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BANANA MARKET INTEGRATION AND COINTEGRATION: IMPLICATIONS FOR SUSTAINABLE AGRICULTURAL DEVELOPMENT

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ABSTRACT

The prices are controlled, guide and determine level of consumption, production, decisions of the market over time, form and places in the market-driven economy. Therefore, the market integration of agricultural commodities is deeply investigated which added valuable evidence regarding the mechanism of the market modification and justified government intervention. Morover, this paper was estimated the level of market integration in the provincial banana markets in Pakistan by using the Augmented dickey-fuller (ADF) and Johanson's Cointegration analysis and monthly wholesale price series from January 1981 to December 2020 are used to conduct the research. Furthermore, results of this study indicated that, banana provincial markets are well integrated and Hyderabad market is the dominant market in Pakistan. In addition to that, the other three provincial markets are well integrated with Hyderabad market. Furthermore, it was concluded that, higher levels of market integration between the banana market are fairly sustainable and viable. However, the banana markets will be further improved the market efficiency and enhance competitiveness by public and private sectors intervention.

Keywords: banana, cointegration, market integration, Pakistan

INTRODUCTION

The pricing system is expected to communicate orders and instruct to regulate the flow of activities in market-driven economies. The price signal indicates and adjusts the consumption, production, and market choices at different places and times. However, the inter-regional markets located at distant places from the place of production and the resultant price differences provide an important feedback on understanding the market (Wani, *et al.,* 2015). Furthermore, Mushtaq *et al.* 2008 indicated that inadequate infrastructure particularly in transportation, not having good market facts, government interventions like imposing a ban on the movement of commodities between provinces, government control of the market and distribution system, and poor implementation of regulatory bodies that result in price fixation and cartels and imperfect market arrangements are the obstacles in market stability and all markets are not integrated. Tahir and Riaz, 1997 conclude that the condition of well-integrated markets not prevailing, which indicate ineffective resource allocation due to the distorted price signals and farmers can produce a surplus which could reduce the farm gate prices and falling the farm income and livelihood.

Moreover, Ahuja, 2006 indicated that, based on the transportation, infrastructure and communication network connections the bigger commodity markets are to be better integrated, but if the smaller markets are not having a good connection then they become more remote markets. Furthermore, Mukhtar and Tariq, 2007 concluded that in developing countries, markets have potential application in policy making, therefore market integration of agricultural products has been taken an important part. Mukhtar and Tariq, 2007 refered that market integration information can help policymakers to make policies and regulations for the provision of good infrastructure and evidence to the regulatory services to evade manipulation on the market. That is also an alternative method to distribute resources and correct the market deficiencies and price stabilization.

In addition to that, exploring the reason behind the price variation between the markets has become an imperative economic tool for knowing the market's situation. In economy of

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various countries included Pakistan, there are numerous hurdles to the competent functioning of markets especially the agricultural product. Furthermore, the poor information and knowledge gap is the the main reasons behind the improper functioning of the agriculture markets. Therefore, the current reserch was conducted on major fruit in Pakistan.

Banana is vital and eatable fruit of the world, however in Pakistan it is essential food, especially for children which provides a rich source of vitamin C, dietary fiber, and manganese. Pakistan has a big share and produces in the banana industry. According to GoP, 2021 the country occupies an area of 34.90 thousand hectares with total production of 135,660 tonnes. Moreover, the larger share in area and production of bananas is in Sindh province. Moreover, due to the favorable soil health and good climatic conditions, this province is favorable for its successful cultivation and produces 87% share of the whole country (fruits and vegetable statistics, 2018-19). In addition to that, in the areas of the central and lower part of Sindh having moderate, the fruits have to have extraordinary acceptance (GoP, 2020). Munyankusi, 2002, reported that Nawabshah, Thatta, Khairpur, and Hyderabad are famous districts for producing bananas on a commercial scale. The reason behind that is distinguished climatic conditions, good soils and ecological situations are predominantly pleasant in the districts

In literature, more focus is on the issue of agronomic practice and constraints in the production of bananas in Pakistan, and less importance is given to the market integration and price signals play role in the local product market. The knowledge of price transmission and overall market performance is imperative for banana farmers and other value chain factors in the market. The performance upsets their marketing choices and disturbs decisions linked to logistical issues and ultimately profits are realized. It also supports the government to adopt the level to encourage market development. Therefore, the study is designed to estimate the level of banana market integration and con integration in major provincial markets in a country. Therefore, the government make good policies regarding the infrastructure, communications, and regulatory facilities to sidestep market manipulation. However, all actions are based on the information generated on paper.

MATERIALS AND METHODS

The data for the wholesale market prices were collected monthly (January to December) from the year 1981 to 2020 of banana fruit. Therefore, as whole 180 observations were collected from different issues of fruits vegetables, and condiments statistics of Pakistan and online from the Agricultural Information Marketing System (AIMS) website. Banana is the preferred fruit among all the provinces in Pakistan. However, based on the data availability, market situation, topographical spreading, and size of trade and its national flow the four major provincial markets (Hyderabad, Quetta, Lahore, and Peshawar) are selected for the study. The study assumes that market arrangements are radial as follows by Ravallion (1986) for the market co-integration study. Where Hyderabad is the banana central market due to the volume of trade and business flow. The provincial market groups are located in Punjab, Khyber Pakhtunkhwa, and Baluchistan provinces respectively and the local market groups are also present in the market. To check the data stationary /unit root Augmented Dickey-Fuller (ADF) test is applied to each series of the model with and without trend. However, price relationship is also evaluated for the overall market performance, therefore, study the stability of price connection of different commodity markets, the Co-integration test is a useful analytical tool (Wani *et al.,* 2015).

Augmented dickey-fuller (ADF) Ttst

Testing the occurrence of unit roots in each series in a model using the Augmented Dickey-Fuller (ADF) test was performed. To avoid the issue of the serial correlation using the Breusch-Godfrey testis was applied (Greene, 2000) and taken the number of lags in the ADF equation.

The following equation is used for estimation**:**

$$\Delta Y_t = \alpha_3 + \beta_3 t + (\varphi_3 - 1) Y_{t-1} + \sum_{i=1}^{k} \theta_i \Delta Y_{t-i} + u_t \quad \text{(A)}$$

Where,

Y_t = each series under investigation where t shows the time trend

1 and u_t is white noise residuals.

The hypothesis for the analysis is

H_o = series have a unit root

H_1 = series do not have a unit root

Johansen's cointegration test

The co-integration is examined the equilibrium level and long-term association of the two series. Therefore, Johansen's co-integration test is applied (1988) if two series are well integrated

to capture the long-run relationship between series. All procedure is based on the maximum likelihood estimation of the vector error correction model (VECM):

$$\Delta Z = + \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \ldots + \Gamma_{p-1} \Delta Z_{t-p+1} + \Pi Z_{t-p} + \Psi x_t + u_{t..}(B)$$

Where Zt defines the vector of I (1) variables which included both endogenous and exogenous variables in the equations. The null hypothesis for the trace test is

Ho= most r cointegrating vectors

H1= alternative that it is greater than r

RESULTS AND DISCUSSION

The initial stage in testing integration checks that either series are stationary or not. Therefore, the ADF test is applied in each market price series. The results of the unit root with the trend and without trend shows in (Table 1 and Table 2).

Table 1. Augmented Dickey-Fuller Tests without trend from the year 1981 to 2020

Variable	Level	First difference	Schwarz info Critical Value of Rejection of Hypothesis is a unit root			Order of Integration
			1%	5%	10%	
Hyderabad	-1.13	-8.60	-3.61	-2.94	-2.61	*I* (1)
Lahore	0.96	-6.49	-3.61	-2.94	-2.61	*I* (1)
Peshawar	0.74	-5.67	-3.61	-2.94	-2.61	*I* (1)
Quetta	3.07	-4.52	-3.62	-2.94	-2.61	*I* (1)

Both table's results show that the null hypothesis of unit root is accepted at first difference therefore we reject the alternate hypothesis. The absolute value of the ADF test for the Hyderabad, Lahore, Peshawar, and Quetta market price series is significant at the level of 99%, 95%, and 90% critical value. Therefore, It is concluded that at level price series are not stationary but while at first difference all the price series are stationary.

Table 2. Augmented Dickey-Fuller Tests with the trend from the year 1981 to 2020

Variable	Level	First difference	Schwarz info critical value of rejection of hypothesis is a unit root			Order of integration
			1%	5%	10%	
Hyderabad	-0.43	-8.66	-4.21	-3.53	-3.20	*I* (1)
Lahore	-1.50	-6.92	-4.21	-3.53	-3.20	*I* (1)
Peshawar	-1.53	-6.12	-4.23	-3.54	-3.20	*I* (1)
Quetta	0.08	-5.62	-4.22	-3.53	-3.20	*I* (1)

The empirical results are also the same with Mukhtar, 2007 for maize price series, Hussain *et al*., 2010 for Gram market, and Mushtaq, 2008 identify the level of market integration of major apple markets in Pakistan using cointegration analysis. The next step is to test the con integration between all the markets after the ADF test a unit root, therefore Johnson's con integration test is applied for all the banana market prices. The next step is to the selection of the order of the Vector Auto Regression (VAR) model to estimate Johnson's cointegration test. The Schwarz Bayesian Criterion (SBC), Hannan-Quinn information Criterion (HQIC), and Akaike Information Criterion (AIC) are also applied to choose the model lag length. But the Sequential modified LR-statistic is used due to smaller values and according to Sims, 1980 it is adjusted for small samples (Sims, 1980).

Table 3. The co-integration output-trace statistics

Equation tested	Null	Alternate	Test value	95% CV
Hyderabad, Lahore, Quetta and Peshawar	r=0	r=1	113.02	47.86
	r≤1	r=2	54.75	29.80
	r≤2	r=3	25.70	15.49
	r≤3	r=4	01.97	03.84

The Next step in the Johansen procedure is to examine the occurrence and number of cointegrating vectors between the markets in each model as followed by Mushtaq 2008. The results of Johansen's cointegration test are shown in (Table 3). Moreover, the results of trace statistics indicated that there are four cointegrating vectors and two common trends at the 95% confidence level. Furthermore, the three statistical values of trace statistics (113.02, 54.74, and 25.70) are greater than their respective 95% critical values (47.86, 29.80, and 15.49). However, the last values of trace statistics 1.97 are smaller than their 95% critical values. In conclusion, the trace test analysis recommends that all market price series are cointegrated and converge to long-run equilibrium and the banana market system is stationary in three ways. Therefore, all the markets are fully cointegrated and the law of one price (LOP) exists in the system.

Table 4. Pair wise cointegration results-trace statistics

Equation tested	Null	Alternate	Statistics	95% CV
Hyderabad-Lahore	r=0	r≥1	22.92	15.49
	r≤1	r≥2	01.96	03.84
Hyderabad-Quetta	r=0	r≥1	18.59	15.49
	r≤1	r≥2	04.21	03.84
Hyderabad-Peshawar	r=0	r≥1	19.03	15.49
	r≤1	r≥2	02.05	03.84

Although the provincial markets are spread and spatially segmented the prices associations suggest, that the markets are connected showing that all the banana exchange places are in a similar economic market. The results are also supported by the studies (Mushtaq *et al.,* 2007, Mushtaq et al 2008 for the apple market in Pakistan; Fredon and Esfahani, 2006 studied the rice market integration.

After checking the relationship between the four markets the next step is to check the pair-wise relationship between the banana markets. In this regards the Hyderabad market is the major regional market in Pakistan because the major share of bananas is coming from this region. Therefore, Hyderabad market is selected and analyzed the relationship with another regional market. Table 4 indicates the pair-wise cointegrating relationships between markets. It is concluded from the results that Quetta, Lahore and Peshawar are powerfully integrated with the Hyderabad banana market in Pakistan.

CONCLUSION AND RECOMMENDATION

This paper has explored the integration between the provincial banana markets of Pakistan by using the wholesale prices data for a banana to identify the market integration and co-integration between the markets. Therefore, it is concluded that all provincial banana markets are cointegrated and move toward the long-run equilibrium. Hyderabad is the dominant market in bananas in Pakistan and all three markets are well integrated with the Hyderabad market. The results conclude that, markets are fully integrated then the government can stabilize the price in one major market and depend on commercialization to produce the same effect in other markets. The cost of stabilization is also reduced significantly for the farmers and will not be hurdled by domestic demand situations. Therefore, the private and public interventions in dominate market to stabilize the market will effect the other markets.

However, it further concludes that, linkages between market price and the interrelationships among markets are a vital role in economic analysis. The transaction cost has an important effect to regulate the degree of market integration because of price linkages between the market and adjustment shock in the banana market in the country. The markets are competitive and due to the high degree of integration hence that will provide reasoning for government to design such interventions which will improve the market competition and efficiency.

AUTHOR'S CONTRIBUTION

S. Rani: Conceptualized the main idea, Review the literature, Data collection analysis, Result and discussion and conclusion part.

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