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Economic Determinants Affecting Terrorism in case of Pakistan: An ARDL Bounds Testing Approach to Co–integration

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Abstract

This study aims to examine the economic determinants affecting terrorism and its impact on Pakistan. The time series data over the time span from 1986 to 2015 has been utilized. The impact is measured methodically under the factors like inflation, growth of economy, unemployment, openness of trade, using an autoregressive distributed lag model. The factors showed co-integration. From the results of this study a negative relationship between the terrorism and economic growth of Pakistan has been found to exist in short and long run. On the basis of empirical findings, the study further recommends that there was negative impact of the terrorism on economic growths, so to achieve a higher rate of economic growth the government must make effective policies and take actions accordingly to reduce all forms of terrorism.

Keywords: Terrorism, GDP, economic growth, inflation, ARDL,

Introduction

The basis of the term terror comes from an ancient proverb from Chinese literature: "Kill one, frighten ten thousand". The method has since evolved with the passage of time but the idea remains the same. Global terrorism is inexpensive, it does not need vast number or highly trained human resources, yet it is able to achieve its objectives by giving ability to small and weak to frighten the big and strong ones (NATO Review 2016).

Several definitions on terrorism in literature points towards a combination of three different objective elements namely "the use of extreme violence" (Enders & Sandler, 2006) second is "attacks by the terrorists on particular organizations and individuals" (Nasir, Ali, & Rehman, 2011) and third is "seeking publicity" (Llussá & Tavares, 2008). On 11 September 2001, a few terrorists attacked on United State giving rise to a string of actions that caused a paradigm shift from local to global "War on Terror" (Reese & Lewis, 2009).

This is surprising for the developing countries because they are the biggest victim of terrorism and are hit hardest and also alert to the external shocks. The loss Pakistan has suffered to terrorism is greater than Greece, Israel, Spain, Turkey and US in terms of death counts (Abadie, 2006). Despite fighting the war as a frontline state, Pakistan has received relatively less moral and financial recognition (Abadie & Gardeazabal, 2003).

There have been 11 major terrorist events on the soil of US Since 9/11 attacks and most of the other were stopped on or before the day of attack. The terrorism incidents were covered by almost all the news channel and the rhetoric it was able to forms was something like "Islamic Arabia worked together in an organized manner against "Christian America" on the other hand domestic terrorist occurred in the form of isolated incidents (Powell, 2011).

Asian countries faced serious threats to their capital markets due to "War on Terror", technical and financial investment, joint ventures, collaborations went dormant, and a sense of insecurity and instability prevailed among investors. Pakistan being in the central of Asia its economy suffered heavily by the upshot of war on terror (Bilal, Talib, Haq, Khan, & Islam, 2012). Pakistan is not only facing dire instability in economic growth due to dried investments, but there was serous damages to the public and private assets that happened due to the emergence of religious and political

induced terrorist. Polarization occurred in the society where the religious factions were of the view that West was trying to impose its agenda and inciting people to take strict action against West.

The terrorist activities causes sudden and unpredicted loss of human lives, hampers economic activity, infrastructure and also creates uncertainty due to that it lowers the investment rate and also economic scaring away investments and hence economic growth is lowered. Since 2001 Pakistan has not only lost the economic growth but also lost the official estimates of $ 35 to 40 billion in only infrastructure repair costs (Ali, 2010).

After a terrorist attack there was large downfall of economic activity because of fear among people the production and transportation system is also disturbed. The results were disturbing as the losses to economic growth were observed to lie between half a percent to ten percent of the GDP per capita (Blomberg, Hess, & Orphanides, 2004), (Gaibulloev & Sandler, 2009), (Abadie & Gardeazabal, 2003).

In this research to gauge the actual cost of terrorism and its impact on economic activity of a developing activities our model is based on the impact of terrorism on the variables like inflation, GDP, trade openness. Previously most of the recent studies have considered a single variable this study has enlarged the canvas in this regard and included a set of major attributes that are affected by terrorism. Following are the objectives of our study.

- To examined the relationship between terrorism and GDP per capita, unemployment, inflation and trade openness.
- To predict empirically Short as well as the Long Run effects of terrorism on economic growth.

Literature Review

The ARDL bound testing technique to co-integration was used while previous empirical evidences confirmed that the co-integration in Pakistan. Increase in the inflation also compounded the social sufferings, to fuel the fire further, the deprived population easily falling into the hands of terrorists and used in terrorist activities, this impacted the economic growth and played a major role in the contribution of terrorism. (Johnston & Sarbahi, 2016) in his study regarding US strikes on terrorist targets in Pakistan using drones and its aftermaths. Most of the theories suggested that the Muslin population were angered due to drone strikes. But on the other hand people think that drone attacks reduced the ability of terrorists to conduct more attacks. The data of US drone strikes in Pakistan from 2007 to 2011was examined the drone strikes were found to have increased the recruitment of fresh suicide attackers and also changed the mode of terrorist activities. They found that drone strikes were linked with decrease in the lethality and incidence of terrorist attacks, also decreased the targeted attacks in tribal areas. (Richardson, 2011) examined the levels of unemployment and higher education that reflected the deficiency of correspond with the increased in terrorist attacks, the data was taken from 56 countries and also used multivariate regression, the unemployment and higher education were found positively correlated and also showed significant impact, which was found increasing with the increase in terrorist attacks.

(Piazza, 2006) conducted study on the terrorism and its root causes like poverty, inequality and poor economic growth. The data was collected from ninety six countries from 1986 to 2002. There was significant relationship between the malnutrition inequality, poverty, unemployment, inflation and poor economic growth with the dependent variable taken was terrorism, the variables like population, ethno-religious diversity showed significant relationship.

Terrorism and its impact on economic development of a country is better explained with the help of Social Cleavage theory than any other piece of literature in this regard. (Mehmood, 2014)

studied that Pakistan suffered the highest terrorism activities compared to any other country regarding number of deaths over a period of around two decades. The Granger causality test VECM and Quasi structural VAR used to check the relation between terrorism and macro economy. The used 4500 sample from terrorist incidents and consequents 10200 deaths was employed. It distinguished between short and long run effects.

(Rasheed & Tahir, 2012) highlighted the Terrorist activities not only affected the region but also affected the infrastructure, financial outcome of a country. Uncertainty caused instability which is the result of terrorist activities resulting in a loss in the foreign investment, due to that confidence in economy further decreases. Pakistan has also faced the decrease in the foreign direct investment due to increased terrorist activities. (Freytag, Krüger, Meierrieks, & Schneider, 2011) explored that the mainstream data does not attribute a strength to socio economic development due to terrorist activity. Researcher used a negative binomial regression analysis. The time period was 1971 to 2007, in order to test the hypothesis poor socio economic developments conductive to terrorism. Researcher used variables like investment GDP per capita trade openness and consumption. The dependent variable terrorism data was collected from global terrorism data base. The result showed that higher level of consumption, trade openness and investment was negatively correlated.

(Azam & Thelen, 2008) highlighted a theoretical frame work and results showed that as the foreign aid received by a country is reduced the number of terrorist attacks increase. Researcher used variables education, Foreign aid, GDP per capita and also terrorism. The study used a sample of 176 countries from the period of 1990 to 2004. The data source of explanatory variables was World Bank's indicators. With the special investment in foreign aid to enhance quality of life of residents in short term and increase level of education in long run can control terrorist attacks. (Blomberg et al., 2004) explored links between terrorism and the state of the country's economy. Researcher used panel data from 130 countries of terrorist and economic variables. The time period was 1968 to 1991. The result showed that at the time of reduced economic activity the terrorism activity was seen increasing. Findings showed that democratic high income countries' economic contraction has increased terrorist activity.

(Bravo & Dias, 2006) analyzed that deprivation was underlying cause of terrorism. The terrorism data collected from 1997 to 2004. The researcher used ordinary least square method and using cross sectional data of two large regions. The result showed that however the determinants of terrorism were different for both geopolitical still had negative relationship between the number of terrorist incidents and the level of development and literacy level.

(Meierrieks & Gries, 2013) analyzed terrorism and economic growth and used 160 countries from 1970 to 2007. The researcher used Granger causality test and least square dummy variable estimator in dynamic fixed effect model. There was heterogeneous relationship with the passage of time. Mechanics of the countries described the variety of factors like cultural affiliation and politico-economic development. The cold war actions of superpowers sputtered terrorism in Africa, South East Asia and Latin America resulting in political instability and strong terrorism activity.

(Saleem & Sarwar, 2015) explored that terrorism was a hotly debated issue in developing countries like Pakistan. The phenomenon depicted an institutional frame work and a valid determinant of an economy. The data from 1975 to 2013 was taken into consideration annually and Johansen's co-integration technique was used. STATA-11 has been used for estimation into the long and short run nexus between variables has been developed. The result showed that both relationships exist. The result showed 89% convergence equilibrium in the variables.

Methodology

Data Sources

This Study comprises of relationship among the terrorism as a dependent variable and as the predictor variables Inflation, GDP, Unemployment, Trade openness were used. The data of terrorism is collected from the Global terrorism data base and the data of predictor's variable was collected on annual bases for world development indicators from 1986 to 2015 from Pakistan.

Techniques

Using the regression model for several variables like Terrorism, Inflation, GDP, Unemployment and Trade openness:

LTERR = f (LGDP, LINF, LUNE, LTRAD)

LTERR=β_0+β_1 LGDP+β_2 LINF+β_3LUNE+β_4 LTRAD + ε…….. (1)

LTERR = Rate of fatalities from terrorist attacks

LGDP pc = Gross Domestic Product per capita

LINF = inflation

LUNE= Unemployment

LTRAD= Trade openness

Where as

LLN = Natural Logarithm

LTERR = TERR = Rate of fatalities from terrorist attacks

LGDP = Real GDP is the measure of the economic growth. The terrorism has been used by (Johnston & Sarbahi, 2016; Mehmood, 2014; Shahbaz et al., 2013)

LINF = Percentage of employment, (Piazza, 2006; Shahbaz et al., 2013)

LUNE= % of Unemployment, (Richardson, 2011)

TRAD= Trade openness, (Freytag et al., 2011)

The Long run is calculated by bound testing and the short run is calculated by co-integration.

Autoregressive Distribution lag model:

This ARDL approach was developed by the (Pesaran, Shin, & Smith, 2001) based on autoregressive and distributed lag model. In any model of ARDL approach the function is its lag values, one or more explanatory variables are its current and Lag values.

This approach to co-integration not only distinguished between the dependent and the explanatory variables but also estimated the relationship among variables, hence removing the problem of autocorrelation and omitted variables.

The ARDL bound testing approach is applied whether the repressors are of 1(0) or 1(1), it required the dependent variable is of 1(1) in level and explanatory should not be 1(2) or the higher.

AUTOREGRESSIVE LAG MODEL (ARDL)

$$\Delta LTer = a + \sum_{i=1}^{n} b_i \Delta\,(LTer)_{t-i} + \sum_{i=0}^{n} c_i \Delta\,(LGDP)_{t-i} + \sum_{i=0}^{n} d_i \Delta(LUNE)_{t-i} + \sum_{i=0}^{n} e_i \Delta(LTOP)_{t-i} + \sum_{i=0}^{n} f_i \Delta(LINF)_{t-i} + \delta_1\, LTer_{t-i} + \delta_2 LGDP_{t-i} + \delta_3 LUNE_{t-i} + \delta_4 LTOP_{t-i} + \delta_5 LINF_{t-i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

ARDL model used the following steps:

a) Dynamics analysis

b) Long run relationship

c) ECM analysis

Results

Unit root test

Table 1. Augmented Dickey Fuller test (ADF)

Variable	Intercept	Intercept and trend
LTER	-2.9678 (0.4250)	-3.5742 (0.4880)
Δ LTER	3.5806 (0.0003)	--
LINF	-2.9677 (0.0016)	
LTOP	-2.9677 (0.3909)	-3.5742 (0.2477)
ΔLTOP	-3.5806 (0.0000)	
LUNE	-2.9677 (0.3820)	-3.5742 (0.6719)
ΔLUNE	-2.9718 (0.0001)	
LGDP	-2.9718 (0.8903)	-3.5806 (0.2148)
ΔLGDP	-2.991878 (0.02)	

A summary of unit root test results indicated order of integration.

Table 2. Order of the integration

Variables	Intercept
LTER	I(1)
LINF	I(0)
LTOP	I(1)
LUNE	I(1)
LGDP	I(1)

The ADF results test indicated that terrorism is stationary at the first difference. The results of the estimated ADF test showed that GDP, trade openness, unemployment are stationary at the first difference. But Inflation is stationary at Level. Hence indicated that there is mixed integration order which is suitable of condition for ARDL Bound testing Approach to Co-Integration.

Table 3. ARDL Bound Testing Approach Dependent Variable Log of Terrorism

T.S	Value	K
F-statistics	9.45	4
Sig.	L.B	U.B
10%	2.45	3.52
5%	2.86	4.01
1%	3.74	5.06

The F- Statistic value 9.45 showed that it is greater than the value of upper bound that is 4.01 at 5% Level of significance. So the null hypothesis indicated that there is no long run Co-integration and hence failed to accept, it confirmed the existence of Co-integration between the variables in this model. Concerned in this model, the effect of GDP, Inflation, unemployment, trade openness on the terrorism, we estimated model 2 by used ARDL Approach (1, 4, 4, 4, 4) model are reported in table 4.

Table 4. ARDL (1, 4, 4, 4, 4) Based on Akaike info criterion (AIC) Dependent variable log Terrorism.

Variable	Coef.	S. E	t-Statistic	Prob.
LTERR(-1)	-0.1197	0.2641	-0.4532	0.6739
LDGP	22.0625	8.4879	2.5993	0.0601
LDGP(-1)	-25.3350	7.1003	-3.5682	0.0234
LDGP(-2)	19.6597	7.4386	2.6429	0.0574
LDGP(-3)	28.8143	9.6466	2.9869	0.0405
LDGP(-4)	-36.0101	9.3368	-3.8568	0.0182
LINF	0.2181	0.1749	1.2472	0.2804
LINF(-1)	-0.4592	0.2151	-2.1352	0.0996
LINF(-2)	-1.0080	0.3181	-3.1692	0.0339
LINF(-3)	0.2777	0.2626	1.0575	0.3499
LINF(-4)	0.4863	0.35611	1.3655	0.2438
LUNE	-0.0096	0.17822	-0.0539	0.9595
LUNE(-1)	-0.7335	0.1907	-3.8472	0.0183
LUNE(-2)	0.4507	0.1553	2.9028	0.0440
LUNE(-3)	0.6301	0.2373	2.6549	0.0567
LUNE(-4)	-1.1454	0.2248	-5.0951	0.0070
LTRAD	10.6656	1.7226	6.1915	0.0035
LTRAD(-1)	-2.6189	1.8874	-1.3876	0.2376
LTRAD(-2)	-12.3107	2.7414	-4.4907	0.0109
LTRAD(-3)	8.7202	1.8757	4.6489	0.0097
LTRAD(-4)	7.6147	2.1712	3.5072	0.0247
C	-42.1547	10.6830	-3.9459	0.0169

In this R-square value is 0.99, F-statistic 27.86 at 0.002 Akaike info criterion = -1.870864. Hence R-square value in the model explained 99 % variation in the dependent variable that is explained by the listed variables. The F-Statistic showed that overall model is statistically significant.

Table 5. Estimated LR coefficient using the ARDL (1, 4, 4, 4, 4) Approach and AIC (Dependent variable =LTERR)

Variables	Coef.	S.E	t-Statistic	Prob.
LDGP	8.2089	1.2754	6.4365	0.0030
LINF	-0.4334	0.9062	-0.4782	0.6575
LUNE	-0.7214	0.1735	-4.1589	0.0142
LTRAD	10.7807	2.3755	4.5383	0.0105
C	-37.6489	6.1839	-6.0882	0.0037

ECM = LTERR – (8.2089* LDGP – LINF – 0.7214* LUNE + 10.7807* LTRAD – 37.6490)

The coefficients of GDP and terrorism have negative and significant relationship which indicated that both GDP and terrorism enhances economic growth in the long run. Inflation has positive relationship with terrorism if inflation is increased terrorism is also increased but the relation is found to be insignificant.

The coefficient of unemployment is positive and statistically significant. If Unemployment increases then terrorism also increases in the country. But trade openness has negative relationship with the terrorism, trade openness increases with decrease in terrorism.

In the analysis the next stage is the estimation short run dynamics of the ARDL Approach (1, 4, 4, 4, 4) for the variable Terrorism.

The short run dynamics the variables was determined by Error Correction Representation of the ARDL model 1. The ECM specification for ARDL ((1, 4, 4, 4, 4) model is reported in the table .

Table 6. Error correction model

Variables	Coef.	S.E	t-Statistic	Prob.
D(LDGP)	22.0624	8.4879	2.5992	0.0601
D(LDGP(-1))	-19.6596	7.4385	-2.6429	0.0574
D(LDGP(-2))	-28.8143	9.6465	-2.9869	0.0405
D(LDGP(-3))	36.0102	9.3367	3.8568	0.0182
D(LINF)	0.2181	0.1748	1.2471	0.2804
D(LINF(-1))	1.0080	0.3180	3.1692	0.0339
D(LINF(-2))	-0.2777	0.2625	-1.0574	0.3499
D(LINF(-3))	-0.4863	0.3561	-1.3654	0.2438
D(LUNE)	-0.0096	0.1782	-0.0539	0.9595
D(LUNE(-1))	-0.4506	0.1552	-2.9027	0.0440
D(LUNE(-2))	-0.6301	0.2373	-2.6549	0.0567
D(LUNE(-3))	1.1453	0.2247	5.0950	0.0070
D(LTRAD)	10.6654	1.7225	6.1915	0.0035
D(LTRAD(-1))	12.3105	2.7413	4.4906	0.0109
D(LTRAD(-2))	-8.7202	1.8757	-4.6489	0.0097
D(LTRAD(-3))	-7.6146	2.1711	-3.5071	0.0247
ECM(-1)	-0.1196	0.2640	-4.2403	0.0133

The coefficient of ECM (-1) value is negative and significant at 5 percent. It implies that in Pakistan inflation, GDP per capita, unemployment and trade openness are co-integrated when terrorism taken as a dependent variable while inflation has a positive but insignificant effect on terrorism.

Table 7. Summary of Diagnostics test

Test Statistic	F-statistic	Prob.
Serial Correlation LM Test(Autocorrelation)	0.5999	0.625
Heteroskedasticity Test	1.0264	0.5575
Normality LM Test	1.3658	0.5051

The result of this table showed that there is no problem of Hetro-skedasticity and Autocorrelation and residuals are also normal.

Test for Model Stability (Cusum and Cusum Square)

The test of model stability Cusum and Cusum squares has been used and this test proposed by (Brown, Durbin, & Evans, 1975). The significance level at 5% portrayed by two lines use to check the stability of variables.

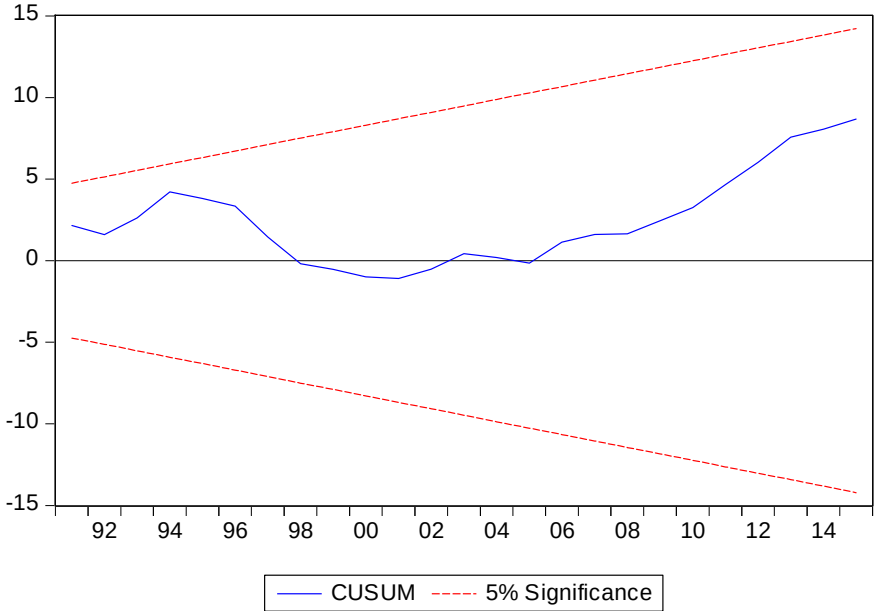

Figure 1. Cumulative Sum of Recursive Residuals

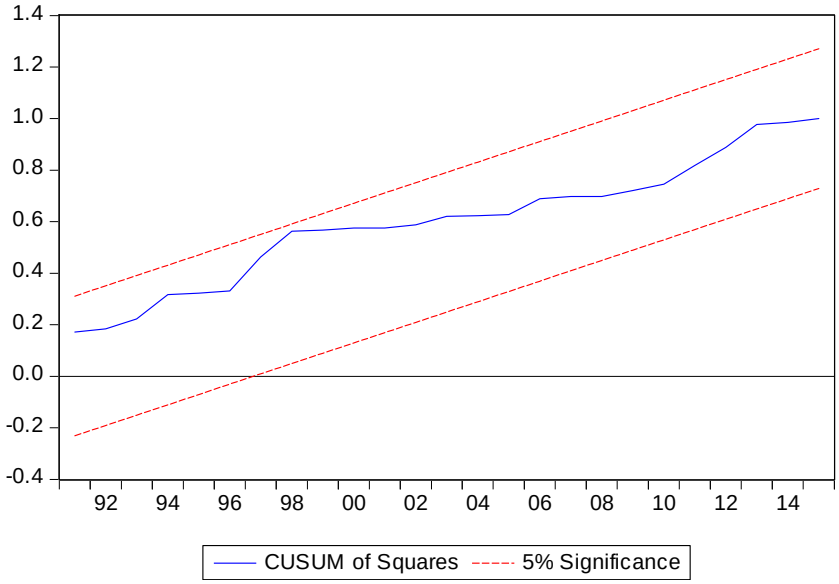

Figure 2. Cumulative Sum of Squares Recursive Residuals

Conclusion and recommendation

This Study examined relationship among the terrorism as a dependent variable and the predictors variables Inflation, GDP, Unemployment and Trade openness. The data of the terrorism was collected from the global terrorism data base. The predictor's variable data was collected on annual bases and data is time series data is collected from the world development indicators from time period of 1986 to 2015 from Pakistan. Results of this study indicated that exist of co-integration among Inflation, GDP, Unemployment, Trade openness when terrorism acts as a dependent variable. There was negative and significant impact of GDP, Unemployment, Trade openness on the terrorism in short and long run. On the other hand inflation and terrorism has positive relationship.

The ECM of the model has negative and significant impact which showed its speed of adjustment from short to the long run equilibrium. Hence diagnostic tests indicated there was no serial correlation and there was no heteroscedasticity. It showed normally distributed and correct specification of the model.

This study showed that in Pakistan if we wish to improve the predictor's variables like Inflation, GDP, Unemployment, Trade openness then terrorism will have to be reduced. So Government of Pakistan should take steps to reduce the terrorism before making any policies that will enhance the economic growth.

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