ARTICLE NO.6

AGRICULTURAL COMMODITY FUTURE TRADING AND ITS IMPLICATIONS – AN OVERVIEW

Neeti Agarwal
Associate Professor, School of Management Studies, IGNOU

Gurbandini Kaur
Research Scholar, IGNOU

Abstract: Derivatives are becoming increasingly important in world market as a tool for risk management, price discovery, speculations and for efficient trading in market. These instruments can be used by traders to offset financial risks. They also provide a mechanism by which diverse and scattered opinions of future are collected which helps in revealing information about future cash market price through future market. This in turn helps in improving the market efficiency.

The paper focuses on the conceptual perspective of commodity future trading and its implication on the commodity market. A thorough review of the literature has been done for future trading in general and commodity market in particular. The objectives of the paper are to study the growth of the commodity market in India and study the price volatility, efficiency and arbitrage opportunity of agricultural future commodity market. The study has been carried out using the secondary data. The study has resulted in finding out the gaps, which define the further scope of the research. The study shows that there is much scope in the Indian market as much has not been done in the country with respect to the agricultural commodity market.

Keywords; Volatility, Spot Price, Future contracts, Agricultural Commodities, Chana, Pepper, Guar Seed, Refined Soya oil, Mustard seed, Trading Days

1. Introduction

Commodity "futures" trading was permitted in India in 2003. The commodity derivative market in India has witnessed phenomenal growth since then. Indian commodity market expanded almost by 50 times in a span of 5 years from INR 665.30 billion in 2002 to INR 33,753.36 billion in 2007 registering a Compounded Annual Growth Rate (CAGR) of a little over 119.3% and was expected to grow at a steady growth rate of about 30% by 2010 and touch a volume of INR74,156.13 billion due to the continued active and wide participation of traders (ASSOCHAM findings). [Indian Rupees One Billion is equivalent to approximately US Dollars 22.63 millions at the exchange rate of US$1 = INR 44.2 then.]

The market comprises 21 commodity futures exchanges, which include five national and 16 (commodity –specific) regional commodity exchanges. During 2010, one commodity exchange, namely the Ahmadabad Commodity Exchange (ACE), was upgraded to a national exchange and rechristened ACE Derivatives and Commodity Exchange Limited, Ahmadabad. Agricultural commodities, bullion, energy and base metal products account for large shares of the commodities traded in the commodities futures market. Futures' trading in zinc and lead, mini contracts was introduced for trading during 2010.

The total value of trade in the commodity futures market has risen substantially in 2010 (Table 1). The growth could be attributed to larger participation in the market, increase in global commodity prices, the advent of new commodity exchanges and the restoration of trade in some of the suspended agriculture commodities. During the year 2010-11 (up to November 2010), in value terms bullion accounted for the maximum share of traded value among the commodity groups (45.22 percent) followed by metals (23.80 percent), energy (19.45 percent) and agricultural commodities (11.53 percent) However, in quantity items, trade in energy accounted for 56.77 percent followed by agricultural commodities (31.57 per cent), metals (11.51 percent), metals (11.51 percent) and bullion (0.05 per cent) (Economic Survey 2010-2011)

Table 1: Turnover on Commodity Future Markets

Name of the Exchange	**Calendar Year**			
	2007	**2008**	**2009**	**2010**
Multi Commodity Exchange, Mumbai	27,30,415	42,84,653	59,56,656	78,95,404
National Commodity and Derivatives Exchange, Mumbai	7,74,965	6,28,074	8,05,720	9,73,217
National Multi Commodity Exchange, Ahmedabad	25,056	37,272	1,95,907	1,80,738
Others	1,24,051	83,885	1,32,173	4,45,366
Grand Total	**36,54,487**	**50,33,884**	**70,90,456**	**94,94,752**

Source: Economic Survey 2010-11

The average daily value of trades in the commodity exchange improved from INR 13,287 crore during 2007, INR 16,400 crore during 2008 to INR 23.200 crore in 2009 (Refer to Table 2).

Table 2: Trade in Commodity Futures Market of Agricultural Commodity

Year	**Volume**	**Value**
2006-2007	5023.92	1317125.21
2007-2008	3,139.03	9,41,283.33
2008-2009	2,309.35	6,27,303.14
2009-2010	3991.21	1217949.00
2010-2011	4168	1456390
2011-12	3878.45	1695550.8

Source Economic Survey 2008-09 & 2009-10 & 2011-12
Volume in lakh tonne
Value in INR Crore

Given the above perspective of commodity future, an attempt has been made to study the present status of the commodity market, so that gap areas can be identified and scope of further research can be judged.

2. Objectives

The objectives of the study are as follows:

1. To study the evolution and growth of commodity market in India.
2. To study the price volatility, efficiency and arbitrage opportunity related to agricultural future commodity market.

3. Research Methods

Since this paper focuses on the conceptual perspective of commodity future trading and its implication on the commodity market, secondary data has been done for future trading in general and commodity market in particular. Secondary data has been gathered from different journals, online database like SSRN, Ebscohost and other e-resources. Use of key words have been done to select the abstract, research objective which has further helped in getting the detail of the work done previously and findings drawn in the past.

4. Discussion

The theoretical framework is framed by highlighting the major research work done in the areas of price volatility, efficiency and arbitrage opportunity of the agricultural future commodity market.

4.1 Price Volatility

Knowledge of price volatility under market oriented agriculture policy is important. This is important because the output price volatility is an indispensable input for farmers and agribusiness decision making (Maynard et.al, 1997). Several price moves are thought to be detrimental to the market since they disrupt trading mechanism causing a loss of liquidity, and prolong the threat to market stability (Becketti and Roborts, 1990, Federal Reserve Board 1997, Darrat & Rahman, 1995).

Questions concerning what constitutes commodity price volatility and how it should be measured have generated considerable debate. Beginning with Massell (1970), most empirical studies attempt to measure unanticipated price movements. Following the hypothesis put forward by Castelino (1981) based on Samuelson (1965) several reasons have been suggested to explain the non stationarity observed in future prices. Broadly **five sources of the volatility** on agricultural future markets have been identified in the literature. They are **year effect**, the **calendar month effect**, the **contract month effect**, the **maturity effect** and **trading session effect**. In practice, various schemes are employed, which sometimes lead to contradictory results.

The first three effects are well analyzed in Milonas and Vora (1985). As indicated in the study, the year effect refers to

(1) Random shocks to supply and demand conditions arising from political decisions or unexpected severe weather conditions (such as grain export embargoes, storms etc.) ;

(2) Public policies (such as government support prices) occurring in specific years and affecting one or several crop cycles.

Calendar month effect or seasonality effect reflects the fact that price volatility increases during months of yield uncertainty, such as summer months when information on changing weather conditions have the most effect on expectations about crop size and quality. Contract month effect reflects price volatility arising from the uncertainty about the conditions of the new crop during delivery months of contracts maturing before the new harvest time. Analyzing five agricultural futures for the period 1972-1983, Milonas and Vora (1985**)** reported strong evidence of year and calendar month effects in all cases, and mixed results for the contract month effect. Vein, Kenyon et al (1987) also examined the month effect especially for corn, soybeans and wheat futures. Their results support the presence of yearly random shocks and monthly seasonal effects on price volatility in these markets. Fama and French (1987) and French (1986) also reported seasonal variations on the basis for U.S. commodity futures, while Khoury and Yourougou (1989), conducting their tests on a weekly basis, found no evidence of seasonality effects for weeks ranging from 9 to 36.

Maturity effect relates to increasing volatility as contracts approach their expiration date. Khoury and Yourougou (1993) carried out a study on six agricultural commodities in Canadian market for a nine year period and found evidence of maturity effect in all the commodities examined by them. Galloway and Kolb (1996) focused that there was no maturity effect in metals but it was substantially present in agricultural contracts and financial futures. Grammatikos and Saunders (1986) examined the maturity effect for volume and price volatility for currency future. The study on maturity effect has also been done by Duong and Kalev (2006), who examined the maturity effect and the presence of negative coherence between spot price and cost of carry for contracts having maturity effect using intra-day commodity prices.

According to Samuelson (1965), futures prices adjust to new information more quickly as maturity draws nearer. This results from the fact that spot and futures prices must cover at maturity. Later study dome by Stein (1979) casts Samuelson's hypothesis as a special case within a more general framework concerning the resolution of uncertainty. Barring seasonal effects, as the contracts reach maturity, the uncertainty fades but futures prices become more volatile as they react more strongly to new information. **The verifiable hypothesis of this is that the volatility of price changes grows larger as contracts approach maturity**.

Regarding the trading session effects, the issue is whether price volatility originate only when it is open or is applicable in other cases as well. Several studies have investigated

this issue in the U.S. security and futures markets. Among these, French and Roll (1986) examined the risk-return relationship between overnight and day trading, which itself induces volatility. Ferris and Chance (1987) also examined U.S. Treasury Bond Futures, prior to the advent of evening trading on April 30, 1987 and reported trading-day price volatility as two to three times greater than that of overnight non trading. Hill, Schneeweis, and Yau (1990) examined Eurodollar and U.S. Treasury bond futures market for the periods of July and August of 1986, 1987 and 1988 and presented evidence that variance of price changes is higher during trading than during non trading sessions. A similar conclusion was reached by Lauterback and Monroe (1989) for gold futures.

One of the most influential studies that have the contribution of Prebisch (1950) and Singer (1950) approach, also presents theoretical justification and empirical evidence of a secular negative trend in the price of primary commodities relative to that of manufactured goods in the 1870-1945 period, Poshilati which is popularly known as Prebisch – Singer Hypothesis (PSH). However, recent empirical evidence has rejected the PSH using stochastic trend models. Nevertheless, this stochastic trend approach was also argued with a lot of limitations as noted by Cochrane (1991).

After studying different views on price volatility, it was found that the greater price volatility would increase a farmer's income risk which already increases by receipt of only fixed and declining govt. subsidies (Young and Shields, 1996). Yang, Haigh and Leatham, 2001, study provides evidence that the agricultural liberalization policy has generally caused an increase in price volatility of major grain commodities (corn, soybeans and wheat). These findings stand in sharp contrast to Crain and Lee's (1996) observations based on wheat markets that market oriented measures in government farm form policies tend to reduce agricultural price volatility. The results of this study also support the previous empirical finding of Ray et al. (1998) although they used a different methodology (simulation).

The effect of future trading on cash price volatility has long been discussed. The observers of financial and commodity markets have often questioned the role of future trading in the volatility of cash price (Committee of Banking, Financial & Urban Affairs, 1988' U.S. General Accounting Office Report 1994). Darrat and Rahman (1995) reported no evidence for cash running from the S&P 500 future trading activity (both volume and open interest) to cash price volatility. However Chatrath, Ramchander and Song (1996) argued that currency future trading activity (trading volume) had a significant positive i.e. destabilizing causal impact on the cash price volatility, with a weaker negative causal influence from the spot exchange rate volatility on future trading activity. Adrange and Chatrath (1998) reported that no causality exists between cash market volatility and open interest positions of large speculations and higher cash price volatility is caused by small traders, which was interpreted as evidence of destabilizing effect.

In Indian context , studies by Thenmozhi (2002), Nath (2003) Bandivadekar et al (2003) and Thenmozhi (2004) reported decline in volatility while Shenbagaraman (2003), Pretimaya et al (2007) and Sibani Prasad Sarangi et al (2007) did not found significant

impact on market volatility in India. Above studies give a mix result about the effect of derivatives on the volatility of the underline markets across the countries.

4.2.1 Market Efficiency

Market efficiency has an influence on the investment strategy of an investor because if market is efficient, there will be no undervalued transaction. An efficient market offers higher than deserved expected returns, given their risk in an emerging market. Efficiency in the context of capital market has been defined in many ways, but the most common way has been defined in terms of what sort of information is available to market participants and how they handle that information. According to this view, an efficient capital market is one where prices of financial assets accurately reflect all information and quickly adjust to new information (Dimson and Mussavian 1998). This definition is referred to as informational efficiency. Nevertheless, the markets are also economic institutions that require resources and economic agents. Efficient markets in this wider economic sense are involved in allocating resources to their most profitable use and in cost effective way. This is called allocative efficiency.

Capital market can also be defined as operational efficient. The concept of operational efficiency pertains to market's ability to provide liquidity rapid execution and low trading costs (Sharpe et al 1999-92).

4.2.1 Efficient Market Hypothesis (EMH)

Efficient market hypothesis is a concept of informational efficiency and refers to market's ability to process information into prices. The idea of the efficient market hypothesis emerged as early as the beginning of the twentieth century in the theoretical contribution of Bachelier (1900)[1] and the empirical research of Cowless (1993)[2]. The EMH is related to random walk theory and the idea of asset price pattern was introduced by Bachelier in 1900 (Pushakwale, 1996).

The concept of market efficiency is based on the theory of random walk process through which we determine underlying market is efficiently or inefficient. If the market is efficient then it follows a random walk process and model will fail to identify any pattern, in such case historical data cannot be useful to determine expected returns. On the other hand if market is not efficient then it means market is not following a random walk process and the model used will identify the pattern of market movement, in this case data series is considered to be stationary and historical data can be useful to identify

[1] On March 29, 1900, a Ph.D. thesis by Louis Bachelier entitled "Theory of Speculation" was accepted by the Faculty of Sciences of the Academy of Paris, which eventually laid the foundation for the random walk hypothesis of market efficiency. (Dimson and Mussavian 1997)

[2] See Fama (1970), Leroy (1989), Dimson and Mussavian (1997)

future returns. From the above discussion it is clear that identification of pattern in this series data is the main key to determine whether the market is efficient or inefficient.

The random walk hypothesis is used to explain the successive price changes which are independent of each other. In other words, in an efficient market at any point in time the actual price of security will be a good estimate of its "intrinsic value"(Fama 1965). Fama (1970) has been the first to develop the efficient market hypothesis. He formalized his hypothesis further and indicates that a market is called efficient if prices "fully reflect" all available information.

(i) Weak – form – efficiency

A market is called weak efficient, if all the information regarding past price movements is reflected in the current prices. Under this form, the information of future prices cannot be predicted by using past price.

(ii) Semi – strong efficiency

Semi strong form markets fully reflect all publically available information in its stock price. Thus one cannot make abnormal profits by using publically available information.

(iii) Strong – form efficiency

The strong form efficiency suggests that security prices reflect all available information, even private information. It is not possible to forecast future price movements.

4.2.2. Market Efficiency

Voluminous literature is available on the behaviour of stock price over time but studies related to testing market efficiency in emerging markets are few compared to the volume of studies published in developed market. There is dearth of published literature for testing market efficiency of commodity market.

The previous research studies proved that the developed markets are weak-form efficient and emerging markets are less efficient than developed stock markets. That means the successive returns are independent and follow random walk. The early studies of Working (1934) Kendall (1943 and 1953), Cootner (1962), Osborne (1962) and Fama (1965) evidenced that the developed market are weak-form efficient. Groenewold and Kang (1993) found Australian market to be semi-strong form efficient. Narayan and Smyth (2005) found strong support of random walk hypothesis for 15 European countries.

All the research results indicate that the past price changes were not helpful in forecasting the future price changes since the markets followed random walk model. However, there are some studies which rejected the random walk hypothesis in the developed markets such as Fama and French (1988) and Poterba and Summers (1988). Hudson et al. (1994)

found that the technical trading rules have predictive power but is not sufficient to enable excess return in UK market. Kwan et al (1995) studied the stock markets of Australia, Japan, Hong Kong, Singapore, South Korea, Taiwan, the UK, the US and Germany employing monthly data from January, 1982 to February ,1991. Their evidence suggested that these markets were not weak-form efficient as they found significant lead-lag relationships among equity markets. Nicolass Gronewold (1997) carried out the various tests of the EMH using daily observations on the statex actuaries price index for Australia and the NZSE-40 index for New Zealand for the period 1975-1992 and concluded that past returns was not so high.

There are few empirical studies on the performance of the Indian commodity derivatives market. A study by Lokare (2007) finds that although the Indian commodity market is yet to achieve minimum critical liquidity in some commodities (sugar, pepper, gur, and groundnut), almost all the commodities show an evidence of co-integration between spot and future prices revealing the right direction of achieving improved operational efficiency, albeit, at a slower pace. Further, hedging proves to be an effective proposition in respect of some commodities. However, in a few commodities, the volatility in the future price has been substantially lower than the spot price indicating an inefficient utilization of information. Several commodities also appear to attract wide speculative trading. One of the reasons for low volumes could be attributed to some of the measures that FMC undertook in the recent period such as daily mark to market margining, time stamping of trades, demutualization for the new exchanges, etc., with a view to promote market integrity and transparency. The exchanges have attributed subsequent fall in the volume of trade with introduction of these measures (Kolamkar 2003). A study by Thomas (2003) reports that major stumbling blocks in the development of derivatives market are the fragmented physical/spot markets. Supporting this view, Lokare (2007) suggests that national level derivative exchanges cannot be founded on fragmented localized cash markets. Because of fragmentation, prices of major commodities vary widely across *mandis*. These differences arise because of poor grading, differential rates of taxes and levies, and inadequacy of storage facilities (Bhattacharya 2007). Similarly, Sahi and Raizada (2006) found that commodity futures market is not efficient in the short-run and social loss statistics also indicate poor price discovery in the commodity market. Future prices do not lead to spot prices in the Indian context refuting the objective of price discovery of commodity futures markets.

There have been a number of studies that have analyzed efficiency of commodity markets in the developed countries. The efficiency of commodity markets can be analyzed by using approaches of Fama (1970). Elam and Dixon (1988) have shown the invalidity of conventional F tests for market efficiency estimation for non stationary time series modeling. Stein (1991) has estimated the social loss due to inefficiency of the future markets. Similar study has been conducted for future market in China. The methodology used in the study has been developed from Lai and Lai (1991). The econometric techniques developed by Engle and Granger (1987) and Johnsen and Juselius (1990) for co-integration allow for a Vector Auto Regressive (VAR) model for determination of spot and future prices and allows for testing market efficiency.

4.2.3 Arbitrage Opportunity

The ease of arbitrage has increased dramatically and it's due in part to the profound changes in the modern capital market including global de regulation. Capital market now cross national border quickly and easily and encourage creation of financial instruments and transactions. The ease of arbitrage and elasticity of international financial markets also make it difficult for one country to impose restrictions or cost on parties to financial transactions. As a result, there are significant costs and benefits associated with arbitrage. Many studies have addressed the scope of arbitrage possibility using future contract in stock or financial markets.

An arbitrage opportunity can be defined as an instance when the law of one price is violated, i.e. when two assets (or combinations of assets) have the same payoffs, but different prices. If markets are efficient, price reflects all information so that the profits made by acting on information do not exceed the costs of trading (Jensen, 1978). Accordingly, assets trade at prices that reflect their fundamental values and no arbitrage opportunity exists. However, the costs of trading are surely positive so that the extreme form of the efficient market hypothesis does not hold. Even with rational traders in the market, an asset may be mispriced if traders have limited ability to take advantage of arbitrage opportunities. Significant arbitrage costs prevent rational traders from exerting sufficient price power to force prices to return to fundamental values (Shiller, 1984 and De Long, Shieifer, Summers, and Waldmann. 1990). For example, arbitrage strategies based on mispricing may be restricted because of limits on short sale proceeds, the cost of portfolio rebalancing, and the possibility of forced liquidation (Lee, Shieifer, and Thaler, 1991). In a costly arbitrage framework with noise traders, Pontiff (1996) identifies factors that affect the profitability of arbitrage and, in turn, the magnitude of mispricing. Using a sample of closed-end mutual funds, Pontiff concludes that the magnitude of mispricing can be explained by various security characteristics, including how difficult the fund is to replicate, the security's dividend yield, and transaction costs.

First the arbitrager's risk is greater when it is more difficult to hedge the fundamental value of the arbitrage position. With greater fundamental risk mispricing is more likely to persist because the cost of arbitrage is greater. Shleifer and Vishny (1997) were able to argue that arbitrage activity is likely to be greater in markets in which arbitragers accurately measure and easily realize the fundamental value.

There are studies that involve testing the arbitrage efficiency through various relationships such as put-call parity and box spread. According to Mittnik and Rieken (2000), 'pure arbitrage' tests are conducted with the assumptions that investors will eliminate all riskless arbitrage opportunities in the options or futures markets. These tests involve jointly testing the hypotheses that the market is efficient, and that the data are synchronized. Examples of testing the index options markets on the US data are Billingsley and Chance (1985), Ronn and Ronn (1989), Marchand et al. (1994), whereas Fung et al. (2004) investigated the data in Hong Kong. While most others either find very restricted arbitrage opportunities or unprofitable positions in arbitrage, Hemier and Miller

(1997) concluded that any market can be inefficient in a particular period. On the other hand, Figlewski (1984), Cornell (1985), Chung (1991), Yadav and Pope (1994), to name a few, studied the index-arbitrage between index futures and the underlying index in the USA and UK. Fung and Draper (1999), Draper and Fung (2002), Jiang et al. (2002), and Chiang, et al. (2003), for example, performed similar tests on the futures markets in Hong Kong. Their results suggest that greater mispricing occurs with increased market volatility, and hence generating profitable arbitrage opportunities.

5. Conclusion

The discussion based on various parameters of the commodity market as a whole show that the researchers have a mixed view. There is no defined viewpoint on any of the variables selected. This clearly shows the uncertainty prevailing in the market which forms the basis of the research. Much of the studies are available on the equity segment of financial market than concentrating on the agricultural commodity market. Moreover the researches are focused on the European and the US market and much is not available on the developing markets like India. This conceptual study therefore provides a scope for research in the developing and emerging markets.

6 References

Adrangi, B and A Chatrath (1998) "Futures Commitments and Exchange Rate Volatility', Journal of Business Finance & Accounting, Vol 25, PP 501-20

Bandivadekar, S and Saurabh Ghosh (2003), 'Derivatives and volatility on Indian stock markets', RBI Occasional Papers , Vol 22, pp 1181-1191.

Becketti S and D J Roberts, 1990, Will increased regulation of stock index futures reduce stock market volatility? Federal Reserve Bank of Kansas City, Economic Review 75, 33-46

Bhattacharyya, Himadri (2007), "Commodity Derivatives Market in India", Economic and Political Weekly, XL II (13), pp.1151-62.

Billingsley, R. S. and Chance, D. M. (1985) Options market efficiency and the box spread strategy, Financial Review, 20, 287–301.

Castelino, M (1981), "Futures Markets: The Maturity Effect on Risk and Return," Unpublished, Ph.D Dissertation City University of New York.

Chatrath, A S Ramchander and F Song (1996) 'The Role of Futures Trading Activity in Exchange Rate Volatility' Journal of Futures Markets, Vol 16 , pp 561-84

Chiang, R. C. P., Fung, J. K. W. and Mok, H. M. K. (2003) The impact of financial crisis on the inter-market arbitrage efficiency between stock futures and the underlying stocks, Working paper, Hong Kong Baptist University.

Chung, P. Y. (1991) A transactions data test of stock index futures market efficiency and index arbitrage profitability, The Journal of Finance, 46, 1791–809.

Cochrane, J. (1991) "A Critical of the Application of Unit Root Tests" Journal of Economic Dynamics and Control, vol 15, pp.207-227.

Cootner P (1962), "Stock Prices Random vs Systematic Changes", Industrial Management Review, Vol 3, Spring , PP 24-45

Cornell, B. (1985) Taxes and the pricing of stock index futures: empirical results, The Journal of Futures Markets, 5, 89–101.

Crain, S J and Lee, J H (1996) volatility in wheat spot and futures markets, 1950-1993: government farm programs, seasonality and causality, Journal of Finance, 51,325-43

Darrat A F & S Rahman, 1995. Has futures trading activity caused stock price volatility? Journal of Futures Markets 15,537-557.

Dimson, E., and Mussavian, M. (1998): "A brief of history of market efficiency". European Financial Management, vol. 4, no. 1, 91-193.

Draper, P. and Fung, J. K. W. (2002) Discretionary government intervention, and the mispricing of index futures, Working paper, Hong Kong Baptist University.

Duong, N.H and Kalev, S.P(2006) A trading analysis of the Samuelson Hypothesis for commodity futures contracts, paper presented at Global Finance Conference, Rio de Janeiro, Brazil

Elam, E and B L Dixon (1988), "Examining the validity as a Test of Future Market Efficiency", The Journal of Future Markets, Vol.8, pp.363-372.

Engle, R. F. and C. W. J. Granger, "Co-intergration and Error Correction: Representation,
Estimation, and Testing." Econometrica, 55(1987): 251-276.

Fama 1965 "The Behavior of Stock-Market Prices. Eugene F. Fama. The Journal of Business, Vol. 38, No. 1. (Jan., 1965), pg. 34-105.

Fama 1970, "Efficient Capital Markets: A Review of Theory and Empirical Work" Journal of Finance, Vol 25, pp.283-306

Fama E F and French K R (1988) "Permanent and Temporary Components of Stock Prices" Journal of Political Economy, , Vol.96, No.2, pp. 246-273

Fama, E.F, and French, K.R (1987):"Commodity Futures Prices: Some Evidence on

Forecast Power, Premiums, and the Theory of Storage, "Journal of Business, 60:55-73.

Ferris, S.P and Chance, D.M (1987): "Trading Time Effects in Financial and Commodity Futures Market," Financial Review, 22:281-294.

Figlewski, S. (1984) Hedging performance and basis risk in stock index futures, The Journal of Finance, 39, 657–69.

French K.R. and Roll R. (1986)""Stock Return Variances: The Arrival of Information and the Reaction of Traders", Journal of Financial Economics, 17;5-26

Fung, J. K. W. and Draper, P. (1999) Mispricing of index futures contracts and short sales constraints, The Journal of Futures Markets, 19, 695–715.

Fung, J. K. W., Mok, H. M. K. and Wong, K. C. K. (2004) Pricing efficiency in a thin market with competitive market makers: box spread strategies in the Hang Seng Index options market, Financial Review, 39, 435–54.

Galloway, T.M and Kolb , R.W (1996) Futures prices and the maturity effect, Journal of Futures Markets, 16(7) 809-28

Grammatikos, T, and Saunders, A (1986) Futures prices variability: A test of maturity and volume effects, Journal of Business, 59: 319-330

Hill,J., Schneeweis T., and Yau, J(1990): "International Trading/Non Trading Time Effects on Risk Estimation in Futures Markets," The Journal of Futures Markets, 4:407-423.

Hudson Robert, Dempsey Michael and Keasey Kevin (1994),"A Note on the Weak Form Efficiency of Capital Markets: The Application of Simple Technical Trading Rules to UK Stock Prices – 1935 to 1994", Journal of Banking & Finance, Vol 20, pp 1121 – 1132.

Jensen, M.V, 1978, "Some Anomalous Evidence Regarding Market Efficiency", Journal of Financial Economics 6(4), 95-101

Jiang, G. R., Tang, N. and Law, E. (2002) Electronic trading in Hong Kong and its impact on market functioning, Working paper, Bank of International Settlements.

Johansen, S., "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models." Econometrica, 59(1991): 1511-1580.

Kendall M G (1943), The Advanced Theory of Statistics, Vol 1, Griffin, London.

Kenyon, D., Kenneth, K,Jordan, J., Seale W and McCabe, N (1987): "Factors Affecting Agricultural Futures Price Variance," The Journal of Futures Markets, 7:73-91

Khoury, N and Yourougou, P (1993) Determinants of agricultural futures prices volatilities. Evidence from Winnipeg Commodity Exchange, Journal of Futures Markets, 13(4): 345-56.

Khoury, N.T and Yourougou, P(1989): "Price Discovery Performance and Maturity Effects in the Canadian Feed Wheat Market," The Review of Futures Markets, 8:402-418.

Kolamkar, D.S. (2003), "Regulation and Policy Issues for Commodity Derivatives in India" in S.Thomas (ed.), Derivatives Markets in India, pp.161-77

Kwan A, Sim A and Cotsomitis J (1995), "The Casual Relationships Between Equity Indices on World Exchanges", Applied Economics, Vol 27, No.1, pp. 33-37

Lai, K. S. and M. Lai, "A Cointegration Test for Market Efficiency." The Journal of Futures Markets, 11(1991): 567-575.

Lauterback, B., and Monroe, M (1989):"Evidence on the Effect of Information and Noise Trading on Intraday Gold Futures Returns," The Journal of Future Markets, 4:297-306

Lee, C. M. C, A. Shleifer, and R. H. Thaler, 1991, "Investor Sentiment and the Closed-End Fund Puzzle," Journal of Finance 46(1), 75-109.

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.

Marchand, P. H., Lindley, J. T. and Followill, R. A. (1994) Further evidence on parity relationship in options on S&P 500 index futures, The Journal of Futures Markets, 14, 757–71.

Massell, B.F, 1970, Export instability and economic structure, American Economic Review, 60, Sept, 618-630

Maynard, L J Harper, J K and Hoffman, L D (1997) Impact of risk preferences on crop rotation choice, Agricultural and Resource Economics Review , 26, 50-9.

Milonas, N.T (1986):"Price Variability and the Maturity Effect in Futures Markets," The Journal of Futures Markets, 6:443-460

Milonas, N.T and Vora, A (1985): "Sources of Nonstationarity in Cash and Futures Prices," The Review of Futures Markets, 4:314-326.

Mittnik, S. and Rieken, S. (2000) Put-call parity and the informational efficiency of the German DAX-index options market, International Review of Financial Analysis, 9, 259–

79.

Narayan and Smyth R (2005), "Cointegration of Stock Markets Between New Zealand, Australia and the G7 Economics: Searching for Co-Movement Under Structural Change", Australian Economic Papers, Vol 44, No.3, pp 231-247

Nicolaas Groenewold (1997), "Share Market Efficiency: Tests Using Daily Data for Australia and New Zealand", Applied Financial Economics , Vol 7, No.6, pp 645-657

Osborne, M F M (1962), "Periodic Structure In the Brownian Motion in the Stock Prices", Operation Research, May/June, pp 345-379

Pontiff, J.. 1996, "Costly Arbitrage: Evidence from Closed-End Funds," Quarterly Journal of Economics 111(4), 1135-1151.

Poshakwale, S.(1996), "Evidence on weak form efficiency and Day of the week effect in Indian stock market, Finance India, Vol.10, No.3, pp.605-616.

Poterba J M and Summers L H (1988), "Mean Reversion in Stock Prices:Evidence and Implications", Journal of Financial Economics, Vol. 22, pp 27-59.

Prebisch , R.(1950). "The Economic Development of Latin America and its Principal Problems". Economic Bulletin for Latin America 1962, vol.7, pp.107-118

Pretimaya S and Kumar P (2007), 'Impact of future trading on underlying spot market volatility' ICFAI Journal of Applied Finance, Vol 13, pp 52-65.

Ronn, A. G. and Ronn, E. I. (1989) The box spread arbitrage: theory, tests, and investment strategies, Review of Financial Studies, 2, 91–108.

Ray D.E, Richardson, J.W. De La Torre Ugarate, D G and Tiller K.H, (1998) Estimating price variability in agriculture implications for decision makers, Journal of Agricultural and Applied Economics, 20, 21-33

Samuelson,P.(1965): "Proof that Properly Anticipated Prices Fluctuate Randomly," Industrial Management Review ,6:41-50

Sharpe, W. F., Alexander, G. J., and Bailey, J. V. (1999): Investments. Sixth Edition. Upper Saddle River: Prentice-Hall, Inc.

Shenbagaraman, P. (2003) Do Futures and Options Trading increase Stock Market Volatility? NSE News Letter, NSE Research Initiative, Paper No 20

Shiller, R. J., 1984, "Stock Prices and Social Dynamics," Brookings Papers on Economic Activity 2,457-498.

Shleifer, A and R W Vishney, 1997,"The Units of Arbitrage", Journal of Finance 52(i), 35-55

Sibani P S and Patnaik, K.U.S (2007) Impact of Futures and Options on the underlying market volatility: An empirical study on S&P CNX Nifty Index, Electronic copy: http://ssrn.com/abstract-962036

Stein, J.L (1979): "Spot, Forward and Futures" Research in Finance 1, H Levy, (ed.), pp 2225-310

Stein, J L (1991), "An evaluation of the performance in speculative markets", In commodity Future and Financial Markets", pp.153-78.

Thenmozhi, M (2002) Futures Trading, Information and Spot Price Volatility of NSE 50 Index Futures Contract, NSE News Letter, NSE Research Initiative, paper No.18.

Thenmozhi, M and Sony, T M (2004), 'Impact of index derivatives on S&P CNX Nifty volatility: Information efficiency and expirations effects'. ICFAI Journal of Applied Finance, Vol 10, pp.36-55

Working H (1934), "A Random Difference Series for the Use in the Analysis of Time Series", Journal of the American Statistics Association, March, pp 11-22.

Yadav, P. K. and Pope, P. F. (1994) Stock index futures mispricing: profit opportunities or risk premia?, Journal of Banking and Finance, 18, 921–53.

Yang, Jian & Haigh, Michael S R David J Leatham, 2001, "Agricultural Liberalization Policy and Commodity Price Volatility: AGARCH Application." Applied Financial Economics, Taylor and Francis Journals, Vol 8(9) Pages 593-98, September

Young, E and Shields D A (1996) Overview: FAIR Act frames farm policy for 7 years, Agricultural Outlook (USDA), April 1-4