DoI: https://doi.org/10.58537/jorangrau.2023.51.3.15

J. Res. ANGRAU 51 (3) 130-135, 2023

MARKET INTEGRATION OF SWEET LIME BETWEEN DOMESTIC AND INTERNATIONAL MARKETS

RAGINI NAIKOTI, SATYVEER SINGH MEENA AND VIKASH*

Dr. Yashwant Singh Parmar University of Horticulture and Forestry,
Nauni, Himachal Pradesh- 173 230

Date of Receipt : 28.4.2023 Date of Acceptance : 30.6.2023

ABSTRACT

The study focused on the integration of domestic and international markets for sweet limes during 2021. The co-integration of commodity prices was considered to be necessary for the implementation of a successful marketing reform for which both domestic and international market prices are required. Due to the lack of information regarding international prices, export price information was gathered from the website of the Agricultural and Processed Food Products Export Development Authority (APEDA), and secondary data regarding domestic prices of sweet lime was gathered from the website of the Agricultural Marketing Information Network (AGMARKNET). The annual average prices data for the chosen markets were gathered, and the Pearson correlation coefficient and Johansen's co-integration analysis approaches were used to analyse the relationship between the chosen market pair. Both markets were found to be correlated through correlation analysis, and the findings of the Johansen Co-integration rank, trace test, and eigen value statistics test were used to analyse the integration among the markets. The study's findings on market integration reveal how closely related the selected market places' pricing are to one another. Additionally, this research demonstrated that the model's variables exhibited an equilibrium long-run co-movement with the market price series.

Keywords: Co-integration, Correlation, Johansen Co-integration Test, Market, Prices

INTRODUCTION

The agricultural market environment is undergoing rapid changes, both on a local and global scale, at an unprecedented pace. Farm prices are impacted by market volatility and consequently, farm income. Market integration influences fruit items' prices as well. Due to seasonality, inelastic demand, variable production, and perishability, fruit prices are volatile. Additionally, there are many marketing intermediates involved in agricultural marketing, which raises the cost of marketing and ultimately drives up prices (FAO, 2017).

Gouel and Laborde (2021) examined how market-mediated changes can help mitigate the impacts of the changing climate. The findings reveal that climate-induced yield fluctuations cause considerable price movements, which encourage production and trade modifications. Both production and trade adjustments lead to world welfare losses, with production adjustments contributing the most.

Beag and Singla (2014) used Johansen's multivariate co-integration approach to examine market integration across five significant wholesale apple marketplaces in the nation: Ahmedabad,

*Corresponding Author E-mail i.d: vikash.kayla@gmail.com

Bengaluru, Delhi, Hyderabad, and Kolkata. The results of co-integration and Granger causality were also supported using impulse response functions, but in some geographically integrated market pairs, the amplitude of price transmission was found to be rather modest. Khatkar *et al.* (2014) using Johansen Granger Causality Tests, one may determine the degree of market co-integration of paddy prices in the key Punjab markets of Amritsar and Haryana, as well as how quickly paddy markets adapt to changes in long-term equilibrium. Patil *et al.* (2014) examined the seasonal variation, price volatility, and co-integration among the major mung bean market places in Maharashtra. All of the selected markets had higher pricing for mung bean during the months of October through December. The cycle-related volatility in prices of green gram in the markets that are selected.Wani *et al.* (2015) through a co-integration analysis of the wholesale weekly prices of three commercial apple varieties, however the analysis discovers no co integration for the American super variety in two pairings of markets. Additionally, the results of the Vector Error Correction Model (VECM) show a mix of positive and negative coefficients, albeit the positive coefficients are greater than the negative coefficient. Paul *et al.* (2016) studied into the key pulses' market integration across five Indian regions. The amalgamation of the wholesale and retail marketplaces was investigated by using the VECM. Using the Johansen co-integration method, Kumar and Jha (2017) examined the co-movement and causation between the prices of agricultural commodities and energy. David *et al.*(2019) investigated the co-integration of the price series for ethanol and agricultural commodities. They also demonstrated how the co-integrated price series' efficiency and predictability are impacted by this relationship.Qiang and Fan (2016) findings shows the world crude market for oil was integrated. Moreover, the world crude market for oil has a geographic and organisational framework. While OPEC is indeed-integrated, crude market for oil in neighbouring nations and areas tend to be linked together. It was discovered that the ties between South and North America, as well as Africa, are relatively stable.

The market integration of sweet lime between domestic and international markets presents challenges and opportunities that need to be addressed. Despite the potential and growing demand for sweet lime as a traded commodity on an international level, knowledge of the extent of market integration, the forces that are driving it, and its effects on producers, consumers, and market dynamics is lacking. Therefore, a detailed examination of the sweet lime market integration is necessary to identify challenges, assess market effectiveness, and create plans to enhance the integration process for the benefit of each stakeholder involved. The objective of this research was to study market integration of prices between international and domestic market.

The study concentrated on the integration of domestic and international markets for sweet limes. The co-integration of commodity prices was crucial to the price determination process. It was considered to be required for the effective execution of a marketing reform.

MATERIALS AND METHODS

The study was conducted during the year 2021. The details of price data was gathered using the reliable secondary sources for domestic and international prices *i.e.,* AGMARKNET and APEDA respectively for the past 10 years between January 2012 and December 2021. Hyderabad's Gaddiannaram market was chosen based on judgmental sampling-market with highest arrivals in the state. Yearly averages were considered for analysis.

Market integration

To establish an association between market pairing, the annual average price statistics of a selected markets were gathered and examined using Pearson's correlation coefficient and

Johansen's Co-integration analysis approach.The following formula was employed to determine the correlation coefficient between the markets.

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{n\sum X^2 - (X)^2}\sqrt{n\sum Y^2 - (Y)^2}}$$

Where, r = correlation coefficient,

n=number of observations.

X = Yearly average prices of selected crop (Rs/qt) in one market.

Y = Yearly average prices of selected crop (Rs/qt) in another market.

Correlation coefficient (s) ranges in value from -1 to +1. The positive number denotes a favourable correlation among markets, meaning that rising prices in one market will raise prices in the other. Stronger degree of association when value is nearer to +1. Depending on the value's sign, a perfect connection can be either positive or negative if the value is exactly +1.

Co-integration

Evaluating the co-integration of market prices was done using the multivariate Johansen approach. To prevent erroneous or arbitrary regression, prior to conducting the co-integration test, the stationarity of the price time series was assessed. The unit roots and stationarity properties of the time series were supported by the ADF test. Concerning the discrepancies in the level and initial price series, an ADF test was performed. The integrated time series variables might be of identical order, but the unit root test identifies which time series variables are incorporated of order one, or I. Analysis was done on the following ADF regression equation for stationarity:

$$\Delta y_t = \beta_1 - \beta_{2t} + \delta y_{t-1} + \Sigma\alpha_i \Delta y_{t-i} + \varepsilon t$$

——————————(1)

Where $\Delta y_t = (y_t - y_{t-i})$ and εt are pure white noise error terms, Y_t represents a vector that needs to have been assessed for co-integration, and t is the time or trend variable. The alternative hypothesis, δ<0, indicates that the time series is stationary, rejecting the null hypothesis, whereas the null hypothesis, δ=0; denoting unit root, states that the time series is non-stationary.

According to the error-correction representation, the Johansen's Co-integration test equation is given following:

$$\Delta z_t = \varphi k \Delta z_{t-k} + \pi z_{t-1} + \mu + \varepsilon t$$

——————————(2)

$z_t$is a vector of I (1) processes with a n*1 size (price of n market), The number of co-integrating vectors determines its rank of π, which is verified using the maximum eigenvalue, trace value, and likelihood ratio test statistics. To account for the variables that were left out, a constant term called μ was utilised. The Akaike Information Criterion AIC was used to determine the number of lags to be considered in the model. The Johansen's trace test was used in this research to establish the rank of a.

$$\lambda_{grace} = -T\sum_{i=r+1}^{n} \ln(1-\lambda i) \text{for r=0, 1, n-1}$$

—————————— (3)

Where the Eigen values for $\lambda_i$indicate how strongly the first difference and the error-correction diverge from one another. The following hypotheses were then studied:

H_o: rank of π=r (null hypothesis),

$H_{\dot{y}}$: rank of π>r (alternate hypothesis)

Where "r" denotes the number of co-integration equations. The test was run under the presumption that the original data had a linear, deterministic trend and that the co-integrating equation contained only an intercept. The original price series has a trend since the variance and mean are not stable over a period of time (non-stationary), however, the co-integrating expression only has the intercept as the price series had been separated while being examined for stationarity.

Table 1. ADF Test for Export Market and Domestic Market

S.No.	ADF Test for Export Market	Stationary Test				
	Test	**Score**	**P-Value**	**C.V.**	**Stationary**	**0.05**
ADF						
1	No Constant	-1.2	2.15	-2.0	FALSE	
2	Constant-Only	942.4	0.01	-3.0	TRUE	
3	Constant + Trend	-2.6	3.53	-3.6	FALSE	
	ADF Test for Domestic Market	Stationary Test				
	Test	**Score**	**P-Value**	**C.V.**	**Stationary**	**0.05**
ADF						
1	No Constant	-1.5	1.36	-2.0	FALSE	
2	Constant-Only	-2.6	1.12	-3.0	FALSE	
3	Constant + Trend	-2.5	3.93	-3.6	FALSE	

Source: Researcher's calculations based on the secondary data

RESULTS AND DISCUSSION

Market integration

The co-integration test analyses the long-run equilibrium while determining whether a group of non-stationary series are co-integrated or not. The co-integration test analyses the long-run equilibrium relationship between the variables and establishes whether a group of non-stationary series are co-integrated. There are numerous ways to check for co integration of variables. Among the techniques that is widely used is the Johansen approach.

A statistical characteristic of time series variables or when the error term in a regression model is stationary is co-integration. There must be a stationary linear combination of non-stationary random variables for the variables to be co-integrated.

To determine if the price sequence of sweet lime were stationary or not, the ADF based unit root testing method was employed (Table 1).

Mahadika *et al*. (2017) used Augmented Dickey Fuller (ADF) test, which depicts that data was not stationary. The series went through in the Johansen co-integration test after being converted from non-stationary I (0) to stationary I (1).The results demonstrate a sustained association between FDI, export volume, and GDP. The variables FDI, Export Volume, and GDP have a long-term association.

Correlation coefficient of domestic and international markets of sweet lime

The correlation coefficient of both domestic and international market pairs was used to calculate the extent of market integration between two markets (Table 2). The findings showed the correlation coefficient between the two markets, meant that the domestic pricing of sweet lime was linked with the international market; if the price of sweet lime increased in one market, it caused the value of sweet lime to rise in other markets, demonstrating the markets' positive price integration.

Uysal and Mohamoud (2018) analyzed the determinants of export performance. The results depict that between the factors that were considered, industry has the strongest correlation with export performance. With a correlation coefficient of 0.6094, it was possible to conclude

Table 2. Correlation between export prices and domestic prices

S. No.		Export prices	Domestic prices
1	Export Prices	1	
2	Domestic Prices	0.98	1

Source: Researcher's calculations based on the secondary data

Table 3. Johansen's co-integration test results for sweet lime markets

S.No.	Co-integration (Johansen) Test				0.05	Maximum Eigen value Test (r=1)			
	Test	**Score**	**C.V.**	**Pass**		**Test**	**Score**	**C.V.**	**Pass**
	Trace Test (r=0)	**0**		**r>0**					
1	No Constant	25.0	12.3	TRUE		No Constant	1.2	4.1	FALSE
2	Constant-Only	13.9	15.5	FALSE		Constant-Only	0.3	3.8	FALSE
3	Constant + Trend	17.0	18.4	FALSE		Constant + Trend	5.2	3.8	TRUE

Source: Researcher's calculations based on the secondary data

that industrialization possesses a 60% deciding influence on a country's export performance.

The integration between the markets for sweet lime prices

Using the numxl tool in MS-Excel, the integration between the markets was examined through Johansen co-integration process. The sweet lime price trace test results shown in Table 3 depicts that the trace statistics value exceeded the acute value at a level of 5 percent. As a result, the researcher was able to build co-integrating equations with a 5% threshold of significance. This suggested that during the study period, long-run equilibrium co-movement between the market price series and the model variables existed. Co-integration must exist for markets to function well over the long run.

For price series of sweet lime in domestic and foreign markets, the co-integration was explored. Table 3 displays the trace test and the Eigen value statistics derived from the Johansen Co-integration rank test.

The Johansen co-integration test results showed that co-integration links exist at a 5 percent level of significance of the chosen markets. As per the prior discussion, regardless of whether the markets are integrated, there could still be short-term disequilibrium since price changes on different markets might not occur instantly or simultaneously.

Ibrahim (2015) in his study, Johansen Co-integration test employed to test whether variables are co-integrated or not. According to the Johansen Co-integration test, there was only a single co-integration equation between citrus export, area, and production.This suggests there was a long-run link (equilibrium) between citrus export area and citrus production.

CONCLUSIONS

For the purpose of evaluating market integration, the domestic and international prices of sweet lime were compared. The findings revealed a strong correlation between the two markets which meant that the domestic pricing of sweet lime was linked with the international market; if the price of

sweet lime increased in one market, it caused the price of sweet lime to rise in other markets, demonstrating the markets' positive price integration.Through Johansen co-integration process, trace test, and eigen value statistics produced from the Johansen Co-integration rank test results, the integration between the markets was analysed. The findings showed that co-integration links exist at a 5% level of significance among the chosen markets.The market integration finding demonstrated that the studied markets are strongly associated and that there is opportunity for exporting the goods but since producer can only expect to make a little profit.

REFERENCES

Beag, F. A and Singla, N. 2014. Cointegration, causality and impulse response analysis in major apple markets of India. Agricultural Economics Research Review. 27(2): 289-298. DoI: 10.5958/0974-0279.2014.00032.9

David, S.A., Inácio, C.M.C and Machado, A.J.T. 2019. Quantifying the predictability and efficiency of the cointegrated ethanol and agricultural commodities price series. Applied Sciences. 9(24):1-14. https://doi.org/10.3390/app9245303

FAO. 2017. Agricultural Productivity and Innovation. The future of food and agriculture-Trends and challenges. Edition 2017.FAO, Rome. pp. 46-55.

Gouel, C and Laborde, D. 2021. The crucial role of domestic and international market-mediated adaptation to climate change. Journal of Environmental Economics and Management. 106: 102408.https://doi.org/10.1016/j.jeem.2020.102408

Ibrahim, M. 2015. Relationship between cultivated area, production and export of citrus fruit of Pakistan: a time series approach. M. Phil thesis submitted to Minhaj University, Lahore, Pakistan.

Khatkar, R. K., Karwasra, J. C., Singh, V. K and Bhatia, J. K. 2014. Market co-integration, price discovery and causation of basmati paddy in Haryana. Indian Journal of Economic Development.10 (1a): 38-44. DoI: 10.5958/j.2322-0430.10.1a.019

Kumar, R.R and Jha, G.K. 2017. Examining the co-movement between energy and agricultural commodity prices in India. Journal of the Indian Society of Agricultural Statistics. 70(3): 241-252.

Mahadika, I. N., Kalayci, S and Altun, N. 2017. Relationship between GDP, foreign direct investment and export volume: Evidence from Indonesia. International Journal of Trade, Economics and Finance. 8(1): 51-54.Doi: 10.18178/ijtef.2017.8.1.538

Patil, V. K., Tingre, A. S and Chaudhari, D. J. 2014. Mungbean price movement across major markets of Maharashtra, Journal of Food Legumes. 27(3): 233-237.

Paul, R. K., Saxena, R and Bhat, S. A. 2016. How price signals in pulses are transmitted across regions and value chain? Examining horizontal and vertical market price integration for major pulses in India. Agriculture Economics Research Review. 22:75-86. DoI: 10.22004/ag.econ.253167

Qiang, J and Fan, Y. 2016. Evolution of the world crude oil market integration: A graph theory analysis. Energy Economics. 53: 90-100, https://doi.org/10.1016/j.eneco.2014.12.003

Uysal, O and Mohamoud, A. S. 2018. Determinants of export performance in East Africa countries. Chinese Business Review. 17(4): 168-178.DoI:10.17265/1537-1506/2018.04.002.

Wani, M.H., Paul, R.K., Bazaz, N.H and Manzoor, M. 2015. Market integration and price forecasting of apple in India. Indian Journal of Agricultural Economics. 70 (2): 169-181.

Naikoti, R., Meena, S. S and Vikash. 2023. Market integration of sweet lime between domestic and international markets. The Journal of Research ANGRAU. 51(3): 130-135.
DoI: https://doi.org/10.58537/jorangrau.2023.51.3.15