

Impact of Terrorism on Macroeconomic Indicators of Pakistan

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Article History:

Received Date:
18th January 2026

Revised Date:
22nd April 2026

Accepted Date:
30th May 2026

Published:
June 30, 2026

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Abstract

This study examines the impact of terrorism on selected macroeconomic indicators and human development in Pakistan during 1985-2023. Annual data are obtained from the World Development Indicators, Global Terrorism Database, and UNDP Human Development Reports. Terrorism is measured using annual terrorism incidents that caused casualties, while the economic variables include real GDP, real investment, real exports, real consumption, real FDI, real debt, defense expenditure, exchange rate, education, and HDI. The empirical analysis shows that terrorism has statistically significant short-run effects on real investment, real exports, defense expenditure, HDI, and exchange rate. The impulse response results indicate negative or mixed responses, particularly for real exports and HDI. The Johansen cointegration results confirm long-run relationships among the variables, and the normalized cointegrating equation suggests a negative long-run association between terrorism and real GDP. VECM results show significant adjustment for real GDP, real investment, real debt, defense expenditure, and HDI. The study concludes that terrorism weakens Pakistan's macroeconomic stability mainly through investment, exports, defense-expenditure pressure, exchange-rate movement, and human-development channels. Policy responses should combine counterterrorism with investment protection, export resilience, human-development spending, and careful fiscal management.

Keywords: Terrorism; Macroeconomic indicators; Human Development Index; Pakistan; Economic stability.

JEL Classification: D74, H56, C32, O15, O53

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1. Introduction

Terrorism affects economies through uncertainty, loss of physical and human capital, fiscal pressure, weaker investment, and reduced external confidence. These issues need to be addressed in social sciences in general and specifically in economics. Terrorism and conflicts have several socio-economic causes as well as major microeconomic and macroeconomic consequences. This has become an emerging topic in literature over the last two decades. History reveals a shift in the dynamics of violent conflicts and terror from interstate to intrastate conflicts, thereby changing the scenario of twenty-first-century wars (Mack, 2005).

The impact of terrorism is not limited to security issues prevailing in an economy. It acts as a catalyst for other problems, such as poverty, deprivation, unemployment, massacres, grievances, and displacement (Justino, 2006). Acts of terrorism also result in infrastructure losses, loss of social values, loss of assets, increased borrowing, hyperinflation, and homelessness.

In the extant literature, terrorism has been discussed to some extent, but these studies mostly focus on developed countries. All those variables and factors cannot be readily applied to a developing country. Moreover, governments and academics have been unable to undertake detailed investigations of the costs associated with terrorism. There are limited studies investigating macroeconomic cost consequences (Mehmood, 2013). The specific dynamics of the cost of terrorism in Pakistan have not been sufficiently considered in the literature. This gap in estimating the cost of terrorism negatively affects policymakers and institutions initiating policies to combat terrorism. Policymakers are unable to formulate policies, develop operational strategies, and plan effectively (Hussain, 2010).

Several previous studies have focused on the macroeconomic consequences of terrorism, particularly reduced growth (Collier, 2003; Collier & Hoeffler, 2004; Collier & Sambanis, 2002). Several variables, such as investment, expenditure, inflation, and remittances, were used by Abadie (2006) in this context. However, the existing literature has paid less attention to how terrorism affects economic development and quality of life.

1.1 Research Gap

The existing literature documents the cost of terrorism and its effects on growth, investment and public spending, but there is limited Pakistan-specific evidence that jointly examines terrorism,



macroeconomic indicators and human development over an updated 1985-2023 sample. Most earlier studies focus either on single economic channels, post-9/11 costs, or growth alone. This study addresses this gap by bringing real GDP, real investment, exports, consumption, FDI, debt, defense expenditure, HDI, exchange rate and education into one time-series framework.

1.2 Objectives of the Research

The objectives of the research are: (i) to examine the impact of terrorism on key macroeconomic indicators of Pakistan; (ii) to investigate the relationship between terrorism and human development; and (iii) to explore the short-run and long-run relationships among terrorism, macroeconomic indicators and HDI.

1.3 Research Questions

The study is guided by three research questions: (i) How does terrorism affect major macroeconomic indicators in Pakistan? (ii) What is the relationship between terrorism and HDI? (iii) Are the relationships among terrorism, macroeconomic indicators and HDI short-run, long-run, or both?

1.4 Significance of the Study

The significance of this study is to unfold the details of the macroeconomic consequences of terrorism. This study examines the macroeconomic consequences of terrorism at the aggregate level, with attention to variables beyond traditional outcomes such as unemployment, poverty, and income. The past two decades have been very difficult for the citizens of Pakistan. Pakistan is one of the most terror-affected countries in the world. Being a developing country, studying the impacts of terrorism on its economic outlook becomes important. The economic consequences of terrorism are supported by many studies, but very little attention is given to developing nations, e.g. (Eckstein & Tsiddon, 2004). Due to poor infrastructure and institutions, developing countries are soft targets for terrorist attacks. Moreover, their economies are too weak to rebound and restore themselves from the damage incurred due to these terrorist attacks. Therefore, this research intends to fill this gap in literature.

Selecting Pakistan as a case study involves several reasons. First, Pakistan has suffered from terrorism for a long time and has a detailed and wide-ranging history of terrorism. Therefore, the



long-term economic consequences can be captured in this economy (Mehmood, 2014). Second, developing countries are more prone to external shocks and therefore provide useful case studies for examining growth-retarding effects compared with developed economies (Blomberg, Hess, & Orphanides, 2004; Frey, Luechinger, & Stutzer, 2007). This study attempts to fill the void by using different predictors of income and economic development, while the Human Development Index is used to check the effects of terrorism on the economic development of Pakistan.

1.5 Scope of the Study

The scope of the study is limited to Pakistan and annual data from 1985 to 2023. The analysis covers terrorism and selected macroeconomic and human-development variables, including real GDP, real investment, real exports, real consumption, FDI, real debt, defense expenditure, HDI, exchange rate and education. The study uses time-series techniques to examine aggregate national-level relationships; it does not estimate provincial, sectoral, household-level or microeconomic costs of terrorism.

2. Literature Review

This section reviews the literature on the consequences of terrorism across different economies. This chapter is divided into three subsections: the first section reviews the literature from developed nations, the second section discusses evidence from developing nations, and the last section reviews the existing literature from Pakistan.

2.1 Evidence from Developed Nations

Discussing the macroeconomic consequences of international terrorism and collateral violence, Blomberg et al. (2004) argue that terrorism has a negative effect on growth. Moreover, there is a diversion of investment toward government expenditure when terrorism incidents occur. There is empirical evidence to support this claim from developing economies, including non-democracies, as well as developed economies such as OECD countries. Terrorism and internal conflicts have a positive and significant relationship. The persistent nature of international terrorism is also explained by this research.

Eckstein and Tsiddon (2004) describe the effects of terrorism on investment, consumption, GDP per capita and exports, finding significant negative effects on these variables. The study finds that,



with an increase in terrorist activities, life becomes more uncertain and unpredictable. Government expenditure on security increases, but life still remains less protected and shorter. Similarly, other macroeconomic variables, such as growth, output, and consumption, also decline. The study also identified that if there had been no terror in Israel in the last three years, growth and output per capita might have been 10% greater than what Israel had at that time. Government expenditure increases by diverting tax revenues toward defense and security.

With respect to terrorism, Abadie and Gardeazabal (2008) find that terrorism affects the world economy through several channels. Terrorism shrinks the capital stock of an economy, increases uncertainty, shifts expenditure toward defense rather than development, and reduces tourism. Moreover, it was found that FDI is negatively correlated with terrorism. Increased terrorism risk is associated with decreased FDI, even after controlling all other risk factors. Findings revealed that if terrorism risk increases by one standard deviation, there would be a 5% decrease in the FDI of that country. It is evident that when a country is suffering from terrorism, there will be a large diversion of investment.

Exploring the relationship between terrorism and uneven economic development, Nabin et al. (2022) identify a significant positive relationship between uneven development and terrorism. The study distinguishes itself from prior research by including multi-dimensional rather than unidimensional measures of socio-economic inequality. Findings hold across both developed and developing countries. The study also employs parametric as well as non-parametric techniques to ensure the robustness of the results. Moreover, further checks are conducted using inequality as well as unemployment measures and results remain consistent. The research confirms that distributional inequalities are not only an outcome but also a significant contributor to terrorist activities. This research has not specifically examined the impact of terrorism on human development indicators in developing economies.

2.2 Evidence from Developing Nations

Gaibullov and Sandler (2008) analyzed how terrorism affects the growth of income per capita. For this purpose, they used panel estimation to identify the consequences of terrorism on growth. Developed countries are more resilient to terrorism compared with developing countries. It was also found that, because of terrorism, government expenditure increases and investment decreases. Furthermore, this research shows that developing countries are more prone to internal violence



and terrorism and are more severely affected by political violence. They further found that growth is reduced by 1.5% if one terrorist incident occurs per million people. Because of transnational terrorism, there is a crowding-out effect of government expenditure and a decreased investment share.

A linkage between terrorism and economic factors was analyzed by Kim and Conceição (2010). Most economic conditions, such as low economic growth and low-income levels, are directly linked with terrorism. The trap runs from terrorism to low human development and vice versa. Huge losses of physical and human capital are the outcomes of deteriorated health and lower levels of education. Terrorism, in turn, destroys institutional capacity, which results in a low level of human development. Terrorism also decreases investment in education and health, so these factors lead to low levels of economic development and deteriorated institutions. This disintegrating cycle traps the country in a low-development equilibrium. This research stresses foreign aid as a tool for human development; however, it does not emphasize other factors that can help raise HDI and control terrorism, such as education and development.

Ozcan and Karter (2020) examined the relationships among economic growth, terrorism, and human development in twelve selected Middle East and North Africa countries for the period 2002-2017 using panel causality methods. The findings obtained from the panel causality analysis show that both terrorism and economic growth have bidirectional causality with the human development index throughout the panel. A causality relationship is also found in many countries on an individual-country basis. The study identified that the human development index is both affected by and affects terrorism and economic growth, establishing a complex circular relationship among these variables. The findings of this research confirm the importance of incorporating human development indicators when assessing the economic consequences of terrorism. This research is limited to MENA countries and does not examine developing countries of South Asia independently.

2.3 Evidence from Pakistan

After 9/11, several studies were conducted on the economic impact of terrorism, and it was speculated that terrorism has many adverse effects on the economy. The study conducted by Mehmood (2014) focuses on the relationship between the macroeconomy and terrorism, particularly after 9/11. The total cost of terrorism in Pakistan was estimated at 33.02% of national



income, or around 1% of GDP per year. Findings also show that the total cost of post-9/11 terrorism was estimated at 7 billion US dollars. However, this study did not incorporate an important variable such as defense expenditure in its analysis.

Zakaria, Jun, and Ahmed (2019) examined the impact of terrorism on economic growth in Pakistan using the generalized method of moments (GMM) estimation approach on annual data for the period 1972 to 2014. The study identified channel variables, such as foreign direct investment, domestic investment, and government spending, through which terrorism influences economic growth. The results reveal that the impact of terrorism on FDI and domestic investment is significantly negative, whereas the impact on government spending is significantly positive. A one per cent increase in terrorism reduces FDI by 0.086 per cent, domestic investment by 0.039 per cent and economic growth by 0.002 per cent. These findings are consistent with earlier literature and provide more recent and updated evidence on the harmful effects of terrorism on the economy of Pakistan. The study also identified that, to increase economic growth, more resources must be allocated to improve law and order and attract foreign investment, while complementary domestic investment must also be increased.

While investigating the sectarian dimension of terrorism in Pakistan, Abbas and Syed (2021) explored the causes, impact and remedies of sectarian terrorism from a regional foreign policy perspective. The study particularly examines the role of the Sunni-Shia divide, the influence of Saudi Arabia and Iran, and the misaligned foreign policy choices as key contributors to the rising tide of terrorism. Findings of the research suggest that economic cooperation with India, bilateral loans disbursed by the Kingdom of Saudi Arabia, and trade relations with Iran significantly increase the chances of sectarian terrorism in Pakistan. The study also concluded that the major problem in Pakistan is religious and sectarian extremism and terrorism. These findings are important as they identify the structural and foreign policy dimensions of terrorism that are often neglected in purely macroeconomic investigations. This study does not examine the broader macroeconomic consequences of such sectarian terrorism on variables like GDP and exports.

Considering the association between terrorism and human capital loss, Feroz and Yasmin (2021) empirically investigated the effect of terrorism on skilled labor out-migration in Pakistan over the period 1973 to 2015. The empirical findings of this study, based on the fully modified ordinary least squares (FM-OLS) technique, suggest that the waves of terrorism have not significantly



driven the out-migration of skilled labor from Pakistan. Instead, traditional push factors, such as inflation, unemployment and the rising capital share in gross domestic product, have remained the major factors behind brain drain from Pakistan. The study also identified that per capita economic growth and poverty have curtailed skilled out-migration. This research contributes to the understanding of the indirect consequences of terrorism through the lens of human capital retention and provides evidence that the economic channels of terrorism are more damaging than the direct migratory ones.

Zulfiqar et al. (2025) analyze the asymmetric relationship between human development and terrorism using Pakistan's data and the Quantile Autoregressive Distributed Lag (QARDL) model. The estimated results reveal the existence of long-term and short-term asymmetric relationships between human capital development and terrorism. Moreover, lower human capital development, inflation, sluggish economic growth and rising unemployment are identified as major causes of terrorism in Pakistan. The study found that inflation and gross domestic product have symmetric relationships with terrorism, whereas human capital development and unemployment exhibit asymmetric relationships. These findings allow policymakers to control inflation, improve employment opportunities and enhance the human development index to mitigate terrorism in Pakistan. This research has further strengthened the argument for including HDI as a key variable in the analysis of terrorism for Pakistan. Furthermore, studies show that terrorism can reduce growth through lower investment and FDI while shifting resources toward government/security expenditure (Blomberg et al., 2004; Mehmood, 2014; Zakaria et al., 2019). Recent HDI-focused work also supports including human development as part of the terrorism-development nexus (Ozcan & Karter, 2020; Zulfiqar et al., 2025).

Recent studies therefore support the inclusion of human development in terrorism-related economic analysis. However, the combined treatment of terrorism, HDI and broader macroeconomic indicators remains limited in Pakistan-focused time-series research. This justifies examining terrorism together with investment, exports, fiscal pressure, debt, education and human development in one updated empirical framework.

Therefore, the research gap lies in the limited joint treatment of macroeconomic and human-development channels of terrorism in Pakistan using an updated annual series. This study



contributes to Pakistan-focused evidence by jointly examining terrorism, defense expenditure, human development, education, and selected macroeconomic variables over the period 1985-2023.

3. Methodology and Theoretical Framework

3.1 Theoretical Framework

The economic impact of wars, conflicts, and terrorism is not new in the economic literature. The issue was initially discussed by Keynes and followed by a comprehensive examination of the economic causes of terrorism by Robbins (Mansfield, 2003). Although studies related to terrorism and its impact on the economy were few before 9/11, the events following 9/11 changed the dynamics of the subject in the world economy and terrorism-affected regions. In recent years, many studies have been conducted in the field; a few notable studies are Abadie and Gardeazabal (2001, 2008), Blomberg et al. (2004), Eckstein and Tsiddon (2004), Enders and Sandler (2006), Sandler and Enders (2008), and Zakaria, Jun, and Ahmed (2019).

Studies on terrorism and macroeconomics have widely used vector autoregressive (VAR) models (Gupta, Clements, Bhattacharya, & Chakravarti, 2004). The VAR model, as advocated by Sims (1980), explains variations in macroeconomic variables without making a strict distinction between exogenous and endogenous variables. With annual data and a relatively small sample, lag length must be selected carefully because additional lags consume degrees of freedom and weaken precision. Past studies such as Eckstein and Tsiddon (2004), Enders and Sandler (1993), Mehmood (2013), and Abadie and Gardeazabal (2008) also show that VAR models or their variants have been widely used for studies incorporating macroeconomic variables and terrorism.

This method of estimation incorporates causality testing through the Granger causality test on a standard vector autoregressive model and then interprets the model in light of statistically significant causal links. This mixed method of estimation is described as a quasi-structural VAR and is considered useful because it helps identify the variables and lagged relationships that are most relevant for the study (Mehmood, 2013).

3.2 Methodology

The empirical procedure begins with the Augmented Dickey-Fuller test to check whether the variables are stationary at the level or first difference. Because the data are annual and cover a relatively small sample, the lag structure is selected carefully using LR, FPE, AIC, HQIC and



SBIC. Table 4.1 shows that all lag-selection criteria select two lags; therefore, the baseline VAR(2) model is estimated. Granger causality is then used to examine whether past values of terrorism help predict macroeconomic and human-development variables and whether reverse causality exists.

Although the system contains 11 endogenous variables and only 39 annual observations, the VAR(2) is retained because all lag-selection criteria indicate two lags and because the purpose is to trace dynamic linkages rather than to estimate a fully structural high-dimensional model. To address the small-sample concern, the discussion focuses on terrorism coefficients, impulse-response patterns, Granger causality and consistency with the VECM results instead of interpreting every coefficient in the large VAR system. Therefore, the results should be read as indicative evidence and are interpreted cautiously.

Impulse-response functions are used to trace the dynamic response of each variable to a one-standard-deviation terrorism shock. Since the variables are treated as I(1), Johansen cointegration is used to test for a long-run relationship among terrorism, macroeconomic variables and HDI, followed by a VECM to examine short-run adjustment toward the long-run equilibrium. The Johansen results are interpreted cautiously because the trace and maximum-eigenvalue tests indicate multiple cointegrating relationships but suggest different ranks. Real FDI and education were also checked during estimation, while Table 4.3 presents the main reported ADF results in compact form.

For this study, the variable vector is specified as:

$$\mathbf{Z}_t = \begin{bmatrix} \text{Terrorism}_t \\ \text{LRGDP}_t \\ \text{RealInvestment}_t \\ \text{RealExports}_t \\ \text{RealConsumption}_t \\ \text{RealFDI}_t \\ \text{RealDebt}_t \\ \text{DefenseExpenditure}_t \\ \text{HDI}_t \\ \text{ExchangeRate}_t \\ \text{Education}_t \end{bmatrix} \quad (1)$$

The study-specific VAR(2) model is specified as:

$$\mathbf{Z}_t = \mathbf{c} + \mathbf{A}_1 \mathbf{Z}_{t-1} + \mathbf{A}_2 \mathbf{Z}_{t-2} + \mathbf{u}_t \quad (2)$$



The terrorism-specific Granger causality restriction for each macroeconomic equation is stated together with an illustrative real GDP equation as follows: $H_0: \beta_{\text{Error},1} = \beta_{\text{Error},2} = 0$

$$\text{LRGDP}_t = \alpha_0 + \alpha_1 \text{LRGDP}_{t-1} + \alpha_2 \text{LRGDP}_{t-2} + \beta_1 \text{Terrorism}_{t-1} + \beta_2 \text{Terrorism}_{t-2} + \sum_{j=1}^2 \theta_j' X_{t-j} + \varepsilon_t \quad (3)$$

where X_{t-j} represents the lagged control macroeconomic variables included in the VAR system.

The Augmented Dickey-Fuller test is used to check the stationarity of the data. Because the data are annual time series from 1985 to 2023, the possibility of a unit root cannot be neglected. The ADF test is expressed as:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{i=1}^p \delta_i \Delta Y_{t-i} + \varepsilon_t \quad (4)$$

To test for a long-run relationship among the variables, the Johansen cointegration approach is used. Johansen cointegration is appropriate when the variables included in the system are treated as I(1) and the deterministic specification is clearly reported. Because some unit-root results are weak and the sample is small, the cointegration results are interpreted cautiously. The GDP-normalized cointegrating relation used in this study is:

$$\text{LRGDP}_t + \beta_1 \text{Terrorism}_t + \beta_2 \text{RealFDI}_t + \beta_3 \text{RealDebt}_t + \beta_4 \text{DefenseExpenditure}_t + \beta_5 \text{HDI}_t + \beta_6 \text{ExchangeRate}_t + \beta_7 \text{Education}_t + c = 0 \dots \dots \dots (5)$$

$$\text{where: } \Pi = \alpha\beta' \quad (6)$$

Here, α represents the loading coefficients and β represents the long-run cointegrating vector. In the short-run analysis, the VECM estimates lagged differenced variables and error-correction terms, which represent disequilibrium in the endogenous variable (Enders, 2010). In the presence of cointegration, VECM models help eliminate trends, reduce the spurious-regression problem, and assess the adjustment process. The VECM is specified as:

$$\Delta \mathbf{Z}_t = \mu + \alpha\beta' \mathbf{Z}_{t-1} + \Gamma_1 \Delta \mathbf{Z}_{t-1} + \varepsilon_t \quad (7)$$

3.3 Data

Data for this study were obtained from the World Development Indicators (WDI), the Global Terrorism Database (GTD), and the Human Development Reports of the UNDP. The data for HDI from 1990 to 2023 were obtained from the Human Development Report published by the United



Nations Development Program (UNDP). Data prior to this period were taken from the calculations of HDI in a time-distance perspective using the benchmark values reported in the Human Development Report 1990. The period of analysis is 1985 to 2023, and the observations are yearly. Data on defense expenditures are taken from WDI. The terrorism variable is measured on a count scale as the total number of annual terrorism incidents causing casualties, obtained from GTD. The Global Terrorism Index (GTI) of the Institute for Economics and Peace is a useful composite severity measure, but GTD incident counts are retained because they provide a longer and transparent annual series for 1985-2023 and allow interpretation of economic magnitude per additional incident.

4. Results and Discussion

The estimation procedure begins with selecting the optimal lag length for the vector autoregressive model. The selection of an optimal lag is also important for examining the causal relationships among the variables. The lag length selection of the VAR model is based on the optimal lag length selection criteria. The LR test statistic, AIC (Akaike Information Criterion), SC (Schwarz Information Criterion) and HQ (Hannan-Quinn information criterion) suggest two-period lags. Therefore, the baseline VAR is estimated to use two lags.

Table 4.1: VAR Lag Length Selection Criteria

Lag	LL	LR	FPE	AIC	HQIC	SBIC
0	220.447	—	2.5e-19	-11.6359	-11.4671	-11.1521
1	641.028	841.16	1.9e-26	-28.2794	-26.2528	-22.4731
2*	886.069	490.08*	2.0e-28*	-35.1705*	-31.2863*	-24.0419*

Note: * shows lag selected by the criterion. All criteria (LR, FPE, AIC, HQIC, SBIC) select lag 2. A VAR(2) model is therefore estimated.

Based on the results of lag length selection, a two-period-lagged VAR model was estimated using 11 variables, with each variable treated as dependent in turn. Each equation of the VAR estimates the first and second lags of all variables in the system. Because this is a large VAR relative to the



39 annual observations and the discussion focuses on the terrorism coefficients and their consistency with other tests. According to Table 4.2, terrorism has statistically significant short-run effects on real investment, real exports, defense expenditure, HDI and the exchange rate, while the evidence for real GDP, consumption, FDI, debt and education is statistically insignificant in the reported VAR table.

Table 4.2: Results of VAR: Terrorism Coefficients on Each Variable

Variable	Terror (L1)	Prob. (L1)	Terror (L2)	Prob. (L2)
Real GDP	0.0000262	0.178	-0.0000137	0.381
Real Investment	0.0001267	0.014**	-0.0001044	0.012**
Real Exports	-0.0001526	0.141	-0.0001854	0.026**
Real Consumption	0.0000456	0.104	-0.0000102	0.653
Real FDI	0.0000512	0.890	-0.0001565	0.598
Real Debt	0.0000147	0.820	-0.0000019	0.971
Defense Expenditure	-0.0000982	0.016**	0.0000683	0.037**
HDI	0.0000022	0.680	0.0000071	0.091*
Exchange Rate	0.0000383	0.565	-0.0000976	0.068*
Education	-0.0000195	0.504	-0.0000169	0.472
Terrorism (own)	0.2024945	0.210	0.1296448	0.319

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Terrorism significantly affects real investment, real exports, defense expenditure, HDI and exchange rate. Real GDP, consumption, FDI, debt and education show no significant short-run relationship.

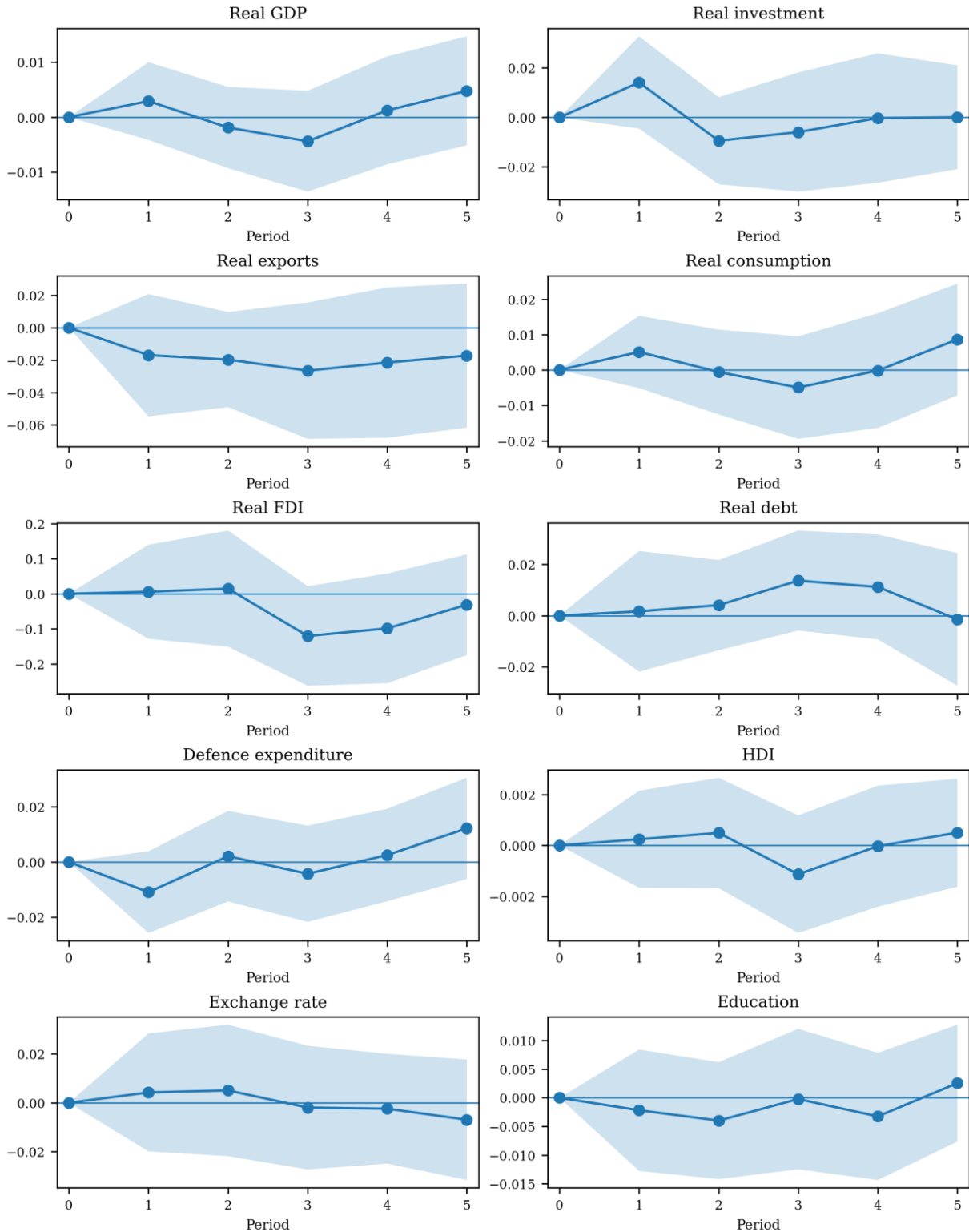
Terrorism has a significant effect on real investment at both lags, a significant negative effect on real exports at the second lag, significant effects on defense expenditure at both lags, a marginally significant effect on HDI at the second lag, and a marginally significant effect on the exchange rate at the second lag. The coefficients for real GDP, real consumption, real FDI, real debt and education are not statistically significant.

The impulse-response functions measure the responsiveness of endogenous variables in the VAR system to a terrorism shock, keeping other shocks constant. A one-standard-deviation terrorism shock is associated with a negative response of real GDP in some periods, although the response changes over the horizon and confidence bands generally include zero. This implies that terrorism may weaken real GDP growth, but the IRF evidence should be interpreted cautiously. These results are broadly consistent with Mehmood (2013) and Zakaria, Jun, and Ahmed (2019).



Figure 4.1: Impulse Response Functions with 95% Confidence Bands

Impulse responses to a one-standard-deviation terrorism shock, VAR(2), 95% confidence bands



Note: Confidence bands are 95 per cent asymptotic bands from the updated VAR(2) model with a constant term.

The solid line shows the estimated response of each variable to a one-standard-deviation change in terrorism, and the shaded area shows the 95 per cent confidence interval. HDI becomes negative in the third period following the terrorism shock, which supports the argument that terrorism can weaken human development. This result is consistent with Ozcan and Karter (2020), who found bidirectional causality between terrorism and the human development index.

The impulse response estimates suggest that real exports show a negative response throughout the five-period horizon. Real investment is initially positive but turns negative after the first period. Defense expenditure is initially negative and then turns positive in the following periods. Exchange rates and education show mixed responses, while GDP, consumption, FDI, debt and HDI also show changing signs across the time periods. These patterns indicate dynamic responses of macroeconomic variables to terrorism. To corroborate these findings, this research uses VAR, Granger causality, cointegration and VECM.

Table 4.3: ADF Unit Root Test (First Difference)

Variable	t-Statistic	p-value	Order
$\Delta(\text{Terrorism})$	-3.189	0.0206**	I(1)
$\Delta(\text{Real GDP})$	-4.094	0.0010***	I(1)
$\Delta(\text{Real Investment})$	-3.151	0.0230**	I(1)
$\Delta(\text{Real Exports})$	-3.717	0.0039***	I(1)
$\Delta(\text{Real Consumption})$	-5.084	0.0000***	I(1)
$\Delta(\text{Real Debt})$	-4.249	0.0005***	I(1)
$\Delta(\text{Defense Expenditure})$	-3.128	0.0245**	I(1)



Variable	t-Statistic	p-value	Order
$\Delta(\text{HDI})$	-5.701	0.0000***	I(1)
$\Delta(\text{Exchange Rate})$	-3.511	0.0077***	I(1)

Note: *** $p < 0.01$, ** $p < 0.05$. All variables are non-stationary at level and stationary at first difference, confirming I(1). This justifies the cointegration and VECM framework.

The ADF results show that the variables reported in Table 4.3 are stationary at first difference. In the case of defense expenditure, HDI and exchange rate, trend, drift and additional lag lengths were used. Table 4.4 shows the results of pairwise Granger causality. Terrorism Granger causes real investment, real exports, defense expenditure, HDI and exchange rate, indicating that past values of terrorism help predict these variables. In the reverse direction, real GDP, real exports, real consumption, real FDI, real debt, defense expenditure, exchange rate and education Granger-cause terrorism. The results therefore suggest bidirectional Granger causality between terrorism and real exports, defense expenditure and exchange rate. Unidirectional causality runs from terrorism to real investment and HDI, while unidirectional causality runs from real GDP, real consumption, real FDI, real debt and education to terrorism. No evidence is found that terrorism Granger causes real GDP, real consumption, real FDI, real debt or education. These results are similar to Mehmood (2013) and Zulfiqar et al. (2025).

Table 4.4: Results of Pairwise Granger Causality (Wald Test)

Null Hypothesis (Terror $\rightarrow$ Variable)	chi2	Prob.	Decision
Terror does not Granger cause Real GDP	1.8564	0.395	Not rejected
Terror does not Granger cause Real Investment	7.1451	0.028**	Rejected
Terror does not Granger cause Real Exports	27.103	0.000***	Rejected



Null Hypothesis (Terror → Variable)	chi2	Prob.	Decision
Terror does not Granger cause Real Consumption	3.9594	0.138	Not rejected
Terror does not Granger cause Real FDI	0.4248	0.809	Not rejected
Terror does not Granger cause Real Debt	0.0927	0.955	Not rejected
Terror does not Granger cause Defense Exp	6.0043	0.050*	Rejected
Terror does not Granger cause HDI	9.1919	0.010**	Rejected
Terror does not Granger cause Exchange Rate	4.7345	0.094*	Rejected
Terror does not Granger cause Education	3.8053	0.149	Not rejected
Null Hypothesis (Variable → Terror)	chi2	Prob.	Decision
Real GDP does not Granger cause Terror	17.743	0.000***	Rejected
Real Investment does not Granger cause Terror	4.4794	0.106	Not rejected
Real Exports does not Granger cause Terror	24.232	0.000***	Rejected
Real Consumption does not Granger cause Terror	22.410	0.000***	Rejected
Real FDI does not Granger cause Terror	10.384	0.006***	Rejected
Real Debt does not Granger cause Terror	10.259	0.006***	Rejected



Null Hypothesis (Terror → Variable)	chi2	Prob.	Decision
Defense Exp does not Granger cause Terror	10.208	0.006***	Rejected
HDI does not Granger cause Terror	0.1119	0.946	Not rejected
Exchange Rate does not Granger cause Terror	36.951	0.000***	Rejected
Education does not Granger cause Terror	12.345	0.002***	Rejected

Note: *** p<0.01, ** p<0.05, * p<0.10. Terrorism Granger-causes real investment, real exports, defense expenditure, HDI and exchange rate. A bidirectional relationship is found between terrorism and defense expenditure and between terrorism and exchange rate.

Table 4.5: Johansen Cointegration — Unrestricted Trace Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (5%)	Decision
None *	—	653.7806	277.71	Rejected
At most 1 *	0.99083	484.8582	233.13	Rejected
At most 2 *	0.94607	379.7355	192.89	Rejected
At most 3 *	0.91318	291.7535	156.00	Rejected
At most 4 *	0.87163	217.8514	124.24	Rejected
At most 5 *	0.84536	150.6519	94.15	Rejected
At most 6 *	0.74287	101.7572	68.52	Rejected



Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (5%)	Decision
At most 7 *	0.59001	69.6585	47.21	Rejected
At most 8	0.35900	24.4716	29.68	Not Rejected
At most 9	0.20802	10.2376	15.41	Not Rejected
At most 10	0.08280	2.7656	3.76	Not Rejected

Note: * denotes rejection at the 5% level. The trace test indicates multiple cointegrating equations, confirming a strong long-run relationship among the variables.

Table 4.6: Johansen Cointegration — Maximum Eigenvalue Test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value (5%)	Decision
None *	0.99083	168.905	70.54	Rejected
At most 1 *	0.94607	105.122	64.50	Rejected
At most 2 *	0.91318	87.981	58.43	Rejected
At most 3 *	0.87163	73.902	52.36	Rejected
At most 4 *	0.84536	67.200	46.23	Rejected
At most 5 *	0.74287	48.894	40.08	Rejected
At most 6 *	0.59001	32.098	33.88	Not rejected



Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value (5%)	Decision
At most 7	0.50323	25.187	27.59	Not rejected
At most 8	0.46077	22.234	21.13	Rejected
At most 9	0.36717	16.472	14.26	Rejected
At most 10	0.14799	5.766	3.84	Rejected

Note: * denotes rejection at the 5% level. The maximum eigenvalue test confirms the existence of multiple cointegrating equations. (Max-eigen statistics computed from the Johansen eigenvalues)

Table 4.7: Normalized Cointegrating Equation (LRGDP as Dependent Variable)

Variable	Coefficient	Std. Error	Prob.
Real GDP (LRGDP)	1.000	(normalized)	—
Terrorism	0.000027	0.0000162	0.096*
Real FDI	0.006939	0.008112	0.392
Real Debt	0.121852	0.034490	0.000***
Defense Expenditure	-0.402445	0.048660	0.000***
HDI	-1.728069	0.229645	0.000***
Exchange Rate	-0.009306	0.029566	0.753
Education	0.566138	0.160255	0.000***



Variable	Coefficient	Std. Error	Prob.
Constant	-10.47882	—	—

Note: *** $p < 0.01$, * $p < 0.10$. Coefficients are from the Johansen normalization ($\beta'Y = 0$); the long-run effect on real GDP is of opposite sign. Terrorism is significant at the 10% level with a negative long-run effect on real GDP. Real debt and defense expenditure are highly significant in the long run.

To examine the long-run relationship among the variables, Johansen cointegration is used. The results of Johansen cointegration (Tables 4.5 and 4.6) confirm the existence of cointegration among the variables. The trace statistics indicate several cointegrating equations, while the maximum-eigenvalue statistics suggest a different rank; therefore, the long-run results are interpreted cautiously. According to the normalized cointegrating equation (Table 4.7), the coefficient of terrorism appears positive in the beta-normalized equation, but the sign reverses when the equation is solved for real GDP. Therefore, terrorism has a negative long-run association with real GDP and is significant at the 10 per cent level.

The normalized Johansen equation can be written as: $LRGDP + 0.000027(\text{Terrorism}) + 0.006939(\text{Real FDI}) + 0.121852(\text{Real Debt}) - 0.402445(\text{Defense Expenditure}) - 1.728069(\text{HDI}) - 0.009306(\text{Exchange Rate}) + 0.566138(\text{Education}) - 10.47882 = 0$.

Solving this equation for LRGDP gives: $LRGDP = 10.47882 - 0.000027(\text{Terrorism}) - 0.006939(\text{Real FDI}) - 0.121852(\text{Real Debt}) + 0.402445(\text{Defense Expenditure}) + 1.728069(\text{HDI}) + 0.009306(\text{Exchange Rate}) - 0.566138(\text{Education})$.

According to the normalized cointegrating equation in Table 4.7, the terrorism coefficient appears positive because the Johansen vector is reported in beta-normalized form with LRGDP normalized to one. Since the cointegrating relation is expressed as $\beta'Y = 0$, solving the equation for LRGDP reverses the signs of the explanatory terms. Therefore, the coefficient implies a negative long-run association between terrorism and real GDP. This interpretation is made cautiously because the result reflects a normalized long-run equilibrium relation rather than a direct one-equation causal effect.



The economic magnitude is small for one incident but meaningful when incidents accumulate. If LRGDP is interpreted in log terms, one additional terrorism incident is associated with an approximate 0.0027 per cent decrease in real GDP in the long run, holding other variables constant. A rise of 100 incidents would therefore be associated with about a 0.27 per cent lower level of real GDP. This practical interpretation clarifies why the positive coefficient in Table 4.7 should not be read as a positive effect on real GDP. Real FDI and exchange rate are statistically insignificant in the long run, while debt, defense expenditure, HDI and education are significant in the normalized relation.

Table 4.8: Vector Error Correction Model — EC Term and Short-Run Terror Coefficient

Equation	EC Term (α , CE1)	Prob.	Short-Run Terror (Δ)	Prob.
Real GDP	-0.4711	0.045**	0.0000054	0.778
Real Investment	-1.1848	0.090*	0.0000980	0.043**
Real Exports	0.4739	0.675	0.0001309	0.198
Real Consumption	-0.1241	0.732	-0.0000200	0.510
Real FDI	-1.7297	0.617	0.0003889	0.355
Real Debt	1.4918	0.025**	0.0000875	0.150
Defense Expenditure	-1.1015	0.028**	-0.0000766	0.085*
HDI	-0.1765	0.035**	-0.0000101	0.024**
Exchange Rate	0.8362	0.241	0.0000989	0.205
Education	-0.1241	0.664	-0.0000407	0.183

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. EC term (α) is the speed of adjustment toward the long-run equilibrium of the GDP-normalized cointegrating relation. Real GDP, real debt, defense expenditure and HDI show significant error correction. In the short run, terrorism significantly affects real investment, defense expenditure and HDI.



The estimates of the VECM model (Table 4.8) show that terrorism impacts selected macroeconomic variables. These results are consistent with the VAR and impulse-response evidence. The effects of terrorism are observed in both the long run and the short run, but the significance differs across variables. The error correction term is significant for real GDP, real investment, real debt, defence expenditure and HDI, indicating that these variables adjust toward the long-run equilibrium relationship. The error correction term is negative and significant for real GDP, real investment, defence expenditure and HDI, showing adjustment toward equilibrium. However, the error correction term for real debt is positive and significant, suggesting that its adjustment may be unstable. Real exports, real FDI, exchange rate, education and real consumption are insignificant in terms of long-run adjustment.

In the short run, terrorism has a statistically significant positive relationship with real investment, with a coefficient of 0.0000980 and a probability value of 0.043. Terrorism also has a statistically significant negative relationship with defence expenditure at the 10% level, with a coefficient of -0.0000766 and a probability value of 0.085. Similarly, terrorism has a statistically significant negative relationship with HDI, with a coefficient of -0.0000101 and a probability value of 0.024. No significant short-run relationship is found between terrorism and the remaining variables. The results from the VECM and cointegration analysis show that there is a limited short-run relationship between terrorism and macroeconomic variables, while the long-run relationship appears to be more substantial. These findings are consistent with Mehmood (2014) and Zakaria, Jun, and Ahmed (2019), who also confirm the adverse macroeconomic effects of terrorism.

5. Conclusion and Policy Implications

The objective of this study was to examine the magnitude and strength of the relationship between terrorism and major macroeconomic and human-development variables in Pakistan during 1985-2023. The research aim was addressed through the VAR(2) model, impulse-response functions, Granger causality, Johansen cointegration and VECM. The findings suggest that terrorism has measurable macroeconomic consequences for Pakistan, but the strength and direction of the relationship differ across variables and across econometric tests.



The updated VAR results show statistically significant or marginally significant effects of terrorism on real investment, real exports, defense expenditure, HDI and exchange rate. Real GDP, real consumption, real FDI, real debt and education do not show statistically significant short-run terrorism coefficients in the reported VAR table. The Granger causality results show that terrorism Granger-causes real investment, real exports, defense expenditure, HDI and exchange rate, while reverse causality is found from several macroeconomic variables to terrorism. This indicates that terrorism and macroeconomic conditions are interlinked rather than one-directional in all cases.

The impulse-response functions suggest that terrorism shocks are associated with negative or mixed dynamic responses. Real exports remain negative over the five-period horizon, real investment becomes negative after the first period, and defense expenditure turns positive in later periods. Other variables show changing signs; therefore, the IRF evidence should be interpreted cautiously, particularly because the confidence bands generally include zero. The Johansen cointegration results indicate long-run relationships among the variables, and the normalized cointegrating equation suggests a negative long-run relationship between terrorism and real GDP. The VECM results show significant adjustment for real GDP, real investment, real debt, defense expenditure and HDI, while the short-run terrorism coefficients are significant for real investment, defense expenditure and HDI.

Overall, the findings support the conclusion that terrorism adversely affects Pakistan's macroeconomic stability and human development through selected channels, especially investment, exports, defense expenditure, exchange-rate pressure and HDI. The evidence does not show that terrorism significantly affects every macroeconomic variable in the short run; therefore, the conclusion emphasizes only those variables supported by the reported tables and impulse-response evidence.

5.1 Policy Implications

The findings of this study suggest five major implications. First, counterterrorism policy should be linked with investment protection. Improving law and order, reducing uncertainty, protecting business activity and improving investor confidence are important because terrorism is found to affect real investment in VAR, Granger causality and VECM results.

Second, export resilience should be strengthened through secure transport routes, trade facilitation, energy reliability, risk-management support for exporters and protection of industrial zones. The



results show that terrorism Granger causes real exports and that the impulse-response function for exports remains negative over the five-period horizon. Therefore, export-oriented sectors should be protected from security shocks and supply disruptions.

Third, defense and security expenditure should be made more efficient so that additional security needs do not crowd out development spending. Terrorism is linked with defense expenditure in the VAR and Granger causality evidence, but Pakistan should avoid a policy response that increases fiscal pressure while reducing allocations for education, health and human development.

Fourth, human development should be treated as part of counterterrorism strategy. Policies that improve education quality, health access, employment opportunities, fair distribution, rule of law and equal opportunity can improve social conditions in terrorism-affected areas. Since HDI is significant in the Granger and VECM results, investment in human development should be presented not only as a social policy but also as an economic and security policy.

Finally, macroeconomic stability should be protected through prudent debt management, credible fiscal policy, exchange-rate stability and institutional reforms. A national-level consensus against terrorism, political stability, civil rights, rule of law and poverty reduction can reduce the socio-economic conditions that allow terrorism to persist. A terrorism-free economy is important for Pakistan to improve investment, strengthen exports, protect human development and reduce the additional burden on public resources.

Conflict of interest

Authors have no conflict of interest

Funding Sources

The authors received no funding to conduct this study

Data Availability

All the data is available in the manuscript. And the datasets used and or analyzed during the current study are available from the corresponding author on reasonable request.

Authors contributions

All authors have contributed to various sections of this manuscript.



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