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Causal Relationship Between Agricultural Trade And GDP In India

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Abstract:

This study investigates the relationship between agricultural trade and agricultural GDP in India during 1990-91 to 2022-23. This study uses the ADF unit root test, Johansen cointegration and granger causality test to investigate the long run causality between export, import and Gross domestic product in the model. All data related to agricultural sector only. The first difference of the variables is found to be stationary and hence LNAGDP, LNAEXP and LNAIMP are integrated of order one I (1). Based on the trace statistic and Eigen value, there existed long run relationship between agricultural trade and agricultural GDP. The nature and direction of relationship between agricultural export, import and agricultural GDP was examined by applying Johansen cointegration test and Granger causality tests. The obtained results showed that there is unidirectional causal relationship from AgriGDP to agricultural export, agricultural GDP to agricultural import and export to import at 5% significance level, while no causality relationship exist from import, export to GDP and import to export. It means AGDP lead to export but Agri export does not lead to AGDP

Key words: causality, agricultural export, cointegration, AGDP

Introduction:

Agricultural trade play's important role in providing livelihoods for farmers and people employed in food production. It also reducing food supply shortage across the globe. India has consistently maintained trade surplus in the agricultural products over the years. Promotion of agricultural exports is important not only for economic growth but also for achieving the self-reliant. The largest importers of India's agricultural products are USA, Bangladesh, China, UAE, Indonesia, Vietnam, Saudi Arabia, Iran Nepal and Malaysia. As per WTO's Trade Statistics 2020, the share of India's agricultural exports and imports in the world agricultural trade in 2019 was 2.07 per cent and 1.46 per cent, respectively. India is among the world's leading producer for many commodities such as dairy, cereals, spices, fruits and vegetables, rice, wheat, cotton and others (Kumar, 2021)

Review of literature

This section of the paper presents a brief review of earlier work on the relationship between export, import and economic growth both at the national and international level.

The study of Nicolaus Herman shombe[1] (2018)assessed the Causality Relationships between Total Exports with Agricultural and Manufacturing GDP in Tanzania by using time series data for the period between 1970 and 2005. The empirical results showed in both sectors there is Granger causality where agriculture causes both exports and manufacturing. Exports also cause both agricultural GDP and manufacturing GDP and any two variables out of three jointly cause the third one. There is also some evidence that manufacturing does not cause export and agriculture. Regarding cointegration, pairwise agricultural GDP and export are cointegrated, export and manufacture are cointegrated.

Osama Ahmed and Walid Sallam[2] (2018) Studied the volatility effect of agricultural exports on agriculture share of GDP of Egypt. From this study, the results indicated a positive link in the short and long term between agricultural exports and agriculture share of GDP, as well as cointegration between the pairs of series used.

Fakhre Alam and Godwin Myovella[3] (2016) examined the causality between agricultural exports and GDP in Tanzania. They employed secondary time series data from 1980 to 2010. This study found evidence in support of a long-run relationship between agricultural exports. Moreover, there is evidence that agricultural exports Granger-cause GDP growth but not the other way round.

P. J. Dawson[4] (2005) investigated the Agricultural exports and economic growth in less developed countries. In this study, he estimated using panel data for 62 LDCs for 1974–1995. The study provided evidence that there are significant structural differences in economic growth between low, lower-middle, and upper-income

LDCs. Investment in the agricultural export subsector has a statistically identical impact on economic growth as investment in the nonagricultural export subsector.

Memon[5] (2008) et.al attempted to study the causal Relationship Between Exports and Agricultural GDP in Pakistan. They found that there is a long-run relationship exists between the two major sectors of the economy. The results are robust indicating that agricultural GDP is an important wheel for enhancing exports of the country. Engle-Granger Causality estimation also confirms the bi-directional causality among the variables under consideration. Whereas in short run analysis, there is no short run causality among the variables. The ARDL short run result suggest the sensitivity of Agricultural GDP with respect to the short run shock in the exports of Pakistan

Faridi and Muhammad Zahir[6] (2012)Contribution of agricultural exports to economic growth in Pakistan. They have estimated the relationship between Gross domestic product (GDP) and agricultural and nonagricultural exports for Pakistan employing Johansen co-integration technique for the period 1972 – 2008. The findings of the study showed that the agricultural exports have negative and significant effect on economic growth while agricultural exports elasticity is 0.58. And also, there is bidirectional causality in agricultural exports and real GDP. They suggested that nonagricultural exports should be promoted

Varshini and Manonmani[7] (2018) investigated in to the impact of WTO on the causal relationship among exports, imports and economic growth between 1995 and 2016. The empirical results indicated that economic growth in India was drived by a growth led import strategy as well as export led growth.

Sachin and Mehta[8] (2015) examined the relationship between gross domestic product, export and import in India using time series data from 1976 to 2014. From the study they concluded that a long run cointegrating relationship between gross domestic product, export and import in India. And also, they found that there is unidirectional causality running from GDP to export, it means in long run GDP led to export but export does not lead to GDP.

Sampath Kumar and Rajesh Kumar[9] (2016) in their paper entitled “causal relationship between export and economic growth evidence from SAARC countries. They obtained results showed that there is unidirectional causation from economic growth to export for Bangladesh and India, and bidirectional causation was found for Afghanistan and Sri Lanka and no causation was obtained for Bhutan, Maldives Nepal and Pakistan.

Syed Wahid Ali Shah et.al[10] (2015) analysed the impact of agricultural exports on macroeconomic performance of Pakistan. This study estimated the relationship between Gross domestic product (GDP) and agricultural and non-agricultural exports for Pakistan employing Johansen co-integration technique by using secondary data for the period 1972-2008.The main findings of the study depicted that agricultural exports have a negative relationship with economic growth of Pakistan while non-agricultural exports have positive

relation with economic growth. They suggested that Pakistan have to do structural changes in agricultural exports by converting its agricultural exports into value added products

Methodology

The analysis used in this study cover annual time series data from 1990-91 to 2022-2023 which was sufficient to capture the short run and long run correlation between export, import and Gross domestic product in the model. All data related to agricultural sector only. Before analyzing all the data has been transformed into natural logarithms and then possible existence of unit roots in the data is examined. The entire estimation procedure consisted of first, unit root test; second, co-integration test and third, Granger causality test. The major objective of the study is to study the causal relationship between agricultural trade and agricultural GDP in India

Methods of Analysis

Unit root test, Johansen tests for co-integration, Granger causality were used to discover and to assess the relation between variables using EVIEWS 9 statistical package

The Unit Root Test

ADF test is conducted for analysis whether we have a non-stationary time series (Dickey & Fuller, 1979). The change in variables was regressed on lagged values of variables given

by the following equations:

$$\Delta X_t = \alpha + ZX_{t-1} + e_t \quad (1)$$

$$\Delta Xt = \alpha + \beta t + ZX\ t\text{-}1 + e_t \quad (2)$$

Z = ADF coefficient to be estimated; t = time selected; α =constant; β = trend.

Testing H0: X has a unit root (non stationary), against

H1: X has no unit root(stationary).

The t statistic of ADF coefficient is compared with the t statistic of test critical values. If the series is stationary, acceptance of H1 of ADF statistic is bigger than the critical t value (Emam et al., 2018). EVIEWS 9 program (which was used in this study) normally adopts 1% and 5% level of significance. Akaike information criterion (AI) is used in order to determine lag length on the extra terms.

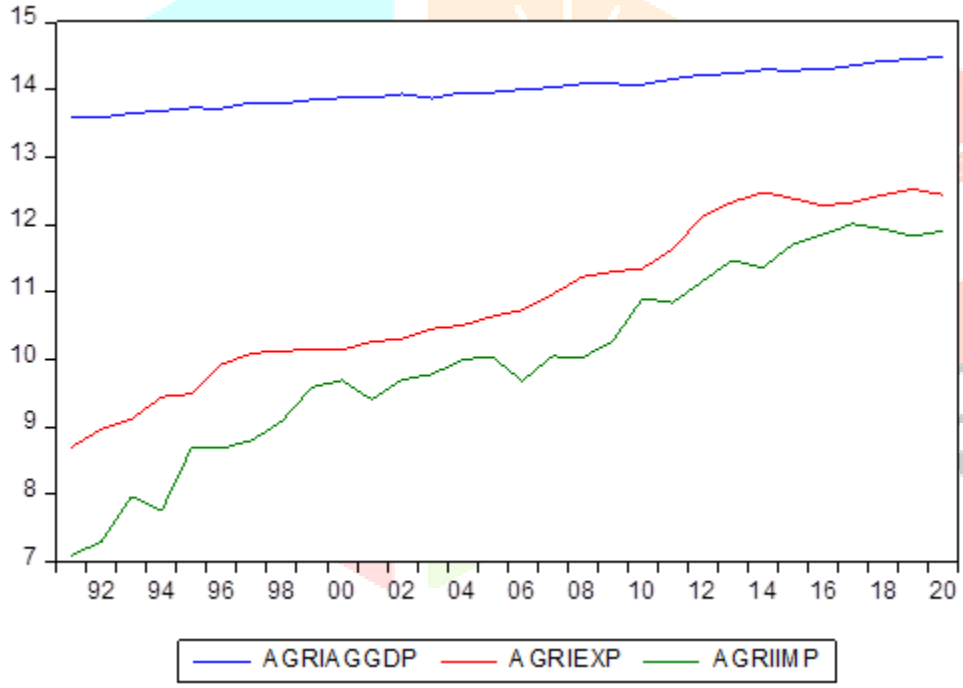
Johansen Tests for Co-Integration

Johansen tests, namely eigenvalue and trace tests, are used for testing co-integration. For both tests, the null hypothesis of no integration was examined against co-integration. However, the two tests are different in alternative hypothesis. Hence, the maximum eigenvalue examines the biggest Eigen-value in relation to the following largest value which is zero. The test statistics is specified by the next equation (Emam et al., 2018):

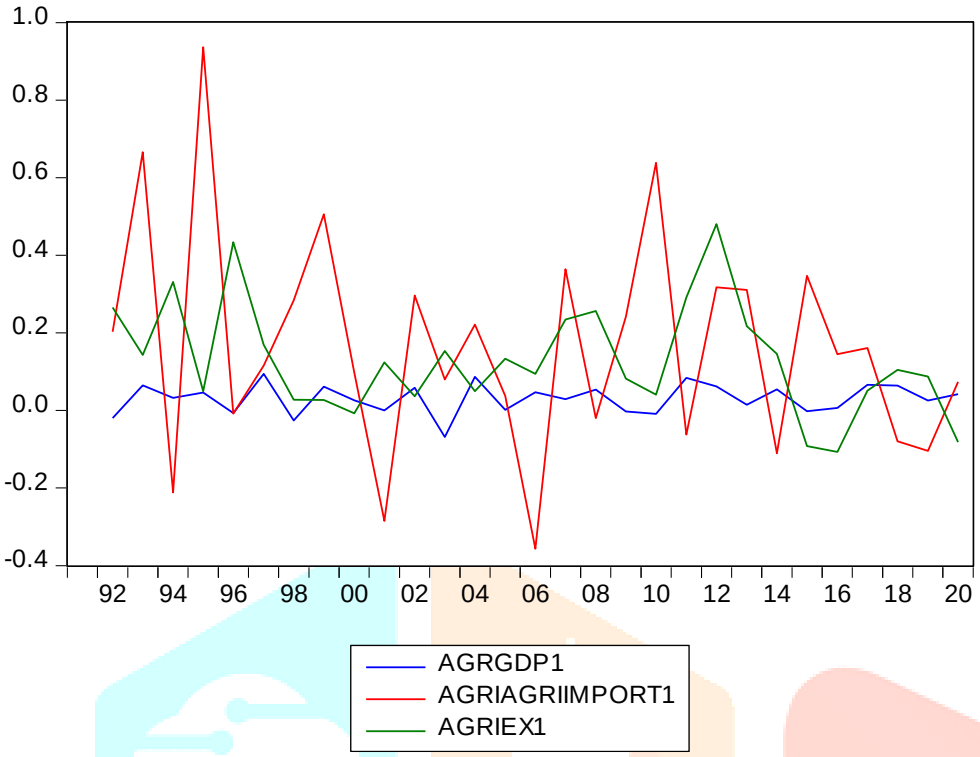
$$LR(r0, r0+1) = -T\ln(1 - \lambda r0+1) \quad (3)$$

LR( ) r r 0 0 , +1 is the likelihood ratio statistic to test whether rank (Π) = r0 against the alternative hypothesis that ranks (Π) = r0 + 1. The trace test examines whether the rank of matrix Π is equal to r0, in particular, tests the null hypothesis rank (Π) = r0, against the alternative hypothesis r0 < rank (Π) ≤ n, n represents the maximum number of co-integrating vectors (Baig & Straquadine, 2014).

Analysis and interpretation
UNIT ROOT TEST AT LEVEL:



UNIT ROOT TEST AT FIRST DIFFERENCE:



Results of Augmented Dickey Fuller Test (ADF)

The results of Augmented Dickey Fuller test for the variables Agricultural export, agricultural import and agricultural GDP are shown in table 1. The obtained results of unit root test based on Augmented Dickey Fuller test indicate the presence of unit root of the variable and therefore, the null hypothesis of the presence of unit root of the variables. However, when the first differences are taken the null hypothesis can be rejected in favour of the alternative hypothesis that the series are stationary. Thus, the first difference of the variables is found to be stationary and hence LNAGDP, LNAEXP and LNAIMP are integrated of order one I (1).

Table:1
Stationarity test (ADF test)

Variable	Level			First difference			Order of integration
	Constant	Trend &constant	None	Constant	Trend &constant	None	
LNAGDP	0.397 (0.979)	-1.651 (0.738)	6.245 (1.000)	-9.616 (0.000)	**-3.659** **(0.041)**	-0.009 (0.668)	I(1)
LNAEXP	1.316 (0.607)	-3.452 (0.070)	2.010 (0.987)	-2.659 (0.097)	**-3.770** **(0.03)**	-2.717 (0.000)	I(1)
LNAIMP	-1.804 (0.370)	-2.946 (0.169)	2.750 (0.997)	**3.099** **(0.04)**	**4.276** **(0.010)**	1.522 (0.117)	I(1)

Source: Author's calculation (using E-views software package)

All the variables are stationary and integrated of order one, Johansen cointegration test can applied to test the presence of long-term relationship between the variables.

Johansen cointegration test was performed to see if there is a long-run relationship between agricultural GDP, agricultural exports and agricultural imports. The variables should be non-stationary in their level form but they should be integrated of the same order i.e. I (1). If both series are integrated of different orders, it is possible to conclude that there is no co-integration. In this study the three variables were found to be stationary at first differencing, that is agricultural GDP agricultural exports and agricultural imports are I (1) series.

This study examines the long run relationship between dependent variable like Agricultural GDP, and two independent variables Agricultural exports and agricultural imports over the period of 1990-2020 The Johansen Co integration test is based on two tests, that is, trace statistics and maximum eigenvalue. The estimated results Johansen cointegration test are represented in tables 2 and 3. The values of the trace statistic (54.95368) and the max eigen statistic (31.37933) are larger than their critical values (29.79707and 21.13162 respectively). This means that there exists a long-term relationship between dependent and three independent

variables. Thus, we reject the null hypothesis of no co-integration. Additionally, Trace statistic and Max-Eigen statistic tests indicate that the three co-integrating equation is at the 5% level

Table.2
Johansen cointegration test Using Trace Statistic.

Hypothesised No.of CE(s)	Eigen value	Trace statistic	0.05 critical value	Probability
None *	0.688358	54.95368	29.79707	0.000
At most 1*	0.486010	23.47434	15.49471	0.0026
At most 2*	0.184431	5.504454	3.841466	0.0190

Table:3
Johansen cointegration test Using Max-Eigen Statistic.

Hypothesised No.of CE(s)	Eigen value	Trace statistic	0.05 critical value	Probability
None *	0.688358	31.37933	21.13162	0.0012
At most 1*	0.486010	17.96989	14.26460	0.0124
At most 2*	0.184431	5.504454	3.841460	0.0190

Source: Author's calculation (using E-views software package)

Results of Granger Causality Test

Granger Causality (1969) analyzed that if the variables are cointegrated then there should be at least one direction of causality between the two variables and this causality has been tested by F-statistics. Table 4 shows the results of Granger causality between agricultural GDP, agricultural exports and agricultural imports.

Table :4
Granger causality test

Null Hypothesis	F-statistic	Prob	Decision
Export does not Granger cause GDP	7.13216	0.0041	Rejected
GDP does not Granger cause export	1.46448	0.2529	Accepted
Import does not Granger cause GDP	3.55618	0.0459	Rejected

GDP does not Granger cause Import	0.08049	0.9229	Accepted
Export does not Granger cause to import Import does not Granger cause to Export	1.15371 4.20745	0.3338 0.0284	Accepted Rejected

Source: Author's calculation (using E-views software package)

The results indicate that there is unidirectional causal relationship from Agri GDP to agricultural export, agricultural GDP to agricultural import and export to import at 5% significance level, while no causality relationship exist from import, export to GDP and import to export

Conclusion

During 2019-20, the value of India's Agri-exports of principal Agri commodities group was Rs.2,52,297 crore which was 1.2% of Gross Domestic Product (GDP) at current prices. Despite covid-19 pandemic, there has been 22.8% growth in Agri exports at Rs. 3, 09,939 crore with a share of 1.6% to GDP during 2020-21. This study investigates the relationship between agricultural trade and agricultural GDP in India during 1990-91 to 2019-2020. Based on the trace statistic and Eigen value, there existed long run relationship between agricultural trade and agricultural GDP. The nature and direction of relationship between agricultural export, import and agricultural GDP was examined by applying Johansen cointegration test and Granger causality tests. The obtained results showed that there is unidirectional causal relationship from Agri GDP to agricultural export, agricultural GDP to agricultural import and export to import at 5% significance level, while no causality relationship exist from import, export to GDP and import to export

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