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Time Series Analysis of Aggregate Export Demand of Pakistan

Saad ud din Khan, Syed Rashid Ali*

Department of Economics, University of Karachi, Karachi, Pakistan

ABSTRACT

This study estimates the aggregate export demand in Pakistan. The secondary data from 1980 to 2018 of different variables are taken from various sources. The major trading partners are the USA, UK, UAE, China, and Germany, which contribute more than 38% in Pakistan's exports. We employ time series analysis and autoregressive distributed lag model (Bound test). The result confirms that the real foreign income of exporting partner has positive and relative price index has a significant negative effect, and the real effective exchange rate has an insignificant negative effect on aggregate export demand of Pakistan.

Keywords: Aggregate demand, export, foreign income, real effective exchange rate, the relative price index.

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***Address of Correspondence:**
rashidali@hotmail.com

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1. INTRODUCTION

Export plays an important role in any economy because it is a revenue-generating source, gives output in the form of a healthy balance of payment, sustainable foreign exchange reserves and affects the industrial environment of a country. In other words, higher export means high foreign exchange and high foreign exchange, in turn, an increase in the purchasing power of a country in the international market.

Pakistan's economy being heavily indebted may not enjoy a higher fiscal multiplier in the absence of a conspicuous fiscal consolidation policy. A safe level of debt to GDP ratio is 100 to 40 percent in case of advanced and emerging market economies, respectively, whereas; Pakistan's debt to GDP ratio is anticipated to be 73.50 and projected to 75 percent by 2020. While recommending the demand-side approach to stimulate GDP through "Fiscal Multiplier Effect", there is a need to estimate the effect of any fiscal policy on domestic output over a certain period. The long-term growth strategy may only delineate by focusing the "External Sector" through the development of local industrial base and strict compliance of import substitution policy.

This study focuses on Pakistan, which experiences a declining trend in exports from the last many years. The value of exports during 2011-12 totaled 25,382.6 million US dollars compared to the 2018 year value of 20,120.1 million US dollar, which shows a 20% decline in the total export. The share of exports in GDP of Pakistan is 7%. The share of Pakistan's exports in total world exports also decreases from 0.14% in 2011 to 0.11% in 2015. On the other hand, the exports of other countries in the region increased for the same time period like India's share in total export of the world increase by 0.43%, a Bangladesh share in total export of

the world increase by 0.14%, a Malaysia share in total export of the world increase by 1.34% and share of Thailand in total export of the world increase by 1.37%.

The objective of this study is to empirically analyze the determinants of Pakistan's aggregate export demand using time series data from 1980 to 2018. This paper tries to examine the short run as well as the long-run relationship between foreign economic activity and demand for exports of Pakistan.

This study is an extended version of previous research carried out in Pakistan in various dimensions. First, it uses extended time series data set from 1980 to 2018. Second, it uses the current time series analysis to estimate the long run and short-run impact of the parameter.

The rest of the paper is organized as follows: literature review is given in section two, section three explains the research methodology and data descriptions, results and discussions are reported in section four, section five outlines suggestions and recommendations.

2. REVIEW OF LITERATURE

Many studies had been seen in literature discussing with a difference based on objective, data sets, study periods, and empirical techniques to estimates exports demand. The pioneering study is Magee (1969), which explained the export performance using time series analysis. Another well-known study by Khan (1974) which analyzed the Export demand and supply functions with a simultaneous equation framework. Followed by some different direction with the concept of elasticities of export demand function by Goldstein and Khan (1978), they determine the elasticities of eight countries using two stage least square method (2SLS). The results confirm a significant positive effect on world income and a negative effect of export price.

Similarly, Goldar (1989) estimates the performance of India's export at aggregate and disaggregate level. Roy (1991), estimates the export demand of Bangladesh and found a positive effect on export with an increase in world income and negative effect on export with an increase in the exchange rate. Ahmed (2000) examined the export demand of Bangladesh using time series data and found long-run relation of export demand with export prices and exchange rate.

For some studies from Pakistan, Naqvi *et al*. (1982) were the first whose study was related to estimating the export performance of Pakistan and found a significant positive effect on world income and the negative effect of price. Followed by Anwar (1985) studied primary and manufactured goods export performance of Pakistan using two stages least squares for the period 1959-80. He found a significant effect of world income and domestic product while insignificant of price. The Khan *et al*. (1993) gave a new dimension to the debate of export performance in context to Pakistan by examining export demand and supply functions for the period 1972-88. Hassan *et al*. (1994) examined the export demand function to improve export performance using three stages least square. Akthar *et al*. (2000) analyzed the impact of price and income on Pakistan's trade with the USA, UK, Germany, and Japan. Zeeshan *et al*. (2003) estimated the export performance using PDL approach. Saad *et al*. (2016) examine the aggregate export performance using Fully Modified Least Squares traditional model of trade and confirm the significant positive relation with foreign income and negative significant with the relative price and real effective exchange rate.

The effective devaluation concept was analyzed by Azhar (1995) by using annual time series data from 1981 to 1995. The results from the spinning sector of the Pakistani textile industry confirm that devaluation did not boost exports. Similarly, Khan and Aftab (1995) estimate the impact of Real Effective Exchange Rate (REER) devaluation on the trade balance of Pakistan and conclude that Marshall-Lerner condition is hardly content.

Kumar and Dhawan (1991) analyzed the effect of exchange rate volatility on Pakistan's export to developed countries and confirmed that the exchange rate volatility hampers the export demand of Pakistan. Mustafa and Rashid (2018) find a negative effect of exchange rate volatility on different macroeconomic variables in

Pakistan. Paul *et al*. (2019) confirm the positive relationship between exchange rate volatility on different macroeconomic variables in Kuwait by using time series data from 1975 to 2015. Similarly, Mustafa and Nishat (2004) estimated the effect of exchange rate volatility on export growth of Pakistan on the various economic blocks and found a significant negative effect in the long and short run.

3. DATA AND METHODOLOGY

The export demand of Pakistan at the aggregate level is estimated through the following model previously used in Saad *et al*. (2016), and the model is also similar to Goldstien (1978).

X_d=f (real income of exporting Partner, relative Price, real effective exchange rate)

The model is in the double log-linear model

$$ln(X_d) = b_0 + b_1 \, ln \, Y_t + b_2 \, ln \, P_j + b_3 \, ln \, REER_{ij} + \mu_t \ldots\ldots (1)$$

Here $X_d is$ a real export of Pakistan, Y_t is the real foreign income, P_t is a relative Price indexf Pakistan export and $REER_i$ the real effective exchange rate of Pakistan to the US dollar. $b_0, b_1, b_2 \; and \; b_3$ Parameters. The expected signs of $b_1 > O \; and \; b_3, \; b_2 < 0 \;\; i.e. b_1 \; is + ve \; and \; b_3, b_2 \; is - ve$

The data come from the world development indicator. Some variable like Export in the real term is obtained to create consistency in data; the exports of Pakistan are first measured in local currency and then converted into real export terms. To do so, we use the export unit index. So, Real exports of Pakistan defined as

$$X_d = \ln\left(\frac{E_t}{UVIX_t}\right)$$

Here X_d is the real exports of Pakistan. Et is the annual nominal exports of Pakistan and UVIXt is the index of an export unit of Pakistan and t is the time period.

The second variable computed has been foreign income yet, Real GDP of the export partnering country of Pakistan used as a proxy. Another variable can also be used as the proxy variable such as industrial production index, but for the sake of simplicity and easy availability of data weighted Real GDP of exporting Partner used.

The third variable computed is a Relative Price Index of export goods of Pakistan (RPI) is the ratio of unit value index of Pakistani exports (UVIX) to the weighted consumer price index of the exporting partner of Pakistan. The relative price variable computed through the following formulae.

$$P_t = \frac{UVIX_{it}}{CPI_{jt}} \times 100$$

Here P_t is the relative price index between Pakistan and exporting partners. $UVIX_{it}$ is the unit value of the index of exports of Pakistan and CPI_{jt} is the consumer price index number of an exporting country j.

4. RESULTS AND DISCUSSION

The summary of the data presented in Table **1**.

Initially, the order of integration or the level of stationary of all individual variable is checked with an informal test (correlogram test) and then followed by a formal test like Augmented Dickey-Fuller test and Phillip- Perron test. The formal and informal test indicates that Yt and REERt are stationary at a level while Xdt and P_t are stationary at first difference. The summary of ADF and PP test results shown in Table **2**. The result of both tests shows that the variable is stationary at a different level. The result summarized in Table **3**.

Table 1. Summary statistics.

	X	Y	P	REER
Mean	7.919	12.211	0.760	2.105
Standard Error	0.045	0.044	0.013	0.022
Median	7.912	12.232	0.754	2.063
Mode	8.197	NA	0.700	1.980
Standard Deviation	0.283	0.274	0.084	0.140
Sample Variance	0.0801	0.075	0.007	0.019
Kurtosis	-1.051	-1.159	-0.098	1.870
Skewness	-0.490	-0.221	-0.471	0.589
Range	0.948	0.911	0.288	1.535
Minimum	7.397	11.703	0.693	1.978
Maximum	8.345	12.614	0.927	2.560
Sum	308.861	476.266	29.65	82.114
No. of Observation	39	30	39	39

Table 2. Augmented Dickey-Fuller and Philip Perron test.

Variables	**Augmented Dickey-Fuller Test (ADF)**				**Phillip-Perron Test (PP)**			
	I(0)		I(1)		I(0)		I(1)	
	C	C & T	C	C & T	C	C & T	C	C & T
X_t	-1.008	-1.978	-6.67*	-6.63*	-1.002	-2.022	-6.672*	-6.633*
Y_t	-3.045*	1.015	-2.203	-3.274	-3.045*	1.122	-2.32	-3.354*
$REER_t$	-3.168*	-3.830*	-9.432*	-4.981*	-2.987*	-3.792*	-11.79*	-19.47*
P	-1.96	-2.365	-8.279*	-8.274*	-1.79	-2.201	-8.12*	-8.24*

Note: The critical values for ADF and PP tests with constant (c) and with constant & trend (C&T) 1%, 5% and 10% level of signi*fi*cance are -3.626, -2.945, -2.611and -4.394, -3.612, -3.243 respectively.

- Show significant at 5%

Table 3. Summary of the stationary result.

Variable	**Level of stationary**
X_t	I(1)
Y_t	I(0)
$REER_t$	I(0)
P_t	I(1)

As all the variables are stationary at a different level, and no variable is stationary at I(2), so Autoregressive distributed lag (ARDL) approach is applied to estimate the long-run relationship between the variable. After checking the level of stationary lag length will be selected using AIC and SIC criteria.

To do so, model (1) estimated at the first difference with lags of dependent and independent variable of the first difference with lags of independents variable using the leg length of 2. The model took the following form

$$D(X) = C_0 + C_1 D\big(X(-1)\big) + C_2 D\big(X(-2)\big) + C_3 D\big(Y(-1)\big) + C_4 D\big(Y(-2)\big) + C_5 D\big(P(-1)\big) + C_6 D\big(P(-2)\big) + C_7 D\big(REER(-1)\big) + C_8 D\big(REER(-2)\big) + C_9 Y(-1) + C_{10} P(-1) + C_{11} REER(-1)$$

The result found of the above model having AIC and SIC criteria value -2.84 and -2.321. These values are the lowest as comparable to the AIC and SIC values obtain from using lags 4 and lag 6. After selecting the lag length criteria, the serial correlation will be tested through serial correlation LM test with a lag length specification 2 with the null hypothesis of no serial correlation. The probability of F statistic is 0.946 shows do not reject Ho. Means there is no serial correlation in the estimated result.

Now the stability checks through the CUSUM test. The results found are stability of the estimated model because the estimated values lie in the marked region, as shown in Figure **1**.

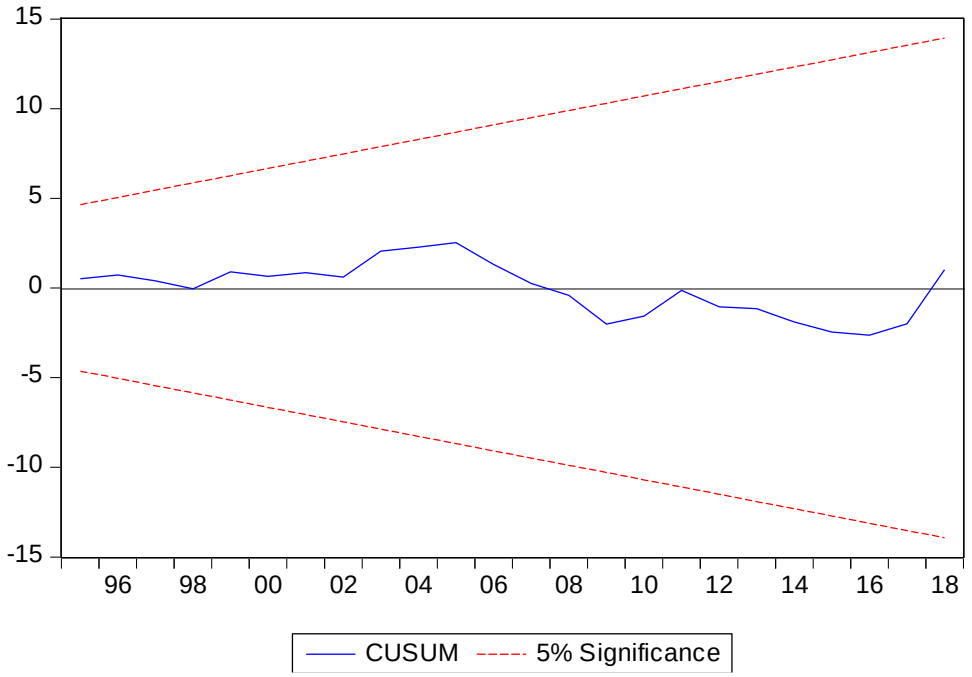

Figure 1. Stability test - CUSUM test.

To check the impact of lag independent variables Wald test used with the null hypothesis. The result found that the probability of the F - statistic is 0.767 shows do not reject Ho means any impact of lag independent variables in the long-run relationship. So the long-run relationship estimated to be

$$X= -0.7095 + 0.774\ Yt - 0.854Pt - 0.082\ REER$$

$$[-1.56] \quad [17.16] \quad [-5.33] \quad [-0.964]$$

To determine the short-run coefficient of the parameter; the residual generated from the long-run estimated equation and the following model is estimated

$$D(X) = C_0 + C_1 D\big(X(-1)\big) + C_2 D\big(X(-2)\big) + C_3 D\big(Y(-1)\big) + C_4 D\big(Y(-2)\big) + C_5 D\big(P(-1)\big) + C_6 D\big(P(-2)\big) + C_7 D\big(REER(-1)\big) + C_8 D\big(REER(-2)\big) + \pi \text{ECT(-1)}$$

Here ECT is the residual series use in the lag term. π is the coefficient of the residual term show the adjustment toward long-run equilibrium. The results found are:

$$D(X) = -0.0008 + 0.216 D\big(X(-1)\big) + 0.403\ D\big(X(-2)\big) - 0.434\ D\big(Y(-1)\big) + 0.930\ D\big(Y(-2)\big) + 0.537\ D\big(P(-1)\big) + 0.057\ D\big(P(-2)\big) - 0.053\ D\big(REER(-1)\big) - 0.064\ D\big(REER(-2)\big) - 0.696 \text{ECT(-1)}$$

Now initially check the serial correlation of the above-estimated result using LM test. The result found that no serial correlation as the probability value is greater than 5% of the null hypothesis. To check the stability CUSUM test is applied. The result found is estimated line lies within the region show the stability in the estimates. Finally, check the short-run coefficient through the Wald test. The results found are none of the coefficients of dependent in the first difference with the first and second lag term shows significance. In other words, no short-run causality found from the independent variable to the dependent variable. The probability of the ECT(-1) variable is less the 5% shows that the whole system is getting adjusted toward the long-run equilibrium at a speed of 69.69%.

5. CONCLUSION AND POLICY RECOMMENDATION

This study investigates the determinants of Pakistan's exports demand using the time series data from 1980 to 2018. The empirical analysis concluded that Pakistan export demand is positively related to the foreign income of export partners, as the coefficient of foreign income of exporting Partner is less than 1% shows income inelastic nature of Pakistan's Exports. Export demand is negatively related to the relative price of export goods because the coefficient is less than 1% shows the inelastic price demand of Pakistan's exports while the real effective exchange rate does not influence Pakistan to export demand very much because it is insignificant. It shows a long-run relationship while a short-run relationship is not determined due to insignificant of all independent variables, although the estimated result of the short-run analysis shows that the system is converging toward equilibrium with the pace of 69.69%.

The current study implies the choice of different export policy. This study helps the policy maker in making a future relationship with trading partners and to encounter the external shocks. Below are some recommendations to enhance the export demand of Pakistan

Pakistan mostly exports to traditional exporting Partner, i.e., USA, UK, UAE, China, and Germany. Nearly 40% of total export direction is to these countries, but the new market should be discovered to increase the export direction.

Proper price policy should be adopted to decrease the price in a foreign market, which will affect an increase in the export volume of Pakistan.

Cost of exported goods should be lowered by providing the input factors at a lowered cost. It may help make our export product price competitive.

As the real effective exchange rate does not act significantly in determining Pakistan export, so variation in the exchange rate does not affect Pakistan export.

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