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ENCOUNTERING PRICE RISK FACING BY COTTON GROWING FARMERS USING COMMODITY DERIVATIVES

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ABSTRACT

This Paper aims to identify the price trend in spot and futures market and how a cotton farmer can hedge his price risk by using derivatives in futures market. Cotton price from 2003 to 2017 is used for analyzing and interpreting basis risk. Econometric models like Vector Error Correction Method (VECM)and Ordinary Least Square Method (OLS) models have been applied to identify the effectiveness of commodity futures in mitigating the cotton price risk. Hedge ratio are also defined in order to hedge risk with different verity of cotton. further paper concludes cotton growing farmers can use commodity futures in reducing price risk faced by them .

KEYWORDS: *Cotton Farmers, Price risk, Basis risk, Vector Error Correction Method,Ordinary Least Square Method, Hedge ratio.*

INTRODUCTION

India is one of the major cotton growing country in the world. Cotton takes a predominate position in defining Indian economy. Textile industries of India pays around 5 per cent to country's gross domestic product (GDP), 14 per cent to industrial production and 11 per cent to total exports earnings. The industry is also the second-largest employer in the country after agriculture, providing employment to over 5.1 crore people directly and 6.8 crore people indirectly, including unskilled women. The textile industry is also expected to reach US$ 223 billion by the year 2021.All the above are the contribution of cotton being a raw material for Indian and other textile industry across the globe. Adjacent to the development of cotton industry the cotton growing framers should get better price for their produce but eventual which is not happening due to lack of information about price in different markets or poor market facilities. Farmers remain poor and exploited by the middle man, the person who create artificial demand and no demand for cotton in spot market put farmers under the circumstance to sell their produce at the price which he wants. Finding the ways to overcome these problem, one of the way is futures market. So many research work has been carried down in these regard but we find hardly few paper regarding cotton. The entire paper is all about how a farmer can encounter a cotton price risk by using commodity derivatives in futures market.

LITERATURE REVIEW:

Sanjay Sehgal, Wasim Ahmad, (2014*)* information transmission in India's agriculture commodity futures market by investigating the price discovery and direction of volatility between futures and spot price of nine agriculture commodities, like barley, cardamom, Castrol seed, chana,chili, mentheoil, pepper, soybean and refined soya, traded on MCX and NCDEX. The empirical results confirm the price discovery between futures and spot price, indicating strong information

transmission. Finally, the study concludes that Indian agriculture commodity derivatives market is evolving in the right direction as futures market has started playing pivotal role in providing information to farmers. **Fred EspenBenth and Steen Koekebakker**, (2014*),* Theco-integration in commodity market, and propose a parametric class of pricing measures which pressures co integration for forward prices with fixed time to maturity and some empirical evidence from refined oil futures price at NYMEX by numerical example showing that co integration leads to Significantly cheaper spread options compared to the complete market case, where co integration disappears for the pricing measures.**K ChandrasekharaRoa , Irfan ulHaq, (2013),**The undertook study of co integration between spot and futures price of Indian agricultural commodities and there by estimates the optimal hedge ratio and hedging efficiency of the agricultural commodities using error correction mechanism. The results indicate good amount of hedging in Indian agricultural commodity markets.**MamathaJain(2014)** examined the relationship between pepper future prices and spot prices. The data includes 59 futures contracts for the period of 5 years from June 2008 to May 2013. For the analysis purpose, some of the financial models were used such as unit root test and co integration test. Unit root test is used to find out the stationary of the series and co integration is used to know the difference between pepper futures prices and pepper spot price. The finding says that there is stationery between pepper futures and spot prices and also there is Co integration between pepper future prices and spot prices. The causality relationship between the spot and futures market was tested by **Rajesh et., al (2015)** by using unit root test and Johansen co-integration test. They also used VECM to check the lead-lag relation. Data were collected from NCDEX from January 2006 to December 2015. The data includes the major four indices of MCX i.e MCXMETAL, MCXCOMDEX, MCXENERGY and MCXAGRI. The results proved that spot market leads the futures market except for energy, where causality exists from futures to spot energy markets. In case of agricultural commodities, the results showed spot leads the futures due to the local supply and demand condition. **Nirmala (2014)** concentrated the operational efficiency of commodity derivatives in India in price risk management. This is an analytical study consisting secondary daily data of spot and nearest month futures prices and they have taken agricultural, energy and metal commodities traded in Indian derivative market. The analysis includes some of the financial models like unit root test, co-integration and ratios. The co-integration reveals that the existence of long run relationship between spot and futures prices of all sixteen selected commodities. The price volatility analysis between futures price and spot price as well as between basis and spot prices indicated highest level of efficiency in all metals except aluminum and energy commodities. Finally, among all the commodities, barley, chana and soya bean indicates higher level of inefficiency.

Commodity Derivatives and Price Risk Management: Commodity price risk is one of the major risks faced by commodity producers and even other market participants in developing countries. Other than traditional mechanisms of crop insurance scheme and Governments' intervention through MSP (Minimum Support Price), modern market driven mechanism such as commodity futures market is one such platform in which commodity traders, producers and even agro processing industries can hedge their price risk using Commodity Derivatives like Commodity Futures, Commodity Options, Commodity Swaps. At present in India only commodity futures are available for hedgers to hedge Cotton price risk. In this paper the effectiveness of Commodity Futures in hedging Cotton price risk has been discussed by using different econometric models.

OBJECTIVE OF THE PAPER:

- To evaluate the hedging effectiveness through hedged and unhedged Cotton price risk

METHODOLOGY: The spot and futures price of cotton from 2003 to 2017 have been collected for the analysis. The analysis has been done with the help of two econometric models VECM and OLS to know the hedging effectiveness of commodity futures derivate**.**

Data:

- Spot and future prices of Cotton has been collected from the capital line website

Tools used for analysis:

- Descriptive statistics:To identify the distribution of spot and future price in order to know the basis risk with descriptive statistics
- Econometric Models: Ordinary least square method (OLS) and Vector Error Correction Method

OLS and VECM Model are applied in order to identify the co-integration relationship between spot and future price of cotton further it measure the deviation from long run relationships and correct those deviations by adjusting spot and future price in identify the variance, covariance and hedge ratio.

Ordinary least square Method:

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

Rst = spot returns for period t.

Rft = futures return for period t.

εt = the residual term

α= the intercept coefficient (constant).

β = the slope coefficient which provides an estimate of the optimal hedge ratio (the minimum hedge ratio).

Vector error correction Method:

$Z_{t-1} = S_{t-1} - \alpha - \delta F_{t-1}$

Z_{t-1} = The error correction term, which measure how the dependent variable adjust to the previous periods deviation from the long run equilibrium

St-1 = Spot series

Ft-1 = Future series

α = The intercept coefficient (constant).

δ = Co- Integration vector

According to Baillier and Myers (1991) The returns on unhedged and hedged position are calculated as fallows

$R(u) = S_{t+1} - S_t$

$R(h) = (S_{t+1} - S_t) - h^* (F_{t+1} - F_t)$

Variance of an unhedged and hedged are

$Var(u) = \Delta_s^2$

$Var(h) = \Delta_s^2 + h^2 \Delta_f^2 - 2h^* \Delta_{sf}$

Where,

S_t = Spot Price

F_t = Future Price

h* = Hedge ratio

R(h) = Hedged

R(u) = Unhedged

Δ_s and Δ_f = Standard deviation of spot and futures

According to Edernigton (1979) The hedging effectiveness (HE) is Calculated as

$$HE = \frac{Var(u) - Var(h)}{Var(u)}$$

Analysis and Interpretation: Analysis and interpretation is done with the time series data of Spot and futures prices from June 2003 to May 2017 collected from capital line.

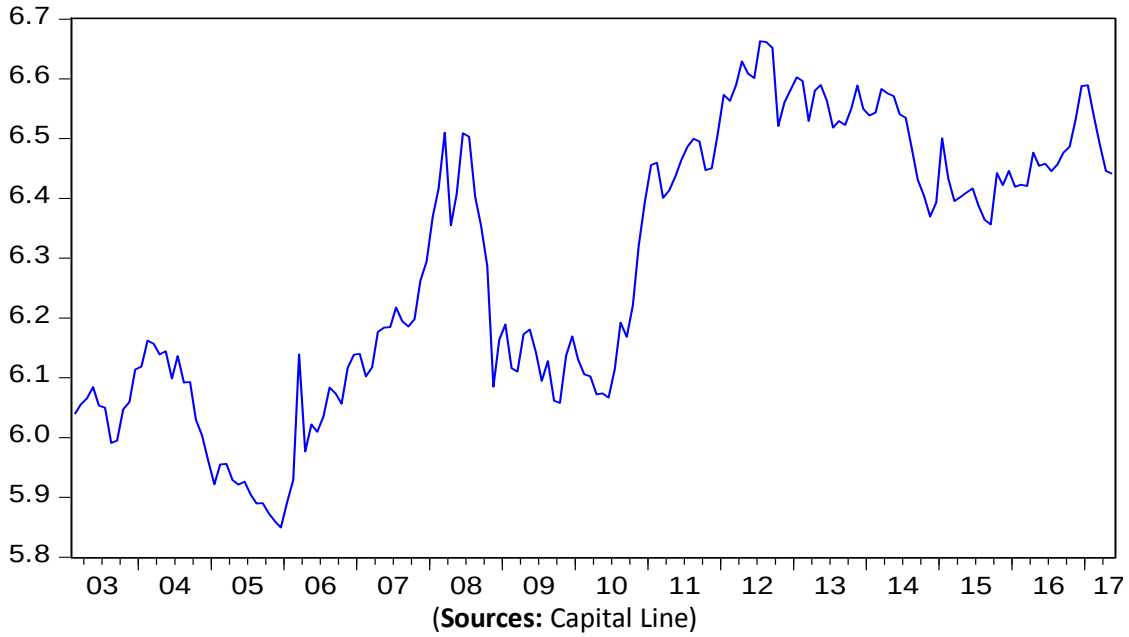
Descriptive statistics of Cottons spot and futures market prices from June 2003 to May 2017

Particulars	Spot price	Futures price
Mean	547.58	552.14
Median	544.46	575.20
Maximum	790.74	782.96
Minimum	339.55	347.00
Standard Devivation	116.66	121.35
Skewness	0.121	0.063
Kurtosis	1.755	1.633
Jarque-Bera	11.516	13.494
Probability	0.003	0.001

(Source: Compiled from the commodity price data taken from capital line website)

Interpretation: The results of descriptive statistics of Cotton spot price and futures price series for the period from june2003 to May 2017.The skewness value of Cotton spot price and futures price 0.063 and 0.121 respectively. The kurtosis value of spot price and futures price is less than the critical value i.e. 1.6333, 1.755 respectively. P values of Cotton spot and futures price which is associated with JarqueBera, which is less than the significance value at 0.05. Therefore, we can say that the Cotton spot price and futures price are not normally distributed.

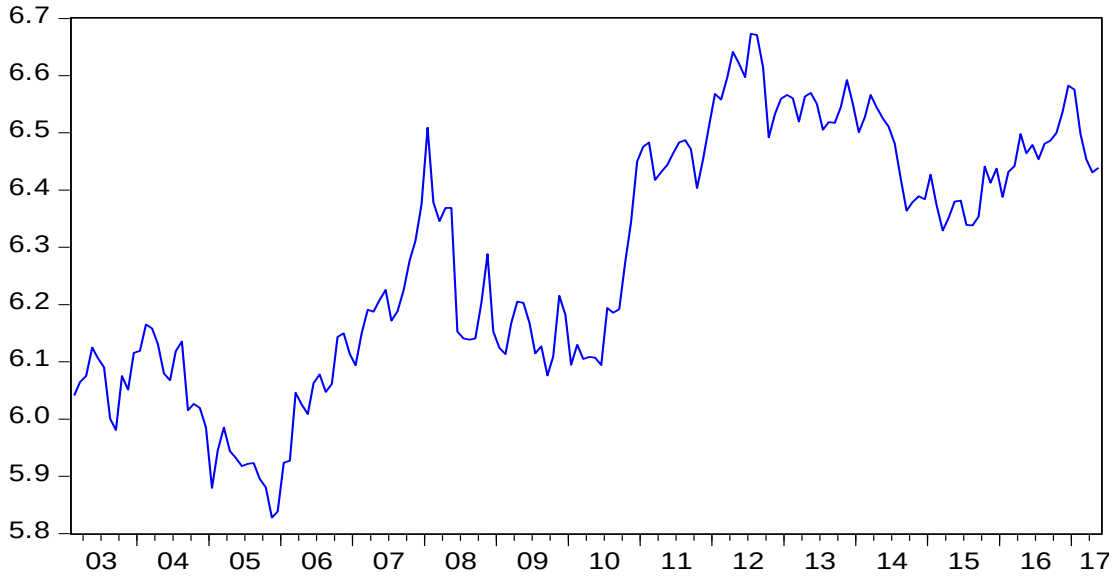
Figure: Log spot price of Cotton



(**Sources:** Capital Line)

The above figure indicates the log values of Cotton spot prices. The above figure we can say that there is no break point or outlier in the Cotton spot prices.

Figure: Log Futures Prices of Cotton



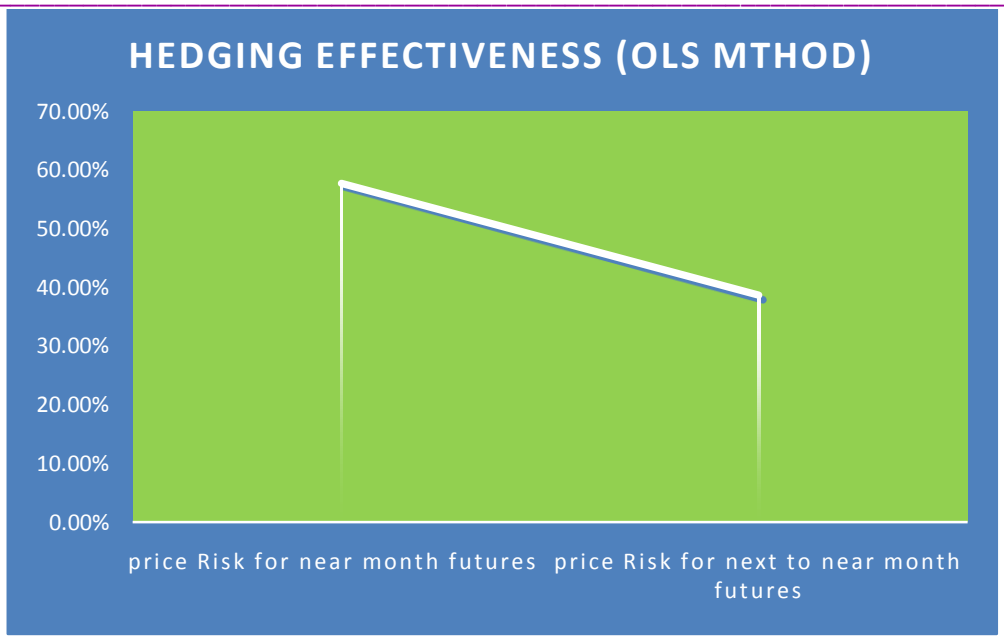
(**Sources:** Capital Line)

The above figure shows the log values of Cotton futures prices. The above figure we can say that there is no break point or outlier in the Cotton futures prices.

Effectiveness of Cotton Futures in Hedging using OLS Method

Cotton	OLS Method			
	Near month		Next to near month	
	Un-Hedged	Hedged	Un-Hedged	Hedged
Return	0.149	0.040	0.121	0.051
Variance	2.661	1.556	1.892	1.021
Hedge ratio (h*)	0.734*		0.597*	
Hedging effectiveness (HE)	0.577		0.387	

(**Sources:** Capital Line)

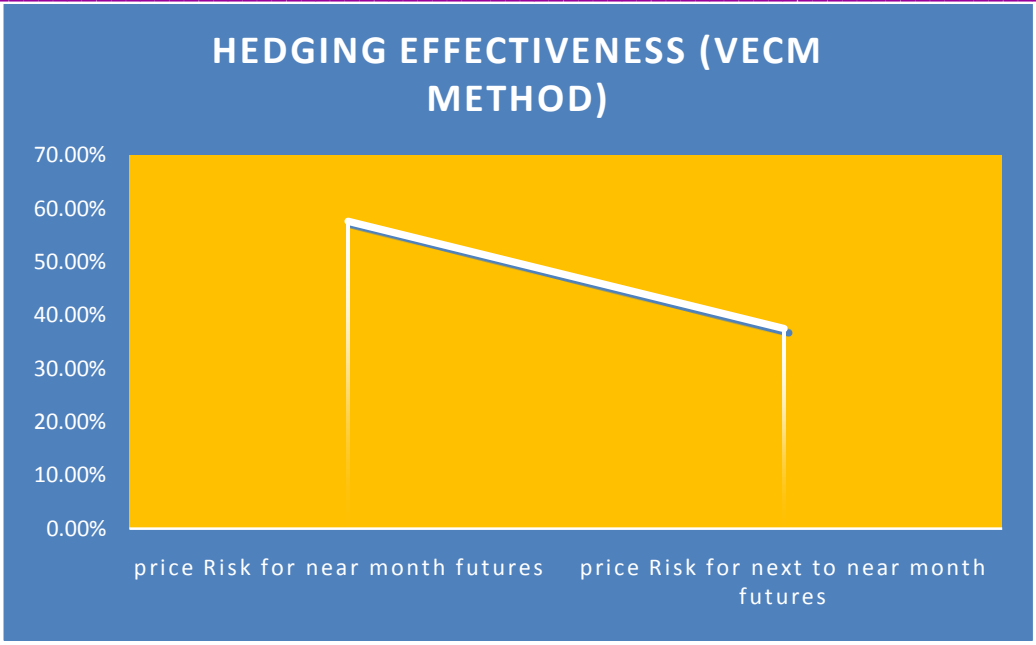


Interpretation: The above OLM model Shows the hedge ratio and hedging effectiveness. Hedge ratio of cotton for near month and next near month contract are 0.734 and 0. 597respectively.That shows 73.4% and 59.6% variance reduction in near month and next to near month contract respectively. Hedge effectiveness are 0.577 and 0.387 indicates that effect of hedging bring down the risk from near month and next to near month 57.7% to 38.7%.

Effectiveness of Cotton Futures in Hedging using VECM Method

Cotton	VECM Method			
	Near Month		Next to Near Month	
	Un-Hedged	Hedged	Un-Hedged	Hedged
Return	0.149	0.034	0.121	0.039
Variance	2.771	1.176	1.709	1.069
Hedge Ratio (h*)	0.771		0.704	
Hedging Effectiveness (HE)	0.576		0.375	

(**Sources:** Capital Line)



Interpretation: Above table and graph depict that the hedge ratio and hedge effectiveness of cotton commodity futures using VECM Method. Hedge ratio for near month 0.771 and for next to near month contract 0.704 respectively. Which shows that there is a reduction in variance from 77% to 70%. The hedge effectiveness for the near month futures 0.576 and next to near month contracts 0.375 respectively. Which shows that by hedging price risk of Cotton for near month futures and 37.5 for next to near month clarifies by hedging the risk can be reduced.

CONCLUSION:

The result of VECM and OLS models support that commodity futures derivative can be used to minimize the Cotton price risk. Therefore, Cotton growing Framers can encounter Cotton price risk by taking a long position in futures market.

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