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Analysis of NCDEX Spices Spot and Futures Trading

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This research paper evaluates the efficacy of spot and futures trading in spices on NCDEX by analysing the relationship between spot prices and futures trading. The study uses daily spot and near-month futures price data from financial year 2015-16 to financial year 2021-22, encompassing 1,777 observations. The ADF test confirmed that both spot and futures prices are stationary at the first difference, while Johansen's cointegration test revealed a significant long-term relationship between these prices for Jeera, Turmeric, and Coriander, with trace values of 67.24, 39.42, and 36.21, respectively. Granger causality tests showed a unidirectional relationship in Jeera and a bidirectional relationship in Turmeric and Coriander, indicating the futures market's dominant role in

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price discovery for Jeera and its shared importance with the spot market for Turmeric and Coriander. These findings suggest that the futures market on NCDEX plays a vital role in price discovery and risk management, making it an essential tool for stakeholders in the Indian agricultural commodity market.

Keywords: Spot price; futures price; commodity futures trading; relationship; spices; NCDEX.

1. INTRODUCTION

Indian agriculture remains the main occupation for approximately 60 percent of the rural population [1]. Despite the growth in non-agricultural jobs, the development within the agricultural sector is critical for reducing rural poverty. However, the sector faces significant challenges, particularly in managing price risks due to the lack of standardized products, organized markets, storage facilities, and effective pricing knowledge. These challenges highlight the need for effective price risk management mechanisms in the agricultural sector.

The volatility in agricultural prices poses a risk not only to individual farmers and traders but also to the economy as a whole. Historically, national governments have attempted to stabilize prices through interventions like physical buffer stock systems and stabilization funds. However, these methods have proven costly and ineffective in the long term [2]. As a result, the commodities futures market has emerged as a viable alternative for price stabilization, allowing hedgers to protect themselves against future price changes.

"The National Commodity and Derivatives Exchange Limited (NCDEX) is a professionally managed on-line, multi commodity exchange focusing on revolutionizing India's agricultural sector. It is India's largest agricultural derivatives exchange with a market share of 75 per cent in agricultural derivative contracts for the financial year ending March 2021. It's reason for existence is to serve as an efficient platform for price discovery and price risk management and this has been consistently demonstrated over the past two decades. It also offers a range of diverse products such as commodity futures, options in goods and index futures that open an abundance opportunity to cater to the needs of various sets of participants in the Agri value chain. NCDEX offers three spices commodities for trading viz., Jeera (Cumin), Turmeric and Coriander" [2].

In India, cumin seed commonly known as 'Jeera' is the dried, white fruit with greyish brown colour of a small slender annual herb. Whereas, turmeric is one of the most important spices as well as therapeutic agent and is grown during Kharif season and coriander being the most widely used spices in India and around the world is one of those herbs whose all parts are edible. Keeping in view the above facts, an attempt is made to critically assess the relationship of NCDEX futures and spot trading in spices with the following specific objective is to analysis of NCDEX spices Spot and future trading. The futures market on NCDEX facilitates transactions among producers, speculators, and arbitrageurs, enabling them to hedge against price volatility and manage risk effectively.

The motivation behind this research stems from the critical need to understand the efficacy of futures trading on NCDEX in stabilizing spot prices for key agricultural commodities. Despite the established role of futures markets in price discovery and risk management, there is limited empirical analysis specifically focused on the NCDEX platform and its impact on the spices market. The research aims to fill this gap by critically assessing the relationship between NCDEX futures and spot trading in spices, providing insights that could inform policy and trading strategies.

Existing literature has extensively discussed the role of futures markets in price discovery and risk management [3,4]. However, most studies have focused on broader agricultural commodities or different markets outside of NCDEX. This research distinguishes itself by focusing specifically on the Indian spices market within the NCDEX framework. By analyzing the relationship between futures and spot prices for Jeera, Turmeric, and Coriander, this study aims to contribute new knowledge to the existing literature and provide a deeper understanding of the dynamics at play within this specific market.

The study is grounded in the Efficient Market Hypothesis (EMH), which suggests that in an

efficient market, prices fully reflect all available information, preventing any trader from consistently achieving abnormal returns [5]. Additionally, the research considers the theory of price discovery, which posits that futures markets play a critical role in revealing information about expected future prices. The study hypothesizes that futures prices on NCDEX are unbiased predictors of spot prices and that price volatility in the futures market is higher than in the spot market. The research will also explore the extent to which risk can be managed through hedging in the NCDEX commodities market. The research will conduct a trend analysis of spot and futures prices on NCDEX, focusing on the spices market. By examining data over a seven-year period, the study will assess the performance of NCDEX in facilitating price discovery and risk management. NCDEX will be measured as the platform facilitating these transactions, with the primary variables being spot prices, futures prices, and price volatility.

The efficacy of the agricultural commodity market is assessed by examining the relationship between futures and spot market prices. Specifically, futures prices represent the market's expectations for future spot prices, while spot prices reflect the current market value of a commodity. By analyzing how closely these prices align over time, we can gauge the effectiveness of the futures market in price discovery and risk management. A strong, predictable relationship between these variables suggests that the market is functioning efficiently, providing accurate pricing signals and enabling stakeholders to manage price risks effectively.

2. REVIEW OF LITRETURE

Nirmala et al. [6] used “econometric tools including the Augmented Dickey Fuller test, Granger Causality test, and Co-integration approach to investigate which market impact was responsible for determining the price in the cardamom futures market. The results of this study imply that by using daily closing data from January 1, 2012, to December 31, 2013, price movement in cardamom futures can be used as a tool for price discovery for spot market transactions. This study has been further validated by comparing the results of international futures cardamom prices”.

Singh and Singh [3] examined “chana futures from May 2005 to December 2014, and found chana futures to be efficient. Further, they established that in the case of agricultural commodities, seasonality plays an important role in the efficiency of the market”.

Raghavendra et al. [7] empirically examined “the price relationship of spot and futures market of agricultural commodities such as Soyabean, Chana, Maize, Jeera and Turmeric for a period from January 2010 to March 2015 traded in NCDEX. The findings indicate the existence of long-run equilibrium relationships between futures and spot prices for all the 5 agricultural commodities that were taken for this study. The commodities like Maize, Jeera and Turmeric have bidirectional relationship where both spot and futures markets influence each other in the price discovery process”.

Arora and Chandar [8] also found bidirectional causality of some commodities while evaluating the efficiency of the futures market for price discovery.

Adapa [9] in his study, “used year-wise data to explore annual changes in commodity prices. Monthly data for select years (2011-2015) was used to identify seasonality and daily price changes were analysed to identify the spot-futures prices differences and convergence towards expiry date. Near month Futures prices were analyzed for price discovery process”.

Samal [10] evaluated “the efficiency of Indian cotton futures prices in predicting futures spot prices during the period January, 2013 to December, 2015 using Vector Auto Regression model and Granger causality tests. To check stationarity in futures and spot prices ADF test is applied. The results shown that both the variables are stationary at level. The VAR model suggests that lag value of futures has more influence on spot price of cotton. The causality test has further indicated that futures markets have negligible ability to predict subsequent spot prices for cotton”.

Nirmala and Swarna [11] showed “the unidirectional relationship or bidirectional relationship between spot and futures prices of crude oil. ADF and Ganger Causality and Co integration test is used to analyse the causal relationship. The results indicate that there is a univariate relationship where spot prices are discovered in futures markets”.

Sastry and Vitala [12] studied “the relationship between futures and spot commodity price and to

find the intensity of futures trading on spot volatility of the selected commodities and to study the trading and settlement pattern of agriculture commodity needs and to facilitate yield to agricultural commodity. It is been found that all commodities have positive correlation and also found that Spot market volatility tends to affect futures market trading activity, measured by trading volumes liquidity".

Manogna and Mishra [13] using "the VECM results revealed that price discovery exists in all the nine commodities with futures market leading the spot in case of six commodities, namely soybean seed, coriander, turmeric, castor seed, guar seed and chana. Whereas in case of three commodities (cotton seed, rape mustard seed and jeera), price discovery takes place in the spot market".

3. METHODOLOGY

The primary objective of this study is to analysis of NCDEX spices spot and future trading, with a specific focus on Jeera, Turmeric, and Coriander. To examine the objective of the study, secondary data on selected spices crops (i.e., Jeera, Turmeric, Coriander) were collected from the reports available on NCDEX website. The data set comprises daily closing spot prices and near-month futures contract prices for each commodity. The historical price reports were collected for a period of seven years from 2015-16 to 2021-22 with 1777 observations. For the purpose of the study, selection of appropriate and sufficient data is significant to achieve the best possible outcomes. In this context, sampling is taken from the available data at NCDEX platform. For measures of central tendency, dispersion, skewness and kurtosis, a total of seven years data is taken. Since Covid 19 pandemic has highly impacted all sectors including agriculture. Post covid-19, commodity futures market dominates the prevailing market through digital platform wherein the buyers and sellers are able to fulfill their demand and supply efficiently. Because of this reason, the study data from FY 2019-20 to 2021-22 is considered as a sample.

The efficacy of agricultural commodity market is assessed through analyzing the relationship of futures and spot market price series. The relationship between futures and spot market prices is a key indicator of market efficiency. A strong, predictable relationship suggests that the futures market is effectively performing its role in price discovery and risk management, thereby enhancing the overall efficacy of the agricultural commodity market. Firstly, the stationarity of the price series was tested with the help of unit root test procedure namely Augmented Dickey Fuller Test and possible cointegration between spot and future price series was checked using Johansen's Cointegration Analysis Test. If the analysis reveals cointegration between the futures and spot price series, it indicates a long-term equilibrium relationship between them. In this case, the Vector Error Correction Model (VECM) would be applied to explore the short-term dynamics and adjustments to maintain the long-term equilibrium.

If there is no cointegration, it suggests that no long-term relationship exists between the series. In this scenario, a Vector Autoregression (VAR) model would be employed to analyze the short-term dynamics and causal relationships between the futures and spot prices without considering long-term adjustments.

Secondly, Granger causality test model was used to find out whether futures price causes effects on spot price or not and vice-versa with their direction of causation.

3.1 Analytical Tools and Statistical Techniques

1. **Measures of Central Tendency, Dispersion, Skewness, and Kurtosis:** These will be used to summarize the characteristics of the price data for each commodity.
2. **One-way ANOVA:** This will test the equality of means between spot and futures prices.
3. **Augmented Dickey-Fuller Test:** This will check the stationarity of the time series data.
4. **Johansen's Cointegration Test:** This will assess the long-term equilibrium relationship between futures and spot prices.
5. **Granger Causality Test:** This will determine the direction and causal relationships between the futures and spot prices.

3.2 Measures of Central Tendency

The measures of central tendency include mean which is the sum of the observed values of a set

divided by the number of observations in the set, maximum and minimum of spot and futures price series for various commodities are assessed.

3.3 Measures of Dispersion, Skewness and Kurtosis

The dispersion such as standard deviation and coefficient of variation for spot and futures prices for various commodities are assessed. The positive square root of the variance is called standard deviation. It explains the average amount of variation on either side of the mean. The coefficient of variation (CV) is the percentage of the standard deviation around/ about the mean. The higher the coefficient of variation, the greater the level of dispersion around the mean. Skewness can be defined as departure from symmetry or lack of symmetry of frequency distribution. If the skewness is less than -1 or greater than +1, the distribution is highly skewed. If the skewness is between -1 to -0.5 or between +0.5 and +1, the distribution is moderately skewed. If skewness is between -0.5 and +0.5 the distribution is fairly symmetric.

The Kurtosis is a measure of the "tailedness" of the probability distribution. A standard normal distribution has kurtosis of 3 and is recognized as mesokurtic. An increased kurtosis (>3) can be visualized as a thin "bell" with a high peak whereas a decreased kurtosis corresponds to a broadening of the peak and "thickening" of the tails. Kurtosis >3 is recognized as leptokurtic and <3 as platykurtic (lepto=thin; platy=broad).

3.4 One-way Analysis of Variance (ANOVA)

One-way Analysis of Variance (ANOVA) was performed to test the equality of means of spot price and futures price for each commodity. The values of *F*-statistic along with corresponding *p*-values are also included.

3.5 Augmented Dickey Fuller Test

Stationary series are the precondition for cointegration and causality analysis. Therefore, a unit root test is performed using an autoregressive model to check whether a time-series variable is non-stationary or not. A series is stationary if the mean and autocovariances of the series do not depend on time. Unit root tests based on Augmented Dickey-Fuller (ADF) test approach was used in this study to examine the stationarity of all the futures and spot price series.

The test of stationarity of futures and spot prices were carried out by estimating the following regression equation 1:

$$\Delta X_t = b_0 X_{t-1} + \sum_{i=1}^{T} b_i \Delta X_{t-i} + \varepsilon_t \quad (1)$$

Where, *Xt* represents the base level or the first difference of the variables. The null hypothesis of non-stationarity is *b*0 = 0. If the null hypothesis is not rejected at the base level of the series, *b0* rejected at the first difference of the series, then the series is taken as stationary at the first difference level, and it is denoted by I (1). The above tests have been performed using a constant intercept and lag length has been determined though Schwarz information criterion.

3.6 Johansen's Co-Integration Model

The Johansen cointegration test is employed on log prices of the three commodities using two methods: (1) Johansen trace test and (2) Johansen maximum eigen test. As this test is sensitive to lag selection, Vector autoregression (VAR) is applied to determine the appropriate lag length as per the Akaike information criterion (AIC). The purpose of the cointegration test is to determine whether a group of non-stationary series are cointegrated or not, and explores the long-run equilibrium relationship among the variables. The Johansen likelihood ratio test statistic, λ trace, and the maximal Eigen value, λmax for the null hypothesis that there are at most r cointegrating vectors are given in equation 2 and 3:

$$\lambda_{\mathrm{tr}\,ace} = -T \sum_{i=r+1}^{k} \ln\left(1 - \hat{\lambda}_i\right) \quad (2)$$

$$\lambda_{\max} = -T \ln\left(1 - \hat{\lambda}_{r+1}\right) \quad (3)$$

3.7 Ganger Causality Test

Granger causality test has been used to analyze the direction and causal relations between futures and spot prices of major agricultural commodities. The Granger [14] approach predicts how much of the current value of one variable can be explained by past values of other variable and then tries to see whether adding lagged values of prior variable can improve the explanation [15]. For instance, Y is said to be Granger-caused by X, if X helps in the prediction of Y, or equivalently if the coefficients on the

lagged X is statistically significant. Specifically, Y_t is causing X_t if some coefficient, a_i, is non-zero. The test for causality is based on an *F*-statistics, which tests whether lagged information on a variable Y provides any statistically significant information about a variable X in the presence of lagged X. The F-statistic is given by:

$$F_1 = \frac{SSEo - SSE1/p}{SSE1/(T-2p-1)} \quad (4)$$

Where, SSE_0 and SSE_1 are the sum of squares of residuals, p is the number of lags and T is the number of observations. It is important to note that the statement "X Granger causes Y" does not imply that Y is the effect or the result of X. This implies that the Granger causality measures precedence and information content but does not by itself indicate causality in the true sense.

4. RESULTS AND DISCUSSION

To analyses the efficacy of agricultural commodity markets, it is vital to understand the basic behavior of spot and futures price series taken from NCDEX daily price data by assessing the central tendency, dispersion, skewness, kurtosis and ANOVA F-test. The outcomes are presented in Table 1.

4.1 One-Way Analysis of Variance (ANOVA)

To assess the efficacy of agricultural commodity markets, an analysis was conducted on spot and futures price series for Jeera, Turmeric, and Coriander using 1,777 observations from FY 2015 to 2022. The mean spot prices were ₹16,868.9 (Jeera), ₹7,208.51 (Turmeric), and ₹7,245.03 (Coriander), with higher coefficients of variation in futures prices—13.39% (Jeera), 15.75% (Turmeric), and 27.51 per cent (Coriander)—indicating greater dispersion. Skewness was minimal for Jeera (0.04) and Turmeric spot prices (0.18), but Coriander showed high skewness (1.00) [16]. Kurtosis revealed that Coriander and Turmeric futures were leptokurtic, while other prices were platykurtic. ANOVA F-tests showed significant differences for Jeera (F = 24.61) and Coriander (F = 5.43) but not for Turmeric (F = 0.57).

It depicted significant values at 5 per cent level of significance of F-statistic in jeera and coriander i.e., 24.61 and 5.43 respectively [17]. Whereas, the F-statistics for turmeric is 0.57 which is not significant at 5 per cent level of significance. This indicates that there is no difference among group means for Jeera and Coriander, but a difference does exist for Turmeric.

One-way Analysis of Variance (ANOVA) depicted significant values at 5 per cent level of significance of F-statistic in jeera and coriander i.e., 24.61 and 5.43 respectively. Whereas, the F-statistics for turmeric is 0.57 which is not significant at 5 per cent level of significance [18]. These results revealed that null hypothesis (H_o) is rejected in the case of jeera and coriander and null hypothesis (H_o) is not rejected in turmeric. This indicates that there is no difference among group means with respect to jeera and coriander but with respect to turmeric the difference exists.

4.2 Unit Root Test Outcomes

The unit root test on spot and futures prices of selected spices is presented in Table 2. The t-statistics at level revealed that for spot prices of jeera, turmeric and coriander is 2.42, -0.66 and -1.13 respectively and for futures prices the t-statistics value for jeera, turmeric and coriander is 0.47, -2.60 and -0.79 respectively [19]. All these values are not statistically significant at 5 per cent level of significance which means that the data is not stationary. Whereas, the t-statistics at first difference are statistically significant at 5 per cent level which means that the data is stationary.

4.3 Cointegration Test Outcomes

The Johansen's cointegration tests statistics for selected spices is presented in Table 3. From the table, it is seen that the number of observations for jeera, turmeric and coriander is 598, 547 and 621 respectively. In the case of zero cointegrating vector (*r* = 0), the trace value and maximum eigen value for jeera in spot and futures market is 67.24 and 66.70 respectively, for turmeric it is 39.42 and 39.09 and for coriander it is 36.21 and 35.96 respectively. All these values are significant at 1 per cent level of significance and hence, the null hypothesis (H_o) is rejected which means that the data has cointegration between spot and futures price series. On the other hand, in the case of one cointegrating vector (*r* = 1), the trace value is equal to maximum eigen value i.e., for jeera is 0.54, turmeric is 0.33 and for coriander it is 0.25. All these values are not significant at 5 per cent level of significance and hence, the null hypothesis (H_o) is not rejected which means that the data has no cointegration between spot and futures price series.

Table 1. Summary statistics of future and spot prices of the commodities

Commodity	Jeera(₹/qt) FY-2015-2022			Turmeric (₹/qt) FY-2015-22			Coriander (₹/qt) FY-2015-22		
Price		**Spot**	**Futures**		**Spot**	**Futures**		**Spot**	**Futures**
Observations	1777	1377	1377	1777	1377	1377	1777	1377	1377
Mean	-	16868.90	16598.70	-	7208.51	7180.90	-	7245.03	7115.40
Minimum	-	12957.90	12535	-	5117.20	5214	-	4582.45	4196
Maximum	-	22340	23120	-	9823.80	10834	-	12530	13044
SD	-	2129.18	2223.91	-	1085.94	1131.30	-	1858.45	1957.70
Skewness	-	0.04	0.34	-	0.18	0.66	-	1.00	1.04
Kurtosis	-	2.19	2.48	-	2.54	3.17	-	3.35	3.51
CV (%)	-	12.62	13.39	-	15.06	15.75	-	25.65	27.51
***F*-value**	24.61*			0.57^{NS}			5.43*		
***p*-value**	0			0.4482			0.0198		

Note: Significant at: *0.05 level, ^{NS} Non significant
SD indicates standard deviation, CV indicates coefficient of variation
Source(s): Authors calculations based on NCDEX data

Johansen's cointegration test results indicate the presence of a long-run relationship between the log values of spot and futures prices. In the case of $r = 0$, both the trace statistic and maximum eigen test statistics revealed that all the price series are cointegrated and there is an existence of one cointegrating equation. Unlikely, in the case of $r = 1$, both trace and maximum eigen statistics are equal in all commodities that suggests presence of longrun relationship but is not cointegrated; thus, including both the phase it is accepted that the log of spot and futures prices is cointegrated with one-to-one and have long-run relationship in the case of all the three commodities. These results suggest market efficacy of Indian agricultural commodity markets. The result is in line with Manogna and Mishra [13].

4.4 Causality Test Outcomes

Granger causality test is employed to measure the short-run lead–lag relationship between futures and spot price returns after the series are checked for stationarity and cointegration. Here returns denote the logarithmic differences of prices. The results of test reported in Table 4. In the case of the null hypothesis (Ho), the F-statistics for jeera is 0.05, for turmeric it is 4.88 and for coriander it is 21.61. Likewise, in the case of the null hypothesis (Ho), the F-statistics for jeera is 70.14, for turmeric it is 14.02 and for coriander it is 67.58. All these values are significant at 1 per cent level of significance (except one) and hence, the null hypothesis (Ho) is rejected which means FR granger cause SR and vice versa except in first case (i.e., SR does not granger cause FR) of jeera where F-statistics is not significant at 1 and 5 per cent level of significance and hence, the null hypothesis (Ho) is not rejected.

The ADF test was applied to examine the stationarity of the spot and future prices, which reveals that both spot and futures prices of all these commodities at first difference are stationary. On the other hand, at level, these prices are non-stationary. Hence, for further analysis it is important to take non stationary data rather than differenced series. After testing for unit root, long-run relationship between spot and futures prices is estimated using cointegration tests. As per results obtained in cointegration, including both the phase it is accepted that the log of spot and futures prices is cointegrated with one-to-one and have long-run relationship in the case of all the three commodities. These results suggest market efficacy of Indian agricultural commodity markets.

The presence of cointegration does not directly indicate market efficiency; rather, it suggests that there is a long-term equilibrium relationship between spot and futures prices. Cointegration implies that any deviations from this equilibrium will eventually correct over time, indicating a connection between the two markets. However, for market efficiency, we would need to examine other factors, such as the speed of adjustment to this equilibrium and the ability of futures prices to predict spot prices accurately. Cointegration is a necessary condition for efficiency but not sufficient on its own. The result is in line with Manogna and Mishra [13]. According to Granger causality test results, however, future prices in jeera and coriander with high F-statistics reflects dominance of Futures market. These designate that the futures market is leading and hence price discovery function occurs in these markets [20]. On the other hand, in the case of turmeric, the F-statistics for both spot and futures prices are almost equal which reflects that both markets are equally important for price discovery [21]. The results for Jeera and Coriander are similar to Manogna and Mishra [13].

Table 2. Unit root test on spot and futures prices of selected prices

Sl. No.	Commodity	Prices	Observations	Augmented Dickey-Fuller (ADF) test			
				Level		1st difference	
				t-statistics	Probability	t-statistics	Probability
1	Jeera	Spot	612	2.42	1.00	-21.73**	0.00
		Futures	751	0.47	1.00	-27.43**	0.00
2	Turmeric	Spot	547	-0.66	0.97	-16.11**	0.00
		Futures	751	-2.60	0.28	-34.01**	0.00
3	Coriander	Spot	633	-1.13	1.00	-22.74**	0.00
		Futures	751	-0.79	0.97	-26.60**	0.00

*Note(s): significance at 1% level of confidence is indicated as ***

Table 3. Johannsen's cointegration tests statistics for selected spices

Sl. No.	Commodity	Observations	Leg length	Trend	Cointegrating vector		Hypothesized No. of CE(s) (no. of cointegrating vector) (r)	Johansen's cointegration analysis	
					Beta of spot	Beta of Futures		Trace value	Max-eigen value
1	Jeera	598	1	No-deterministic	-0.99	1	*r* = 0	67.24**	66.70**
							r = 1	0.54	
2	Turmeric	547	1	No-deterministic	-1.02	1	*r* = 0	39.42**	39.09**
							r = 1	0.33	
3	Coriander	621	1	Quadratic deterministic	-1.01	1	*r* = 0	36.21**	35.96**
							r = 1	0.25	

*Note: significance at 1% level of confidence is indicated as ***

Table 4. Granger causality tests statistics for selected spices

Sl. No.	Commodity	Observations	Granger causality test				
			Null Hypothesis	F-statistics	Probability	Relationship	
						Direction	Lead- lag result
1	Jeera	598	SR does not granger cause FR	0.05	0.95	-	Unidirectional
			FR does not granger cause SR	70.14**	0.00	FR ➔SR	
2	Turmeric	547	SR does not granger cause FR	14.98**	0.00	SR➔ FR	Bidirectional
			FR does not granger cause SR	14.02**	0.00	FR ➔ SR	
3	Coriander	621	SR does not granger cause FR	21.61**	0.00	SR➔ FR	Bidirectional
			FR does not granger cause SR	67.58**	0.00	FR➔ SR	

*Note(s): * and ^{NS} indicates significance at, 1% level of confidence, respectively. SR stands for Spot Price Returns and FR for Futures Price Returns*

5. CONCLUSION

The analysis of NCDEX futures and spot trading in Jeera, Turmeric, and Coriander revealed significant findings that highlight the critical role of the futures market in price discovery and risk management. The Augmented Dickey-Fuller (ADF) test confirmed the stationarity of price series at the first difference, while Johansen's cointegration test demonstrated a long-term equilibrium relationship between futures and spot prices for all three commodities, with trace values and maximum eigenvalues significant at the 1per cent level. The Granger causality test indicated that futures prices predominantly lead spot prices in Jeera and Coriander, reflecting the futures market's dominance in these commodities. For Turmeric, a bidirectional relationship was observed, suggesting that both futures and spot markets are equally important for price discovery. These results underscore the efficacy of the futures market on NCDEX in stabilizing prices and providing accurate pricing signals, which are crucial for the agricultural commodity market. In comparison to the spot market, the futures market is better at accurately reflecting new information to prices. Therefore, it is concluded that the futures market is crucial to the process of determining prices for the three commodities we chose, making it valuable for both buyers and sellers of the commodities in the spot and futures markets.

6. POLICY IMPLICATIONS

In comparison to the spot market, the futures market is better at accurately reflecting new information to prices. Therefore, it is concluded that the futures market is crucial to the process of determining prices for the three commodities we chose, making it valuable for both buyers and sellers of the commodities in the spot and futures markets.

The positive coefficient of volatility spillover means that the future (spot) market is slow to adjust to spot (future) market to restore an equilibrium point. These results also revealed that good news (positive shocks) generates larger volatility than bad news (negative shocks) for spot and futures market in all the selected commodities. Speculators should come in investment action at the time of good news.

Commodity market is efficient in risk management for both traders and farmers with effective hedging efficiency in most of the times but not always. So, for profitable hedging sufficient knowledge and understanding of market behaviour is recommended in this study.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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