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Impact of Net Export on Gross Domestic Product (GDP) of Pakistan

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Abstract

This study analyses the effects of net exports upon Pakistan's GDP with an analysis of annual time-series data covering 1978 to 2017. The dependent variable will be GDP in this research with exports, imports, gross fixed investment, Government expenditure, interest paid on external debt and Private consumption representing the independent variables. The ADF unit root test results indicated that the variables are stationary primarily at first differencing which allows the ARDL approach to be employed. The ARDL bounds test provided evidence of long run cointegration between the variables through a F-statistic of 5.080 which was above the 5% upper bound (3.61). Long run results indicated that exports have a positive influence on GDP; (β=0.1735; $p<0.001$) alongside a positive effect from gross fixed investment (β=0.1862; $p<0.001$), government expenditure (β=0.1740; $p<0.001$) and private consumption (β=0.9041; $p<0.001$). Imports were found to have a negative impact upon GDP (β=-0.2735; $p<0.001$) whilst interest paid on external debt also has a negative affect (β=-0.0272; $p=0.020$). The short run results were also found to be significant with an ECM coefficient of negative significance (β=-0.9989; $p<0.001$) confirming that adjustments to long-run equilibrium occur rapidly. This study recommends the promotion of export activity through improved productivity; increased levels of productive investment; and an emphasis on the importation of capital goods as means of achieving such growth in exports and GDP.

Keywords: Gross domestic product, time series, trade balance, cointegration

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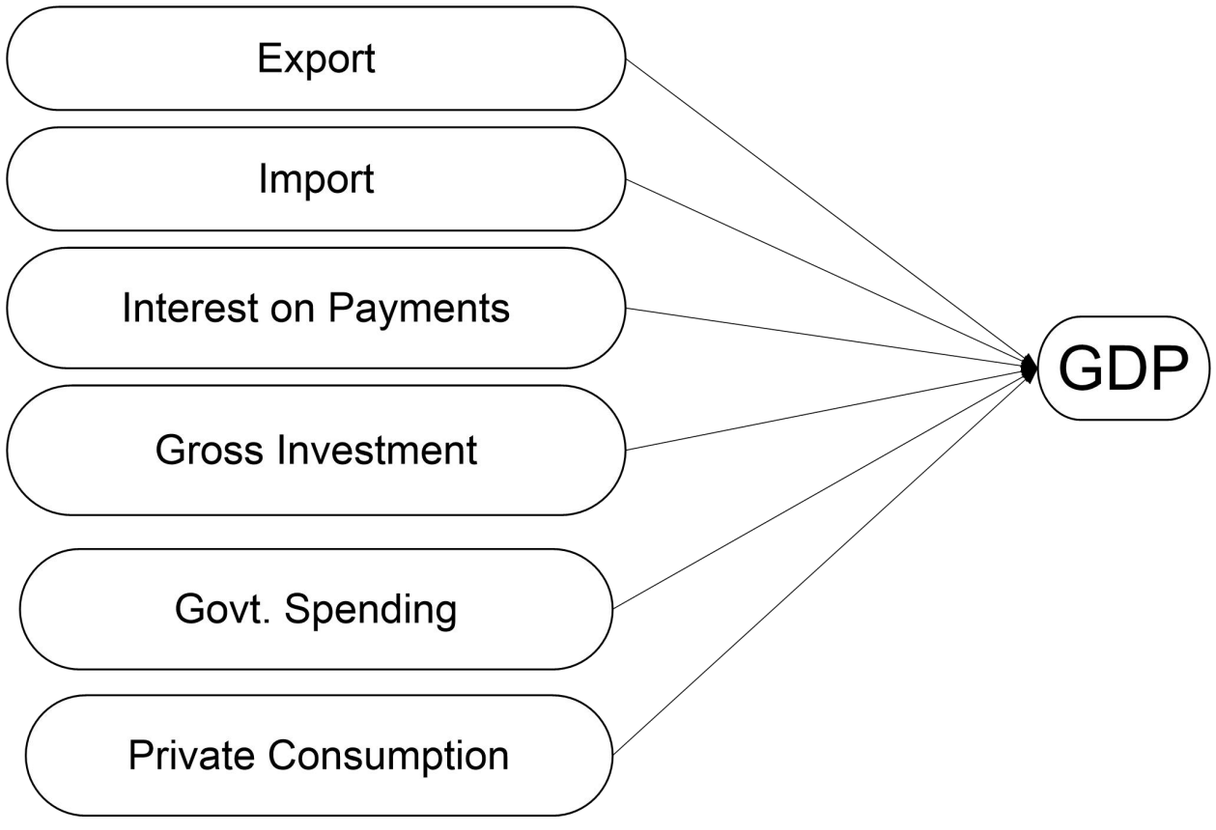
Introduction

Every society in the world focused on their economic growth. Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time. GDP includes all private and public consumption, government outlays, investments, private inventories, paid-in construction costs and the foreign balance of payment export are added, imports are subtracted, and export and import are the most important contributors to economic growth (Iqbal, et al., 2024). Export is an important contributor to economic growth and it improves the standard of living of a society, it has access to worldwide market and it increases the level of income by generating foreign exchange. The role of export is especially important in those countries where financial markets are not fully established (Masoof, 2015). Export is an engine for economic growth of an under developed countries like Pakistan, there are two types of export agricultural and non-agricultural. Net exports can be either positive or negative. When exports are greater than imports, net exports are positive. When exports are lower than imports, net exports are negative. An import means getting goods into one country from another country. Imports play vital role in enhancing exports, these imports could be in the form of raw materials or machineries; both are used in the manufacturing sector. According to Shirazi and Mannap, (2004) explained that there is a long run relationship between export and economic growth. Export, import and investment have a significant behavior towards GDP of Pakistan (Quddus & Saeed, 2005). Pakistan should focus on boosting up its foreign trade. Considering Pakistan ,Sherazi and Manap, (2005), Malik & investigated ELGH and used co-integration and different estimation techniques to investigate the long-run /short-run and causal relationships between the growth of exports and output (Rafiq & Yun, 2018). Apart from finding positive relationship while employing ELGH, there are many researches which concluded rejection which includes (Wheeler & Mody, 1992). The study of (Mustafa, 2019) explained the causal relationship between the imports and foreign direct investment, according to this study, high inflation directly affects the inflows of the foreign investment. The trade policies of Pakistan are promoting the trade direction all around the world. However, Pakistan economic policy is to concentrate more countries like west Europe, USA, Middle East and many other countries (Alam, A, 2013). The study of Mottaleb and Kalirajan, (2010) explains that the countries which have larger economic growth, higher GDP growth rate and responsive business environment, are most successful in attraction of foreign direct investment in their home countries. Some of the most important exports and imports items are determined such as cotton garments, cloth, rice dominate in exports (Wang et al., 2025). Eight goods account for 80% of total imports; these are oil, machinery, chemical transportation parts, equipment, iron, tea and many other items which are not easily available in Pakistan (Hussain & Kimuli, 2012).

Model:



GDP=f (EXP1, IMP,INT, GI, GS, PC)

GDP=GDP (current LCU)

EXP1=Exports of goods and services (current LCU)

IMP= Imports of goods and services (current LCU)

INT= Interest payments on external debt (% of exports of goods, services and primary income)

GI=Gross Investment (Gross fixed capital formation (current LCU)

GS=Government Spending (General government final consumption expenditure

PC=Private Consumption (Households and NPISHs Final consumption expenditure (current LCU)

$$GDP=\beta_o + \beta_1 EXP1 + \beta_2 IMP + \beta_3 INT + \beta_4 GI + \beta_5 GS + \beta_6 PC + U_t$$

t= time series

U= error term

ECONOMETRIC METHODOLOGY

The empirical study examined the impact of exports on the GDP of Pakistan. The study obtained annual time series data from 1978-2017. The relationship regressed through Gross Domestic Product (GDP) as dependent variable while Exports (EXP1), Imports (IMP), Gross investment, government spending, interest and private consumption as independent variables. Econometric techniques Augmented-Dickey Fuller (ADF) unit root test employed to check the Stationarity of the variables in the study. Autoregressive distribution lag model (ARDL) and Error Correction Model (ECM-ARDL) employed for the long run and short run relationship in the study. Policy measures to promoting exports of valuable goods and importing capital goods for the further economic activity must be encouraged.

The type of research study is casual and the data is time series. Different techniques were used to analyze the data. Descriptive statistics is used to provide the summary about the observations and samples. It also describes the utmost features of the collected of data. It shows the standard deviation, median, mean measured for both dependent and independent variables. ADF is important for time series data for examining the stationary of the data. It was proposed by Dickey and Fuller (1981). Time series data contain unit roots dominated by stochastic trends. ADF null hypothesis is a time series non- stationary. Co integration is used to check the integration between two or more variables.

Augmented Dickey- Fuller(ADF) (1981)

The stationary of time series data is necessary for avoiding spurious regression analysis because it is impossible to get reliable results and making forecasting with a non-stationary series. The Augmented Dickey-Fuller (ADF) test is employed to check the stationary of the variables.

$$\Delta X_t = \theta X_{t-1} + \sum_{j=1}^{q} \varphi_{j.}\, \Delta X_{t-j} + e_{1t}$$

$$\Delta X_t = \alpha + \theta X_{t-1} + \sum_{j=1}^{q} \varphi_{j.}\, \Delta X_{t-j} + e_{2t}$$

$$\Delta X_t = \alpha + \beta t + \theta X_{t-1} + \sum_{j=1}^{q} \varphi_{j.}\, \Delta X_{t-j} + e_{3t}$$

X_t is a time series to be tested for unit root. t is a time trend. e_t is white noise error term.

ADF is computed in the same way as the regression equation of D.F. it is simple form of D.F test lagged dependent variance in A.D.F regression equation are included until the error become white noise.

CO-INTEGRATION:

If two variables having linear combination, I (1). This combination is said co- integration. If variables have different order of integration, then the combination will have an order of integration equal to highest order.

Let $X_{i,t} \sim I(di)$ i= 1,2,3.....k

This means that k variable is integrated order di

$Z_t = \sum_{i=1}^{k} \alpha i\, X_{i,t}$

$Z_t \sim I(\max, di)$

Zt is the linear combination of k variable X_i

$X_{1,t} = \sum_{i=2}^{k} \beta_i X_{i,t} + z_t$

Where $\beta_i = -\frac{\alpha_i}{\alpha_I}$

$Z'_t = \frac{Z_t}{\alpha_I}$

$X_{1,t}$ is normalized equation.

Z'_t is the error which is not white noise. The mean Z'_t is not stationery and auto- correlation with X_i at I(1).

Let $Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + U_t$

all the variables have I(1).

Estimated the model:

$Y_t = \widehat{\beta}_1 + \widehat{\beta}_2 X_{2t} + \widehat{\beta}_3 X_{3t} + \widehat{U}_t$

Now solve it for $\widehat{U}_t$

$Y_t - \widehat{\beta}_1 - \widehat{\beta}_2 X_{2t} - \widehat{\beta}_3 X_{3t} = \widehat{U}_t$

Now the error term is white noise, and have linear combination of I(1). Variable will be I(0).

This mean error is stationary and variable are co- integrated.

RESULTS AND DISCUSSION:

Table 1: Descriptive Statistics

	LGDP	LEXP1	LGI	LGS	LIMP	LINT	LPC
Mean	28.56084	26.54421	26.73328	2.400279	26.93493	2.033988	28.30280
Median	28.56709	26.75199	26.71433	2.389115	26.90474	2.306860	28.25863
Maximum	31.09559	28.75638	29.16418	2.820480	29.35563	2.775592	30.89669
Minimum	25.89613	23.51457	24.14116	2.051660	24.20760	0.956520	25.67977
Std. Dev.	1.597073	1.610495	1.528074	0.176180	1.529368	0.554474	1.602788
Skewness	0.008475	-0.255312	-0.043812	0.168038	0.061087	-0.556659	0.079245
Kurtosis	1.776910	1.831273	1.776965	2.994867	1.820547	1.812557	1.751316
Jarque-Bera	2.493726	2.711099	2.505821	0.188289	2.343394	4.415829	2.640553
Probability	0.287405	0.257806	0.285672	0.910151	0.309841	0.109930	0.267061
Sum	1142.433	1061.768	1069.331	96.01118	1077.397	81.35951	1132.112
Sum Sq. Dev.	99.47500	101.1540	91.06537	1.210540	91.21972	11.99023	100.1882

Observations	40	40	40	40	40	40	40

Table: 1 shows summary of statistics variables of this study. We start from the dependent variable that is GDP. Mean of dependent variable is 28.56084 and median is 28.56709 which show the middle value of the data. Maximum value of the data is 31.09559 and minimum value is 25.89613 which show the range of the data. Skewness of the data is 0.008475. Value of Kurtosis is 1.776910. Jarque-Bera value is 2.493726 and the value of P is 0.287405.

Now we see the first independent variable that is Export which is denoted by EXP1. Mean of the first independent variable is 26.54421 and median is 26.75199 which shows the middle value of the data. Maximum value of the data is 28.75638 and minimum value is 23.51457 which show the range of the data. Skewness of the data is -0.255312. Value of Kurtosis is 1.831273. Jarque-Bera value is 2.711099 and the value of P is 0.257806.

Now we see the 2nd independent variable that is gross investment which is denoted by GI. Mean of the second independent variable is 26.73328 and median is 26.71433 which show the middle value of the data. Maximum value of the data is 29.16418 and minimum value is 24.14116 which show the range of the data. Skewness of the data is -0.043812. Value of Kurtosis is 1.776965. Jarque-Bera value is 2.505821 and the value of P is 0.285672.

Now we see the third independent variable that is government spending which is denoted by LGS. Mean of the third independent variable is 2.400279 and median is 2.389115 which show the middle value of the data. Maximum value of the data is 2.820480 and minimum value is 2.051660 which show the range of the data. Skewness of the data is 0.168038. Value of Kurtosis is 2.994867. Jarque Bera value is 0.188289 and the value of P is 0.910151.

Now we see the fourth independent variable that is import which is denoted by IMP. Mean of the fourth independent variable is 26.93493 and median is 26.90474 which show the middle value of the data. Maximum value of the data is 29.35563 and minimum value is 24.20760 which show the range of the data. Skewness of the data is 0.061087 . Value of Kurtosis is 1.820547. Jarque Bera value is 2.343394 and the value of P is 0.309841

Now we see the fifth independent variable that is export which is denoted by E. Mean of the fifth independent variable is 2.033988 and median is 2.306860 which show the middle value of the data. Maximum value of the data is 2.775592 and minimum value is 0.956520 which show the range of the data. Skewness of the data is -0.556659. Value of Kurtosis is 1.812557. Jarque Bera value is 4.415829 and the value of P is 0.109930.

Now we see the sixth independent variable that is export which is denoted by E. Mean of the third independent variable is 28.30280 and median is 28.25863 which show the middle value of the data. Maximum value of the data is 30.89669 and minimum value is 25.67977 which show the range of the data. Skewness of the data is 0.079245 . Value of Kurtosis is 1.751316. Jarque Bera value is 2.640553 and the value of P is 0.267061.

Correlation analysis:

Table 2: Results of Correlation Matrix

LGDP	1.000000					
LEXP1	0.992916 51.51273 0.0000	1.000000 ----- -----				
LGI	0.998708 121.1271 0.0000	0.993473 53.68774 0.0000	1.000000 ----- -----			
LGS	-0.369208 -2.448980 0.0191	-0.361907 -2.393168 0.0217	-0.363109 -2.402317 0.0213	1.000000 ----- -----		
LIMP	0.997006 79.48471 0.0000	0.988697 40.65156 0.0000	0.996746 76.23150 0.0000	-0.338185 -2.215237 0.0328	1.000000 ----- -----	

LINT	-0.868038 -10.77738 0.0000	-0.853282 -10.08724 0.0000	-0.863992 -10.57785 0.0000	0.484139 3.410814 0.0015	-0.875933 -11.19247 0.0000	1.000000 ----- -----	
LPC	0.999426 181.7857 0.0000	0.989109 41.42563 0.0000	0.997445 86.06309 0.0000	-0.379493 -2.528495 0.0157	0.997381 85.00618 0.0000	-0.875404 -11.16353 0.0000	1.000000 ----- -----
	LGDP	LEXP1	LGI	LGS	LIMP	LINT	LPC

Correlation matrix shows the strength of the relationship of variables. **Table 2** shows that some variables are positively correlated and some are negatively correlated with each other. The dependent variable (LGDP) is positively correlated with export (LEXP1), import (LIMP), gross investment (LGI) and private consumption (LPC) & government spending (LGS) and interest (LINT) are negatively correlated with dependent variable (LGDP). LGI & LINT are negatively correlated with EXP1, LGI, LIMP and LPC. It is also observed that EXP1 is also highly and positively correlated with the LGI, LIMP and LPC.

Table 3: UNIT ROOT TEST:

Sr. no	**Variables**	**T-statistic**		**Prob**	
		At level	**At 1st difference**	**At level**	**At 1st difference**
1	**LGDP**	-0.865072	-5.931843	0.7887	0.0000
2	**LEXP1**	-3.020212	-4.787590	0.0417	0.0004
3	**LGI**	-0.745501	-6.005313	0.8231	0.0000
4	**LGS**	-1.467108	-5.390826	0.5395	0.0001
5	**LIMP**	-1.031656	-6.166474	0.7324	0.0000
6	**LINT**	-0.953992	-5.227216	0.7599	0.0001
7	**LPC**	-0.253802	-5.135907	0.9226	0.0001

In table-3 unit root test is applied. Through unit root test we check that our data is stationary or non- stationary. Policy implication is not reliable on non–stationary data. So first we remove non stationary data to make it stationary. In table 4 all variables are stationary on at 1st difference. All result shows that there is a mixed order of integration we are going to use ARDL for this data.

Table 4: LAG LENGTH CRITERIA:

VAR Lag Order Selection Criteria						
Endogenous variables: LGDP LEXP1 LGI LGS LIMP LINT LPC						
Sample: 1978 2017						
Included observations: 37						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	187.2755	NA	1.38e-13	-9.744624	-9.439855	-9.637179
1	440.3195	396.6635	2.35e-18	-20.77403	-18.33588*	-19.91447*
2	476.6978	43.26064	6.27e-18	-20.09177	-15.52025	-18.48010
3	560.9476	68.31066*	2.33e-18*	-21.99717*	-15.29227	-19.63337

* 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

Table 4 shows VAR lag order selection criteria select number of variables and number of observation in minimum and maximum lag required for co-integration approach, Sequential modified LR test statistics (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), Hannan-Quinn information criterion (HQ) are used for lag length of the variables.

Table 5: BOUND TEST:

ARDL Bounds Test		
Sample: 1981 2017		
Included observations: 37		
Test Statistic	**Value**	**K**
F-statistic	5.080156	6
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.12	3.23
5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

In table 5 Autoregressive (ARDL) bound testing result are applied. F- Statistics used for testing the null hypothesis of no co-integration among the variables. The calculated F-statistics (5.080156) is greater than upper bound (3.61) value at 5% level of significance so null hypothesis is rejected and alternative hypothesis is expected. It shows that GDP, Export, Import, Gross investment, Government spending, interest on external debt and private consumption have long run relationship.

Table 6: Long-run Analysis:

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEXP1	0.173547	0.012185	14.242896	0.0000
LGI	0.186153	0.016975	10.966470	0.0000
LGS	0.173968	0.018850	9.228858	0.0000
LIMP	-0.273490	0.033611	-8.136833	0.0000
LINT	-0.027160	0.010276	-2.643126	0.0203
LPC	0.904087	0.028499	31.723541	0.0000
C	0.403717	0.113525	3.556197	0.0035

In table 6 long run result of the study are presented. The result shows that LEXP1 has positive and significant relationship with GDP. It shows that 1 unit increase in LEXP1 it increases 0.173547 in GDP. LGI has positive and significant relationship with GDP. It shows that 1 unit increase in LGI it increases 0.186153 in GDP. LGS has positive and significant relationship with GDP. It shows that 1 unit increase in LGS it increases 0.173968 in GDP. LIMP has negative and significant relationship with GDP. It shows that 1 unit decrease in LIMP it decreases -0.273490 in GDP. LINT has negative and significant relationship with GDP. It shows that 1 unit decrease in LINT it decreases -0.027160 in GDP. LPC has positive and significant relationship with GDP. It shows that 1 unit increase in LPC it increases 0.904087 in GDP.

Table 7: Short-run Analysis:

Dependent variable= GDP				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEXP1)	0.136493	0.013850	9.855298	0.0000
D(LGI)	0.180270	0.019174	9.401827	0.0000
D(LGS(-2))	-0.032258	0.013868	-2.326105	0.0368
D(LIMP)	-0.241187	0.020155	-11.966600	0.0000
D(LINT(-2))	0.044791	0.012047	3.717903	0.0026
D(LPC)	0.897790	0.035489	25.297827	0.0000
ECM	-0.998901	0.214778	-4.650844	0.0005
Cointeq = LGDP - (0.1735*LEXP1 + 0.1862*LGI + 0.1740*LGS -0.2735 *LIMP -0.0272*LINT + 0.9041*LPC + 0.4037)				

All variables in short run have significant impact on GDP and R square is , Adjusted R square is, DW statistics is and F- statistics is.

CUSUM AND CUSUM $_{Sq}$:

CUSUM & CUSUM squares help to check the stability of the model which shown in figure 1 & 2. Both show that our data is significant and within the region of the lines.

Figure 1:

Plot of Cumulative Sum of Recursive Residuals

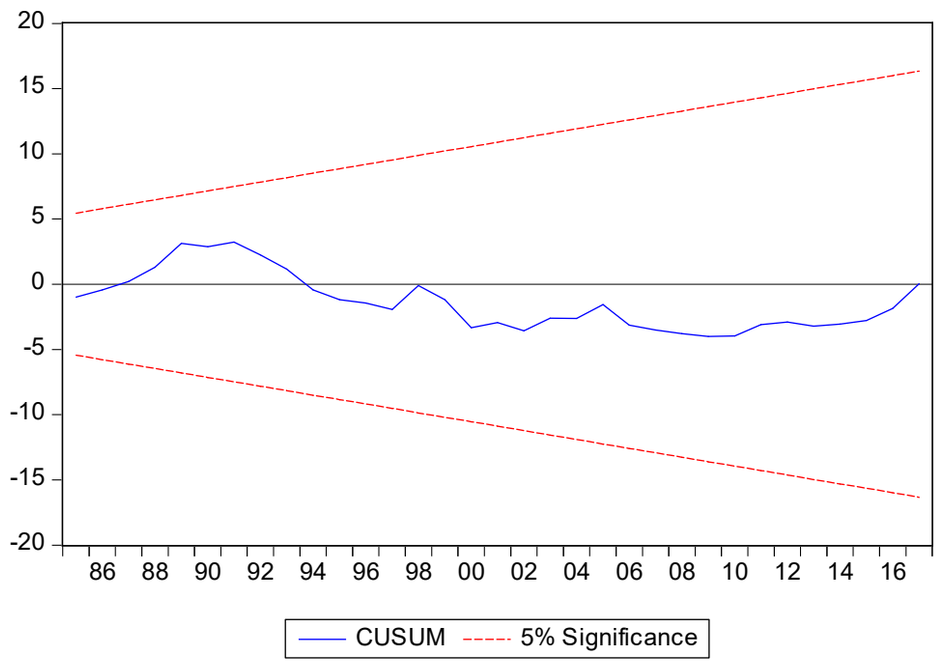
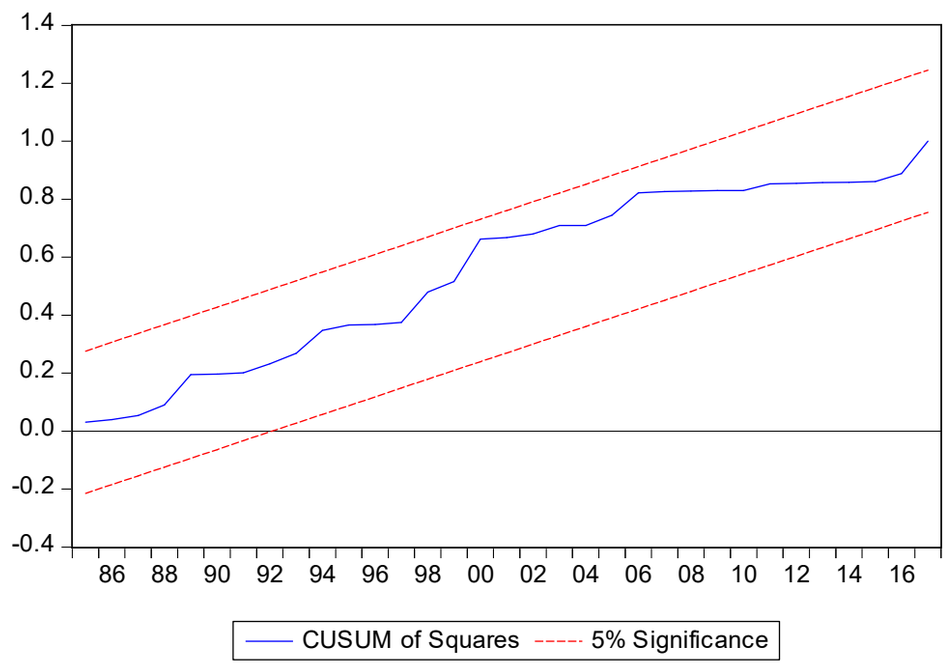


Figure 2:

Plot of Cumulative Sum Of Recursive Residuals



CONCLUSION

Pakistan is focused on improving its economic growth and the country is constantly trying to increase its export growth rate but due to poor infrastructure, the cost of production has been increasing as well while on the other hand Pakistan is facing stiff competition with countries like India and China in the export market.

Our study suggest that Pakistani Government should concentrate on improving infrastructure, increase export and should not import raw material and import finished goods. Pakistani Government should boost up its foreign trade. Export and import are huge predictors of GDP. Customer trust is very necessary for success of any business, that's why Government should focus on improving his customer trust in foreign market. Pakistan has abundant of natural resources so utilization of natural resources can increase its export.

POLICY SUGGESTION

Our study evaluates the impact of Pakistan's net export on GDP. Pakistan has consistently deficit trade. This is very serious issue because export has impact of any economy. But due to political instability and terrorism in Pakistan value of net export are not positive. In this study, we have concluded that government should import capital goods (machinery) instead of raw material because that machinery can be used to make goods using raw materials and can be export in shape of finished goods. Due to terrorism, law and order situation Pakistan has bad impression and foreign customers are not trusting on Pakistan. So Pakistan should set up seminar for this purpose and Pakistani ambassadors can do this very actively.

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