



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact Factor: 6.078

(Volume 7, Issue 4 - V7I4-1386)

Available online at: <https://www.ijariit.com>

Forecasting of the cotton price using an econometric model

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ABSTRACT

A commodity market is a place for investors to trade in commodities like precious metals, crude oil, natural gas, energy, and spices, among others. Currently, the Forward Markets Commission allows futures trading in India for around 120 commodities. Trading in commodities is great for investors seeking to diversify their portfolio, as these investments often help with inflation. The Indian commodity derivatives market has shown solid flexibility to the Covid-19 pandemic, recovering rapidly from the underlying stock following the nation-wide complete lockdown. This study examines the market fundamentals, contract specification and market and price behaviour is the supreme problem of commodity investors and trader. The present study spotlights the price behaviour/movement and market behaviour/volatile in Indian agricultural commodity market (MCX) using econometric model. The study aims at market fundamentals of the commodity which includes demand, supply, import and export and changes in contract specification. The study also aims to study the volatility and caused effect between futures price and spot price of commodity cotton from the period 2019 to 2020 daily data were collected from Multi Commodity Exchange (MCX). This study also analysed the correlation and co-integration between the spot price and futures price of commodity cotton in Multi Commodity Exchange (MCX). The study employed statistics tools such as descriptive statistics, unit root test (ADF test), correlation test, OLS regression test, co-integration test, granger causality test, GRACH Test and ARIMA. The study found that existence of normality and absence of unit root in time series data, also risk was higher than the mean return of futures and spot price of commodity cotton. There was low positive correlation between futures price and spot price of commodity cotton. In co-integration between spot and future price of commodity cotton explains that there is a long run relationship and both the prices are interconnected. The GARCH test evidenced that low volatility secured both futures price and spot price of commodity cotton and absence of cause and effect during the study period. The investors have to consider the high volatility commodity futures price which make effective in trading and investments in the aspect of price discovery. The result replicates that each commodity traded or invested in exchange has different price effectiveness concept and the investors and trader should recognise the commodity to hedge price risk. The last step that is ARIMA examines that the best criteria to forecast the cotton future price is ARIMA(0,1)(0,0).

Keywords— Commodity market, spot and future market, price discovery, ADF test, GARCH test, Granger causality test, ARIMA model

I. INTRODUCTION

In India, Agriculture locale is the fundamental region and spine of the economy of a country. In product market, three exchanging stages are National Commodity and Derivative Exchange and besides Multi Commodity Exchange in India. In Agriculture item market is incredibly early and powerful in India, yet watchfully ranchers are confronting different dangers and most basic thing and testing part is regard danger of product. The Indian Agriculture formation of farming work has run over a goliath change in the agribusiness locale in the wake of tolerating new strategies of government towards the value impact and movements to improve the creation level. India has a long history of exchanging items. In 1875, the Bombay Cotton Exchange Association was shaped. Regardless, exchanging on possibilities contracts changed into a test considering huge worth change. In 1947, basic and significant strategy choices needed to contribute emphatically to the progress of the destinies and forward business regions in the country. In 2003 India product market was allowed to do exchange possibilities contracts. Product exchanging India had fantastic improvement particularly for commonplace item. In 2007-08 Indian government limited exchanging on certain thing as a piece of its adversary of Inflationary measure. Indian ware market has progressed on various events in a time of 5 years for example from INR 665 billion out of 2002 to INR 33,753 billions of each 2007 enlisted a CAGR-Compounded Annual Growth Rate. The cash related market has run over different kinds of difficulties which improved the market to settle and set up the monetary instrument to beat the danger. What has really changed is the degree of threat and the supporting

instruments in the monetary cultivation work. There are different subordinate instruments made in the market to help the peril and to coordinate the danger in monetary market. The financial backers' premium to extend the danger has improved the helper market. Those money related specialists who expected to protect themselves against the value variance assistant market were their foundation to exchange. The troublesome issue face by maker, creator and vendor is regard change the perspective. The country item cost is influenced by powers like accessibility of stock, request and supply, storm thoughts, accessibility of stockroom working environments, anomaly in use, trade import arrangements of India and friend nations, government intercessions, for example, least help costs, and so on Farming area as a rash impact considering conflicting business sector and hazy things exchanged the trade and market. The explanation for the value impacts can be a couple, for example, characteristic disasters, being typical, public and generally speaking political changes, change in the economy and change in industry philosophies, and so on By exchanging into the future market to make income, inspectors capital is required to broaden liquidity in the item market. Future business sectors licenses experts commitment in a more controlled climate where checking and perspective on the people is conceivable. India has recovered its circumstance of likely the greatest producer on earth during the latest decade owing to an enormous rising in yields and likewise bringing creation venture up in the country. India is as of now the greatest creator and the second greatest client and exporter of cotton in the world. Other critical countries conveying cotton fuse China, US, Pakistan and Brazil. In India, cotton creation is scattered across different states anyway generally accumulated in central India particularly in states like Gujarat, Maharashtra and Telangana. India's cotton conveys have extended essentially from mid 2000s following the liberal augmentation in local creation. India has become the greatest exporter in 2011-12. In any case, India's charges have declined in the resulting years. Critical admission protests of India join Bangladesh, China, Pakistan, Vietnam and Sri Lanka in the years. Cotton possibilities trading India has 135 years of history in India. Bombay Cotton Trade connection Ltd was set up in 1875 for setting everything straight possibilities trading cotton. Close by various items, destinies trading cotton was moreover suspended during 1970s. Eventually, cotton destinies trading in reality has gotten dynamic with rebuilding of items destinies trading and show of web trading on open multi-product exchanges the mid 2000s. Possibilities arrangements of cotton are open on local exchanges for rough cotton and ginned cotton.

A. Market characteristics :

- The Indian material industry is fantastically cotton based. Maybe than generally speaking material usage, which is moved strongly for non-cotton fibers with extent of 40 to 60 'cotton' to 'non-cotton' strands, use in India is 60 to 40 for cotton. The current size of the Indian materials industry is surveyed to be forty seven billion dollar consistently, and creating at twenty percentage every year. Since the wiping out of the amount framework, Indian passages have created by twenty six percentage appeared differently in relation to the prior year's totally out of thirteen billion dollar. The overall perspective in the material region is fiery.
- India is the third greatest creator of cotton on earth, anyway with respect to productivity it is one of the least. The ordinary region under cotton creation has moved from nine million hectares in 2001/02 to 8.8 million hectares in 2005/06. Creation during a comparative period has extended from two million tons to four million tons. The ordinary yield of Indian cotton, which was 307 kg for each hectare in 2001/02, had improved to four sixty eight kg for every hectare in 2005/06.
- The genuine variables of the market call for capable threat the board strategies that are huge for accomplices, similar to producers, exporters, sponsors, processors, and SMEs. Right when what's to come is dark, current methodology and approaches, including market-based threat the board financial instruments like 'Cotton Futures', offered on the MCX stage can improve efficiencies and join force through esteem risk the chiefs.

B. Market factors influencing cotton :

- The homegrown premium inventory circumstance, between crop esteem balance, cost of creation, and overall value circumstance are the fundamental factors that influence expenses and cost available.
- Climate and other threat factors related with agribusiness collects in like manner have an orientation on creation of cotton.
- Government approaches on import, fares, and least help cost are enormous influencers of cotton costs.
- Cotton yarn costs in different business areas the country over show a high association of above ninety percentage with India's unrefined cotton costs.
- Worldwide exchange is particularly huge for cotton. In addition around thirty level of the overall cotton fiber delivered being exchanged, it is moreover traded by suggestion as yarn, attire and textures.

II. REVIEW OF LITERATURE

S. Baranidharan (2021) in their paper "Effect of Volatility and Causal Movement between Cotton Futures Price and Cotton Spot Price in Indian Commodity Market" have analyzed the effect of volatility and causal movement in cotton market with spot and future price in India. The data used were secondary daily data from 1st Jan 2017 to 31st Dec 2019 from MCX. The methodology used are econometric model such as Descriptive Statistic, Unit Root test, Correlation Test, OLS Regression Test, Cointegration Test, Granger Causality Test and GRACH Test. **Xiaohui Yang (2019)** in her paper "The Prediction of Gold Price Using ARIMA Model" have forecasted the gold price using ARIMA model. The study forecast the international gold price that is priced in US in the first half of the month of July 2018. The data are collected from the World Gold Council with 1305 observations of daily gold price from July 1st 2013 to June 29 2018. The methods used are Augmented Dickey-Fuller (ADF) test and ARIMA model. **Mrs. B. Kishori and V. Preethi (2018)** in their paper "Gold Price forecasting using ARIMA Model" have forecasted the gold price using the ARIMA model. The data collected are secondary data from World Gold Council from January 2012 to December 2017. The methodology used is Durbin-Watson test and ARIMA model to forecast the gold price. **Gouri Prava Samal (2017)** in her paper "Price Discovery Efficiency of Cotton Futures Market in India" have forecasted the price of cotton in future market. The data collected were secondary data from NCDEX collected from April 2013 to November 2015. The methodology used are econometric model such as Augmented Dickey-Fuller (ADF) test, Vector Autoregressive Model and Causality Test. **Ashwini Darekar (2017)** in their paper "Cotton Price Forecasting in Major Producing States" have forecasted the

price of cotton in major states. The data collected are the time series data related to monthly average prices of cotton from AGMARKNET website 11 years (from January, 2006 to December, 2016) has been collected for selected states to forecast the prices. The method used are econometric model such as ARIMA model analyses and forecasts time series data. **Sudeshna Ghosh (2017)** in her paper “Forecasting Cotton Exports in India using the ARIMA model” have analyzed the exports of cotton by using ARIMA model. The paper has collected data sets from Directorate General of Commercial Intelligence & Statistics. The data collected is from April, 2010 to June, 2015. The methodology used are econometric model like ARIMA model. **Gopal Naik (1999)** in their paper “Econometric Modelling of the Indian Cotton Industry for Forecasting and Policy Simulations” have forecasted the price of cotton in India using econometric model. The data collected are secondary annual data for the period 1971-72 through 1994-95. The methodology used is econometric model was used to forecast the price by three-stage least squares(3S-LS) method.

III. OBJECTIVE OF THE STUDY

1. To study and understand in detail about the market fundamentals and contract specification of the commodity cotton from MCX.
2. To study and analyse the normality, stationarity and effect of volatility in spot and future price of commodity cotton using econometric model.
3. To forecast and analyse the future price of cotton.

IV. METHODOLOGY OF THE STUDY

After collecting data, firstly the five year data from 2015 – 2019 is used to analyse the market fundamentals which include the demand and supply in both Indian and global Scenario, Export and import of the commodities cotton. Secondly, the time series data collected of one year from 2019 – 2020 is used to find the average monthly returns of 1-month, 3-months and 6-month and check the divergence of future and spot prices that is analysis of contango, normal backwardation or expected principle. Thirdly, the average monthly returns data is used to analyse normality, stationarity and volatility and forecasting of future price of the commodities using econometric model in EViews software.

A. Market fundamentals :

There are different market fundamentals which impacts the price of the commodity such as demand and supply with respect to Indian and global scenario, Import and export. Increase or decrease in these market fundamentals effects the future price of the commodity in the market. The increase or decrease in the fundamentals can be due to change in policies, economic factors in the countries, government regulation in different countries, impact of COVID-19, etc.

B. Average Monthly Returns & Divergence :

The average monthly returns for both spot and future price is calculated as follows :

$$\text{Monthly Return} = \{(\text{Closing Price on Last Day of Month}) / (\text{Closing Price on Last Day of Previous Month})\} - 1 \quad (1)$$

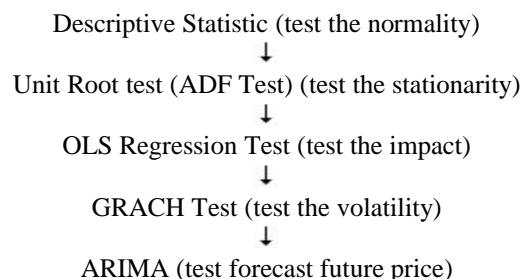
Commodities are for the most part exchanged the money or spot market at the market value, P_0 . Subsequently the future value P_t addresses the cost of the ware at some future cost on schedule. The difference among future and the spot price is known as BASIS.

$$\text{BASIS} = P_t - P_0 \quad (2)$$

The basis is essentially inferable from the conveying costs of a ware. In case there were no conveying costs included and accepting there were no weakness, the future value today will be identical to the normal future spot cost. On account of sureness, the, the typical reason would be comparable to focus in a market where there are no conveying expenses and shortcomings. At the place of vulnerability, the relationship among future and expected spot cost at future date isn't questionable. In case of vulnerability, to explain the normal premise there are three speculation. They are Normal backwardation, contango and expectation principle.

C. Econometric Model :

Econometric models are measurable models used in econometrics. An econometric model decides the quantifiable relationship that is acknowledged to hold between the diverse money related amounts identifying with a particular monetary marvel. An econometric model can be resolved from a deterministic financial model by mulling over vulnerability, or from an econometric model which itself is stochastic. Notwithstanding, it is furthermore possible to use econometric models that are not appended to a specific monetary speculation. The different test used for both the commodity in the research are as follows :



V. HYPOTHESIS STATEMENT

1. **Alternative hypothesis (H_1):** There is normality of spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

Null hypothesis (H₀) : There is no normality of spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

2. **Alternative hypothesis (H₁)**: There is stationarity of spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

Null hypothesis (H₀) : There is no stationarity of spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

3. **Alternative hypothesis (H₁)**: There is impact and correlation between spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

Null hypothesis (H₀) : There is no impact and no correlation between spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

4. **Alternative hypothesis (H₁)**: There is volatility of spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

Null hypothesis (H₀) : There is no volatility of spot and future price in the market for selected cotton future and spot price in Multi Commodity Exchange(MCX) India.

VI. ANALYSIS AND INTERPRETATION

A. Market fundamentals :

1. Demand and supply :

Indian scenario: India's yearly creation of cotton has been consistently expanding in the new year's upheld by an ascent in land, better hereditarily changed seeds, and improved practices. India's assessed production is 37 million bunches of cotton in 2017-18 yield year. The land in 2017-18 was 12.40 million hectares and a yield of 507 kg/ha, as against the world normal of 802 kg for every hectare. In India, cotton is planted during March–September and gathered during September–April. This is assessed to have additionally expanded to 31.4 million bundles in 2017-18 yield year. Gujarat, Maharashtra, and Telangana are the significant producers of cotton, representing more than 66 percent of the production. India has been a significant exporter of cotton since 2005-06, and as of now, the world's second biggest exporter. It is assessed that India had sent out 6.78 million bunches of cotton in 2017-18. The decrease in supply of the cotton is due to reduction in the production at 11% because the farmers switched to other commodity in the season due to price reduction. But at the same period during 2017, we can see that there is a demand due to increase in mill consumption and small scale industry consumption.

Global scenario : Cotton production and exchange is generally spread across the world, with in excess of 80 countries developing the harvest. Be that as it may, its creation, utilization and exchange are overwhelmed by a couple of countries. The world cotton production in 2017-18 is relied upon to be 26.93 million metric tons that is 158.34 million bunches of 170 kg each as compared and 23.22 MMT that is 136.53 million bundles of 170 kg each in 2016-17. The world's four biggest cotton delivering nations are India, China, the US, Brazil and Pakistan. They represent almost 76% of the world's creation. The other significant makers incorporate Turkey and Uzbekistan. The main two customers of cotton are China and India that is more than 53% of the world's utilization, which is assessed to be around 26.69 MMT. Pakistan, Bangladesh, Turkey, Vietnam and Indonesian are the other significant purchasers. In the past year, worldwide exchange has been around 8-9 MMT. The U.S. is the biggest exporter of crude cotton, representing more than 33% of the worldwide exchange; China was the biggest merchant till 2014-15. From 2015-16, Bangladesh is the biggest merchant.

2. Import:

India's cotton imports are probably going to jump 80 percentage from a year prior as production could decrease to the most reduced level in nine years because of low precipitation in key developing district. Higher imports by the world's greatest cotton maker could uphold worldwide costs, exchanging close to their most minimal in over a year. The drop in Indian supplies could help adversaries like the United States, Brazil and Australia increase cargoes to Asian purchasers like China, Bangladesh and Pakistan. The nation could import 2.7 million bales in 2018-19 promoting year finishing on 30 Sept, up from 1.5 million bales every year prior. Turning factories have imported 548,000 bales before the finish of January out of absolute agreements of 1 million bales marked so far in the current advertising year. India imports cotton mostly from the United States, Brazil and Egypt. Downpours in Gujarat and Maharashtra, which represent the greater part of India's cotton creation, were almost a quarter beneath ordinary during the June-September monsoon season in 2018. India is probably going to create 33 million bales in the present season and flow season, down from prior estimate of 33.5 million bales and previous year yield of 36.5 million bundles. The drop in yield is probably going to prompt lower cotton shipments from India. India's fares could fall 27.5 percentage from a year prior to 5 million bales, the most reduced level in 10 years. In June, dealers were anticipating that India should send out however much 10 million bales in the midst of strong interest from China because of the exchange question among Beijing and Washington. Exchange bodies have been decreasing cotton creation gauges for the ebb and flow season because of low precipitation and as irritation assaults diminish per-hectare yields. There is increase in total import in 2019-20 at 46% due to major drought in growing states such as Maharashtra, Telangana, Gujarat, and Andhra Pradesh and short supply of quality materials from textile mills as poor quality of cotton cannot be used for spinning mills.

3. Export :

Higher exports by the world's most prominent cotton creator in 2020/21 season, started on Oct. 1, could trouble overall expenses and limit shipments from enemies, for instance, the United States and Brazil to key Asian buyers like China, Bangladesh and Vietnam. A recuperation in overall expenses could lift Indian fare to 7 million bales in the new season from 5 million bundles each year earlier. Overall cotton costs have been near their generally essential in just about 17 months, while the Indian rupee hit a two-month low, growing specialists' edges from abroad arrangements. Indian cotton is being offered at around 74 pennies for every lb, cost and freight premise, to buyers in China, Bangladesh and Vietnam for November shipment, versus more than 77 pennies from Brazil and the United States. An enormous bit of the shipments are going towards China and Bangladesh. India will have adequate overabundance for exchanges as the country is set to make more cotton this year than past 35.45 million parcels. In October 2019, representatives conveyed 700,000 packs and arrangements for another 1 million groups have completed desk work for November 2019 shipment. Cotton sends out addresses around 23% of India's finished materials and attire exchanges. During

2018-19, outright material and pieces of clothing conveyed stayed at US\$ 36.62 billion. The passages of cotton yarn, cotton surfaces and cotton made-ups came to US\$ 3.90 billion and US\$ 5.95 billion, independently. During 2019-20, there has been decline in the fares by 16% because of COVID-19 pandemic and lockdown in the significant fare nations like China.

B. Contract specifications:

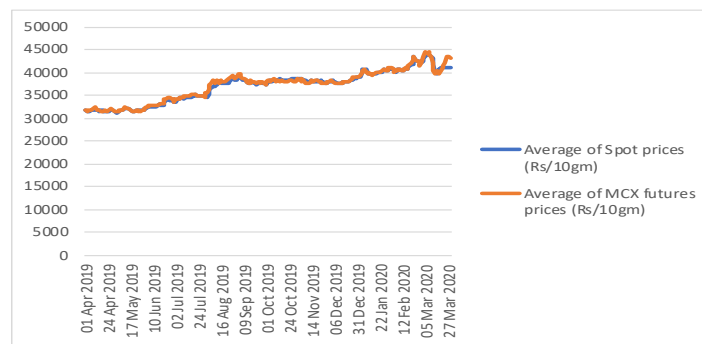
- In 2016, SEBI allowed commodity exchanges to modify contract specifications regarding quality parameters, ensuring the bourses are enabled to respond in market requirements.
- In 2019, SEBI changed the duration of staggered delivery period to at least five working days.
- In 2021, the base price of Daily prime limits slabs were changed to previous day’s closing price of the asset in the stock exchange.

C. Average Returns:

- From the below table 1. we can observe that the average returns is fluctuating between 190% to 200% and can also observe that the price has been decreasing in the month of August but the market has recovered in the month of September. This high volatility can be seen during this period to the effect of cotton prices in the market due to COVID-19 pandemic where the stock market impacted on the commodity market.
- Monthly average returns:** From the below table 1. we can observe that the spot price is above the future price in cotton commodity over the period. This situation is called as “Normal Backwardation” as future buyer that is net long position is rewarded for risk. Thus, we can observe that the future market is dominated by hedgers who attempt to avoid risk with a decrease in the price of cotton.
- 3-month and 6-month average returns:** From the below table 1. we can observe that there is alternate increase and decrease in every 3-months in the future price where there is increase in whole year except in the month of July-September with an average of 1-2% decrease. This can be due to the effect in long and short position in the market by the players which effected the demand of the cotton commodity due to COVID-19 pandemic. On the other hand, we can observe there is an decrease in April- September with 49% and irrespective of decrease in the month of January - March when we take 6-month average there is increase in the price during October- March due to increase in production post lockdown and good weather condition during crop season in the beginning of October in major growing countries.

TABLE I. TABLE SHOWING MONTHLY AVERAGE RETURNS OF COTTON

Month	Cotton future monthly average	Cotton spot monthly average
April	2.00162136	2.00162136
May	1.999200106	1.998217469
June	1.998217469	1.998648199
July	1.998408896	1.99842316
August	-1.997362597	1.998694269
September	2.00075376	1.998857404
October	1.998797357	1.997801509
November	1.999592713	1.999348668
December	2.001057425	2.000589775
January	1.999660859	2.000472446
February	1.996971135	1.998639941
March	1.994823172	1.998817241



GRAPH I. GRAPH SHOWING AVERAGE SPOT AND FUTURE PRICE

D. Econometric Analysis of Cotton:

FIGURE 1. FIGURE SHOWING DESCRIPTIVE STATISTICS OF COTTON FUTURE PRICE AND COTTON SPOT PRICE

	Cotton future price	Cotton spot price
Mean	-1.991183	-1.991591
Standard Deviation	0.124594	0.124344
Skewness	15.85033	15.95621
Kurtosis	253.8111	256.0704
Jarque-Bera	689707.5	702138.6
Probability	0.000000	0.000000

The above fig 1. depicts results of descriptive statistics. Mean average returns of cotton futures price is negative (-1.991183) and the value of standard deviation 0.124594 is higher than the mean returns price, which explains that the risk is higher than the average returns of cotton future price. The standard deviation of cotton spot price is 0.124344 and the value is negative (-1.991591). This implies that during the research the price was positive and the risk is higher. The skewness value of cotton futures and cotton spot is positive (15.85033) and (15.95621) respectively. This implies the direction and degree of symmetry distribution. The distribution of skewness of both cotton future and cotton spot is 0, thus the distribution is skewed to right which implied positive skewness. The probability of Jarque-Bera significant at 1% level which means that the probability values are (0.000) and (0.000) which is less than 1% (0.01) with both cotton future and cotton spot respectively. Thus the whole analysis implied that there is existence of normality in selected time series data. Hence, we can eliminate the null hypothesis.

FIGURE 2. FIGURE SHOWING DESCRIPTIVE STATISTICS OF COTTON FUTURE PRICE AND COTTON SPOT PRICE

Lag Length: 6 (Automatic - based on SIC, maxlag=15)					
ADF TEST RESULTS		Cotton Futures Price		Cotton Spot Price	
		t-Stat	Prob.*	t-Stat	Prob.*
Augmented Dickey-Fuller test statistic		-6.051147	0	-6.0235	0
Test critical values:					
1% level		-3.456197		-3.456197	
5% level		-2.872811		-2.872811	
10% level		-2.572851		-2.572851	
*MacKinnon (1996) one-sided p-values.					

The above fig 2. exhibited the results of ADF test of selected variable of cotton futures price and cotton spot price to test stationarity. The t-statistic value of cotton futures price (-6.051147) and cotton spot price (- 6.0235) are lower than the critical values of 1% level,5% level and 10% level are -3.451976, -2.872811 and -2.572851 respectively and also probability value is less than 1% (0.01). Thus, there is stationarity in the price. Hence, we can eliminate the null hypothesis.

FIGURE 3. FIGURE SHOWING ANALYSIS OF CORRELATION BETWEEN COTTON FUTURE PRICE AND COTTON SPOT PRICE

	CPO FUTURES	CPO SPOT
CPO FUTURES	1	0.997141
Probability	----	0.0000
CPO SPOT	0.997141	1
Probability	0.0000	----

The above fig 3. shows the results of correlation. The value of correlation coefficient is low (0.997141). The value of probability is 0.0000 which is less than 1% (0.01) significant level. This implies that there is significantly positive and low /weak correlation relationship between cotton futures price and cotton spot price that is if there is increases in cotton futures price then there increase in cotton spot price and vice versa.

FIGURE 4. FIGURE SHOWING ANALYSIS OF IMPACT OF COTTON SPOT PRICE ON COTTON FUTURES PRICE

Dependent Variable: COTTON FUTURES				
Variable	Coefficient	Standard Error	t-Statistic	Probability
SPOT	0.999148	0.004723	211.5320	0
C	-0.001289	0.009425	-0.13677	0.8913
R-squared	0.994289	Mean dependent var	-1.99118	
Adjusted R-squared	0.994267	S.D. dependent var	0.124594	
S.E. of regression	0.009434	Akaike info criterion	-6.48133	
Sum squared resid	0.022872	Schwarz criterion	-6.45386	
Log likelihood	841.3327	Hannan-Quinn criterion	-6.47029	
F-statistic	44745.79	Durbin-Watson stat	2.239421	
Prob(F-statistic)	0			

The above fig 4. shows the impact of cotton spot price on cotton future price. The value of R square is 0.994289 higher than the value of Adjusted R square at 0.994009 and this implies that the model fit in and explains the relationship summary. The value of R square signifies that there is variation of 0.4 percentage in cotton futures price. The size of the coefficient for cotton spot price gives the size of the effect that variable has on cotton futures price whereas the sign on the coefficient is positive which implies there is same or parallel direction of effect of cotton futures price on cotton spot price. In OLS regression, the value of coefficient is 0.999148 which implies that when cotton spot price increases by one cotton futures price expect to increase by 0.999148. The Prob (F-Statistic) explains the overall significance of the regression model which implies the significance level of cotton futures price and cotton spot price. In the study, all the regression coefficients are equal to zero. The value of Prob (F-statistics) is (0) which is lower than 10% (0.10) significant level and it depicted the probability of null hypothesis being true. From the table we can observe

that the OLS results, probability is significant which implies that overall the regression is true. The value of Durbin Watson is 2.239421 which represents that the value of Durbin Watson is more than mid-range value 2. This indicates there is no autocorrelation in the price. This implies that previous day or yesterday cotton spot price fall cannot affect the next day price.

FIGURE 5. FIGURE SHOWING ANALYSIS OF IMPACT OF COTTON FUTURE PRICE ON COTTON SPOT PRICE

Dependent Variable: COTTON		SPOT		
Variable	Coefficient	Standard Error	t-Statistic	Probability
FUTURE	0.995137	0.004704	42.60976	0
C	-0.010091	0.009386	1.526562	0.2833
R-squared				
R-squared	0.876001	Mean dependent var	-1.99159	
Adjusted R-squared	0.875518	S.D. dependent var	0.124344	
S.E. of regression	494.9407	Akaike info criterion	-6.48535	
Sum squared resid	62956241	Schwarz criterion	-6.45788	
Log likelihood	-1973.451	Hannan-Quinn criterion	-6.47431	
F-statistic	1815.592	Durbin-Watson stat	2.246324	
Prob(F-statistic)	0			

The above fig 5. shows the impact of cotton future price on cotton spot price. The value of R square is 0.876001, which is higher than the value of Adjusted R square at 0.875518 and it implies that the model fit in and explains the relationship summary. The value of R square signifies the 0.4 percentage variation in cotton spot price. The size of the coefficient for cotton future price, gives the size of the effect that variable has on cotton spot price, and the sign on the coefficient is positive which implies there is same or parallel direction of effect of cotton spot price on cotton future price. In OLS regression, the value of coefficient is 0.995137 which implies that when cotton future price increases by one cotton spot price expect to increase by 0.995137. The Prob (F-Statistic) explains the overall significance of the study regression which implies the significance level of cotton spot price and cotton future price. In the study, all the regression coefficients are equal to zero. The Prob (F-statistics) value (0) which is lower than 10% (0.10) significant level and it depicted the probability of null hypothesis being true. As per the above OLS results, probability is significant. This implies that overall the regression is meaningful. The value of Durbin Watson is 2.246324 which represents that the value of Durbin Watson is more than to mid-range value 2. This indicates there is no autocorrelation in the price. This implies that previous day or yesterday cotton future price fall cannot affect the next day price.

FIGURE 6. FIGURE SHOWING ANALYSIS OF COINTEGRATION BETWEEN COTTON SPOT PRICE AND COTTON FUTURE PRICE

Series: COTTON FUTURES & COTTON SPOT				
Lags interval (in first differences): 1 to 4				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized				
No. of CE(s)	Eigen value	Trace Statistic	Critical Value	Prob.**
None *	0.183534	33.53086	15.49471	0
At most 1 *	0.170379	0.822397	3.841465	0.3645
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigen value)				
Hypothesized				
No. of CE(s)	Eigen value	Max-Eigen Statistic	Critical Value	Prob.**
None *	0.183534	51.50347	14.2646	0.0000
At most 1 *	0.170379	47.44381	3.841465	0.0000
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

From the above fig 6. we can observe that the value of trace value of cotton future price and cotton spot price (33.53086) and (0.822397) are higher than the critical value (15.49471) and (3.841465) respectively. The value of probability of cotton future price and cotton spot price (0.0000) are less than the significant level 1 percent and 5 percent. The value of trace value cotton future price and cotton spot price (51.50347) and (47.44381) are higher than the critical value (14.2646) and (3.841465) respectively. The value of probability value cotton future price and cotton spot price (0.0000) are less than the significant level 1 percent and 5 percent. Both the values of trace test and max-eigen test implies that the existence of long run relationship between cotton futures price and cotton spot price. Therefore, the co-movement and price changes are interconnected in cotton future price and cotton spot price and indicates that the commodity market are least market correction, standard and highly regulated. The investors who trades

and invests in g cotton futures and spot commodity market in long term, should consider the price movements to agriculture in the investment strategy and analysis which assist the portfolio of the investors.

FIGURE 7. FIGURE SHOWING ANALYSIS OF PAIR WISE GRANGER CAUSALITY TESTS BEWTEEN COTTON SPOT PRICE AND COTTON FUTURE PRICE

Pair wise Granger Causality Tests			
Lags: 5			
Null Hypothesis:	F-Statistic	Probability	Remark (Unidirectional or bidirectional cause effect)
COTTON SPOT does not Granger Cause COTTON FUTURES	0.74992	0.5869	No direction of cause and effect
COTTON FUTURES does not Granger Cause COTTON SPOT	7.85387	0.1368	No direction of cause and effect

The above fig 7. represents the results of Granger Causality Tests. The values of probability of cotton spot cause and effect to cotton futures is 0.5869 and the value of probability of cotton futures cause and effect to cotton spot is 0.1368. This implies that there is no direction of cause and effect between cotton futures and cotton spot. Therefore, if any changes in market and economic crisis affect the cotton futures price it doesn't cause and effect the cotton spot price and vice versa. Hence, the investors should be careful about their investments in cotton future and spot market even though it cannot get effected or caused by each other.

FIGURE 8. FIGURE SHOWING ANALYSIS OF GARCH TEST COTTON FUTURES PRICE

Dependent Variable: COTTON FUTURES				
Method: ML - ARCH (Marquardt) - Normal distribution				
Convergence achieved after 87 iterations				
Pre-sample variance: back cast (parameter = 0.7)				
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Probability
C	-1.994338	0.054867	-36.34846	0
Variance Equation				
C	0.004730	0.001420	3.332064	0.0009
RESID(-1)^2	-0.057476	0.032952	-1.744233	0.0811
GARCH(-1)	0.460728	0.145814	3.159693	0.0016
Volatility = (RESID(-1)^2 + GARCH(-1))			0.403252	

The above fig 8. represents the volatility of cotton futures daily price. The total value of RESID(-1) and GARCH(-1) is 0.403252 this implies that there is low volatility of cotton future price. Hence, existence of low volatility implies that price of cotton futures movement is vulnerable. The investors have to consider the high volatility cotton futures price which can make their investment and trading more effective. Hence, we can eliminate null hypothesis.

FIGURE 9. FIGURE SHOWING ANALYSIS OF GRACH TEST COTTON SPOT PRICE

Dependent Variable: COTTON SPOT				
Method: ML - ARCH (Marquardt) - Normal distribution				
Convergence achieved after 87 iterations				
Pre-sample variance: back cast (parameter = 0.7)				
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)				
Variable	Coefficient	Std. Error	z-Statistic	Probability
C	-1.999195	0.000336	-5953.396	0
Variance Equation				
C	0.002125	0.001366	15.55617	0.0000
RESID(-1)^2	-0.022073	0.006757	-3.266881	0.0011
GARCH(-1)	0.283228	0.044727	6.332323	0.0000
Volatility = (RESID(-1)^2 + GARCH(-1))			0.261155	

The above fig 9. represented the volatility of cotton spot daily price. The total value of RESID(-1) and GARCH(-1) is 0.261155 this implies that the low volatility of cotton spot price during the study. Hence, existence of low volatility implies that price of cotton spot movement is vulnerable. The investors have to consider the high volatility cotton spot price which can make their investment and trading more effective. Hence, we can eliminate null hypothesis.

FIGURE 10. FIGURE SHOWING ANALYSIS OF ARIMA ON COTTON FUTURE PRICE AND COTTON SPOT PRICE

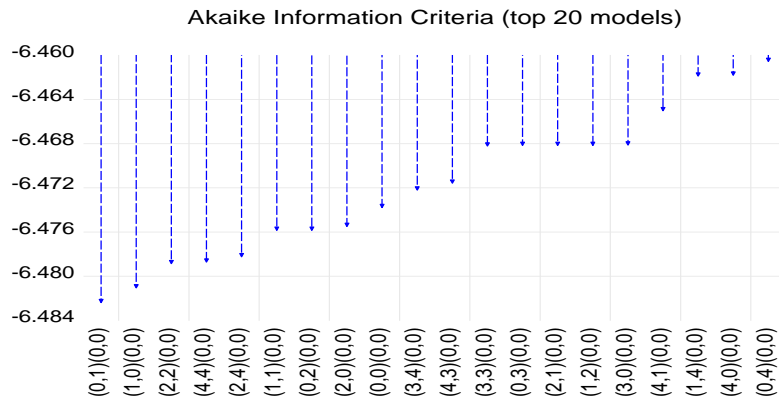
Number of estimated ARMA models: 25
 Number of non-converged estimations: 0
 Selected ARMA model: (0,1)(0,0)
 AIC value: -6.48221489117

After comparing the fit statistics, only ARIMA (0,1)(0,0) satisfy all the criteria, hence we obtained the model ARIMA (0,1)(0,0) which is used to forecast the future cotton price. The generalized ARIMA (0,1)(0,0) model is in the form :

$$X_t = 58.809(1+0.734) + X_{t-1} - 0.354 (X_{t-1} - X_{t-2}) + 0.869 et-1 \tag{3}$$

The below graph 2. shows the parameter estimate of ARIMA (0,1)(0,0) with respective significance level. Here all the significant values are less than 0.05 so ARIMA (0,1)(0,0) was taken into consideration among the 25 models with Akaike's Information Criterion (AIC) -6.48221489117 as it is the least than other 25 models the same is shown in the above fig 10 and below graph 2.

GRAPH II. GRAPH SHOWING AIC OF COTTON



VII. LIMITATION OF THE STUDY

1. There are a few limitations in anticipating a data with econometric model. This model is used for short run just, to perceive little assortment in the data. In case of sudden change, in the informational collection if there ought to emerge an event of progress in government strategy or financial insecurity, etc it gets hard to get the particular change, from now on this model gets insufficient to gauge in the present circumstance more over determining with this procedure relies upon presumption of direct auxiliary data anyway there is no evidence that the cotton cost is straight in nature.
2. The cotton price forecasting was done dependent on the straight historic information however there is no solid proof on the linearity of the information. So if there is any abrupt changes in government policies, political party changes, unexpected changes in securities exchanges, economic instability such as economic friction, rivalry and so on. The information gets non-direct so it is hard to figure the price in this situation.
3. The study focuses on only forecasting and understanding volatility of the price of the both commodity. Further the study does not make any budgetary forecasting owing to paucity of secondary data sets.

VIII. CONCLUSION

The research examines the study on volatility, normality, stationary and forecasting of both the commodities cotton spot and future price. The research used time series daily data of one year which was collected from www.mcxindia.com. The research also explains the market fundamentals which includes demand and supply with both Indian and global scenario, export and import of both the commodities and how it was impacted the economy over the year in India. It also includes the contract specification as per the Multi commodities exchange regulations for both buyers and sellers and the market factors which influence the commodities cotton. In the econometrics of cotton, the study results that mean average returns of cotton future was negative with was lower than the risk. Also results that the time series data of cotton future and spot price are significantly stationarity during the research period. Hence we can analyze that future research would be more accurate and reliable. The correlation value was low with implies that there is a weak or low correlation between the cotton spot and future price. The regression analyzed that there is no impact of cotton future to spot price and vise-versa, in detail there no impact of today's price to the next day's price. In cointegration between cotton spot and future price explains that there is a long run relationship and both the prices are interconnected. The granger causality test explains that there is no cause and effect in the direction of both cotton spot and future price. GARCH test implies that there is low volatility in the prices during the study. The last step that is ARIMA examines that the best criteria to forecast the cotton future price is ARIMA(0,1)(0,0).

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