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AN ESTIMATION OF EFFECT OF AGRICULTURAL EXPORTS ON THE ECONOMIC GROWTH OF PAKISTAN

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ABSTRACT

Agricultural exports are worth taking in Pakistan's economy. Therefore an estimation was made to aware with the effect of agricultural exports on the economic growth and time series data of agricultural Gross Domestic Product (GDP) and agricultural exports of Pakistan were considered from 1972 to 2015. The pre-requirements of the model employed by using unit root test and found stationary at order of integration one i.e. I (1). The optimal lag selection criteria by using likelihood ratios criterion of order two leaded to estimate Vector Auto Regressive (VAR) model. The findings of Granger causality ensures the existence of bi-directional causality, which explores that the agricultural exports and agricultural GDP moved in a long run relationship mode. It is finally concluded that the system was convergent in nature as indicated by the impulse response, racier, indicating that, agricultural GDP is a critical factor for enhancing agricultural exports and also true inversely.

Keywords: agricultural exports, agricultural GDP, causal relationship, stability analysis

INTRODUCTION

The momentum of growth in Pakistan's economy remained at 5.5% (GoP, 2018). The production systems of Pakistan have evolved from being agricultural economy to the diverse growing industrial country. The agricultural industry is the most distinguishing due to its spillover effects on other sectors of the economy. Its macroeconomic spreads through significant contribution towards the growth of production, income, employment and trade (Weidemann, 2009). The typical considerations of economists regarding the possible positive relationship between economic growth of the country and international trade is of worth that there are positive outcomes especially for developing countries like Pakistan. The on-going liberalization of the world's trade radiation pattern also created opportunities for Pakistan. It provided the ways to be integrated wisely into the global trading system. Pakistan can tap its regional comparative advantage of agricultural commodities and non-agricultural exports. The fair potential and comparative advantages has been suggested in the production of many agricultural products e.g., wheat, cotton, fruits, rice, vegetables, flowers, etc. (Mustafa, 2003). Economic growth measurements are of worth that all macroeconomic decisions are followed by its menstruation (Medina and Schneider, 2018). Although, the GDP is complicated to measure, but in its more basic form, the calculation can be carried out by two ways, income and expenses. Logically, both measures are arriving almost to the same GDP level (Jones, 2016). The method of the income refers to the sum of the total remuneration of the employees and gross profits of the businesses constituted except the subsidies. The method of summing up expenses is often practiced by adding "total consumption, investment, public expense and net exports". Same is the case when national GDP is disaggregated to study the specific sectors of the economy like industry and agriculture. Small and medium sized agribusiness enterprises create cycles in agricultural economic growth during short run (Adenle *et al*., 2017). For attaining the long run economic growth, trend of all factors including business cycles should be stabilized in agriculture sector. The production of agricultural commodities is highly sensitive to climatic conditions so it fluctuates on seasonal or yearly

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basis accordingly and these fluctuations can also be observed globally.

In past, agricultural trade policy of Pakistan has been handicapped in many ways, especially in addressing diversification, openness, and competitiveness while studied between inter and intra regions. The fair implementation of tariffs in Pakistan is hard due to unnecessary pressures of political and financial interest groups. Resultantly, a greater reduction of tariff fetched from finished and semi processed goods would be to the tune from 70 percent to 60 percent (1994-1995 statutory rates).

The export of the commodities has been increasing trend over time. It seems that the economic prosperity and welfare effect through export of agricultural commodities are not fairly distributed to reduce the income inequalities in agriculture sector (Abbas *et al.*, 2018). So, the analysis and quantitative approach to study the agricultural economic growth has the significance for revisiting future agricultural policies. In spite of the substantial performance of agricultural exports, still a huge potential needs to be taped by exploiting the factors of production. To get the reasonable share in world market, Pakistan needs to address the issues of poor standards of packing, financial resources and access to scientific/ technical expertise (Mustafa, 2003). The purpose of the study is to explore that how the conventional modeling techniques can be extended in an effort to help the policymakers to formulate effective economic policies in an open macroeconomic framework. The study explores the economic growth scenarios in agricultural sector of the Pakistan's economy in compliance to promoting agricultural exports. Specific objectives of the study includes to measure the causality relationship in agricultural economic growth and agricultural exports (whether it's bi-directional or unidirectional) and to suggest policy recommendations for boosting exports of Pakistan's agricultural commodities.

MATERIALS AND METHODS

The gains from trade are well documented in the literature of economic theory (Ito and Krueger, 2007; Bhagwati, 1978; Feenstra, 2015). They have been analyzed over two centuries. The macroeconomic models in open economy framework focused on different variables, such as real exchange rate, degree of openness, terms of trade, export performance and tariffs (Edwards, 1998). In this study causality of agricultural exports and agricultural GDP has been studied. Unfortunately, the usual OLS methods do not follow the strategy to make this analysis valid.

If the variables included have the characteristics of simultaneity then there should be no distinction between endogenous and exogenous variables. This entails that same set of regressors included in each equation, which conduces to development of VAR model. Therefore, the vector autoregressive (VAR) model has been applied in this study due to bivariate context. A system of equations was developed to extract the model called vector autoregressive model (VAR) in a bivariate context (X and Y):

Generally,

$$Y_t = \alpha_0 - \gamma_1 X_t + \alpha_1 Y_{t-1} + \alpha_2 X_{t-1} +, \ldots, + u_t \quad ..(1)$$

$$X_t = \beta_0 - \gamma_2 Y_t + \beta_1 Y_{t-1} + \beta_2 X_{t-1} +, \ldots, + v_t \quad ..(2)$$

Where, u_t and v_t are error terms. Equation 1 and 2 can be expressed in matrix form as:

$$\begin{bmatrix} 1 & \gamma_1 \\ \gamma_2 & 1 \end{bmatrix} \begin{bmatrix} Y_t \\ X_t \end{bmatrix} = \begin{bmatrix} \alpha_0 \\ \beta_0 \end{bmatrix} + \begin{bmatrix} \alpha_1 & \alpha_2 \\ \beta_1 & \beta_2 \end{bmatrix} \begin{bmatrix} Y_{t-1} \\ X_{t-1} \end{bmatrix} + \begin{bmatrix} u_t \\ v_t \end{bmatrix}$$

In simplified form, matrix can be re-written as:

$$Z_t = A_0 + A_1 Z_{t-1} + V_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

The equation 3 is the VAR model for two lags. It can be estimated by assuming that frequency of error terms is zero. Augmented Dickey-Fuller (ADF) test have been suggested to check the stationarity of the data series (Fuller, 1976). The optimal lag length used by considering likelihood ratios.

Granger causality

The analysis produces two tests from this technique: the first describes the null hypothesis that the variable X does not Granger cause the variable Y and the second test describes the null hypothesis that the variable Y does not Granger cause the variable X.

$$H_0: \alpha_{01} = 0 \; or \; x_t \; does \; not \; granger \; cause \; y_t$$
$$H_1: \alpha_{01} \neq 0 \; or \; x_t \; granger \; cause \; y_t$$

And for second hypothesis

$$H_0: \beta_{01} = 0 \; or \; y_t \; does \; not \; granger \; cause \; x_t$$
$$H_1: \beta_{01} \neq 0 \; or \; y_t \; granger \; cause \; x_t$$

The level of significance is known as the p-value and decision about the null hypothesis can

be made at desired level of significance. Keeping in view the pros and cons of the model, there is no worry about exogenous or endogenous variables' differentiations in estimation because endogenity and exogenity in the estimation of "system" behaves in the same way (Antonakis *at al.*, 2014).

Impulse response function

The impulse response function detects the response of the innovations estimated by the equation to shock in the economy. An impulse traces the response of one-time shock in the innovation. The response is accumulated by the sum of the impulse responses. When the same shocks occur, they are interpreted as the step impulse (Helmut, 2008).

Data and variables

The bulk of data includes the variables, GDP, Agricultural GDP and agricultural exports of Pakistan from 1972 to 2015. The traded items of agricultural commodities are reported in agricultural statistics without making the category of raw materials, semi-manufactured or manufactured till 1980. From 1981 to onward, agricultural statistics of Pakistan was categorized by three major groups. In category A, all exported items are reported which consisted of raw materials and in category B, all semi-manufactured items are reported while category C, contained all other manufactured items (GoP, 1981). The core category of agricultural commodities is category A, because it has major share in total exportable volume. This category is selected for the present study due to its significant relationship with agricultural GDP.

Real agricultural GDP

The mean growth rate of real agricultural GDP (AY) was 3.27 percent from 1972 through 2015 with variation to the tune of 2.76 percent around the mean. The data series portrayed negatively skewed behavior with asymmetric normal distribution. The maximum value of growth rate was achieved at 8.70 percent during FY 1991-1992 and the lowest growth rate at -3.40 percent achieved in the FY 1992-1993.

Real agricultural exports

The variable of agricultural exports (AX) has been computed by adding the values of primary commodities exported. The mean growth rate of real agricultural exports was 3.0 percent from 1972 through 2015 with very low to the extent of 0.2 percent variation around the mean. The Skew-ness of the data series was negative with asymmetric normal distribution. The highest growth rate of 54 percent was achieved in the FY1976 and the lowest growth rate of -60 percent in the FY1997.

RESULT AND DISCUSSION

Both the selected series followed stationary properties and order of integration was same (Shrestha and Bhatta, 2018), i.e., I (1). The statistics of likelihood ratios guided lag order selection at two lags. So, the research was proceeded with further tests at lag (2). The output of VAR indicated that first order parameter of AY is less than unity which ensures stability in the system (Sun and Yu, 2019). This condition is also true for second order. The parameter of AX for first difference has the value less than unity, so it follows the stability condition. The second order test parameter is also less than unity; so the variable of AX is in stability mode. The parameter values of intercept C are 0.005 and 0.16 respectively, indicating that the intercept are valid for both variables.

Stability analysis of VAR

Through inverse roots of AR characteristics polynomial system, it is found that the system is stable and there are no explosive roots as shown in Figure 1. The roots are far from unity, suggesting the presence of a non-stochastic trend (Hunter *et al.*, 2017), as well as, no complex roots present in the system.

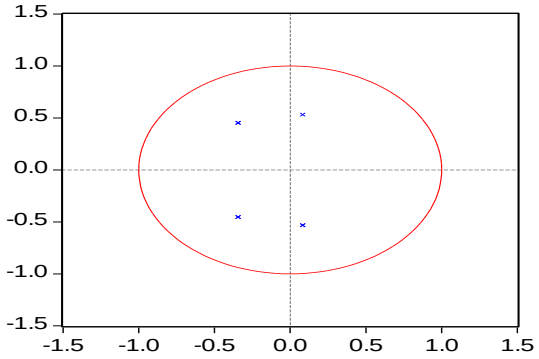

Figure 1. Inverse roots of AR characteristics polynomial

Impulse response function (IRF)

This analysis used impulse response function as an additional check of the VAR equilibrium in correspondence to time path. The contemporaneous identifying restrictions of

Cholesky type were employed in order to draw meaningful interpretations (Shin and Zhong, 2018). The recursion specified structure assumed that variables contemporaneously influence the latter variables but not necessarily true for inverse as given in figure below:

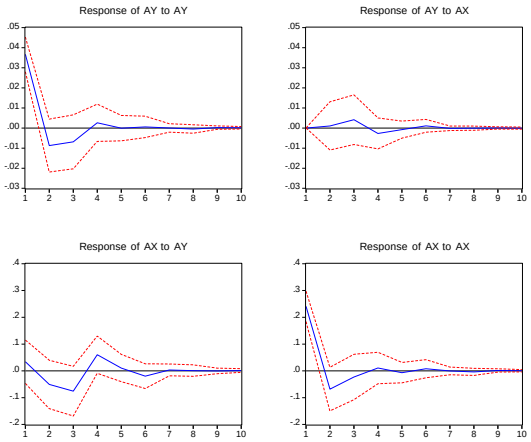

Figure 2. Response of Cholesky one S.D. innovations ± 2 S.E.

The cross variables panel in Figure 2 shows the norm response of positive shocks in agricultural output to agricultural exports. In the low state level of bounds, shock in agricultural output to agricultural exports is positive (0.002) in the first period and increasing, it remains positive and increasing in the second time period as well. In the first period, response of shock is persistent and continuously increasing and it declines after third period. This trend enters in negative region just before the fourth period with value of -0.0025 which dies out ultimately in the seventh period. In the higher state level, the response of shock has positive value of 0.020 in the first period and increasing, and remains positive in the second period. The impact has sharp positive increase and it ultimately dies out in eighth period. Both the states have significant responses and they are sensitive to the order of variables (Dizaji, *et al.*, 2016).

Granger causality test estimates

The estimation output for causality relationship between the variables is presented in Table 1. The study employed probability to decide any kind of relationship between the variables via analyzing the sample from 1972 to 2015. The values of probability were constructed under the null hypothesis of non-causality. The estimates showed that there was a bi-directional causality existed between AY and AX.

Table 1. Pair wise Granger causality statistics

Null Hypothesis	Obs.	F-Statistic	Probability
AX does not Granger Cause AY	38	1.62863	0.02115
AY does not Granger Cause AX	38	0.28101	0.07568

The premise of the process that future cannot cause current events but past event can cause current was tested through Granger causality analysis (Maziarz, 2015). The findings of the Granger causality test output is auspicious to conventional economic theory of trade that there exist bidirectional Granger causality between economic growth and exports on aggregate and is also true for subsectors of the economy like agriculture. It suggested that there was a long-run relationship between the agricultural GDP and agricultural exports because the system is stable and convergent in nature. The stability and convergence was reasserted by the impulse response function presented in graphical form in Figure 2. The results also indicated that agricultural GDP is an important factor to enhance agricultural exports and is also true inversely.

CONCLUSION

The agricultural sector helped a lot to accelerate Pakistan's exports. The bidirectional relationship witnessed that agricultural exports does cause agricultural GDP and its true vice versa. The recursion specified structure assumed that variables contemporaneously influence the latter variables. The stability analysis suggesting the presence of a non-stochastic trend, as well as, no complex roots found in the system. Previously, it was believed that agriculture could not be a driver of exports growth. Today, the export potential of the agricultural sector have been realized, especially due to the recent upsurge in prices of agricultural commodities. Sustainability of agricultural growth seriously suffered because Pakistan could not expect major increases in water availability in the foreseeable future. It is also affirmed that agricultural economic growth provides the basis for agricultural exports. It suggests that there is a long-run relationship between the agricultural GDP and agricultural exports because the system is stable and convergent in nature. The stability and convergence are also reasserted by the impulse response function. The result also indicates that agricultural GDP is an important factor to enhance agricultural exports and is also true inversely. Moderate growth in both agricultural GDP and agricultural exports were observed by using decade wise data. Thus, it

was concluded that increase in agricultural economic growth boosts agricultural exports.

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AUTHOR'S CONTRIBUTION

Q. Khan: Data collection, analysis and write up.
I. Saeed: Supervisor.
A. Hussain: Literature review.
A. Jabbar: Model estimates technical discussion.

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