review*, Vol. 39, No. 6

Working, H. (1948), Theory of the Inverse Carrying Charge in Futures Markets, *Journal of Farm Economics*, Vol. 30, No. 1

Working, H. (1949), Professor Vaile and the Theory of Inverse Carrying Charges, *Journal of Farm Economics*, Vol. 31, No. 1, Part 1

Working, H. (1949a), The Investigation of Economic Expectation, *American Economic Review*, 39, Supplement

Working, H. (1953), Futures Trading and Hedging, *The American Economic Review*, Vol. 43, No. 3

Working, H. (1953), Hedging Reconsidered, *Journal of Farm Economics*, Vol. 35, No. 4

Working, H. (1953), Price Supports and the Effectiveness of Hedging, *Journal of Farm Economics*, Vol. 35, No. 5, Proceedings of the Annual Meeting of the American Farm Economic Association Meeting Jointly with the Western Farm Economics Association

Working, H. (1954), Whose Markets?: Evidence on Some Aspects of Futures Trading, *Journal of Marketing*, Vol. 19, No. 1

Working, H. (1956), New Ideas and Methods for Price Research, *Journal of Farm Economics*, Vol. 38, No. 5

Working, H. (1962), New Concepts Concerning Futures Markets and Prices, *The American Economic Review*, Vol. 52, No. 3

World Bank. (1996), India Managing Price Risks in India's Liberalized Agriculture: Can Futures Markets Help? Report No. 15453-IN, WB

Yamey, B.S. (1983), The Economics of Futures Trading: Some Notes and Queries in Streit, M.E (ed.) *Futures Markets: Modelling, Managing and Monitoring Futures Trading*, Basil Blackwell and European University Institute

Yamey, B. (1986), Hedging, Risks and Profits: Notes on Motives for Hedging on Futures Markets in Goss, A.B. (ed.) *Futures Markets: Their Establishment and Performance*, Croom Helm

Yang, J., Balyeat, R.B. and Leatham, D.J. (2005), Futures Trading Activity and Commodity Cash Price Volatility, *Journal of Business Finance & Accounting*, 32(1) & (2)