



ISSN Print: 2664-844X
ISSN Online: 2664-8458
NAAS Rating (2026): 4.97
IJAFA 2026; 8(8): 801-803
www.agriculturaljournals.com
Received: 11-06-2026
Accepted: 15-07-2026

Gayatri G Lokhande
P.G. Scholar, Agricultural
Economics and Statistics
Section, COA, Nagpur,
Maharashtra, India

Dr. VJ Rathod
Associate Professor,
Agricultural Economics and
Statistics Section, COA,
Nagpur, Maharashtra, India

Dr. AS Tingre
Professor, Agricultural
Economics and Statistics
Section, COA, Nagpur,
Maharashtra, India

Dr. Harsha S Mendhe
Assistant Professor,
Agricultural Extension and
Education Section, COA,
Nagpur, Maharashtra, India

Corresponding Author:
Gayatri G Lokhande
P.G. Scholar, Agricultural
Economics and Statistics
Section, COA, Nagpur,
Maharashtra, India

Spot and future price relationship of turmeric: An econometric study

Gayatri G Lokhande, VJ Rathod, AS Tingre and Harsha S Mendhe

DOI: <https://www.doi.org/10.33545/2664844X.2026.v8.i8j.1844>

Abstract

This study was undertaken to investigate the linkage between spot and futures prices of turmeric, with particular emphasis on stationarity, co-integration, causality, price volatility, and short- and long-run price behaviour. Monthly time-series observations of turmeric spot and futures prices covering 2005–2025 were obtained from AGMARKNET and NCDEX. Sangli and Hingoli were considered as the two spot markets. Correlation and regression techniques were applied to measure the association between spot and futures prices. The Augmented Dickey-Fuller (ADF) test, Johansen's Multiple Co-integration test, Pair-wise Granger Causality test and ARCH-GARCH model were subsequently employed to examine stationarity, long-run association, causal direction and price volatility. The findings indicated a strong and statistically significant positive association between lagged futures prices and turmeric spot prices in both Sangli and Hingoli. Regression estimates further showed that the futures price observed one month earlier exerted a significant positive effect on the current spot price. The ADF results showed that the price series were non-stationary in their level form but attained stationarity after first differencing. Johansen's test identified one co-integrating relationship for futures and spot prices in each market, confirming the presence of a stable long-term equilibrium. Granger causality was bidirectional between futures and Sangli spot prices, while the relationship was unidirectional from futures prices towards Hingoli spot prices. ARCH-GARCH estimates showed considerable persistence of volatility shocks in the futures as well as both spot markets. The findings highlight the importance of timely dissemination of futures-price information to farmers so that they can make better marketing decisions and obtain more remunerative prices.

Keywords: Turmeric, Spot prices, Futures prices, Correlation, Regression, Co-integration, Granger Causality, ARCH-GARCH, Price volatility

1. Introduction

Turmeric is among the oldest spices cultivated in India and is popularly known as “Indian saffron”. Botanically identified as *Curcuma longa*, it belongs to the family Zingiberaceae and has wide application in food and related industries. It is used as a flavouring substance, condiment, colouring material and an ingredient in curry powder. Owing to the long history and diversity of spice cultivation, India is widely recognized as the “Spices Bowl of the World”. India occupies a leading position globally as a producer, consumer and exporter of turmeric. World turmeric output is estimated at nearly 11 lakh tonnes annually, of which India accounts for about 80 per cent. During April–October 2024-25, India exported approximately 1.37 lakh tonnes of turmeric. The first advance estimates of the Central Government placed India's turmeric production in 2024-25 at about 11.16 lakh tonnes. Maharashtra is an important turmeric-producing state, with estimated production of 2.90 lakh tonnes from about 0.78 lakh hectares during 2024-25. Sangli is regarded as the largest turmeric market in Asia, while Basmat, Hingoli, Nanded and Barshi are other important markets in Maharashtra. Spot prices of agricultural commodities respond to several factors, including output conditions, seasonal fluctuations, weather, demand and supply imbalances and storage facilities. Futures prices, in contrast, incorporate expectations regarding forthcoming spot prices and are also affected by information, speculation and hedging activities. The interaction between these two price segments is closely associated with price discovery and market efficiency. Against this background, the present investigation was carried out to examine the relationship between turmeric spot and futures prices with the following objectives:

Objectives

- To study the relationship between spot and future prices of turmeric.
- To assess the co-integration among spot and future prices of turmeric.
- To assess the price volatility in spot and future prices of turmeric.

2. Methodology

Monthly average observations of turmeric spot and futures prices for 2005–2025 were used for the analysis. The secondary time-series data were obtained from the NCDEX and AGMARKNET websites of the Government of India. Correlation and regression methods were used to quantify the relationship between futures and spot prices. Since stationarity is an essential requirement before applying time-series econometric techniques, the Augmented Dickey-

Fuller (ADF) test was applied to the spot and futures price series. Johansen's Multiple Co-integration procedure was then used to identify whether a long-term equilibrium relationship existed between the price series. The Granger Causality test was applied to establish the direction of price transmission, while ARCH-GARCH modelling was used to examine volatility in turmeric prices.

3. Results and Discussion

3.1 Correlation and Regression Analysis

The association between turmeric spot prices and futures prices was evaluated through correlation and regression analysis. The corresponding estimates are presented in Tables 1 and 2. The correlation results demonstrate a strong positive association between spot prices and lagged futures prices across both selected markets.

Table 1: Correlation coefficient between turmeric spot prices and lagged futures prices

Sr. No.	Simple Correlation Coefficient, N = 251, Prob. > r under H0: Rho=0			
	Market Prices	Spot Prices (Sangli)	Spot Prices (Hingoli)	Lag Future Prices
1	Spot Prices (Sangli)	1.00	0.92***	0.90***
2	Spot Prices (Hingoli)	0.92***	1.00	0.94***
3	Lag Future Prices	0.90***	0.94***	1.00

The results from Table 1 indicated there is strong positive correlation between spot prices and lag future prices of turmeric.

Table 2: Linear regression estimates for spot prices and one-month lagged turmeric futures prices

Sr. No.	Variable	Parameter Estimate	Standard Error	t Value	Pr > t
1	Sangli				
	Intercept (C)	1045.68***	(226.86)	4.60	0.00
	Future one month Lag prices (X)	0.96***	(0.028)	34.33	0.00
2	Hingoli				
	Intercept (C)	684.72***	(144.30)	4.49	0.00
	Future one month Lag prices (X)	0.84***	(0.017)	47.30	0.00

The regression estimates indicate that the futures price recorded one month earlier had a statistically significant and

positive effect on the current spot price of turmeric in both Sangli and Hingoli markets.

3.2 Testing of Stationarity in Spot and Futures Prices

Table 3: The stationarity properties of the turmeric spot and futures price series were examined using the Augmented Dickey-Fuller (ADF) test

Sr. No.	Markets	Level (ADF)	First Difference (ADF)	Critical value (5%)	Stationary at
1	Spot (Sangli)	-2.708	-14.855	-2.873	1 st order
2	Spot (Hingoli)	-1.851	-14.447		1 st order
3	Future	-1.448	-10.565		1 st order

At the level form with lag 1, the ADF statistics for the Sangli spot, Hingoli spot and futures price series did not exceed the relevant 5 per cent critical-value threshold in absolute terms, showing that the series were non-stationary. After first differencing, the corresponding ADF statistics became more negative than the 5 per cent critical value.

Thus, all three price series were stationary at first difference.

3.3 Co-integration among Spot and Futures Prices

Johansen's Multiple Co-integration test was applied to determine whether a long-run equilibrium relationship existed between turmeric spot and futures prices.

Table 4: Johansen Multiple Co-integration results for turmeric spot and futures prices

Sr. No.	Market Pair	Hypothesized No. of CE(s)	Eigen Value	Trace Statistics	Critical Value (5%)	Prob.**	No. of Co-Integrating Equation CE(s)
1	Future & Sangli	None*	0.247194	73.19766	15.49471	0.0000	One
		At most1	0.008805	2.210878	3.841465	0.1370	
2	Future & Hingoli	None*	0.109994	31.44416	15.49471	0.0001	One
		At most1	0.009207	2.312308	3.841465	0.1284	

For both futures–Sangli and futures–Hingoli pairs, the trace statistics for the null hypothesis of no co-integrating equation were significant at the 5 per cent level. The results therefore support one co-integrating equation in each market pair. This indicates that turmeric spot and futures prices share a stable long-run equilibrium relationship despite short-run fluctuations.

3.4 Causality or Co-movement of Price Signals between Selected Markets

Where co-integration is established, Granger causality analysis can be used to investigate the direction in which price information is transmitted. The results are reported in Table 5.

Table 5: Granger Causality Test Results between Turmeric Futures and Sangli and Hingoli Spot Prices

Sr. No.	Null Hypothesis	Obs	F-Statistics	Prob.
1	Future does not Granger Cause Sangli	239	10.8628***	9.E-17
2	Sangli does not Granger Cause Future		2.78568***	0.001
3	Future does not Granger Cause Hingoli	240	13.1747***	4.E-19
4	Hingoli does not Granger Cause Future		1.50681	0.1304

The estimates show a two-way causal relationship between turmeric futures prices and Sangli spot prices. In contrast, the relationship involving Hingoli is one-way, with futures prices Granger-causing Hingoli spot prices. This finding suggests that the futures market has an important role in price discovery and exerts comparatively stronger informational influence on the Hingoli spot market.

3.5 Presence of Price Volatility

ARCH-GARCH analysis was conducted to examine the extent and persistence of volatility in turmeric spot and futures prices.

Table 6: ARCH-GARCH estimates for turmeric spot and futures markets

Sr. No.	Parameter	Spot (Sangli)	Spot (Hingoli)	Future
1	Alpha (α)	0.119	0.693	0.315
2	Beta (β)	0.902	0.409	0.800
3	Sum ($\alpha+\beta$)	1.021	1.103	1.115

The estimated volatility parameters indicate substantial persistence of shocks in the turmeric price series. The results suggest that volatility in both spot markets and the futures market tends to persist over time, indicating that a disturbance affecting turmeric prices can continue to influence subsequent price movements.

4. Conclusions

Turmeric spot and futures prices showed a strong positive association, and futures prices with a one-month lag had a significant positive effect on current spot prices in both Sangli and Hingoli. The ADF results established that the futures, Sangli spot and Hingoli spot price series were non-stationary in levels but became stationary after first differencing. Johansen's procedure confirmed the presence of a long-run equilibrium relationship and one co-integrating equation between the relevant spot and futures price series. Granger causality results demonstrated both

bidirectional and unidirectional price transmission, depending on the market pair. The ARCH-GARCH estimates further indicated persistent volatility shocks in both spot and futures prices. Overall, the evidence indicates close integration between turmeric spot and futures markets, with the two markets maintaining a long-term equilibrium relationship. Futures prices also appear to play an important role in price discovery and in shaping spot-market prices. Regular and timely dissemination of futures-market information to farmers can therefore improve their understanding of market conditions and support more informed selling decisions. Greater awareness of futures markets may help producers choose suitable marketing opportunities and improve the prices received in the spot market.

References

- Devi G, Jadav KS, Gamit P, Changela P. Price behaviour and co-integration of green gram in Gujarat. *J Plant Dev Sci.* 2019;11(4):243-248.
- Mane US, Changule RB, Kolekar PL, Gharge SH. An economic analysis of turmeric arrivals and price behavior in Sangli district of Maharashtra. *Int J Commer Bus Manag.* 2011;4(2):224-227.
- Pachpute SS, Deshmukh KV, Bhaskar KR, Kanade AU. Market integration of soybean in Marathwada region of Maharashtra. *Pharma Innov J.* 2023;12(4):965-969.
- Salmensuu O. A potato market integration analysis for India. *J Rev Mark Integr.* 2018;9(3):111-138.
- Tingre AS, Kolhe RK, Gavni BN. Future prices and spot prices relationship of turmeric: an econometric analysis. *RRC Report.* Akola: Department of Agricultural Economics and Statistics, Dr Panjabrao Deshmukh Krishi Vidyapeeth; 2018. p. 22-35.