Determinants of Rice Exports: An Empirical Analysis of Pakistan

Muhammad Bilal[1] and Syed Badar-ul-Husnain Rizvi[2]

Abstract

This study has determined those factors that affect the rice exports of Pakistan. Rice is the 2nd major staple food of Pakistan after wheat and Pakistan is the 3rd largest exporter of rice. Annual time series data for the period 1980-2015 has been used for the purpose of estimations which include 31 observations. All the variables have been used in the log form. For stationarity of data Augmented Dickey-Fuller test has been used. All the variables are stationary at their first difference. Johansen cointegration method has been used to check for long run relationship. Rice production, domestic consumption as a proxy for domestic demand, world's total rice exports as a proxy for international demand, rough rice yield, domestic price and export price have been used as rice exports determinants. Results suggest that production, yield and international demand are positively significant while export price and domestic price are negatively significant. Domestic demand is insignificant. Vector Error Correction model is used to check long run to short run equilibrium adjustment of the model. VECM shows that model is converging 0.56% annually. At the end it is recommended that Govt. should take necessary steps to improve the yield per hectare and also production of rice in order to increase its exports because these are found to be the most effective determinants.

1. Introduction

Pakistan is an agrarian economy and agricultural sector plays a quite significant role in Pakistan's Economy. Agricultural exports have their own importance in economy of Pakistan and agricultural exports have quite significant share in overall exports of Pakistan. In 2010-11 Food exports share was about 18% in overall exports of Pakistan. Cotton manufacturer's contribution was also more than 50% in overall exports of Pakistan.[3] Recently in 2011-12 the combined share of Rice exports and cotton manufacturers is almost 60% (Economic Survey).

There are four major agricultural crops in Pakistan that are Wheat, Rice, Cotton and Sugarcane. Out of these four crops rice and cotton are the major source of export earnings for Pakistan. Share of these two commodities is almost 60% in total exports of Pakistan. But export of raw cotton is very small because mostly manufactured cotton is exported. So rice is one crop which contributes significantly in exports of Pakistan and also Pakistan is the 3rd largest exporter of rice (USDA)[4]. Rice is second largest staple food of Pakistan and it is a major source of export earnings for Pakistan in recent years. Share of Rice exports in overall exports of Pakistan is 8.7% in 2011-12 and it was 11.5% in fiscal year 2009-10. So a 10% share of a single commodity in overall Pakistani exports is quite impressive. Rice contributes almost 1% in GDP of Pakistan and 4.7% in agriculture.

---

[1] Graduate, Department of Economics, University of Gujrat, Pakistan

[2] Lecturer, Department of Economics, University of Gujrat, Pakistan

[3] Economic Survey of Pakistan (2010-11).

[4] United States Department of Agriculture (USDA)

2. Literature Review

Abolagba, *et al* (2010) tried to determine the factors that can influence the agricultural exports of Nigeria with reference to cocoa and rubber. Time series data from 1970-2005 had been used for this purpose. OLS method was applied. Export of specific commodity was taken as dependent whereas domestic output, domestic consumption, exchange rate, average producer price, average world market price, interest rate and average total rainfall were independent. For Rubber Semi-log and for cocoa linear function is used. 1 percent significance level was used. Domestic production and average producer prices were positively while exchange rate and domestic consumption were negatively significant. Interest rate and world market prices were positive for rubber and negative for cocoa. In findings output, domestic consumption, average producer price and exchange rate play key role in exports.

Nwachukwu, *et al* (2010) had tried to examine competitiveness of Nigeria's cocoa exports with the help of export performance and determinants of cocoa export. Time series data was used for different variables like production of cocoa, export of cocoa, world export of cocoa and exchange rate ranging from 1990-2005. Export performance ratio was estimated for Nigeria's comparative advantage which is called revealed comparative advantage (RCA). To make RCA symmetric revealed symmetric comparative advantage (RSCA) index was obtained as (RCA-1/RCA+1) which ranges from -1_+1. Regression was done using Ordinary Least Square (OLS). In findings Nigeria was highly competitive in export of cocoa. To find out determinants of cocoa exports four functional forms were used out of which exponential function was best fit. Cocoa output and world export volume were positively significant while exchange rate was significant and had negative impact. Export price was negative but insignificant.

Kumar, *et al* (2008), tried to find out empirically the performance, competitiveness and determinants of exports. Time series data was used. Comparative advantage was examined through export performance ratio. Log linear model was used for determinants of exports. Exports depend upon total international trade in specific commodity, export price, exchange rate and world market size. Indian exports of gherkin and cucumber depend positively on their international trade volume, Exchange rate, export prices but export price was insignificant. In findings India was highly competitive in exports of both these commodities and exchange rate was significant determinant than prices.

Haleem, *et al* (2005) had tried to estimate an export supply function for citrus fruit in Pakistan. Annual time series data from 1975-2004 was used for the analysis. Quantity of citrus exported depends upon export unit value index, domestic production, and domestic price index, GDP of Pakistan, and exchange rate. Tabulation method was used to determine export performance. Co-integration was used to estimate elasticity of price for citrus. Dickey Fuller test was used to check unit root. All series were stationary at first difference except domestic production which was stationary at level. Johansen co-integration method was used. Each variable had correct sign except citrus production. Domestic price index was negatively significant. Export price, exchange rate and GDP were positively affecting citrus exports. All variables were significant.

Gbetnkom and Khan (2002) had tried to find out determinants of agricultural exports of Cameroon for three commodities cocoa, coffee and banana from 1971/72-1995/96. Simple OLS method was used. For stationarity Unit root and Co-integration tests were applied. Exports supply(tons) depends on ratio of producer price to domestic price index positively, ratio of export price to producer price positively significant for banana only, agricultural export credit positively significant, average annual rainfall(mm) positively but insignificant for banana, classified road network positively but insignificant for banana and lag exports positively significant for only banana. Dummy variables for coffee and cocoa were

deregulation positively significant, abandonment insignificant and ICA quotas (coffee) negatively insignificant, ICCA buffer stocks (cocoa) positively significant while for banana restructuring of banana sector positively significant and quota imposed negatively insignificant.

Athukorala, tried to explain some patterns of processed food exports from developing countries and then tried to find out some determinants of exports of processed food. Data was used from 1970-1994. Dependent variable was the annual growth of processed food exports. Explanatory variables were openness of policy regime, agriculture resource endowment, per capita income and growth rate of per capita income. Results show that resource endowment was insignificant so not an important explicator. Separately including per capita and per capita growth suggest that per capita growth was more significant. Coefficient of open was also significant with positive sign.

Lukonga (1994) had tried to review the performance of non-oil exports of Nigeria during the period 1970-90. Nigeria's exports supply was taken with respect to three commodities cocoa, rubber and palm kernel and depends upon ratio of exports price to domestic price index, productive capacity and domestic demand. Ordinary least square method was used for estimations of export supply equations for these three commodities. Exports supply depends positively on price elasticity for cocoa and rubber while negatively for palm kernel which was insignificant. Productive capacity index was negative for cocoa & rubber while positive for palm kernel but only significant for cocoa. Domestic demand was negative for all three commodities. Dummy was positively significant for cocoa and rubber denoting a change in intercept and slope.

Yousuf and Yousuf (2007) had tried to explore determinants of three major agricultural commodities of Nigeria including cocoa, rubber and palm kernel. Time series data from 1970-2002 had been used for analysis. Error Correction Mechanism was used. Unit root test was also applied and all series were stationary at first difference. Quantity Eexported was used as dependent while price ratio of export to domestic unit value index, net exports value, real GDP, domestic production, exchange rate, premium are independent. In findings GDP, exchange rate and net exports had positive impact on exports while price ratio and premium had negative impact.

Ghafoor, *et al* (2010) had tried to find out the impact of those factors that affect the export of mango in Pakistan. Primary data was collected through survey of forty mango exporters and modeled it using double log form of regression analysis. Results indicate that education of exporter, experience of exporter, average purchase price, average sale price, average marketing cost, and ISO certificate had a significant impact on exports of mango. Education, experience, average sale price, and ISO certificate had significant positive impact while average purchase price and average marketing cost have significant negative impact on exports of mango.

Sharma (2000) had tried to find out determinants of exports in India by using annual data for 1970-98. The study used simultaneous equation framework and two stage Least Squares method (2SLS) was applied. Exports demand negatively depends upon real effective exchange rate, relative prices of exports (ratio of unit price of Indian exports to ratio of unit price of world exports) but insignificant to world income and positively on lagged exports demand. While exports supply depends positively on export prices relative to domestic prices, negatively on domestic demand pressure for which fiscal deficit was used as proxy, positively on FDI and Infrastructure facilities but insignificant and positively significant on lagged exports supply and time trend.

3. Theoretical Framework

This study is about determinants of rice export so rice export is taken as a dependent variable. Explanatory variables include total production of rice, domestic demand of rice, international demand of Pakistani rice, rice yield, producer price and export price. The proposed model is under:

Rice Exports = f (Rice production, Domestic Demand, International Demand, Rice yield, producer price and Export Price)

3.1. Domestic Production

Production is a supply side determinant of exports. It is a main determinant that can increase exports. In a closed economy oversupply will lead to a decrease in prices as a result incentives of producers will decrease in producing more. But in in an open economy when production of a commodity exceeds its domestic consumption then surplus of output or oversupply can be supplied in international market as export of that commodity. So it gives incentive to producers to produce more because by exporting overproduction they can increase their profits. Exports are also a major source of foreign exchange reserves for an economy. Therefore a positive relation is expected between production and exports. In empirical literature Abolagba *et al* (2010), Nwachukwu *et al* (2010), Parasad (2000), Yousuf and Yousuf (2007), Majeed and Ahmad (2006) Barghandan, *et al* (2011) confirm this positive relationship.

3.2. Domestic Demand

Domestic consumption is used as a proxy for domestic demand of the rice. As domestic demand will increase domestic consumption will also increase. Increase in domestic demand causes domestic prices to increase as well. This increase in domestic demand will cause supply of rice to shift towards domestic market and domestic consumption will increase and thus exports supply will decrease. So this leads towards a negative relationship between domestic consumption and exports. In empirical literature Abolagba *et al* (2010), Lukonga (1994) and Sharma (2000) has proved this relation.

3.3. International Demand

World's total rice exports are taken as a proxy for the international market size for exports of. Increase in world's total rice exports means that market size is increasing as a result rice exports from home country will also increase. This suggests a positive relationship between rice exports and market size. In empirical literature Nwachukwu *et al* (2010) and Kumar *et al* (2008) has used this variable and proved this positive relationship as well.

3.4. Yield

Rough rice yield could be an important determinant of rice exports. A minor increase in yield could increase the production of rice to a greater extent without increasing harvested area of rice and thus exports. So it could have a significant impact on rice exports. A positive relationship is expected between the rice exports and yield.

3.5. Domestic Price

Domestic price or retail price is the price of a commodity at which commodity's sale and purchase takes place domestically. This price is different from producer price. Our concern is with domestic price. A higher domestic price gives incentive to sellers to sale the commodity domestically instead of exporting and also increased domestic price may be due to increased domestic demand. So it has a negative impact on exports. In literature Haleem *et al* (2005) has proved this relationship for Pakistan's citrus fruit exports.

3.6. Export Price

Average world market Price is taken as a proxy for the export price. Whenever export prices increase export becomes costly to the importers. As a result importers may decrease their imports. Increase in export prices may also result in a decrease in the nation's competitiveness with respect to other exporting nations. So a negative impact of export prices is expected on rice exports. In empirical literature Abolagba *et al* (2010), Narayan & Narayan (2004) and Nwachukwu *et al* (2010), Yousuf & Edom (2007) have proved this relationship. Haleem *et al* (2005), Kumar *et al* (2008) have used this variable and their results show a positive impact.

4. Data and Methodology

Annual time series data has been used for the sake of analysis for period 1980-2010. There are total 31 observations because for a time series analysis there should be at least 30 observations if we want to estimate reliable results. Seven variables have been used in the study for the estimations. These variables include rice exports, rice production, rice domestic consumption, rice world total exports, rough rice yield, producer price of rice and export price of rice. Data is taken from United States Department of Agriculture (USDA)[5] and Food and Agriculture Organization (FAO)[6] Domestic consumption is taken as proxy for domestic demand of rice while world total rice exports are taken as a proxy for international demand of rice. Most of the variables are in quantities like rice exports, rice production, domestic consumption of rice, world total exports of rice and rough rice yield while others are average annual prices so there is no problem of nominal or real terms with these variables.

4.1. Unit Root Test (Augmented Dickey Fuller)

When we deal with a time series the first and foremost step is to check whether the underlying time series is stationary or not. If we want to apply the appropriate technique on the underlying time series then we must be aware of the order of integration of underlying time series. Stationarity is also important in the context that if we apply OLS to a non-stationary time series it may result in spurious regression. A time series will be stationary if it fulfills following three characteristics

A time series will be stationary if it fulfills following three characteristics

Let Y_t is a time series. For stationarity it must fulfill the following three characteristics

    i. $E(Y_t) = \mu$ (i.e. Mean is constant)

    ii. $Var(Y_t) = E(Y_t - \mu)^{2} = \sigma^2$ (i.e. Variance is constant)

    iii. $Y_k = E[(Y_t - \mu)(Y_{t-k} - \mu)^2]$ (i.e. Covariance is constant)

In short, for a stationary time series its mean, variance and covariance remain the same and do not vary with time. If a time series does not fulfill all these characteristics then it is called as non-stationary time series.

To check the unit root in the data Augmented Dickey-Fuller (ADF) Test is used. ADF is an extended form of Dickey-Fuller test. In DF test we assume that error terms are uncorrelated or white noise but if error terms are correlated then ADF is best because it also allows for Serial Correlation to be checked. ADF test has the following regression equation

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-1} + \varepsilon_t$$

Where ε_t is white noise error, $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$ where Δ represents first difference, q represents number of lagged difference, These lags are included to make error term white noise in above equation. β_1 is intercept and t represents time trend.

ADF has a null hypothesis same as DF

$H_0 = \delta = 0$; There is Unit root,

$H_1 = \delta < 0$; There is no unit root

ADF uses same critical values as DF. If $\Delta Y_{t-1} = 0$ then ADF = DF. So there is no difference between ADF and DF in that case.

4.2. Johansen Cointegration

If we regress two non-stationary time series' on each other it may result in a spurious regression. If underlying time aeries is non-stationary then OLS is not a good option for estimations. OLS is an appropriate method if all the variables are I (0) i.e. stationary at level otherwise one should check for the possible co-integration relationship between the underlying non-stationary series. 'OLS is for short run relationship while co-integration suggests a long run relationship between the series'.

"If the linear combination of two time series having unit root is stationary then we can say that the two time series are co-integrated." Gujarati (2004).

Let there are two variables x and y and both are I (1). Now if we regress y on x as

$Y_t = \beta_1 + \beta_2 X_t + \varepsilon_t$ Now if we write this as $\varepsilon_t = Y_t - \beta_1 - \beta_2 X_t$

Now if we check unit root of ε_t and if it turns out to be I (0) then we can say that their linear combination is stationary and both the variables are cointegrated.

"A test for co-integration can be regarded as a pre-test to avoid spurious regression" (Granger).

Johansen cointegration method is used to estimate long run relationship because all the variables become stationary at their first difference i.e. I (1). It uses VAR framework and treats all variables as endogenous. Johansen maximum likelihood test allows testing for more than one cointegration relations. Johansen test allows estimation of all the possible long run relations (Haleem *et al* (2005)). It uses two likelihood tests for determining the cointegration relations Brooks (2002).

     i.   The Trace test

     ii.   The Maximum Eigenvalue test

4.3. Vector Error Correction Model (VECM):

Vector Error Correction model is a restricted VAR model and it deals with those series which are non-stationary and found to be cointegrated. It was first developed by Hendry (1995). If Cointegration exists between series which suggests a long run relationship then VECM is used to check the short run properties of cointegrated series. For VECM cointegration must exist otherwise no need of VECM. It tells us about long run to short run adjustments of the model.

5. Estimations and Results

For estimations double log model has been used and for this all variables are used in log form and all the estimations have done using statistical software E-Views.

$lX_t = \beta_0 + \beta_1\, lQt + \beta_2\, lDC_t + \beta_3\, lWX_t + \beta_4\, lY_t + \beta_5\, lXP_t + \beta_6\, lDP_t + \varepsilon_t$

Where

- lXt = log of rice exports
- lQt = log of Rice production
- lDCt = log of domestic consumption of rice which is used as a proxy for domestic demand of rice.
- lWXt = log of world total rice exports which is used as a proxy for International demand of rice.
- lYt = log of rough rice yield
- lXPt = log of export price of rice

- lDPt = log of producer price of rice

5.1. Unit Root Test

Augmented-Dickey Fuller (ADF) Results

Table 5.1: Augmented Dickey Fuller Unit Root Results

#	Variables	Linear Graph	At Level		At First Difference		Decision
			Test Statistics	Critical Value (95%)	Test Statistics	Critical Value (99%)	
1	LX	Trend & Intercept	-3.310	-3.574	-6.363	-4.324	I(1) at 1%
2	LQ	Trend & Intercept	-3.198	-3.574	-5.859	-4.310	I(1) at 1%
3	LDC	Trend & Intercept	-2.926	-3.568	-5.667	-4.310	I(1) at 1%
4	LWX	Trend & Intercept	-3.458	-4.297	-6.462	-4.324	I(1) at 1%
5	LY	Trend & Intercept	-2.462	-3.581	-8.009	-3.574	I(1) at 1%
6	LXP	Intercept Only	-1.681	-2.964	-4.776	-3.679	I(1) at 1%
7	LDP	Trend & Intercept	-2.964	-3.568	-6.003	-3.574	I(1) at 1%

- Critical Values have been taken from Mackinnon (1996)
- All variables are in log form.
- All variables have trend except Export Price
- Optimum Lag Selection is 7 on basis of Schwartz Information Criterion (SIC) default set by EViews.

Above table is showing that according to linear graph plotted all the variables have trend and intercept except export price which has only intercept while no trend. All the variables have been used in log form. For ADF at level 5% level of significance is taken as a criterion. If any variable is significant at 10% level of significance then its first difference has been taken. Only those variables are considered as I (0) which are significant at 5% or less at level. ADF results show that all the variables are insignificant at level at 5% significance level. The first difference of each variable has been taken in order to make them stationary. Their first difference makes them stationary at 1% level of significance. ADF results show that all the variables are I (1).

5.2. Optimum lags Selection

The first step is now to select an appropriate lag length for the model. For this purpose appropriate lag order is obtained from VAR model.

Table 5.2: VAR Lag Order Selection

Endogenous variables: LX LQ LDC LWX LY LXP LPP				Exogenous variables: C		
Sample: 1980 2010				Included observations: 29		
Lag	LogL	LR	FPE	AIC	SC	HQ
0	123.427	NA	7.68e-13	-8.029	-7.699	-7.926
1	237.229	164.818*	9.75e-15*	-12.499	-9.858*	-11.672*
2	286.818	47.878	1.83e-14	-12.539*	-7.589	-10.989

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

There are five set criteria's in E-Views for lag selection which include Sequential modified LR test statistics (LR), Final Prediction Error (FPE), Akaike information Criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ). According to table 5.2 LR, FPE, SC and HQ are suggesting 1 lag as optimum while only AIC is indicating 2 lags as optimum. For this study 1 lag will be used as optimum because four criterions are suggesting 1 lag while only 1 criterion is suggesting 2 lags. Because most of the criterions are suggesting 1 lag and also underlying time series has only 31 observations so to avoid over-parameterization only 1 lag has been selected as an appropriate lag for the study.

5.3. Johansen Cointegration Results

Johansen cointegration has been applied to the data to check whether there exists long run cointegration relationship among variables or not because all the variables are cointegrated of order 1 i.e. I (1).

Table 5.3: Trace Test Results

Sample (adjusted): 1982 2010			Included observations: 29 after adjustments			
Trend assumption: Linear deterministic trend						
Series: LX LQ LDC LWX LY LXP LPP						
Unrestricted Cointegration Rank Test (Trace)						
Hypothesized No. of CE(s)	Null Hypothesis	Alternative Hypothesis	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	r = 0	r ≥ 1	0.894	171.086	125.615	0.000
At most 1 *	r = 1	r ≥ 2	0.703	106.138	95.754	0.008
At most 2 *	r = 2	r ≥ 3	0.665	70.9110	69.819	0.041
At most 3	r = 3	r ≥ 4	0.463	39.2182	47.856	0.252
At most 4	r = 4	r ≥ 5	0.392	21.209	29.797	0.344
At most 5	r = 5	r ≥ 6	0.189	6.776	15.494	0.604
At most 6	r = 6	r ≥ 7	0.024	0.718	3.841	0.397
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level						
r indicates cointegration relations.						
* denotes rejection of the hypothesis at the 0.05 level						
**MacKinnon-Haug-Michelis (1999) p-values						

Table 5.4: Max Eigenvalue test Results

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)						
Hypothesized No. of CE(s)	Null Hypothesis	Alternative Hypothesis	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	r = 0	r ≥ 1	0.894	64.948	46.231	0.000
At most 1	r = 1	r ≥ 2	0.703	35.227	40.078	0.159
At most 2	r = 2	r ≥ 3	0.665	31.693	33.877	0.089
At most 3	r = 3	r ≥ 4	0.463	18.009	27.584	0.494
At most 4	r = 4	r ≥ 5	0.392	14.430	21.132	0.331
At most 5	r = 5	r ≥ 6	0.189	6.058	14.265	0.606
At most 6	r = 6	r ≥ 7	0.024	0.718	3.8415	0.397
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level						
r indicates cointegration relations.						
* denotes rejection of the hypothesis at the 0.05 level						
**MacKinnon-Haug-Michelis (1999) p-values						

According to table 6.3 and 6.4 both trace test and max eigenvalues test reject the hypothesis of no cointegration. Max Eigenvalues test is unable to reject null hypothesis at most 1 which means according to max eigenvalues test there is at least 1 cointegration relation that exists between the variables. Trace test is unable to reject at most 3 null

hypothesis thus suggests that there exists at least 3 cointegration relations. Trace test is more reliable than maximum eigenvalues test (Cheung and kai (1993), Liang (2006)). So according to trace test there are three cointegration relationships among variables.

Table 5.5: Normalized Cointegration Coefficients

Cointegrating Equation		Log likelihood	233.7484			
LX	LQ	LDC	LWX	LY	LXP	LDP
1.000000	-1.083	0.108	-0.542	-1.452	0.263	0.380
Standard Errors	0.415	0.179	0.167	0.517	0.064	0.145
T-statistics	-2.612	0.603	-3.256	-2.808	4.085	2.625

5.3. Normal Equation

In equation form signs of normalized cointegration coefficients will be reversed because EViews gives equation in deviation form so explanatory variables needs to be brought to the right side of the equation. Equation form will be as given below.

LX = 1.083 (LQ) - 0.108 (LDC) + 0.542 (LWX) + 1.452 (LY) - 0.263 (LXP) - 0.380 (LDP)

All the coefficients are statistically significant and exhibit the correct signs according to the theory except coefficient of domestic consumption of rice which is taken as a proxy for domestic demand has the right sign but statistically it is insignificant.

➢ Domestic production of rice has a statistically significant and highly positive impact on the rice exports of Pakistan. According to the coefficient of rice production a 1% increase in rice production will lead to a 1.08% increase in rice exports of Pakistan. So production is a main supply side determinant and it has a major impact on rice exports.

➢ Coefficient of domestic consumption which is used as a proxy for domestic demand is statistically insignificant though it has the correct sign.

➢ Coefficient of world's total rice exports which is used as a proxy for international demand of rice is statistically significant and has the correct sign. According to this a 1% increase in world's total rice exports (international demand) will cause an increase of 0.54% in rice exports of Pakistan. So it is also a strong determinant.

➢ Coefficient of yield also exhibits the correct positive sign and also it is statistically significant. Coefficient of yield suggests that a 1% increase in rough rice yield will lead to an increase of 1.45% in rice exports of Pakistan holding all other factors constant. This coefficient has the strongest impact on rice exports among all the determinants.

➢ Coefficient of export price has also correct sign and also statistically significant. This coefficient suggests that a 1% increase in the export prices of Pakistani rice will lead to a decrease of 0.26% in rice exports of Pakistan.

➢ Domestic price coefficient is also statistically significant and exhibits correct sign. According to this coefficient a 1% increase in domestic price of rice in Pakistan will cause a 0.38% decrease in overall rice exports of Pakistan. Domestic Price has a stronger effect than the export price.

Results show that all the variables used in the study have correct signs and all are significant except one variable which is domestic consumption of rice.

Vector Error Correction Model

Table 5.6: Vector Error Correction (VECM) Model

Error Correction	D(LX)	D(LQ)	D(LDC)	D(LWX)	D(LY)	D(LXP)	D(LDP)
CointEq1	-0.559	-0.071	-0.045	0.067	0.159	-0.067	0.039
St. Errors	0.341	0.151	0.163	0.167	0.065	0.311	0.170
t-Statistics	-1.64	-0.47	-0.28	0.39	2.44	-0.22	0.23

Error Correction term tells us about the long run to short run convergence or divergence of the model. Error correction term has a negative sign which means that model is converging in long run to short run. Its value is -0.558 which means that model is converging by almost 0.56% annually and its t value suggests that it is just significant.

6. Conclusion and Policy Recommendations

The study results suggest some policy recommendations which would be helpful for the enhancement of rice exports of Pakistan. Pakistan is now the third largest exporter of rice in the world but it still needs to increase its exports to a larger extent. Pakistan is suffering from the problem of balance of payments deficit. In 2011-12 (July-April) Pakistan has a BOP deficit of $ 2,542. In 2011-12 Pakistan's current account deficit is $ 3,394 million (July-April). The main reason of this BOP[7] deficit is trade deficit. Trade balance is continuously going into deficit from previous many years. In 2011-12 it is $ 12,683 million (July-April). It has been increased almost 20% as compared to previous years trade deficit which was $ 10,516 million. Its main reason is that imports are growing continuously while export growth is not so impressive. So BOP deficit is a major problem for an economy especially for Pakistan in these days. So in such conditions exports growth is very necessary for Pakistan. Main concern of present study is also rice exports and rice is a major source of exports earnings. On the basis of study findings there are some policy recommendations that would be helpful in increasing rice exports of Pakistan.

➤ Rough rice yield is found to be the major determinant of rice exports of Pakistan. If rough rice yield increases by 1% the rice exports will increase by 1.45%. In rice production Egypt has the highest yield while Pakistan has only 36% of yield as compared to Egypt which is a quite large difference. Yield is also showing significant impact on the rice exports. So it suggests that govt. should invest in this crop. High quality seeds should be used, proper pesticides should be made available to get better yield. Farmers should be guided to the proper use of pesticides and fertilizers. Fertilizers are very important one and also very expensive. 1 Kg of fertilizer nutrient produces almost 8 kg of cereals like wheat, rice and maize etc. All Pakistani soils have deficiency of nitrogen. For a proper use of these things Govt. should also subsidize farmers in these things. Availability of machinery should also be made sure. Quality is also an important input for increasing yield (Economic Survey).

➤ Coefficient of production has also a strong positive impact on exports of rice. Results show that if production of rice increases by 1% its exports will increase by almost 1.08%. Pakistan is not included in the top ten producers of rice production and despite of this it is the third largest exporter of rice in the world (FAO). So Pakistani Govt. should take steps to increase its production of rice. For this purpose quality seeds should be used. Proper use of pesticides and fertilizers should be made in the sector. Agricultural production can be increased to a significant extent through proper use of certified and quality seeds. Pakistan's 90% soil is deficient of nitrogen and phosphorus. So proper use of fertilizers is very important to increase production. Govt. should make sure the availability of

---

[7] Balance of Payments

fertilizers. Recently in 2011-12 total consumption of fertilizers has decreased by 4.9% which is not a good sign because it is also an essential input in increasing agricultural production. It is the responsibility of Govt. to overcome all these problems so that production of rice as well as other agricultural crops could increase (Economic Survey).

➢ Price variables are also affecting rice exports negatively and both are also significant. Export price show the price competitiveness of rice exports in international market. Increase in export price means that exports become expensive in world market and nation's competitiveness will decrease which will result in a decrease in exports quantity. Coefficient of export price shows that a 1% increase in it will decrease exports by 0.26%. So to avoid such increases in export price Govt. should not impose tariffs and taxes on exporters because such taxes will cause an increase in export price and at the end exports will decrease.

References

- Abolagba, E. O., Onyekwere, N. C., Abonkpolor, B. N., and Umar, H. Y. (2010). Determinants of agricultural exports.Journal of Humane Ecology, 29(3), 181-184.
- Athukorala, P. C., & Sen, K. Processed food exports from developing countries: Patterns and Determinants.
- Brooks, C. (2002). Introductory Econometrics for Finance. *Cambridge University Press.*
- Cheung, Y., and Kon, S. L. (1993). Finite-Sample Sizes of Johansen's Likelihood Ratio Tests for Cointegration. *Oxford Bulletin of Economics and Statistics,* Vol. 55, No. 3, pp. 313-328.
- Dickey, D. A., and W. A. Fuller (1981) Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica* 49, 1057–1072.
- Dickey, D.A. and Fuller, W.A., (1979). "Distribution of the Estimators of Autoregressive Time Series with a Unit Root", Journal of the American Statistical Association, Vol.74, pp. 427-431.
- Gbetnkom, D., and Khan, S. A. (2002). Determinants of agricultural exports: the case of Cameroon.African Econ. Res.Consortium (AERC),120: 1–41.
- Ghafoor, A., Mustafa, K., & Zafar, I. (2010). Determinants of Mango Exports from Pakistan. Journal of Agricultural Research, 2010, 48(1).
- Gujarati, D. N. (2004). Basic Econometrics. 4th ed.McGraw-Hill Inc. New York, United States of America (USA).
- Haleem, U., Mushtaq, K., Abbas, A., & Shiekh, A. D. (2005). Estimation of Export Supply Function for Citrus fruit in Pakistan. The Pakistan Development Review 44: 4 Part-II (winter-2005) pp. 659-672.
- Hendry, D. F. (1995). *Dynamic Econometrics.* Oxford University Press
- International Rice Research Institute, Los Banos, Laguna, Philippines.
- Johansen, S. (1988). Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control* 12, 231–254.
- Johansen, S. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregresive Model, Econometrica, 59, 1551-1580.
- Johansen, S. (1995). Likelihood-based Inferences in cointegration vector Autoregressive Models. Ox-ford: Ox-ford University Press.
- Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money. *Oxford Bulletin of Economics and Statistics* 52, 170–209.

- Kumar, N.R., Rai, A. B., & Rai, M. (2008). Export of Cucumber and Gherkin from India: Performance, Destinations, Competitiveness and Determinants. Agriculture Economics Research Review, vol. 21, pp 130-138.
- Liang, Y., and Lu, W. (2006). Empirical Likelihood inference for linear transformation models. *Journal of Multivariate Analysis*, 97, 1586-1599.
- Lukonga, I. (1994). Nigeria's Non-Oil Exports: Determinants of Supply and Demand, 1970-90. IMF Working Paper.
- Nwachukwu, I. N., Agwu, N., Nwaru, J., and Imonikhe, G. (2010). Competetiveness and Determinants of Cocoa Export from Nigeria. Report and Opinion. 2(7).
- Government of Pakistan, (Various Issues) *Economic Survey*. Islamabad: Finance Division, Economic Adviser's Wing.
- Sharma, K. (2000). Export Growth in India: Has FDI played a Role? Economic Growth Center, Yale University, Center Discussion Paper No. 816.
- Yusuf, S. A., and Yusuf, W. A. (2007). Determinants of selected agricultural export crops in Nigeria: An ECM Approach. AAAE Conference proceedings, 469-472.