

## ARTICLE

# An Empirical Analysis of Defense-Economic Growth Relationship

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### ABSTRACT

Most of the developing and developed countries try to make peace and promote it but still it is seen that large portion of the overall global GDP is spent on the defense sector. This study surveys defense-growth nexus by incorporating openness to trade, external debt, gross capital formation and labor force in production function. The study uses annual time series data over the period 1972-2016. For estimation purposes, the study employed ADF unit root test and P-P unit root test for testing stationarity properties, ARDL Bound test to cointegration used for testing long run relationship. The empirical evidence of the study reveals that Economic growth is positively affected by spending on defense sector, capital investments, labor force, and openness to trade in long run while external debt has a negative effect on economic growth. Apart from this, empirical evidence also suggests that in short run; there is positive imperative role of capital investment, defense spending, and openness to trade in growth process, while external debt retards the pace of economic growth. Results of the study indicates that defense spending could be used as a fiscal tool for achieving sustainable growth, government should invest high R&D in defense.

## 1. Introduction

The impact of defense spending on economic development differs from one country to another. It is a common phenomenon that a significant amount of GDP is spent on the defense sector worldwide because advance technology in defense of country played a significant in national development<sup>[1]</sup>. Whether it is developed or developing country, defense sector spending is on the rise since last few decades. Due to this high portion of budget spending on defense sector, the growth of the economy is

affected and it results in crowding out of the country's capital. As per Benoit<sup>[2]</sup> economic growth depends on the portion of budget the countries spend on defense, the heavy spending on defense may have some kind of impacts on the overall economy of any country. Due to peaceful environment of any country, it attracts foreigner to invest in any country. It may be one of the reasons for investment opportunities. The defense-growth nexus was first studied by Benoit (1973)<sup>[2]</sup> who focused on this specific issue and establish that spending on defense is helpful to economic

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development. Later, several other researchers examined the relationship among defense sector expenditure and economic growth<sup>[3]</sup>. They argue that defense spending is conducive to economic growth by positive spillover effects of spending on defense as mentioned by Feridun et al., (2011)<sup>[4]</sup>. There are some other studies too which support this phenomenon, but some studies proved that this help in economics growth in developed countries while it retards the economic growth in the developing countries. On the other hand, some argues that high defense spending crowd-out investment from development to non-developmental purpose thus impede economic growth<sup>[5]</sup>. From theoretical point of view, there are two approaches through which defense spending effects economic growth i.e. Keynesian, and Neoclassical. From Keynesian point of view, an increase in defense spending effects growth process positively through the enhancement of aggregate demand, employment creation, provision of peaceful environment for investments and so forth. Apart from this, positive spill-over effects of defense spending affect economic growth positively through engaging resources in R&D, human capital development, education, technological advancement and so forth<sup>[6,7&8]</sup>. On the other hand, neoclassical economists argue that defense spending negatively affect the economic growth. Increasing in defense sector spending diverts resources from developmental to non-developmental purposes. This appears to crowd-out both private and public-sector investments which decrease economic growth<sup>[9,10]</sup>. Defense spending in developing countries is unfriendly as compare to the developed countries<sup>[11,12]</sup>. Defense spending in developing countries hinders the growth process and has adverse effect on the growth. The main reason of this adverse effect is that defense spending diverts the developing country resources from development to non-development sector. These developing countries try to fulfill defense sector needs by importing defense related products from more developed countries. The developing country can utilize these resources on technological progress, development in infrastructure and can also reduce the heavy taxes imposed on poor people. After the 80's the world observed incredible increase in terrorism and its negative impact on the overall economy of the countries in some countries. So, to eradicate this problem, proper policies were required to strengthen the overall security system and to eradicate the terrorism. For this, increase in defense spending was mandatory in most of the countries who were suffering from terrorism; Pakistan was also part of it. Defense spending can also promote the economic growth of a country if defense products are exported to other countries. Countries like US earn handsome earning by exporting the

defense spending to other countries as it is the highest supplier of defense products. Its products for defense are too expensive and for developing and poor countries it is almost impossible to purchase the defense products. For those developing countries there are opportunities to invest in defense sector research and development (R&D) so they can produce their own low-cost defense products. In his research work, Benoit (1973) defense spending by any country results in stimulating the economic growth through positive spillover effects. Spending in defense sector lowers the cost of resources, increase the profits, decrease unemployment, increase in the overall demand. It can be said that defense sector encourages the economic growth of country through increasing employment, aggregate demand and production<sup>[13]</sup>. Geographically, Pakistan lies in a prime strategic position, but over the years it has lost too much due to its location, rather than cultivating any benefits. The geopolitical hostilities, strategic and political positioning is making Pakistan to spend more on its defense sector since independence. The armed confrontation and the political rivalry between Pakistan and India are one of the main factors of increase in the military sector spending. Pakistan is a country which faced more terrorism, to curb this menace of terrorism the government has to have increase defense spending and it was inevitable. To curb these hostilities and terror attacks it is mandatory for governments to spend on defense sector. Defense spending might affect economic growth both positively or negatively<sup>[14]</sup>. As a direct effect it can spin-off the investment from defense spending to other sectors of the country. While as an indirect effect it might reduce the overall economic growth simply by reducing the saving ratio, lack of social expenditure, lack of public expenditure on health, education and sometimes severe balance of payment deficit of the country. Hence, defense spending and economic growth has both negative and positive impacts on the overall economy in the countries. Foreign and domestic investment, peaceful environment for production activities contributes towards the positive impact of defense sector spending on economic development. Economic growth further contributes to technical skills, advancement in research activities, infrastructure development and educational training for constant development of economic growth<sup>[15,16]</sup>. While on the contrary, a negative impression of defense sector expenditure on economic growth might be observed. Defense expenditure might distort the allocation of resources by crowding-out the private investment. It can also negatively affect the economic growth by diverting the resources from productive projects to unproductive projects<sup>[17,18]</sup>. The main objectives of the study are (i) To investigate the relationship between

defense spending and economic growth (ii) To investigate the causality among economic growth and other independent variables like capital, labor, defense spending, trade openness and external debt and to suggest some policy implication.

## 2. Theoretical Framework

The debate regarding the theory of defense expenditure mainly consists of two schools of thoughts. The one backing Keynesian, while the other against it. The group backing Keynesian school of thought put forward that in Keynes Military Hypothesis, military sector expenditure aids the overall economy of the country which encourages and lifts the overall economic development by multiplying its effect<sup>[19,20,21,22]</sup>. These theories support that defense sector expenditure encourages the economic growth over various routes. Defense sector spending assures a peaceful atmosphere which boosts the local as well as the foreign investors. These local and private investments increase the exports of country; create employment opportunities and aggregate demand. All the firms within the country will adopt modern techniques and technologies of production<sup>[23]</sup>. In further studies, the authors argue that defense sector spending contributes in enhancing the overall growth through improving educational training, provision of employment opportunities, infrastructure and engaging country resources in high development and research events. Similarly, manufacture of highly inventive military sector products can play important part in accelerating the economic development and are positive spillover impacts of defense sector spending<sup>[24,25,26]</sup>. These authors say that defense sector spending is harmful for economic growth and it hinders the overall growth of country because of countless reasons. Defense spending hampers the growth process of the country by crowding out the useful resources from creative to non-creative activities. Military sector expenditure damages the government expenditure for progressive purposes like roads, dams, railways tracks, electricity and many other infrastructure developments which are essential for maintenance of economic development<sup>[27,28,29]</sup>. For developing countries that rely on deficit budgeting by borrowing money to meet their defense spending are prone to distort the credit market. This distortion result in further enhancement of expenses on defense, as the interest rates would soar. Following it would impede the private investments that would hamper the economic progress<sup>[30]</sup>. Hence, defense spending vis-a-vis crowding out and distortion effect would lead to deviation of resources from civil to defense purposes, and would retard the economic growth, technological advancement and long-term productivity.

## 3. Methodology

For testing stationarity properties, ADF unit root test and P-P unit root test has been employed. In order to test cointegration relationship among the variables, ARDL bound testing approach has been used. The data on variables GDP per capita, capital, labor force, defense spending as share of GDP, trade openness (exports + imports) as share of GDP and external debt is obtained from World Bank (WB), SIPRI and various Economic Surveys of Pakistan of period 1972-2016.

### 3.1 Econometric Model:

Feder (1983)<sup>[31]</sup> established the empirical model to examine the effect of military sector expenditure on economic development. The empirical modeling for probing the association among defense expenditure and economic development was established by Feder (1983). Following the lead of Biswas and Ram (1986)<sup>[32]</sup>, who first adopted Feder (1983)'s model of export-growth nexus in less developed countries for testing the connection among expenditure and economic development, numerous empirical assistances to the guns-and-butter debate have employed alternatives of the same approach. Deger and Sen (1995)<sup>[33]</sup> characterize the Feder model as "a splendid empirical workhorse to investigate the impact of military expenditure as an explanatory variable in a single-equation growth regression analysis, which is grounded in the neoclassical theory of growth" (Mintz and Stevenson 1995), or at least "fairly well grounded in the neoclassical production function framework"<sup>[34]</sup>. The popularity of the approach lies in the arrival of a direct connection from theoretical model to econometric requirement. Alexander (1990)<sup>[35]</sup> also employed Feder model and later on, Feder model was used by Yildirim et al. (2005)<sup>[13]</sup> to test the impact of military expenditure on economic development in case of 58 developing countries. Recently, by employing Feder (1983)<sup>[31]</sup> model, Kumar and Shahbaz (2012)<sup>[36]</sup> examined military-economic growth nexus. This study also uses Feder (1983) defense expenditure model to explore the nexus between economic development and military expenditure by including capital, labor force, trade openness and external debt for Pakistan.

Given for the economy of two sectors with a defense M production function as:

$$M = m(L_m, K_m) \tag{i}$$

And a civilian G productions function:

$$G = G(L_G, K_G, M) \tag{ii}$$

In addition, the inputs  $L_m$ ,  $L_G$ ,  $K_m$ ,  $K_G$  are labor and capital share for the military and civil sector respectively. Following Wilkins, we include M in equation (ii) to allow an externality effect from the defense sector to civilian

sectors. Aggregate labor (L), capital (K) and national income (Q) are given in equation (iii), (iv) and (v) respectively.

$$L = L_m + L_G \tag{iii}$$

$$K = K_m + K_G \tag{iv}$$

$$Q = M + G \tag{v}$$

Considering the above relationships, and taking the total difference of equation (v) and then dividing by Q we obtain equation (vi):

$$\frac{\partial Q}{Q} = \frac{\partial G}{\partial L} \frac{dL}{Q} + \frac{\partial G}{\partial K} \frac{dK}{Q} + \frac{\partial G}{\partial M} \frac{dM}{Q} \tag{vi}$$

Then multiply the first term of RHs of (vi) by L/L and then third term by M/m.

$$Q = F_L L + F_k \frac{dk}{Q} + F_m M \frac{M}{Q} \tag{vii}$$

The above equation (vii) is the simplest form of the Feder Ram model and it shows that how economic growth depends on capital and labor growth.

### 3.2 Research Design

This study examines the impact of defense spending on economic development for both long run as well as short run by using Keynesian model by including trade openness and external debt in production function for the Pakistani economy. The study changed the series into natural logarithm due to inefficient and unreliable estimates by simple linear series<sup>[37]</sup>. According to Sezgin (2001)<sup>[16]</sup> better and unbiased empirical results are provided by log linear specification. Following is the empirical equation for the function of production:

$$\ln G_t = \beta_0 + \beta_1 \ln K_t + \beta_2 \ln L_t + \beta_3 \ln DS_t + \beta_4 \ln TR_t + \beta_5 \ln EXD_t + \mu_t$$

Where,  $\ln G_t$  is natural log of GDP per capita proxy for economic development,  $\ln K_t$  is natural log of capital,  $\ln L_t$  is natural log of labor force,  $\ln DS_t$  is natural log of defense spending as share of GDP,  $\ln TR_t$  is natural log of trade openness, which include imports and exports as share of GDP and  $\ln EXD_t$  is natural log of external debt.

In this research study GDP is used as dependent variable. While on the other side capital, labor, defense spending, trade openness and external debt are incorporated as some independent variables. The purpose to choose GDP as our dependent variable is to understand the effect of the said independent variables on the dependent variable and to see that how these variables are affecting the overall GDP of Pakistan.

### 4. Estimation and Analysis of Results

Descriptive statistics is illustrated in following Table 1. The descriptive statistics shows that mean and standard

deviation of  $\ln(G)$  is 10.54 and 0.27 respectively, whereas the minimum and maximum value of  $\ln(G)$  is 10.04 and 10.98 respectively. The mean and standard deviation of  $\ln(K)$  is 2.85 and 0.11 while max and min values are 3.03 and 2.55 respectively. The mean and std. deviation of  $\ln(DS)$  is 1.63 and 0.26 respectively. While the minimum and maximum value of  $\ln(DS)$  are 1.18 and 1.98 respectively. The mean of  $\ln(TR)$  and  $\ln(L)$  is 3.49 and 17.78 and their standard deviation is 0.11 and 0.37 respectively. Whereas, the minimum value of  $\ln(TR)$  and  $\ln(L)$  is 2.99 and 16.75. Similarly, the maximum value of  $\ln(TR)$  and  $\ln(L)$  is 3.66 and 18.01 respectively. The mean of  $\ln(EXD)$  is 23.78. Its standard deviation is 0.792. While, minimum and maximum value of  $\ln(EXD)$  is 22.12 and 24.90 respectively. Table results show that economic growth, capital, defense spending, trade openness and external debt are left skewed while labor force is skewed right. From the kurtosis data, the variable  $\ln(DS)$  show that it has the lowest kurtosis while the highest kurtosis value is of variable  $\ln(TR)$ . While all the other variables have positive kurtosis, which means that the distribution has "fat tail" right. All the series in Jarque-Bera are normally distributed.

**Table 1.** Descriptive statistics

	Ln(G)	Ln(K)	Ln(DS)	Ln(TR)	Ln(L)	Ln(EXD)
Mean	10.54	2.85	1.63	3.49	17.78	23.78
Median	10.59	2.88	1.70	3.50	17.35	23.98
Maximum	10.98	3.03	1.98	3.66	18.01	24.90
Minimum	10.04	2.55	1.18	2.99	16.75	22.12
Std. Dev.	0.27	0.11	0.26	0.11	0.37	0.79
Skewness	-0.22	-0.91	-0.41	-1.8	0.06	-0.43
Kurtosis	1.95	2.1	1.75	9.26	1.82	2.16
Jarque Bera	2.36	6.15	4.08	98.35	2.54	2.64
Probability	0.30	0.04	0.12	0.00	0.28	0.26

It is mandatory to examine the properties of variables that are stationary so that no false regression is observed. After that, long run relationship will be examined among the variables. P-P unit root test and ADF unit root test used to check the stationary of variables. In Table 2 and Table 3, the properties of time series of the variables Log of GDP, log of capital, log of labor force, log of defense spending, log of trade openness, and log of external debt are given. The results of (ADF) and (PP) unit root test confirms that variables capital, economic growth, labor force, trade openness, defense spending and external debt are non-stationary at levels while all these variables are stationary at the first difference. On the other hand, the only variable

which is stationary at level is trade openness. From the results it can be conclude that all the variables are mixed integrated i.e. I(0) and I(1). So, we can say that the series of these variables may also be co-integrated.

**Table 2.** Augmented dickey fuller unit root tests

Variables	Only Intercept		Intercept and Trend		Outcome
	Level	1ST Diff	Level	1ST Diff	
LnG	-0.90	-5.26***	-1.67	-5.19***	I(1)
LnK	-2.17	-6.27***	-2.40	-6.68***	I(1)
LnL	-0.50	-4.48***	-1.99	-4.45***	I(1)
LnDS	-0.31	-7.93***	-1.86	-7.82***	I(1)
LnTR	-5.47***	---	-5.07***	---	I(0)
LnEXD	-1.69	-4.50***	-2.79	-4.91***	I(1)

\*, \*\*, and\*\*\*shows the rejection of Null hypothesis at 10%, 5% and 1% level of significance respectively. Critical values are MacKinnon (1996) one sided p-values.

**Table 3.** Philips-Peron unit root test

Variables	Only Intercept		Intercept and Trends		Outcomes
	Level	1st Diff	Level	1st Diff	
LnG	-0.84	-5.27***	-1.90	-5.19***	I(1)
LnK	-2.23	-6.27***	-2.30	-6.67***	I(1)
InL	-2.23	-6.27***	-2.30	-6.67***	I(1)
LnDS	-0.44	-7.65***	-1.98	-7.58***	I(1)
InTR	-5.72***	---	-5.38***	---	I(o)
InEXD	-2.84	-3.59***	-2.42	-3.57***	I(1)

\*\*\*, \*\* and \* indicates the rejection of Null hypothesis at 1%, 5% and 10% level of significance respectively. Critical values are MacKinnon (1996) one sided p-values.

From the above table the empirical results of these tests indicate that all the variables are combined with mixed order of integration. For such case, the ARDL test is used in order to check the association among all variables. However, before apply the ARDL bound testing approach; lag length should be appropriately selected.

**Table 4.** Bound testing to cointegration

F-Bounds Test Null Hypothesis: No levels Relationships

Test Statistic	Value	Signif.	I(o)	I(1)
F-statistic	6.408418	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

The F-statistics of cointegration are given in Table 4. The empirical results in the table suggests that calculated F-statistics is F=6.408 which is more than the upper critical bound value i.e. 3.38 at 5% level of significance reported by Lee, K., Pesaran, M. H., & Smith, R. (1997). Results of the bound testing to cointegration shows that there is a long run relationship between economic growth,

capital, labor force, defense spending, trade openness and external debt for Pakistan over the period 1972-2016.

**Table 5.** Estimated long run coefficients using ARDL approach

Dependent Variable: lnGDpT			
Regressor	Coefficients	Standard Error	T-Statistics
Constant	-6.27	0.733	-8.560
LnK	0.306	0.048	6.261*
LnL	1.036	0.099	10.481*
LnDS	0.130	0.031	4.182*
LnTR	0.215	0.051	4.229***
LnEXD	-0.125	0.733	-8.560***

Diagnostic Test

Test	Statistics	Probability
R <sup>2</sup>	0.998	
F-Statistics	753.786	0.000
χ <sup>2</sup> Normal	0.34	0.84
χ <sup>2</sup> Serial	0.22	0.69
χ <sup>2</sup> ARCH	0.10	0.74
χ <sup>2</sup> White	3.43	0.52

Note:

① χ<sup>2</sup> Normal (Jarque–Bera statistic for normal residuals)

② χ<sup>2</sup> (Breusch–Godfrey LM test for no first-order correlation of serial)

③ χ<sup>2</sup> ARCH (for no autoregressive conditional heteroscedasticity)

④ χ<sup>2</sup> WHITE (for homoscedastic errors)

\* Test statistics are significant at 10Percent(level of significance).

\*\* Test statistics are significant at 5 Percent(level of significance).

\*\*\* Test statistics are significant at 1 Percent(level of significance).

Long run coefficients of the (ARDL) bound approach are given in Table 5. The projected long run coefficient of capital has positive effect on economic development in case of Pakistan. Capital is significant at 1%. The results concluded that 1% increase in the capital will also increase the GDP by 0.30% which results in rejection of the hypothesis that capital does not affect the economic growth of Pakistan. The results are in line with the findings of (Beckaert et al. (2005)<sup>[38]</sup>. Similarly, for Pakistan, labor force has a positive and highly significant impact on economic development in the long run. The estimated re-

sult recommends that an increase of 1% in labor force will also increase the GDP by 1.0 percent. This results in the rejection of hypothesis that labor force does not affect the economic growth for Pakistan. These outcomes are similar with the new growth models that incorporate a knowledge producing sector can be interpreted as incorporating the role that investment in human capital (e.g. expenditures on education and training) could have a more permanent impact on the growth process if high skills and training go hand-in-hand with more intensive research and development and a faster rate of technological progress, or if the adoption of new technologies is facilitated by a highly skilled workforce.

Similarly, the long run coefficient of military expenditure has highly significant positive influence to GDP in case of Pakistan. The evidence shows that an increase of 1% in military expenditure will also result in an increase of GDP of the country by 0.13 percent. This empirical evidence, results in rejection of the null hypothesis that military expenditure has no impact on the overall economic development. Thus, the above results provide validation of Keynes military Hypothesis which is, that military expenditure serves as an injector in the economic growth of the country and it excites and enhances the economic growth through its multiplier effects in case Pakistan. These results of our study are similar to that of Hassan, M. K. (2004)<sup>[39]</sup>. The author reported that military expenditure boosts the economic development in case of Pakistan. However, the projected coefficients are different than that study due to the different time span used in both the studies. However, the empirical results of this study are similar with findings of Asghari, M. (2017)<sup>[40]</sup> for Guatemala economy, who found that military spending and economic growth both are positively associated. Moreover, the long run relationship between trade openness and economic development is positive for Pakistan and trade openness is significant at 10 percent. 1 percent increase in trade openness will automatically increase the overall GDP by 0.21 percent, which results in the rejection of null hypothesis that trade openness does not significantly affect the economic development process. The results of our study are according to that of new growth theory. The theory claims that trade will expand the market, encourages the research and developmental projects, reallocates employment to more innovative activities that require more human capital and increases knowledge flow among countries.

Whereas the long run coefficient of external debt has a destructive impact on the economic development of Pakistan. The results further suggest that external debt retards the economic activity in Pakistan and the result of this study are similar with the findings<sup>[41]</sup>. The empirical evi-

dence of the study is consistent with the findings of Ali, B. M., & Mshelia, S. I. (2007)<sup>[42]</sup> that external debt causes poverty in the country which is debtor. In their view external debt is the main cause of hampering economic growth. The long run estimations of the model, given in Table 6 show that four out of the five independent variables (capital, labor force, defense spending, and trade openness) show a positive impact in encouraging the growth process in case of Pakistan. While only one independent variable (external debt) has a negative impact in promoting the overall growth process. Further, we will explain the Impact of the parameters as: The capital has a positive effect on the overall growth process in long run for Pakistan. This suggests that an increase in the capital stock will promote the economic growth of Pakistan by providing the basic infrastructure facilities i.e. energy, education and transport and dams. To the economic progress, labor force is considered as highly advantageous. By increasing the productivity, it contributes towards the development of economic sector. Enhancement of labor force result in overall demand as the buying power rises. The skilled labor is an attraction for the foreign investors that would accelerate the economic activity in the country. Though, it is also mandatory that a comprehensive policy regarding the skilled labor should be in place that can further improve the skills of labor and encourage the technological advancements towards the higher productivity. Investment on labor would reduce the cost of production and result in increased overall market activity of any country. Similarly, military sector spending has positive role in overall economic growth in long run in Pakistan. Conducive environment portrays a promoting role of defense sector spending on the Pakistan economy. Conducive environment results in foreign investment well as local investment. Positive spillover impact of military spending on Pakistani economy also plays a promoting role. Producing own defense products and then exporting these defense products to other countries also contributes positively on the overall economic growth of a country. Other positive impacts of defense spending are like engaging the population in R&D, educational skills and providing technical skills for sustainability of overall economic growth. In case of Pakistan, trade is an imperative policy tool to speed up the economic progress. Due to trade, the exports of the country surge which results in capital inflow. By creating the balance between imports and exports, trade deficit can also be scaled down. Export enhancement can lead to rise in production which would help in keeping the production cost at low. Due to low production cost, the prices of commodities would be in reach, and will create further demand. In addition, trade enhances market competition

that would compel the producers to work on R&D, which would bring about the technological innovation in the market. An innovative market has capacity to support the economy and keep the production cost in control. The effect of external debt on the overall economic development of Pakistan is negative. An increase in the external debt will result in downfall of economic development. Ali, H. E. (2011)<sup>[43]</sup> also studied the effect of external debt on economic growth for Pakistan and found that external debt retard the economic growth and it has negative impact on the overall productivity of capital and labor which thereby adversely affects the economic growth of the country. The remedy to overcome external debt is that the country should increase its savings and trade (increase exports and decrease imports) as the policy measure. This will result in the less dependency on the external debt.

**Table 6.** Error correction representation for the selected ARDL model

DEPENDENT VARIABLE: ΔGDPt			
Regressor	Coefficients	Standard Error	T-Statistics
Constant	-2.707	2.067	-1.309
ΔK	0.103	0.028	3.622***
ΔL	0.221	0.162	1.365
ΔDS	0.039	0.033	1.170***
ΔTR	0.100	0.027	3.648***
ΔEXD	-0.202	0.043	-4.655***
ECM (-1)	-0.856	0.113	-7.566***

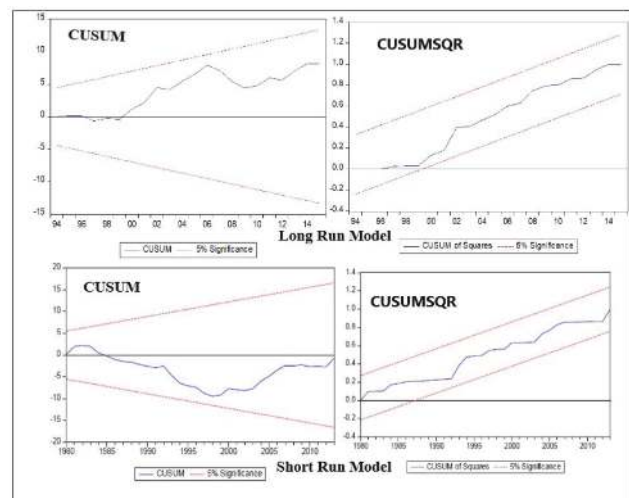
$$ecm = LNGDP-0.306*LNK-1.036*LNL-0.130*LNDS-0.215*LNTR+0.125*LNEXD+6.271*C$$

NOTE: Significance of 10%, 5% and 1% are represented as \*,\*\* and \*\*\* respectively.

To examine the short run relationship among variables, Error Correction term of OLS is used. Table 6 shows the results of short run relation. It gives an idea about the adjustment speed a variable would take to converge from short run disequilibrium to long run equilibrium. Banarjee et al (1998)<sup>[44]</sup> stated that the formation of long run relation among variables is calculated through the significance of lagged error term having a negative sign. It can be confirmed from the results as reported in Table 6, that lagged error term is -0.85 and represent a high significance. It can be deducted from the stats that convergence rate from a previous year shock to current year is nearly 85 per cent. In case of short run, capital, labor force, military spending and trade openness have encouraging effect on the overall economic development of Pakistan. While on the contrary, external debt has an overall harmful influence on the overall economic growth of the country. External debt has stronger impact as compared to the capital, labor force, trade openness and military spending, whereas the impact of defense sector spending and labor force has irrelevant or insignificant effect in the short run. Similarly,

in both short and long run, labor force has a strong impact on economic growth. Capital and trade openness both are strongly significant and have an encouraging impact on economic development. So, from the empirical evidence of the study, it is confirmed that there is short run impact of capital, defense spending, trade openness and external debt. While there is a long run impact of all the variables on economic growth in case of Pakistan.

The estimates of short run of the study suggest that, capital, trade openness and military spending effects growth positively while labor has insignificant impact. While external debt has a negative effect on the economic development in the short run. This declares that policy makers in Pakistan should use capital, military spending and trade openness as a tool for encouraging the economic growth and achievement of economic goals in the short run. Since the start of War on terror, Pakistan is playing a frontline ally role. As a backlash, terrorists targeted government institutions, public places and property causing invaluable loss to the state. Resultantly, the environment turned out to be unfriendly for trade and economic activity. To counter such active threats, many offensives were launched against the terrorists. These measured required an updated military gear, technological advance surveillance systems and on ground military operations, that incurred a huge cost. With effective policy measures, a peaceful conducive environment was intended that can facilitate and attract the investors and lay grounds for economic acceleration and sustainability. Model used for study has reflected satisfactory results for diagnostic test applied such as serial co-relation, normality, model specification and auto regressive heteroskedasticity. In addition, to test the longer and short run dynamics, cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ) tests (Figure 1).



**Figure 1.** Longer and short run dynamics

## 5. Conclusion

The empirical evidence of the unit root test indicates that the order of integration of trade openness is  $I(1)$ , while all the other variables, such as, GDP, capital, labor force, defense spending and external debt are integrated at  $I(0)$ . Apart from this, long run relationship between the afore-said variables has been confirmed by cointegration analysis. From the results of Unit Root tests, it was revealed that variables used in the study possess integration of mix order. Hence, for the mixed order of integration, the ARDL Bound testing approach was chosen to analyze the cointegration among the selected variables. From the results long run relationship was confirmed between the economic growth, capital, labor force, defense spending, trade openness and external debt. In the long run, economic growth had positive affect on capital, labor force, defense spending and trade openness. On the other hand, external debt had negatively affected the economic growth. It was also revealed from the results that defense spending and trade openness had a positive contribution towards the economic development in the short run, while labor demonstrated insignificant. Further the Causality analysis reflected a unidirectional causality running from government's expenditure on defense to development of growth, confirming the applicability of Military Keynesian hypothesis in case of Pakistan for the period under investigation. Results confirmed that defense expenditure is a useful policy tool which stimulates the economic growth through its multiplier effect. The results of this study imply that external debt retards the economic growth. External debt always weakens the growth of economy and effect the investment adversely. Too much reliance on debt should be discouraged by the policy makers. Therefore, the debt policy be revised and to counter the deficit budgeting practice the government should widen the base of income generation ventures.

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