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# The Determinants of Military Expenditures in Pakistan

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## ABSTRACT

Using auto regressive distributed lag (ARDL) bound testing, it was determined what factors influence Pakistani military spending. World Development Indicators of the World Bank provided the time series data from 1975 to 2020. The findings demonstrate the long-term cointegration between the variables in the equation describing military spending. The results in the disturbances lack serial correlation, autoregressive conditional heteroscedasticity (ARCH), and heteroscedasticity. Jarque-Bera's normality test shows that stochastic disturbances follow a normal distribution as well which shows that the finest versions of the models are displayed. The residual characteristics and stability tests of the error correction model are thus satisfied. We conclude that the government should focus on these empirical findings while formulating military expenditures for Pakistan: Government of Pakistan should focus on increasing the GDP growth so that military expenditures should be met according to the requirement, as there is positive association between GDP growth and military Expenditures. FDI can play a major role in increasing GDP growth.

## ملخص

من خلال استخدام اختبار الحدود باعتماد الانحدار الذاتي ذي الفجوات الموزعة (ARDL)، تم تحديد العوامل التي تؤثر على الإنفاق العسكري الباكستاني. وتوفر مؤشرات التنمية العالمية للبنك الدولي بيانات السلاسل الزمنية من عام 1975 إلى عام 2020. وتبين النتائج التكامل المشترك طويل المدى بين المتغيرات في المعادلة التي تصف الإنفاق العسكري. النتائج في الاضطرابات تفتقر إلى


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الارتباط التسلسلي، انحدار ذاتي مشروط باختلاف التباين (ARCH)، واختلاف التباين. ويبرز اختبار الحالة الطبيعية لجاك بيرا (Jarque-Bera) أن الاضطرابات العشوائية بدورها تتبع نمطا طبيعيا في التوزيع، وهذا ما يوضح أنه يتم عرض أفضل نسخ النماذج. وبذلك يتم استيفاء الخصائص المتبقية واختبارات الثبات لنموذج تصحيح الخطأ. ونستنتج أنه يتعين على الحكومة التركيز على هذه النتائج التجريبية في تخصيصها للنفقات العسكرية في باكستان: ينبغي لحكومة باكستان التركيز على زيادة نمو الناتج المحلي الإجمالي بحيث ينبغي تلبية النفقات العسكرية وفقا للمتطلبات، لأن هناك ارتباط إيجابي بين نمو الناتج المحلي الإجمالي والنفقات العسكرية. ويمكن للاستثمار الأجنبي المباشر (FDI) أن يساهم بشكل كبير في زيادة نمو الناتج المحلي الإجمالي.

## ABSTRAITE

En utilisant le test de liaison ARDL (auto regressive distributed lag), il a été déterminé quels sont les facteurs qui influencent les dépenses militaires pakistanaises. Les indicateurs du développement mondial de la Banque mondiale ont fourni les données chronologiques de 1975 à 2020. Les résultats démontrent la cointégration à long terme entre les variables de l'équation décrivant les dépenses militaires. Les résultats concernant les perturbations sont dépourvus de corrélation sérielle, d'hétéroscédasticité conditionnelle autorégressive (ARCH) et d'hétéroscédasticité. Le test de normalité de Jarque-Bera montre que les perturbations stochastiques suivent également une distribution normale, ce qui montre que les versions les plus fines des modèles sont affichées. Les caractéristiques résiduelles et les tests de stabilité du modèle à correction d'erreur sont donc satisfaits. Nous concluons que le gouvernement devrait se concentrer sur ces résultats empiriques lors de la formulation des dépenses militaires pour le Pakistan : Le gouvernement pakistanais devrait se concentrer sur l'augmentation de la croissance du PIB afin que les dépenses militaires soient satisfaites en fonction des besoins, car il existe une association positive entre la croissance du PIB et les dépenses militaires. Les IDE peuvent jouer un rôle majeur dans l'augmentation de la croissance du PIB.

**Keywords**: Military Expenditures, GDP growth, FDI, Trade

**JEL Classification:** E20, F52, H40, H56

## 1. Introduction

The basic question about determining military expenditures is how much money is required for defense proposes? How much threats being faced by a country? How a country can afford these expenditures to counter the threats? So, to determine the factors affecting military expenditures, we have to focus on fiscal policy and security policy of a particular country. Generally political governments decide about the allocation of military expenditures. It is relied upon military doctrine whether the expenditures should be made on personnel development of army or on weapons related equipment. This decision depends on nature of expected threats. To determine military expenditures, a particular country has to consider the enemy's strength, neighbors, economic conditions, and political status (Balla, 2000).

> *The following current and capital costs are covered by military defence: Armed forces, especially those involved in peacekeeping; defence ministries and other governmental organisations projects for the government; Paramilitary forces may participate in military operations and military space activities if they are deemed capable of doing so (Kumar, 2017).*

Understanding the factors that influence military spending is crucial since it might potentially hinder the development of developing nations' economies in post-conflict settings. Additionally, the vicious cycles that can be created by conflict, economic expansion, and military spending make it even more crucial that these drivers be recognised. In common sense, military expenditures are taken as most undesirable and hostile type of public expenditures. But why the different countries allocate major share of their budget for military purposes? It is an important question that needs to be investigated, especially in the case of Pakistan.

The further justification for this research is two stepped as firstly, Pakistan is located in the most important area of South Asia which has faced a high level of insecurity & uncertainty. A few specialists accept that Pakistan and India are in weapons contest conditions (Dunne et al., 1999; Ocal, 2003; Yildirim and Ocal, 2006). Secondly, Pakistan has an inside and outer security emergency. Moreover, after the atomic blasts in 1998, Pakistan has become an atomic force. As Pakistan has been facing internal

terrorism as well as China-Pakistan Economic Corridor (CPEC) has been launched successfully, so responsibility of Pakistan Army has been increased. Furthermore, there are many other factors that are boosting military expenditures of Pakistan. So, it was necessary to determine relevant determinants of military expenditures in Pakistan.

## 2. Literature Review

Droff and Malizard (2021) employed a demand function model for the annual data period 1958–2017 to check the key determinants of French defense spending. The dependent variable was real defence spending, while the independent variables were GDP, NATO membership, military actions abroad, and population as a proxy for public service demands. They concluded that the system is resistant to changes in specifications and alterations in defense policy after 1991. This article emphasizes that economic factors are the primary determinants of French defense policy.

The method of estimating ideal points was utilised by Seiglie and Xiang in 2021. (i.e., an item response model). They examined a sample of roll-call data on defense spending from the 112th US Senate to assess the reasons of military spending. The dependent variable measured legislative attitudes on defense spending, while the endogenous factors were veteran status, unemployment, and college education. They came to the conclusion that Republicans are more inclined to favour military spending, which we discovered to be statistically and substantively significant throughout our investigation. Additionally, interest group campaign contributions have a significant impact on how likely a legislator is to support defense expenditure. A congressional district's elected official is more likely to support military spending if there are more veterans or if the unemployment rate is lower. The impact of public opinion disappears if district demographics are taken into account.

To examine how defense spending affects people's subjective well-being, Kwon (2021) used complete sample estimates (OLS and Ordered Probit Model with Clustered Standard Error) for the annual data period 1995 to 2014. The dependent variable was the amount spent on defense, whereas the independent variable was the amount spent on all military, defense-related, and paramilitary forces. According to a number of criteria, they came to the conclusion that defense spending had a negative impact on individual SWB in both developed and developing countries. The

findings suggest that after reaching a saturation threshold, increased defense spending is likely to drive out other crucial policy areas that are just as beneficial in lowering the likelihood of violent conflict.

Yalta and Yalta (2021) applied a three-stage least squares (3SLS) model for the period 1980-2016 to check the factors affecting defense spending in the Gulf. The dependent variable was military spending, while the independent variables were real GDP, population size, and real oil price. Results show that the GCC member states do not subsidize each other's military spending. Furthermore, the US military presence in the region has a significant impact on defense spending in the region.

According to Sheikh and Chaudhry (2013), Pakistan and India have hostile and violent relationships, and neither of the countries ignores its defense spending. A country's defense burden is inevitable, and it allows resources of a state to be moved from development projects (Anwar, et al., 2012). Smith (1980 & 1995) lighted the way to delve into the multiple determinants of military expenditures within a neoclassical model that focuses the question in hand a wider and more comprehensive method.

Since their initiation as independent states in 1947, India and Pakistan have sustained a hostile relationship with each other. There are a lot of factors behind the hostile and combat behaviors of the two neighboring countries. The main factor is the religious differences (Alexander, 1987; Ganguly, 1995 & 1997; Deger and Sen, 1990; Tibbett and Lodhi 1997). Many other factors such as political, social, racial, and economic exist. Both governments do not think that they are just racing for weapons in enmity and wasting their developing budgets (Tibbett and Lodhi, 1997).

Albalate et al. (2012) explained that military expenditures were affected positively by civil war, past war, emulation, concentration, gross domestic product per capita and negatively by democracy, freedom, trend, majoritarian, pres. major and population (Albalate, Bel, and Elias, 2012). Income, relative price, spill-in, debt-to-export ratio, debt-to-reserve ratio, population, domestic distress, and democracy have short- and long-term effects on defense budgets (Wang, 2013). There was positive impact of gross domestic product, security web, urbanization on military expenditures while negative impact was found on military expenditures by globalization, population, regional military expenditures and dependency ratio (Solrain, 2017). All levels of democracy are responsible

of increasing military expenditures except social democratic political regimes where less amount is spent on military requirements. Second, increasing level of military expenditures lead to much inequality of income (Töngür, Hsu and Elveren, 2015). Main components and determinants of size of military expenditures are economic, external, non-economic, internal, geographical, geopolitics, political and geostrategic that are playing an important role (Kumar, 2017).

Thus, there are at least three persuasive reasons for examining the determinants of military expenditure: the role it plays in post-conflict conditions, its effects on growth in developing countries and the vicious circles shaped by military spending, growth and conflict. Objective of this research is to find out determinants of military expenditures in Pakistan. No single study was found out that considered total debt services (percent of GNI) and population below fourteen years as determinants of military expenditures with latest data. Ajmair et al. (2018) examined the impact of military expenditure on economic growth in Pakistan but did not consider the determinants of military expenditures. So, it was necessary to know about relevant determining factors of military expenditures in Pakistan.

## 3. Data and Methodology

The stationarity of the variables was examined using the Augmented Dickey Fuller (ADF) test. Estimation techniques was decided to find out relevant determinants of military expenditures after finding out the stationarity of variables. We applied ARDL bound testing estimation technique as no single variable was found out stationary at second difference while all variables were a mixture of stationarity at first difference and at level.

### 3.1. Model

To determine the factors that influence military spending in Pakistan, we estimated the multiple linear regression model shown below. Existing empirical literature on military expenditures' determinants was consulted to collect independent variables. The relation that we have interest in estimation is:

$$me_t = \alpha + \beta_1 fdi_t + \beta_2 gdpg_t + \beta_3 p14_t + \beta_4 trd_t + \beta_5 tds_t + \varepsilon_t \quad (1)$$

The ARDL model shape of equation (2), according to Pesaran et al. (2001), having short run and long run relationship is as under:

$$\Delta lnme_t = \varphi_0 + \sum_{i-1}^{p} \varphi_1 \Delta lnme_{t-i} + \sum_{i-0}^{p} \varphi_2 \Delta lnfdi_{t-i} + \sum_{i-0}^{p} \varphi_3 \Delta lngdpg_{t-i} + \sum_{i-0}^{p} \varphi_4 \Delta lnp14_{t-i} + \sum_{i-0}^{p} \varphi_5 \Delta lntrd_{t-i} + \sum_{i-0}^{p} \varphi_6 \Delta lntds_{t-i} + \beta_1 lnme_{t-1} + \beta_2 lnfdi_{t-1} + \beta_3 lngdpg_{t-1} + \beta_4 lnp14_{t-1} + \beta_5 lntrd_{t-1} + \beta_6 lntds_{t-1} + \mu_t \quad (2)$$

Following the establishment of cointegration, the long term relationship is estimated using the conditional ARDL model, which is defined as:

$$lnme_t = \varphi_0 + \beta_1 lnme_{t-1} + \beta_2 lnfdi_{t-1} + \beta_3 lngdpg_{t-1} + \beta_4 lnp14_{t-1} + \beta_5 lntrd_{t-1} + \beta_6 lntds_{t-1} + \mu_t \quad (3)$$

The short run dynamic relationship is estimated using the following error correction model:

$$\Delta lnme_t = \varphi_0 + \sum_{i-1}^{p} \varphi_1 \Delta lnme_{t-i} + \sum_{i-0}^{p} \varphi_2 \Delta lnfdi_{t-i} + \sum_{i-0}^{p} \varphi_3 \Delta lngdpg_{t-i} + \sum_{i-0}^{p} \varphi_4 \Delta lnp14_{t-i} + \sum_{i-0}^{p} \varphi_5 \Delta lntrd_{t-i} + \sum_{i-0}^{p} \varphi_6 \Delta lntds_{t-i} + \delta ect_{t-1} + \mu_t \quad (4)$$

Where

$me_t$ = military expenditures

$fdi_t$ = foreign direct investment

$gdpg_t$ = GDP growth (annual percentage)

$p14_t$ = Population under age of fourteen years

$trd_t$ = total trade volume (percentage of GDP)

$tds_t$ = total debt services (percentage of GNI)

$\varphi_0$ = Constant term

$\mu_t$ = White noise

$\varphi_1 - \varphi_6$ = Coefficients of short run explanatory variables)

$\beta_1 - \beta_6$ = Coefficients of long run explanatory variables)

$ect_{t-1}$ = Error correction term

$\delta$ = adjustment speed operator

$\Delta$ = Operator of first difference

$ln$ = Natural log.

$p$ = operator for lag length

Subscript t indicates the time-series data while small letters were used to write the variables in log form.

Expected relationship of independent variables and dependent variable is as under:

- Expected relationship between foreign direct investment and military expenditures is positive in case of Pakistan as suggested by Pacific et al. (2017).

- Deger's (1986) found positive relationship between total population and military expenditures in case of 44 less developed countries while Albalate et al. (2012) found negative association in case of 157 countries of World. And we will see the impact of population below fourteen years' age. This seems that there will be a positive relationship in our case as aged, grouped people are non-productive.

    - Expected relationship between gross domestic product growth ($gdpg$) and military expenditures is positive in case of Pakistan and India as suggested by Sheikh and Sharif (2013).

    - Expected relationship between trade and military expenditures is positive if trade balance is surplus, and relationship is negative if trade balance is deficit. Dunne (2003) claimed that in developing countries, exports earnings support in generating foreign reserves to pay foreign debt and also permit imports to be brought without borrowing from foreign financial institutions

like IMF. So there is negative relationship between debt services and military expenditures.

- Expected relationship between debt services and military expenditures is negative. As we have to make payment against foreign debt in shape of debt services.

World Bank's World Development Indicators (WDI; 2020) was consulted to take annual data during the period 1975-2020**.** To find out relevant determining factors of military expenditures, we used auto regressive distributed lag approach. The Residual Johansen test (1991 and 1995), the maximum likelihood-based Johansen-Juselius (1990) test and based Engle-Granger (1987) test, are some of the other methods used to perform cointegration analysis. However, due to low power and other issues (non-linearities, heteroscedasticity, noise in the independent variables, outliers, etc.) associated with non-auto regressive distrusted lag techniques of cointegration, the autoregressive distributed lag (ARDL) approach has become more prominent. Although autoregressive distributed lag does not require checking time series qualities of variables, it is important to do so to check none of the variable is 2$^{nd}$ difference stationary. Because of the following reasons the ARDL technique is used (Pesaran et al. 2001).

- It is not essential to test the variables' integrating order.
- Even small sample size can be used with this method.
- If the lag length is known, the model can be estimated using ordinary least squares.
- Both short and long-term relationships are estimated.

Before estimating the military expenditures equation through ARDL, Akaike information criteria (AIC) was used to choose the optimum lag length. In ARDL, determining the optimal lag length is critical since it clarifies over-parameterization and degree-of-freedom-saving (Tsadkan, 2013 and Taban, 2010).

## 4. Results and Discussion

Results of Augmented Dickey Fuller (ADF) test are given in Table-1. It shows that military expenditures are first differenced stationary in intercept specification at one percent level of significance; foreign direct investment is level stationary at 10 percent in both specifications. In both provisions, the increase of the gross domestic product is level and stationary at the 1% threshold of importance. At a ten percent level of significance, a population under the age of fourteen is first differenced stationary in intercept and trend definition. At a 1% significance level, the total trade volume (as a percentage of GDP) is first differenced stationary in intercept and intercept & trend specifications. Total debt services (percentage of GNI) are level stationary in intercept at ten percent and first differenced stationary at ten percent, in intercept & trend specifications at one percent significance level.

**Table 1:** ADF Unit Root Test

| Variables | Level | | 1st Difference | |
|---|---|---|---|---|
| | Intercept | Intercept& Trend | Intercept | Intercept& Trend |
| *me* | -0.88 | -1.62 | -4.90* | -1.62 |
| *fdi* | -2.86** | -3.88** | -11.90* | -11.78* |
| *gdpg* | -5.92* | -6.26* | -11.77* | -11.58* |
| *p*14 | -2.06 | -1.47 | -2.12 | -3.57** |
| *tds* | -2.06 | -2.77 | -9.52* | -9.47* |
| *trd* | -2.65** | -2.90 | -2.90** | -6.93* |
| 1 % critical values | -3.58 | -4.17 | -3.58 | -4.17 |
| 10% critical values | -2.60 | -3.18 | -2.60 | -3.18 |

Note: $\boldsymbol{me, fdi, gdpg, p14, tds\ and\ trd}$ represent overall military expenditure, foreign direct investment, GDP growth (annual percentage), Population under-age of fourteen years, total debt services (percentage of GNI) and total trade volume (percentage of GDP). Variables containing two ** are significant at ten percent level of significance while variables containing one * are significant at one percent level of significance.

### 4.1. Lag Selection

Before estimating an ARDL model, the Akaike Information Criterion (AIC) and the Schwarz Bayesian criterion (SBC) are commonly used to choose the optimal lag length. Because AIC is useful for small sample

sizes, so. it was applied to choose the optimal lag length in this case. (Tsadkan, 2013). Instead of using the first difference, Uko and Nkoro (2016) suggest measuring ARDL at the level.

In the first stage, the F-statistic is determined using the two lags provided by the Akaike Information Criterion. Table -2 demonstrates that model one's estimated F-statistics are more than the upper bound of 1% critical values, offering empirical support for the rejection of the null hypothesis that there is no cointegration between the variables.

**Table 2:** F-statistics of Cointegration Relationship

| | **Model 1** | |
|---|---|---|
| **F. Statistic Calculation** | 7.092 | |
| | Level of Significance | |
| | L.B | U.B |
| '1 percent' | 3.06 | 4.15 |
| '5 percent' | 2.39 | 3.38 |
| '10 percent' | 2.08 | 3.00 |

Note: upper bound (UB) and lower bound (LB) are critical values, respectively. Source: - Calculations of Authors.

## 4.2. Long Run Cointegration

Table 3 displays the calculated coefficients for the long-run cointegrating vectors. The findings indicate that foreign direct investment has a negative and considerable impact on military spending. Given the abundance of resources made accessible by foreign direct investment in the local economy, the relationship between foreign direct investment and military spending should be positive, but in this case, the results are negative. Reason may be the uncertain atmosphere in Pakistan due to terrorism. Increasing military spending is a frequent policy response to reduce conflict and discontent in a nation. In addition to aiding in the state's defense against internal and external conflict, the strategy also produces other beneficial economic and business effects, like safe investor returns (Deger and Sen, 1983). The rise in military spending, however, has opportunity costs associated with it, including increases in government spending, taxes, import costs (if those imports include weapons and training), borrowing costs, and an expansion of the money supply (see, for example, Dunne, Smith, and Willenbockel, 2005).

Furthermore, increased military spending not only deprives physical, economic, and financial infrastructure of productive investments, but it also serves as a message to prospective multinational FDI investors to stop investing in the nation out of concern for a potential armed conflict. Therefore, investing in the military would be economically illogical if the costs of doing so outweighed the benefits.

Gross domestic product growth affects military expenditures positively and significantly. When gross domestic product growth increases, a huge number of resources is available to meet the requirement of military expenditures. Same results were presented by Heo (1998) that there is positive link between real GDP growth rate and military expenditures (average share of GDP).

Population's underage of fourteen years and military expenditures have negative and insignificant association. Increasing population under fourteen years require more defense expenditures, so results should be positive that are according to the theory. Negative association between population and military expenditures was also witnessed by Dunne and Perlo-Freeman (2003), Collier and Hoeffler (2007) and Dunne, Perlo-Freeman, and Smith (2008).

Total debt services (percentage of GNI) are showing positive and significant relationship with military expenditures. There should be negative association between total debt services and military expenditures. Channel can be explained that very a smaller number of resources is left behind for military expenditures when increasing total debt services are paid. But here in case of Pakistan the relation is positive as Pakistan is facing enmity of India and its allies. Dunne, Perlo-Freeman, and Soydan (2004) concluded that external debt and budget deficit have negative impact on military expenditures indirectly through affecting GDP growth negatively.

Total trade volume (percentage of GDP) has negative and insignificant association with military expenditures. Relationship between total trade volume and military expenditures should be positive if trade balance is positive while it should be negative in case of negative trade balance. Here results are negative as the trade balance is negative in case of Pakistan. Polachek and McDonald (1992) concluded that trade between two countries become the root cause of reduction in military spending that shows negative relation between trade openness and military expenditures.

**Table 3:** Long-run Estimation

| Model-1 | | | |
|---|---|---|---|
| **Variables** | **Coefficient** | **t-statistic** | **p. value** |
| *fdi* | -0.064 | -1.980 | 0.071 |
| *gdpg* | 0.104 | 2.064 | 0.061 |
| *p*14 | -0.189 | -0.244 | 0.810 |
| *tds* | 0.286 | 4.219 | 0.001 |
| *trd* | -0.154 | -0.764 | 0.459 |

### 4.3 Short Run Cointegration/ Model of error correction

Table-4 displays approximate short run dynamic relationships derived from the error corrected ARDL model. It is obvious from the table that foreign direct investment, GDP growth, Population's underage of fourteen years, Total debt services (percentage of GNI) and Total trade volume (percentage of GDP) cause military expenditures both in short and long run. The justifications have already been summarized in table 3 for the long run relationship.

In a dynamic model, the error correction term ( $ect_{-1}$ ) gauges how quickly corrections are performed to return the system to equilibrium. If the error correction term has a significant negative estimate, long-run equilibrium can be attained. Its estimate of -1.021 indicates a one-year change in the direction of long-run equilibrium's deviations.

The residuals of the error corrected version of the auto-regressive disturbed lag model were also assessed using several diagnostic tests. No serial correlation, heteroscedasticity, or autoregressive conditional heteroscedasticity (ARCH) impact is seen in the disturbances, according to the results. Another argument for the normal distribution of stochastic disturbances is made by Jarque-Bera's normality test. That exhibits models in their ideal alignment. Thus, the residuals of the error correction model satisfy their properties.

**Table 4:** Model of Error Correction

| **Model-1** | | | |
|---|---|---|---|
| **'Variables'** | **'Coefficient'** | **'t-statistic'** | **'p. value,** |
| $\Delta(me(-1))$ | 0.448 | 4.257 | 0.001 |
| $\Delta(me(-2))$ | 0.528 | 4.336 | 0.001 |
| $\Delta(me(-3))$ | 0.272 | 2.337 | 0.037 |
| $\Delta(me(-4))$ | 0.391 | 2.774 | 0.016 |
| $\Delta(fdi)$ | -0.039 | -2.912 | 0.013 |
| $\Delta(fdi(-1))$ | 0.008 | 0.663 | 0.519 |
| $\Delta(fdi(-2))$ | -0.020 | -2.074 | 0.060 |
| $\Delta(fdi(-3))$ | 0.019 | 2.704 | 0.019 |
| $\Delta(gdpg)$ | -0.046 | -4.405 | 0.000 |
| $\Delta(gdpg(-1))$ | -0.153 | -7.897 | 0.000 |
| $\Delta(gdpg(-2))$ | -0.118 | -7.873 | 0.000 |
| $\Delta(gdpg(-3))$ | -0.076 | -5.580 | 0.000 |
| $\Delta(p14)$ | 7.009 | 1.898 | 0.081 |
| $\Delta(p14(-1))$ | 13.419 | 2.547 | 0.025 |
| $\Delta(p14(-2))$ | -7.834 | -1.344 | 0.203 |
| $\Delta(p14(-3))$ | -8.103 | -1.388 | 0.190 |
| $\Delta(p14(-4))$ | 20.974 | 4.564 | 0.000 |
| $\Delta(tds)$ | 0.137 | 5.649 | 0.000 |
| $\Delta(tds(-1))$ | -0.152 | -6.398 | 0.000 |
| $\Delta(trd)$ | 0.223 | 3.603 | 0.003 |
| $\Delta(trd(-1))$ | 0.2680 | 3.698 | 0.003 |
| $\Delta(trd(-2))$ | 0.350 | 4.866 | 0.000 |
| $\Delta(trd(-3))$ | 0.246 | 3.538 | 0.004 |
| $CoInt\ Eq(-1)$ | -1.021 | -8.629 | 0.000 |
| Tests of Diagnostics | | | |
| F- statistic for LM Test | 1.862 | | 0.205 |
| F- statistic for ARCH | 3.20 | | 0.995 |
| F- statistic for White Test | 1.009 | | 0.519 |
| J.-B. Test | 4.182 | | 0.123 |
| $R^2$ | 0.912 | | |
| Adjusted.$R^2$ | 0.800 | | |

The model's short and long run estimations are tested using cumulative sum of recursive residuals (CUSUM) and cumulative sum of square of recursive residuals (CUSUMSQ). This test finds parameter instability if the cumulative sum exceeds the 5% critical bounds (Farhani, 2012). Figures 2 and 1 demonstrate that CUSUMSQ and CUSUM do not deviate from the top and below boundaries by exceeding five percent critical values. As a result, we discover that there are no structural splits in the long and short run estimates during the sample period.

**Figure 1:** CUSUM of Recursive Residuals

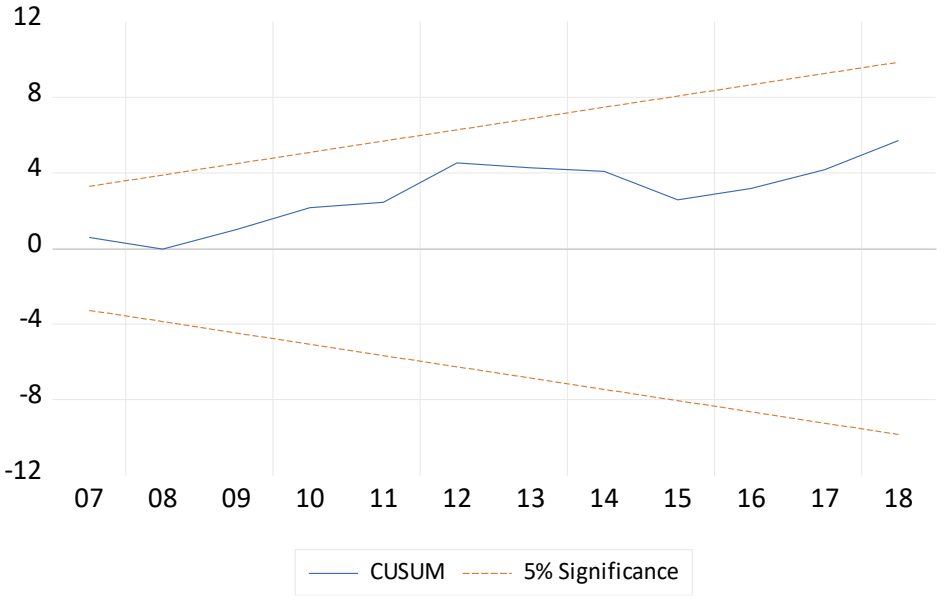
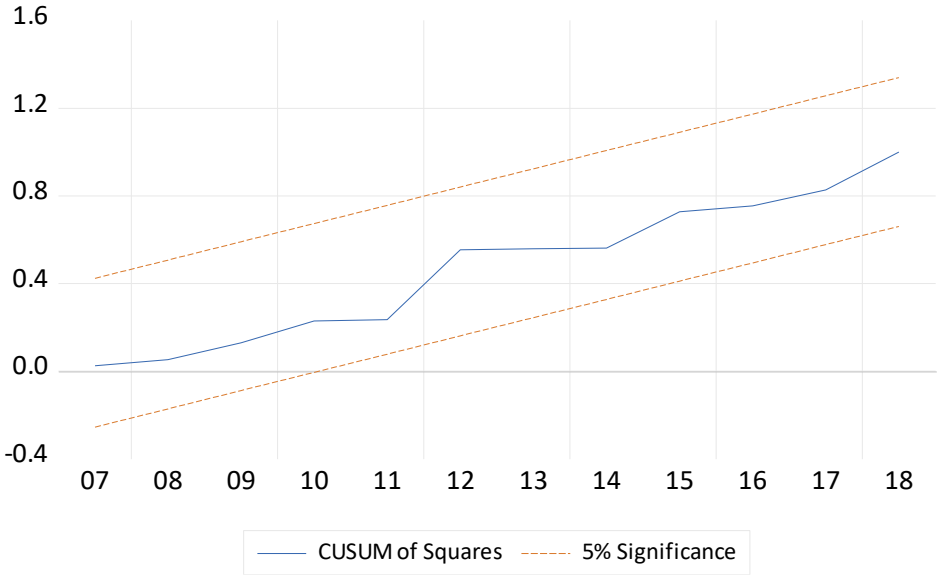



**Figure 2:** CUSUMSQ of Recursive Residuals



## 5. Conclusion and Policy Implications

Here, we used auto-regressive distributed lag to identify the factors that influence military spending in Pakistan (ARDL). We made use of annual data from 1975 to 2020. This was caused by the lack of necessary data due to Bangladesh being a new country. There is a long-term relationship between the variables depicted in the ARDL equation discussed in the methods section. The results further indicate that foreign direct investment GDP growth (annual percentage), population underage of fourteen years, total trade volume (percentage of GDP) and total debt services (percentage of GNI) are considered the concerned determining factors of military expenditures. The estimated coefficients of long-run cointegrating vector show that there is negative and significant relationship between foreign direct investment ($fdi$) and military expenditures. Growth in gross domestic product ($gdpg$) affects military expenditures positively and significantly. Population underage of fourteen years ($p14$) and military expenditures have negative and insignificant association. Total debt services (percentage of GNI) ($tds$) are showing positive and significant relationship with military expenditures. Total trade volume (percentage of GDP) ($trd$) has negative and insignificant association with military expenditures.

There is no serial correlation, autoregressive conditional heteroscedasticity (ARCH), or heteroscedasticity in the data for the disturbances. Jarque-Bera's normality test shows that stochastic disturbances follow a normal distribution as well. The best versions of the models are displayed. The residual properties of the error correction model are thus satisfied.

According to figures -1 and -2, CUSUM and CUSUMSQ are unable to deviate from the lower and upper boundaries by more than 5% critical values. As a result, we discover that there are no structural splits in the long and short run estimates during the sample period.

We conclude that the government should focus on these empirical findings while formulating military expenditures for Pakistan: Government of Pakistan should focus on increasing the GDP growth so that military expenditures should be met according to the requirement, as there is positive association between GDP growth and military Expenditures. FDI can play a major role in increasing GDP growth.

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