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War on terror: Do military measures matter? Empirical analysis of post 9/11 period in Pakistan

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Abstract This paper is the first attempt to investigate the causal relationship between military spending, terrorist attacks and intensity of terrorism in case of Pakistan, by applying the ARDL approach to cointegration and innovation accounting approach for causality analysis. The results indicate that war on terror is the major determinant of military spending followed by terrorism intensity and the number of terrorist attacks respectively. The study further finds that terrorism intensity and terrorist attacks Granger-cause military spending but the reverse is not present. The failure of military measures to curtail terrorism and its intensity induces one to suggest greater involvement of civil intelligence agencies by raising their budgets instead of pure military budget.

Keywords Causality analysis · Military spending · Civil intelligence · Terrorism

JEL Classification C12 · C32 · O16

1 Introduction

The world has witnessed tremendous increase in terrorist and violent incidents of amplified intensities in the first decade of the new millennium. Consequently, wide literature is available explaining the causes and consequences of terrorism. Although controversies still exist on the determinants of violence, a consensus is developed among the scholars and policy makers about the adverse consequences of violent incidents for an economy. As a result, anti-terrorism efforts remain high on the political agenda of nations all over the world. Indeed, eradicating the core causes of terrorism is the only sustainable solution to the problem. This, however,

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is a long-term process and relying only on this solution may be a dreadful mistake. The immediate solution, therefore, requires policies aimed at strengthening the security system. This paves the way for increasing budgets for military spending in most of the countries, and Pakistan is no exception.

Majority of the terrorism and armed conflicts have been observed in low-middle-income countries (Gupta et al. 2004). Of all the middle-income countries, Pakistan has suffered from highest number of terrorist attacks in the last few years. These attacks were intensive in terms of casualties as well. For instance, from summer of 2007 to late 2009, more than 5,500 people were killed in suicidal bomb blasts and other attacks on civilians. The attacks have been attributed to a number of reasons: sectarian violence—mainly between Sunni and Shia Muslims; the easy availability of guns such as AK-47 and spread of weapon culture; and the influx of ideologically driven "Afghan Arabs" based in or near Pakistan, originating from the USSR-Afghanistan war 1980s which blew back into Pakistan.

After the bloodbath of 9/11, the joint attack by the US and coalition forces on Afghanistan ended the Taliban's regime. The Taliban could not counter the invaders' air-strikes and were ordered to be dispersed by Mulla Omer; the Taliban's supreme commander. However, after couple of years the Taliban came out from their hideouts and started attacking the coalition forces in Afghanistan. It was perceived that Al-Qaeda, Taliban supporters and other Islamist combative found safe sanctuary in the rugged Pakistan-Afghanistan border region, forcing Pakistan to conduct a military operation in 2004 in Waziristan; one of the agencies in the Federally Administered Tribal Areas (FATA) of Pakistan. This military operation together with the drone attacks by the US led to the emergence of what is now called Pakistani Taliban. Tahreek-e-Taliban Pakistan (TTP), one of the most influential and dangerous groups among the Pakistan Taliban, declared a war initially against Pakistan Army. In retaliation to the collateral damage, this war spread to the rest of the FATA region. Afterward, the terrorist attacks spread in entire country, resulting in numerous casualties (Kronstadt 2007). This domestic terrorism in Pakistan has turn out to be a serious problem distressing major Pakistani cities. There were signs of the so called "Talibanization" in the country which became major concern for the Government of Pakistan and it started taking serious actions against it. All these factors were used as rationale for increasing military budget to fight the so-called war on terror. Subsequently, the defense budget has been on the rise and even for the fiscal year 2011–2012, the Parliament's Standing Committee for Defense has approved an increase of 13–18 %. Such high increases in defense budgets are usually at the cost of developmental expenditures but are not much opposed by the masses assuming that they are used for curtailing terrorism.

In this backdrop, the study in hands aims to examine whether or not the mere increased allocation of resources for defense expenditure is fruitful in reducing the number of terrorist incidents or their intensity (or both) in the terrorism-victimized country of Pakistan. The study further explores the impact of war on terror, the number of terrorist incidents, and the intensity of these incidents on the increment in military budget. It is worth mentioning here that this study makes a contribution to the existent literature in the sense that it is the first attempt to incorporate both terrorism and its intensity simultaneously. For this purpose, both the autoregressive distributed lag (ARDL) bounds testing approach and Innovation Accounting approach for causality analysis are used.

Rest of the study proceeds as follows; Sect. 2 discusses detailed literature on the topic. Section 3 gives theory and the subsequent econometric specification. Section 4 gives a brief description of data and methodology used in the analysis. Results are discussed in Sect. 5, while Sect. 6 concludes the study.

2 Review of literature

The ample and extensive literature available on conflict and terrorism can broadly be classified into several categories, which are one way or the other related to each other. For instance, one kind of literature studies the economic cost of armed conflicts for economies (see, for example, Abadie and Gardeazabal 2003; Venieris and Gupta 1986; Barro 1991; Alesina and Perotti 1993, 1996; Alesina et al. 1996; Rodrik 1999; Arunatilake et al. 2001; Richardson and de Samarasinghe 1991). Likewise, a series of literature focuses on the relationship between defense spending on economic growth. Nevertheless, mixed results are found regarding the direction of impact. For example, Benoit (1978) concludes that the effect of defense spending on economic growth is positive in less developed countries. On the other hand, however, Arora and Bayoumi (1993) and Knight et al. (1996) find that a fall in defense spending stimulates the pace of economic growth. This is due to the fact that lower military spending promotes economic growth by the augmentation of capital formation and the upgrading of competence with which resources are consumed in the economy (Gupta et al. 2004). Similarly, contradictory results are reported in various studies conducted for specific countries. Sezgin (1997, 2001) has analyzed the defense spending pattern of Turkish economy from the year 1950 to 1994 and has proven the existence of a positive relation between defense spending and economic growth. Conversely, in the case of Greece, Sezgin (2000) finds an inverse relationship between defense spending and economic growth.

Likewise, another group in the conflict literature tries to identify the fiscal impact of counter-terrorism actions. Some studies have also established the link between defense spending and economic growth as well as between economic growth and tax policy of a country. For example, Caroll (2006) explores that the spending for national defense directly manipulates the federal corporate income tax rate. Furthermore, the economic cost of counter-terrorism measures and the ensuing effects on the fiscal balance have also been investigated (Lis 2007). The study confirms the crowding-out of productive investment due to security issues and the resultant increase in defense spending, leading to reduction in resource availability for any other productive activity. Interestingly, Blomberg et al. (2004) believe that although terrorist attacks do give way to an increment of government spending, yet this ascend can compensate the abridged investment spending of the same quantity in the short run.

There had been a wide debate on the relationship between expenditures being done on military defense and level of terrorism prevailing in the country. Literature on this issue has unanimously concluded the fact that there is no nexus between defense expenditures and terrorism incidents. Theoretical stance expects to have significant decrease in terrorist activities, as defense expenditure increases, so that military measures can be effective in suppressing terrorism. Even so, the literature does not support this presumption, suggesting such futile military interventions may be well counterproductive. Empirical literature in this area (Brophy-Baermann and Conybeare 1994; Cauley and Im 1988; Enders and Sandler 1993) has compared the number of terrorist attacks before and after the effectuation of counter-terrorism military activities, so that the impact of such policies on terrorism can be gauged. On similar lines, Landes (1978), Sandler (2005) and Silke (2005) has a consensus that taking vehement measures for controlling terrorism, ironically, instead of thwarting them, stimulate such attacks.

Likewise, Omand (2005) alleges that the absence of comprehensive long-term strategy for combating terrorism at international level impedes such attempts nationally. In case of United States, Lum et al. (2006) refute the effectiveness of counter-terrorism measures, concluding that such measures tend to provoke terrorism further. Moreover, in case of Turkey, Feridun and Shahbaz (2010) find, conversely, a uni-direction causality running from terrorist attacks

to defense spending. Recently, Akhmet et al. (2013) investigated the determinants of terrorism using South Asian data over the period of 1980–2011. Their FMOLS results show that poverty increases terrorism dominantly while population growth, income inequality, unemployment and political instability are also contributing factors to terrorism. Inflation is also positively linked with terrorism but trade openness has insignificant impact on terrorism. Malik and Zaman (2013) examined the consequences of terrorism using macroeconomic data for Pakistan over the period of 1975–2011. They applied Granger causality and Variance decomposition approach to examine the causality among the variables. Their results indicate the feedback effect between unemployment and terrorism while the unidirectional causal relationship is found running from population growth, price level, poverty and political instability to terrorism.

For this reason, it can be asseverate that existing literature denies the role of military measures in ebbing terrorism. However, the entire literature on the linkage between terrorism and military spending concentrates merely on terrorism and not on its intensity. Even the unidirectional causality from terrorism to military spending needs to be reassessed by modeling together the three variables namely, terrorism, intensity of terrorism and military spending. With this milieu, the present article intents to enrich the available literature by not only assessing the effectiveness of military measures in deterring terrorism in Pakistan, but also by evaluating the distinct effects of terrorism and its intensity on defense spending.

3 Theory and econometric specification

This section discusses the theoretical foundations linking military spending, terrorism and intensity of terrorism. However, before these channels are explained, it would be expedient if terrorism and the intensity of terrorism are discussed and distinguished. Terrorism is simply the number of terrorist incidents occurred during a particular period. On the other hand, terrorism intensity is measured by the number of casualties, inclusive of both deaths and injuries, occurred as a consequence of a particular terrorist attack. In this regard, firstly, the possible channels through which terrorism or its intensity affect defense spending are explored. Next, the theoretical possibilities of the impacts of military spending on terrorism are discussed. Finally, the estimable econometric specification is formulated in the light of these theoretical considerations.

It is now an established fact, with empirical support, that an upsurge in terrorist incidents leads to higher expenditures on defense. The reason for this positive association is the common belief that increment in military spending is the most effective and in fact the only possible measure that could be taken for combating terrorism. People look up to the military forces as their only saviors and this provides grounds to ask for more military budget. It is believed, at least theoretically, that higher the number of terrorist attacks, the easier it will be to gain public support to convince the policy makers to allocate more resources to defense expenditures. Therefore, with this perspective, there is expected to be a positive relation between terrorist incidents and military spending.

As mentioned earlier, this study is the first and foremost attempt to incorporate the intensity of terrorism as a separate variable in the estimation of relationship between terrorism and defense spending. We believe, based on our experiences and interactions with people in Pakistan, that it is not only the number of terrorist attacks but also their intensities which are crucial to spur on military expenditures. For example, several blasts with less human damages may not be equivalent in spreading terror to a single blast engulfing hundreds of human lives. Especially in Pakistan, a terrorist attack which is unsuccessful in terms of casualties is no

more a paramount news. People have become used to such news. Nonetheless, attacks taking human lives do have detrimental psychological effects and spread fear among the masses. It is this fear of the intensity of terrorism which instigates the demand for security from the masses and so empowers the policy makers to enhance defense budget. For these reasons, one can expect positive impact of terrorism intensity on military expenditures.

Next we assess the linkage between military spending and terrorism, treating latter as a dependant variable. It is already notified in previous section that most of the empirical literature rejects causality running from military spending to terrorism. However, based on theoretical assertions, it is expected that a rise in defense spending must lead to a lessening of terrorist activities believing that military measures are effective in combating terrorism. Nevertheless, as brought into light by some studies mentioned above, it is also important to note that counter-terrorism measures may also be counter-productive and may spark up terrorism as its repercussion. Furthermore, there can be another indirect channel as well, at least theoretically, through which rise in military spending may dilate terrorism. If in a country, the economic conditions do play a role in terrorism, then diverting resources to military spending will leave little in the budget to spend on ameliorating the economic environment of the "haves-not". In fact, such diversion may worsen their situation. Hence, one may expect both positive and negative impact of military spending on terrorism; both in terms of attacks and intensity.

As, we are interested in investigating the effect of terrorism and its intensity on military expenditure, thus, in the light of above discussion, primarily the following econometric specification will be estimated:

$$\ln M_t = \alpha_0 + \alpha_1 \ln TA_t + \alpha_2 \ln TI_t + \varepsilon_t \tag{1}$$

where $\ln M_t$ represents the natural log of military spending per capita, $\ln TA_t$ is the natural log of terrorist incidents, $\ln TI_t$ is the natural log of intensity of terrorism and ε_t is regression error term.[1] α_1 and α_2 are the two coefficients and, based on theoretical considerations, there signs are expected to be positive.

4 Methodology and data

4.1 Methodology

This study explores the relationship among military spending, terrorism attacks and intensity of terrorism. The use of time series data for analysis calls for testing of stationarity of all the variables. This is a critical prerequisite to circumvent the problem of spurious regression. If the ordinary least square (OLS) regression is applied to non-stationary variables used in level form, the coefficients obtained as a result will be meaningless. Nonetheless, several procedure are available to explore cointegration in non-stationary series; Engle–Granger's (1987); two-step Johansen's (1992) maximum likelihood; Pesaran–Shin's (1999) and Pesaran et al. (2001) the autoregressive distributive lag (ARDL) models. Engle–Granger's approach does not offer the best choice if more than one cointegrating vector is present (Seddighi et al. 2006). However, between the Johansen's (1992) maximum likelihood method and Pesaran et al. (2001) the ARDL method to cointegration, the latter is preferred for three obvious reasons; first, this approach can be applied irrespective of whether the variables are $I(0)$ and $I(1)$; second, the small sample properties of the ARDL approach are far superior to that of

[1] See Shahbaz (2010) for justification of log-linear specification.

the Johansen and Juselius's cointegration technique (Pesaran and Shin 1999). Thirdly, the ARDL bounds testing helps to derive dynamic error correction model through a simple linear transformation without losing information about long span of time. The error correction model integrates the short-run dynamics with the long-run equilibrium without losing information about long-run.

The ARDL bounds testing approach to cointegration involves estimating the unrestricted error correction method (UECM) of the ARDL model as follows:

$$\Delta \ln M_t = \alpha_1 + \alpha_M \ln M_{t-1} + \alpha_{TI} \ln TI_{t-1} + \alpha_{TA} \ln TA_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta \ln M_{t-i} + \sum_{j=0}^{q} \alpha_j \Delta \ln TI_{t-j} + \sum_{l=0}^{m} \alpha_k \Delta \ln TA_{t-l} + \mu_{1i} \quad (2)$$

$$\Delta \ln TI_t = \beta_1 + \beta_{TI} \ln TI_{t-1} + \beta_{TA} \ln TA_{t-1} + \beta_M \ln M_{t-1} + \sum_{i=1}^{p} \beta_i \Delta \ln TI_{t-i} + \sum_{j=0}^{q} \beta_j \Delta \ln TA_{t-j} + \sum_{l=0}^{m} \beta_k \Delta \ln M_{t-l} + \mu_{2i} \quad (3)$$

$$\Delta \ln TA_t = \delta_1 + \delta_M \ln M_{t-1} + \delta_{TI} \ln TI_{t-1} + \delta_{TA} \ln TA_{t-1} + \sum_{i=1}^{p} \delta_i \Delta \ln TA_{t-i} + \sum_{j=0}^{q} \delta_j \Delta \ln TI_{t-j} + \sum_{l=0}^{m} \delta_k \Delta \ln M_{t-l} + \mu_{3i} \quad (4)$$

The α_1, β_1 and δ_1 are drift components and μ_i is assumed to be white noise residual term. The akaike information criterion (AIC) is used to select the optimal lag structure to make sure that serial correlation does not exist. Pesaran et al. (2001) tabulated lower critical bound (LCB) and upper critical bound (UCB) to take decision whether long run relation between the variables exists or not. The null hypotheses of no cointegration are $H_0 : \alpha_M = \alpha_{TI} = \alpha_{TA} = 0$, $H_0 : \beta_M = \beta_{TI} = \beta_{TA} = 0$ and $H_0 : \delta_M = \delta_{TI} = \delta_{TA} = 0$ while hypotheses of cointegration are $H_a : \alpha_M \neq \alpha_{TI} \neq \alpha_{TA} \neq 0$, $H_a : \beta_M \neq \beta_{TI} \neq \beta_{TA} \neq 0$ and $H_a : \delta_M \neq \delta_{TI} \neq \delta_{TA} \neq 0$. The next turn is to compare the calculated F-statistic with critical bounds by Turner (2006) to analyze whether cointegration relation exists or not. If upper critical bound is less than computed F-statistic then decision is in favor of cointegration i.e. long run relationship exists. There is no cointegration between the variables if calculated F-statistic is lower than lower critical bound (LCB). If calculated F-statistic lies between lower and upper critical bounds then decision about cointegration is inconclusive.

After the long-run relationship among the variables is established and the long-run estimates are obtained, the next objective is to conduct causality analysis. For this purpose, we use the innovation accounting approach (IAA).[2] This approach consists of variance decomposition and impulse response function. The variance decomposition allows us to detect the contribution of each variable in the variation occurred in a particular variable ahead the sam-

[2] It is argued in economics literature that the Granger causality approaches such VECM Granger causality test has some limitations. The causality test cannot capture the relative strength of causal relation between the variable beyond the selected time period. This weakens the reliability of causality results by VECM Granger approach (Wolde-Rufael 2009).

pled period. If a variable explains significant variation in another variable, it will imply that the first variable causes the other. The impulse response function, on the other hand, represents the response of one variable to shocks in others. This is also helpful in demonstrating the direction of effect generated by the shocks.

4.2 Data

This underlying study uses four variables for analysis, namely, terrorism, intensity of terrorism, military spending and a dummy for war on terror period. The overall period of analysis is 1974–2012. Several studies in the conflict literature used number of terrorist incidents as measure of terrorism (see, for instance, Nasir et al. 2011) whereas some made use of the number of fatalities as proxy for terrorism (Feridun and Shahbaz 2010). Assuming that both these measure have different degree of psychological impact, the present article brings into play both these proxies as two different variables. Consequently, in this analysis, the number of terrorist attacks occurred in a particular year is used as a measure of terrorism. On the other hand, the number of causalities in these attacks is a proxy for intensity of terrorism. The data on terrorism (terrorist attacks) is obtained from South Asian Terrorism Portal (SATP), maintained by Institute of Conflict Management, India. SATP compiles terrorist attacks in Pakistan in the form of descriptive news arranged chronologically, derived from various news sources, separating suicide attacks provides a unique dataset, to study pure effect of terrorism as opposed to effect of others forms of conflict as studies, typically, clump together insurgencies and acts of warfare and crime under the umbrella of terrorism. Furthermore, as mentioned above suicide incidents do not suffer from same degree of reporting bias as compared to other terrorist incidents, due to their inherent spectacular nature. Data on military spending is obtained from the Pakistan Economic Survey (2010). As rightly discussed in Feridun and Shahbaz (2010), the results obtained by using the overall defense spending data should be interpreted with care as there might exists some degree of measurement error. Unfortunately, for unrevealed reasons, the separate data on expenditures used for counter-terrorism measures is not made public. Therefore, data on overall military spending remain the only option to be used in the analysis.

After Afghanistan, Pakistan is the second country that faced the drastic consequences of the 9/11 event, in shape of terrorism. Being neighbor to Afghanistan became a curse for Pakistan as Taliban allegedly found hideouts in the bordering tribal areas of Pakistan after US attack on Afghanistan. At US insistence, the Pakistan Army launched an operation in the tribal areas resulting in huge collateral damage. In response, the terrorists started terrorist attacks of high intensities in the settled areas of Pakistan killing more than an estimated 32000 thousand people and injuring more than this number. Consequently, military budget also started rising. The estimated loss to the economy is more than 69 billion dollars [Pakistan Economic Survey, 2011]. Hence, in order to investigate whether the war on terror has any effect on Pakistan's military expenditure, a dummy variable is used in the analysis. It takes the value "1" for the years from 2002 to 2010, and "0" for the rest of the years. Table 1 illustrates the descriptive statistics for these variables.

The descriptive statistic and correlation matrix shows that all the series are normally distributed as shown by estimates of Jarque–Bera normality test. The correlation analysis indicates that there is high and positive correlation exists from terrorist attacks and terrorism intensity to military spending. Terrorists, attacks and terrorism intensity are also highly correlated.

Table 1 Descriptive statistics and correlation matrices

Variables	$\ln M_t$	$\ln TA_t$	$\ln TI_t$
Mean	6.2216	5.1746	3.4556
Median	6.5030	5.9989	3.6375
Maximum	7.4642	8.4053	6.8090
Minimum	4.2328	0.0000	0.0000
Std. dev.	0.9609	2.4204	1.9346
Skewness	−0.5555	−0.7832	−0.1312
Kurtosis	2.0714	2.4908	1.9486
Jarque–Bera	3.2321	4.1827	1.8104
Probability	0.1986	0.123518	0.4044
$\ln M_t$	1.0000		
$\ln TA_t$	0.8775	1.0000	
$\ln TI_t$	0.8663	0.9217	1.0000

Table 2 The results of unit toot tests

Variables	ADF	DF-GLS
$\ln M_t$	−0.8257 (1)	−0.9169 (1)
$\Delta \ln M_t$	−3.7106 (1)**	−3.4800 (1)***
$\ln TA_t$	−1.9934 (3)	−1.9406 (2)
$\Delta \ln TA_t$	−5.1377(2)***	−4.8378 (2)***
$\ln TI_t$	−1.8814 (1)	−1.9587 (1)
$\Delta \ln TI_t$	−4.3601 (1)***	−4.1140 (2)***

The *** and ** denote significance at 1 and 5 % level of significance respectively. The figures in the parenthesis are the optimal lags for ADF and DF-GLS test

5 Estimation results and discussion

Although the ARDL approach to cointegration is applicable irrespective of whether the variables are integrated of order zero or one, still pre-testing for non stationarity is worthwhile for the reason that the presence of a variable(s) with $I(2)$ or higher can complicate the F-test, making the results unreliable (Ouattara 2004). As a result, following Dickey and Fuller (1979) and Elliot et al. (1996), the augmented Dickey-Fuller (ADF) test and the modified Dickey-Fuller t-test (DF-GLS) are conducted in order to identify the order of integration of the variables. It is perceptible from the Table 2 that all the variables have unit root problem at level but are stationary at first difference. Hence, both tests confirmed that all the series are integrated of order one.

It was argued by Baum (2004) that ADF and DF-GLS unit root tests provide biased and inconsistent results when a structural break point occurred in the economic series such as terrorist attacks in our case. After 9/11, there was a major shift in terrorist attacks and, therefore, in military expenditure in Pakistan due war on terror. To solve this issue, we have applied Zivot and Andrews (1992) unit root test that allows the structural break information at one point of time. This uses there models which allow (i) a one-time change in variables at level form, (ii) a one-time change in the slope of the trend component i.e. function and (iii) a model has one-time change both in intercept and trend function of the variables to be used for empirical propose. The null hypothesis of ZA test implies that the variable is found to be trend-stationary with one unknown time break. Zivot-Andrews unit root test fixes all points as potential for possible time break and does estimate through regression for

Table 3 Zivot-Andrews unit root analysis

Variable	Z-A at level			Z-A at 1st difference		
	T-statistic	TB	Decision	T-statistic	TB	Decision
$\ln M_t$	−3.120 (3)	1990	I(0)	−7.068 (3)***	2004	I(1)
$\ln TA_t$	−4.093 (4)	1986	I(0)	−7.453 (3)***	1989	I(1)
$\ln TI_t$	−4.518 (4)	1998	I(0)	−8.399 (3)***	1996	I(1)

*** Indicates significance at 1 % level of significance

all possible break points successively. The results are reported Table 3. It can be concluded from unit root analysis that the variables are not stationary in level form but integrated in first difference. The structural break pointed by ZA unit root test show that $\ln TA_t$ series pointed out 1st terrorist attack on Egyptian Embassy in Islamabad in 1986. Similarly, $\ln M_t$ shows withdrawal of Soviet Union from Afghanistan which impacted defence spending in Pakistan in 1990. The structural break in $\ln TI_t$ series noted the bomb attacks in Pakistan in 1998 injected by RAW (its intelligence services Research and Analysis Wing) of India. This implies that variables have unique order of integration which leads us to use ARDL bounds testing approach to cointegration for long run relationship between the variables.

Once the order of integration of variables is identified, the next step is to investigate whether or not, there is a long-run relationship among these variables. Nonetheless, before proceeding to testing of cointegration, an important step is to select the optimal lag length of the variables. Conventional methods are used for this purpose. According to these criteria, the optimal lag length is three. After the lag length is selected following Akaike information criterion, the ARDL bound testing approach to cointegration is applied to investigate the long-run relationship among the variables. Table 4 reports the results of this test.

As it is evident from the Table 4, all the three equations are tested keeping each variable as dependant variable respectively. The respective lag length of dependant and explanatory variables in each equation are also reported in Table 4 below each equation. The results suggest that the null hypothesis of no long-run relationship between the variables is rejected at 5% and 10 per cent levels respectively when military spending, terrorist attacks and terrorism intensity are treated as response variables. The calculated F-statistics are 6.763, 6.117 and 7.946 while the value of upper bound is 6.437 and 5.420 at 5 and 10 per cent level of significance. This indicates three cointegrating vectors among military spending, terrorist attacks and intensity of terrorism over the study period of 1974–2010 in case of Pakistan. The reason for using the critical bounds generated by Turner (2006) is that they are better suited to small samples as compared to Pesaran et al. (2001) and Narayan (2005).

It may be noted that presence of structural break in the time series makes long run relations residual based less powerful and unreliable. In our study, we may consider the event of 9/11 as a structural break for the reason that Pakistan has observed a sharp increase in terrorist attacks afterwards. Consequently, we may also encounter the problem mentioned above. To deal with this deficiency of the ARDL bounds testing approach to cointegration, we have applied the Gregory and Hansen (1996) structural break cointegration test to examine the robustness of long run relationship between the three variables. The Gregory-Hansen cointegration test is superior over the residual based cointegration tests in the sense that it allows the presence of one structural break in the series. The results of this test are reported in Table 5.

According to these results, in case of terrorist attacks being dependent variable, cointegration prevails between military spending, terrorist attacks and terrorism intensity even

Table 4 ARDL bounds testing to cointegration analysis

Bounds testing to cointegration			
Estimated model	$M_t = f(TA_t, TI_t)$	$TA_t = f(M_t, TI_t)$	$TI_t = f(M_t, TA_t)$
Optimal lag length	(3, 3, 3)	(3, 2, 2)	(2,3, 3)
F-statistics	6.763**	6.117***	7.946**
	Critical values ($T = 36$)		
	Lower bounds $I(0)$	Upper bounds $I(1)$	
1 per cent level	7.527	8.803	
5 per cent level	5.387	6.437	
10 percent level	4.447	5.420	
Diagnostic tests			
R^2	0.8626	0.8618	0.7883
F-statistics	2.746 (0.0899)	6.2829 (0.0003)	3.6165 (0.0115)
J-B normality test	2.3582 (0.3075)	1.6706 (0.4337)	1.3195 (0.5169)
Breusch–Godfrey test	0.1599 (0.6968)	0.0282 (0.9723)	0.9826 (0.3366)
ARCH LM test	0.3500 (0.5592)	0.0738 (0.7879)	0.8313 (0.3702)
Ramsey reset test	0.2456 (0.7866)	0.7127 (0.7406)	1.4069 (0.2825)

The *** and ** denote the significant at 1 and 5 % levels of significance respectively. The optimal lag structure is determined by AIC

Table 5 Gregory-Hansen structural break cointegration test

Model	$T_M(M/TI, TA)$	$T_{TA}(TA/M, TI)$	$T_{TI}(TI/M, TA)$
ADF-Test	−3.687	−5.833***	−3.745
Prob. values	0.0005	0.0000	0.0004

*** Shows significance at the 1 % level. The ADF statistics show the Gregory-Hansen tests of cointegration with an endogenous break in the intercept. Critical values for the ADF test at 1, 5 and 10 % are −5.13, −4.61 and −4.34 respectively

after allowing for structural break in 2001. These results are obtained by employing the fully modified ordinary least square (FMOLS) approach. This outcome indicates the statistical significance of dummy variable for structural break in the terrorist attacks series.[3] After confirming the existence of cointegration among these variables, equation 1 has been estimated using the ARDL cointegration methodology to get the long-run estimates. These results are reported in Table 6.

Table 6 demonstrates the results of two models. In the first model, we have included only military expenditures, terrorism and its intensity. The second model is a variant of the first model in the sense that it also includes the dummy variable to capture the effect of war on terror on military spending. It is obvious from results of the two models that both terrorist attacks and the intensity of terrorism play an important role in expanding military expenditures in Pakistan. However, as is evident from the table, the coefficient of terrorism intensity is greater than terrorist attacks in both the models. This portrays the fact that, in the long-run, intensity of terrorism is more critical factor that contributes to growth of military

[3] The OLS regression results are available from authors upon request. We have used dummy i.e. 1 after 2001 and 0 for the rest of the years.

Table 6 Long run results

Dependent variable = $\ln M_t$				
Variable	Coefficient	T-statistic	Coefficient	T-statistic
Constant	4.5538***	25.5548	4.6721***	31.7644
$\ln TA_t$	0.1847***	3.0708	0.1346**	2.6832
$\ln TI_t$	0.2212***	2.9586	0.2145***	3.5385
Dum	–	–	0.6118***	4.2684
Diagnostic tests				
$R-squared$	0.7986		0.8716	
$F-statistics$	65.4434	0.0000	72.4674	0.0000
$\chi^2 NORMAL$	2.1561	0.3402	2.2800	0.2463
$\chi^2 ARCH$	0.1476	0.3486	0.4060	0.5283
$\chi^2 WHITE$	2.2342	0.0880	2.5659	0.0478
$\chi^2 REMSAY$	0.2321	0.5661	2.1654	0.1135

$\chi^2 NORMAL$ refers to the Jarque–Bera statistic of the test for normal residuals, $\chi^2 SERIAL$ is the Breusch–Godfrey LM test statistic for serial correlation, and $\chi^2 ARCH$ is the Engle's test statistic for autoregressive conditional heteroskedasticity, and $\chi^2 REMSAY$ is model specification test. *** and ** represent significance at 1 and 5 % levels

expenditures. Furthermore, the significance of war on terror variable in the second model confirms the notion that military expenditure has increased tremendously during this period. Interestingly, with higher coefficient value than the other two variables, war on terror emerges as the most vital determinant of defense spending. In fact, the war on terror has been the major argument presented by the government for increased defense budget since 2002. The reason is that Pakistan, being a frontline ally in the war on terror, has suffered from violent assaults by Taliban. With the passage of time, the terrorist spread from tribal regions to settled areas. This required army to enhance its capacity to fight the insurgents, thereby increasing defense budget. The diagnostic tests given in the lower part of Table 6 confirm the validity of these results. Moreover, the estimations of two specifications also confirm the robustness of results.

After the long-run dynamics is discussed, the next concern is to scrutinize the direction of causality amongst these variables. The application of the ARDL bounds testing approach to cointegration only tests the existence of long relationship between the variable but does not suggest the direction of causality between them. It is documented by Morley (2006) that existence of long run association between the variables is necessary but not sufficient condition to reject the non-causality hypothesis. The empirical evidence reported in Tables 4 and 5 confirm the cointegration between military spending, terrorism and intensity of terrorism but it is not sufficient to discern the direction of causality. Nonetheless, this existence of long run relationship between the variables does suggest that there must be causality at least in one direction. These reasons necessitate the use of innovation accounting approach (IAA) consisting of variance decompositions and impulse response functions (Wolde-Rufael 2009). The results of causality tests based on variance decompositions are shown in Table 7. There are three major blocks in the table representing the variance decomposition of each other three variables separately. Variance decomposition of military expenditure, terrorist attacks and intensity of terrorism is presented in first, second and third blocks respectively.

The first block in Table 7 substantiates the notion that military expenditure are caused both by terrorist attacks and terrorism intensity. In addition, it also illustrates that the contribution of

Table 7 Variance decomposition approach

Time horizons	Variance decomposition of ln M_t			Variance decomposition of ln TA_t			Variance decomposition of ln TI_t		
	ln M_t	ln TA_t	ln TI_t	ln M_t	ln TA_t	ln TI_t	ln M_t	ln TA_t	ln TI_t
1	100.0000	0.0000	0.0000	1.6597	98.3402	0.0000	0.6000	43.0349	56.3649
2	97.0782	2.0837	0.8380	1.1985	73.7479	25.0535	0.8021	32.4418	66.7560
3	86.3641	12.8070	0.8287	1.4179	71.9610	26.6209	1.3849	30.0052	68.6097
4	79.6557	19.2881	1.0561	2.2405	72.1640	25.5954	2.0475	34.5513	63.4011
5	75.3187	21.3278	3.3533	2.4376	72.6238	24.9385	2.2360	37.8223	59.9416
6	71.7624	21.6262	6.6113	2.6692	72.6066	24.7240	2.4168	38.4275	59.1556
7	68.7134	20.5883	10.6981	2.8624	71.9048	25.2327	2.5723	38.3891	59.0385
8	66.5629	19.2640	14.1729	3.0458	71.3885	25.5656	2.6781	37.6974	59.6244
9	64.9558	17.9526	17.0915	3.1880	70.7712	26.0406	2.7975	37.2741	59.9283
10	63.9880	16.9164	19.0955	3.3460	70.4032	26.2506	2.9174	36.9510	60.1315
11	63.4206	16.1041	20.4752	3.4951	70.0779	26.4269	3.0608	36.8046	60.1345
12	63.1691	15.5048	21.3261	3.6452	69.8858	26.4689	3.2042	36.7000	60.0956
13	63.0586	15.0566	21.8846	3.7837	69.7238	26.4924	3.3492	36.6291	60.0215
14	63.0239	14.7331	22.2429	3.9138	69.6044	26.4816	3.4824	36.5695	59.9479
15	62.9955	14.4911	22.5133	4.0295	69.4964	26.4740	3.6031	36.5309	59.8658

terrorism intensity (22.5 %) to variation in military expenditure is higher than that of terrorist attacks (14.5 %). These results corroborate the one reported in Table 6 where terrorism intensity appeared to be more important determinant of military expenditures than terrorist attacks. The second and third blocks in Table 7 show defense spending contributes only 4 and 3.6 % to variations in terrorism and its intensity respectively. Hence, one may say that neither terrorism nor its intensity is caused by military spending. These results are interesting but not surprising as most studies in defense literature found the same results with respect to terrorism. Lastly, both terrorism and its intensity cause each other as is evident from their contributions to variations in each other. Based on these results, we may conclude that there are unidirectional causalities running from terrorism and its intensity to military spending, while bidirectional causality exists between terrorist incidents and terrorism intensities.

The second technique in innovation accounting approach is impulse response function. The impulse response function given in Fig. 1 validates the results of variance decomposition given in Table 7. It is obvious from the figure that both terrorism and its intensity increase military expenditure, though the latter respond with a lag to terrorism intensity. Furthermore, both these variables bring a permanent increase in military spending. Similarly, terrorist attacks and terrorism intensity affect each other positively. It is interesting to see the terrorist attacks reduce initially in response to increase in military spending. However, the impact turns positive within a year. Terrorism intensity, on the other hand, responds positively to higher defense budget. The reason may be that the insurgents responds with more deadly attacks (such as suicide bombings) when there is military operations financed by increased budgetary allocations. Overall, results show that unidirectional causal relationship is found running from terrorism intensity and terrorist attacks to military spending. The feedback hypothesis exists between terrorism intensity and terrorism attacks.

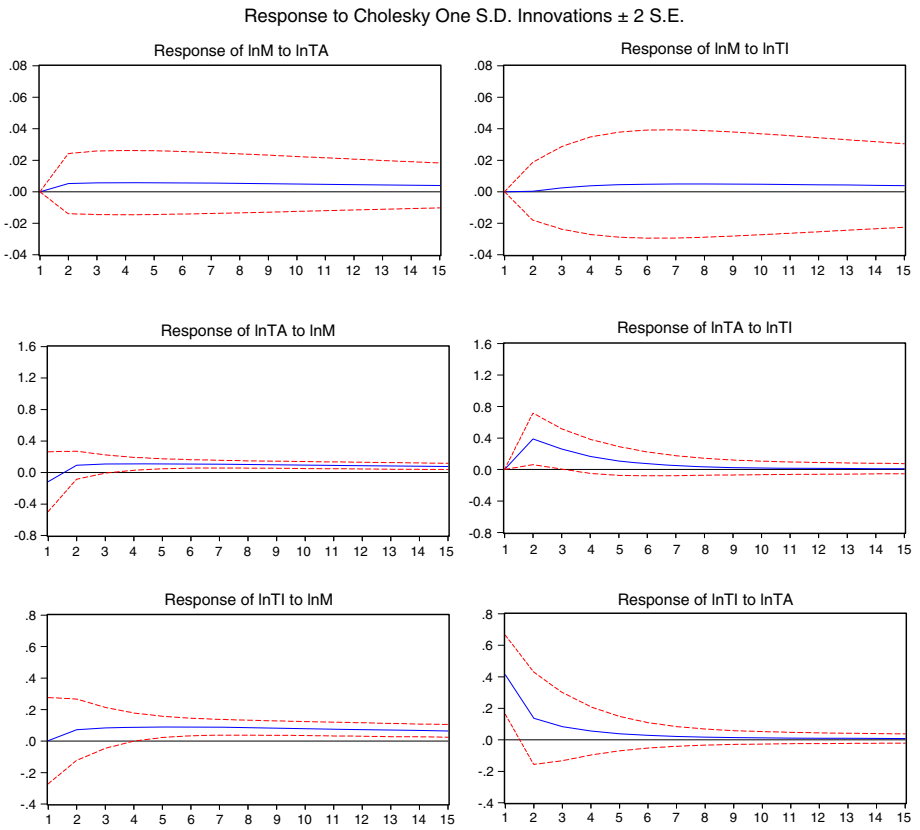

Fig. 1 Impulse response function

These results combined with those present in Tables 6 and 7 raise two very important points that call for attention. The first point is regarding the causality running from terrorism and its intensity to military spending. It is obvious from the combined results that the intensity of terrorism has more psychological effects on the masses than the number of terrorist incidents and, therefore, becomes a convincing factor for high military spending. This result is in line with our hypothesis. As mentioned in the theoretical section, terrorist incidents without casualties have less effect on the people of Pakistan. They have become used to these incidents and, as a result, are less terrorized by them. The high frequency of terrorist attacks has become a daily matter for them. More importantly, such incidents are no more "Headline News" in print and electronic media. Nevertheless, terrorist attack intensive in terms of high fatalities does spread terror in general public. The recent military operation in the Swat district of Khyber Pakhtunkhwa is a good example of how terrorism intensity can raise military expenditure, as soon after the operation the military budget has been increased without any opposition.[4] Since, the number of terrorist incidents and the intensity of terrorism have neither the same impact on, nor do they have the same meaning for the people anymore, ergo, one should be very careful in using these variables interchangeably in the models.

[4] In Swat, the terrorism intensity was extremely high not only because of high fatalities but also due to the type of terrorist attacks, including suicide bombings and beheading the people. Its intensity was felt even in Islamabad and therefore, when the operation was conducted in Swat, it was welcomed by the people.

The second point is related to the absence of causality running from military spending to both terrorism and its intensity. It is worth mentioning that these results highlight the failure of enhanced military spending not only in controlling the terrorist attacks but also in curtailing their intensities. This failure in the latter case is even more worrying, pointing to the fact that the terrorists not only move around easily but have also been able to carry powerful explosives with them with the same ease. Subsequently, the conventional notion that terrorism can be eliminated or at least reduced through higher military spending is not an empirical fact in Pakistan.

6 Conclusion and policy recommendations

The prime objective of the underlying study was to investigate the causality between military spending, terrorism, and intensity of terrorism. By making use of the ARDL approach to cointegration and the innovation accounting techniques for causality analysis, the study finds that terrorism intensity is more critical determinant, than terrorist attacks, of military spending. Moreover, war on terror emerges as a major factor of increased budgetary allocations for defense. On the other hand, neither terrorism nor its intensity is influenced by military spending. In the following lines, we conclude the results and then make appropriate policy recommendations on basis of these results.

It is rightly said by Feridun and Shahbaz (2010) that military measures alone are not enough and there should be social, political and economic measures to fight against terrorism. However, these are long term solutions which basically originate from the literature on determinants of terrorism that calls for eradication of root causes of violence. It is, however, important to investigate the reasons responsible for the failure of military measures in curtailing terrorism. Three points are very important in this regard. Firstly, the policy makers need to understand that military is trained specifically for the protection of boundaries from foreign invaders. Conversely, for internal security, civil agencies such as police and Federal Investigative Agency (FIA) are established. Moreover, in contrast to military personnel, the police is spread throughout the country and is an important source of law enforcement at the lowest possible level in the sense that an Station House Officer (SHO) of police in a particular area knows all the information about each household in that area. What is wrong with the current counter-terrorism policy is the extreme reliance on military measures to combat terrorism on one hand, and the negligence of the role of civil agencies on the other. Moreover, most of the terrorist attacks are originated and executed internally and the terrorist network exists throughout the country. Therefore, given the specific nature of terrorism and keeping in view the structural hierarchies of the law enforcement agencies in Pakistan, we believe that instead of looking to pure military measures and thereby allocating all the resources to them, concrete measures should be taken to strengthen the civil intelligence agencies. These should include training of the personnel, provision of advanced weapons as well as equipments for detection of explosive materials; and better coordination between the military, civil intelligence and law enforcement agencies. Given the resource constraint, this may not be an inappropriate policy to cut military budget to allocate funds to civil intelligence agencies to strengthen them to fight this war at the forefront. Seen in this perspective, the decision to increase military budget between 13 and 18 % in the last fiscal year in the name of war-on-terror should be carefully reviewed in the next budget discussions in the parliament. On the other side, the budgets of civil intelligence agencies should be increased substantially.

The second problem with this current counter-terrorism policy is the unequal provision of security. In Pakistan, few people including parliamentarians and even the high ranked

military and civil officials are provided security at the cost of rest of the people. This has a counterproductive effect on security, as not enough personnel are available to inspect the various suspicious areas thereby providing easy hideouts for terrorists. As a result, a sense of insecurity prevails among the general public which has adverse psychological consequences like lowering the tolerance level in the society. So, these personnel should be released from the security of VIPs and should be used for inspections purposes.

Lastly, the current measures to restrict terrorists' movements in the form of inserting cameras and making check posts at roads within the cities are not only inappropriate but also counter-productive. Capturing terrorists with explosive materials on these check posts, having not even a single vehicle-scanner, is insanity. Absence of scanners, even at the entrance points in important cities such as Islamabad, is worrisome. In contrast, these check posts, instead of providing security, create blockage on the roads and increase the probability of terrorist attacks in these congested areas. Such attacks have been observed in many cities including the Peshawar district of Khyber Pakhtunkhwa. Hence, as a productive measure, these check posts should be equipped with advanced scanning facilities.

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