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Modelling the Asymmetric Impact of Terrorism and Military Expenditure on Tourism Development: A Case of the Tourist Destination Country

Abstract

This study evaluates the asymmetric effects of terrorist attacks and military spending on India's tourism sector by considering gross capital formation and foreign direct investment inflows in the tourism function as controlled variables. Considering the period 1980 to 2017, we employed a non-linear autoregressive distributed lag (NARDL) model and frequency domain causality. This study found that a 1% positive (negative) shock in the partial sum of the terrorist incidents would decrease (increase) the tourist arrivals by 0.17% (0.19%), respectively. However, a positive shock in the partial sum of military spending would enhance tourist arrivals, while a negative shock would lower them both in the short and long run. In addition, gross capital formation and foreign direct investment inflows favourably influence India's tourism development in the long run. The findings from frequency domain casualty also resonate with this study's short-run and long-run findings.

Keywords: tourism development, terrorism, military spending, NARDL, frequency domain causality, India

1. Introduction

Terrorist activities threaten to disrupt the flow of tourist arrivals in any country. India has witnessed a series of terror attacks in both pre- and post-independence periods. The nation was shattered after the incidents of the 26/11 in 2008 Mumbai assault, which was the most heinous and horrific terrorist strike in Indian history. The targets were historic sites, including the Taj Mahal Palace, Victoria Railway Terminus, etc. According to government records, a response to an inquiry in the lower house of national parliament claimed that this occurrence caused a 3.3% decline in international visitor arrivals (Parida et al., 2015). Other major terrorist attacks, including the Pulwama assault in 2019, the Uri attack in 2016, the Jaipur explosions in 2008, the Mumbai train bombings in 2006, the Parliament attack in 2001, the attack on Central Reserve Police Force (CRPF) in Sukma, Chhattisgarh in 2018, Amarnath Yatra attack in 2017 and many other such attacks have had a substantial impact on tourists' perceptions of India's security. As a result, some suspicion regarding the country's tourism development has been raised.

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Tourism significantly boosts India's economy, generating $234 billion in revenue annually and employing 8.1% of the nation's workforce (Kumar, 2020). According to government figures, the travel and tourism industry contributed 4.7% of the country's overall Gross Domestic Product (GDP) in 2020 (Keelery, 2022). Previous studies have found that nations such as Israel, Turkey, Greece, and Italy have faced terrorist acts that have had a significant impact on their tourism market share (Drakos & Kutan, 2001). While tourism is a crucial sector for upholding peace and happiness through pleasure and escapism, a strong defence sector reflects the stability and political prowess of the nation. A causal influence cannot be ruled out (Adeleye et al., 2023; Laiginhas et al., 2023).

Moreover, terrorism incidents are sudden and affect unforeseen shocks, but a country's defence must always be prepared to act in unexpected situations. The only way to send a solid message to external threats is by developing a strong defence sector through optimal military spending. However, the message can act as both a positive and negative shock on the economic factors, which is yet to be studied in the extant literature. In this study, we have explored the relationship between tourism, terrorism, and military spending, whereby the positive and negative shocks in military expenditures and terrorism are considered independent variables to ascertain the asymmetric impact on tourist arrivals.

The identified research gap has further motivated utilising the recent econometric methodology, such as the Non-linear Autoregressive Distributed Lag (NARDL) model by Shin et al. (2014), a modified and updated ARDL model. While the ARDL model can only accommodate the autoregressive terms of lag combinations, the NARDL model is augmented to incorporate the subject variables' decomposed positive and negative components to unravel the relationship's non-linearity. The NARDL model further helps ascertain the decomposed independent variables' asymmetric cumulative dynamic multiplier effect on the dependent variables, fulfilling the specific requirements for resolving the research objectives.

Consequently, terrorism and armed conflict resolution control mechanisms not only support international tourism, but their incorporation contributes to enhancing the sustainability dimension of tourism development. Tourism growth is closely associated with many countries' capital, infrastructure, knowledge, and ability to access global marketing and distribution chains, for which net foreign direct investment (FDI) is considered the most essential and effective tool. FDI significantly boosts tourism through required capital for buildings, infrastructure, knowledge, and improvement in tourist-related facilities. FDI can also be utilized to build hotels, roads, airports, and other crucial infrastructure to boost tourism (Fauzel, 2020; Onifade et al., 2022). The tourism industry will undoubtedly benefit if nations can draw FDI in more significant amounts and expand it significantly. In addition, Rej et al. (2023) have also explored the importance of government backing and strategy leaning towards capital allocation in the tourist destinations in developing nations like India to not only safeguard the tourist destinations' peace and safety but also to enhance heritage and natural resources for speedy penetration of international tourism. We have employed FDI as % of GDP and gross capital formation to predict the influence of these variables in international tourism in India. We have not taken a share of domestic and foreign investment in the tourism sector due to the non-availability of these data, which might have better policy inferences on international tourism in India.

This study contributes several ways to the body of knowledge on the topic. First, the study examined the impact of terrorism and military expenditure on the trajectory of tourism expansion in India over the data period 1980-2017. Secondly, the study explored gross capital formation as a standalone component of thriving tourism growth, which has rarely been examined in the literature on the tourism-terrorism nexus. Finally, the policy takeaway from our empirical findings may assist policymakers with some helpful policy implications that adhere to the tourism expansion of the country, even under the circumstance of possible coexistence of armed conflict in the nation.

2. Literature review

The empirical literature review section will be structured into three distinct sections to examine various facets of the research landscape comprehensively. First, it will provide an in-depth discussion of relevant studies investigating the intricate terrorism-tourism nexus. The second segment will delve into an extensive review of studies focusing on the complex interplay between military spending and terrorism. Finally, the third section will concentrate on a thorough examination of studies exploring the military spending-tourism nexus.

2.1. Terrorism-tourism nexus

Several of the empirical literature has examined the nexus between terrorism and tourism/economic growth (Sloboda, 2003; Feridun, 2011; Karamelikli et al., 2020; Adedoyin et al., 2022). However, previous empirical studies have found a mixed relationship between the abovementioned. The findings of the above studies, among others, differ from one another because of the econometric technique, sample size, focused area, theories, etc. Most empirical studies employed linear methodologies to determine the link between tourism and terrorism (Fareed et al., 2018; Khan & Rasheed, 2016), while the non-linearity/asymmetry is rarely investigated. For example, the earlier studies of Enders and Sandler (1991), Sandler et al. (1992) for European nations, and Sloboda (2003) for the United States examine the impact of terrorism on tourism. The empirical findings of these studies reveal a significant negative effect of terrorism on tourism.

For Turkey, Feridun's (2011) study examines the causal relationship between terrorist attacks and the tourism industry, spanning 1986 to 2006. The study applied an ARDL approach and indicated a negative causal effect of terrorism on tourism. Boojhawon and Seetanah (2018) utilized the ARDL approach to explore the impact of terrorism on Mauritius's tourism demand from 1983 to 2015. They discovered that terrorism negatively affects tourism in the short term but not significantly over the long term. In a similar vein, Shah et al. (2020) applied the ARDL method to assess how terrorism affects tourism in Pakistan, concluding that terrorism severely hampers domestic tourism in both the short and long term. Harb and Bassil (2020) discovered a non-linear association between terrorism and tourism, which varies depending on the number of immigrants arriving in the destination country. They did not observe the negative impact of terrorism on tourism until it became inescapable.

Ajogbeje et al. (2017) applied the Vector Autoregression (VAR) model to understand how terrorism impacts Nigeria's tourism sector and broader macroeconomic factors, finding that increased terrorism significantly reduces tourism revenues and adversely affects various macroeconomic variables. Radić et al. (2018) also employed the VAR model to examine the tourism-terrorism nexus in Europe from 2001 to 2015, discovering that while Germany, Turkey, and the UK support the tourism-led terrorism hypothesis, Spain and Italy align more with the terrorist-led tourism hypothesis. Additionally, Santana-Gallego et al. (2016) analyzed the effects of terrorism, corruption, and crime on tourist arrivals in 171 countries between 1995 and 2013. Their findings indicate that terrorism and crime negatively impact tourist arrivals, while bribery seems to have no significant effect. For Nigeria, Raifu et al. (2022) examine the terrorism–tourism nexus conditioned on military spending between 1995Q1 and 2019Q4. The study finds that terrorism significantly and negatively affects tourism arrivals. Conversely, increased military expenditures positively impact tourism, demonstrating its influential role in moderating the adverse effects of terrorism on the tourism sector. Similarly, the studies by Rej et al. (2023) on India, utilizing dynamic ARDL simulations, and by Iheonu (2023) on Africa, employing Prais-Winsten regression and Driscoll and Kraay-type Fixed Effects models, both find that terrorism plays a crucial role in the tourism growth.

2.2. Military spending-terrorism nexus

As countries respond to interstate conflicts, it is rational for nations to escalate their military budgets in the face of terrorist activities. The increase in domestic and international terrorism heightens national security

concerns, prompting countries to augment their defence spending. Supporting this, George and Sandler (2018) found that rising transnational terrorism against NATO members from 1968 to 2015 resulted in increased NATO defence expenditures. Additionally, following several notable terrorist incidents in Europe during the mid-2000s, NATO nations actively improved their military defences against terrorism, as noted by Dzambic (2011). The study by Khalid et al. (2020) also examined how military spending influences the relationship between armed conflict and international tourist flows in 188 countries from 1995 to 2015. The study used the gravity model and found that the effectiveness of military expenditure as a mediating factor varies by region and the extent of military spending. Specifically, a moderate military expenditure can attract international tourists in conflict-prone areas, while excessive military spending tends to exacerbate armed conflicts rather than mitigate their adverse effects on tourism.

Das (2019) explores the terrorism-military expenditure-foreign capital inflow nexus in India. It employs econometric analyses to understand these dynamics. The study uses Indian data from 1977-1978 to 2016-2017, including an index for terrorism based on the number of incidents, deaths, and injuries. Key findings include a co-integrating relationship between terrorism and military expenditure but not between terrorism and foreign capital inflow, indicating complex interactions between these elements in the Indian context. Hunter (2021) examines the impact of terrorism on military spending across 119 states from 1989 to 2012. Using a cross-sectional time series approach, the analysis reveals that terrorism positively affects military expenditures. However, the extent of this effect varies between democratic and authoritarian states. The study finds that democracies are more likely to increase defence funding in response to terrorist attacks than authoritarian states. Additionally, international terrorist attacks significantly influence defence spending in democratic countries. The research highlights the interplay between regime type, terrorism, and military expenditure decisions.

2.3. Military spending-tourism nexus

Tourism thrives in a peaceful and stable environment, whereas conflicts and the fear of terrorism negatively impact it, as Khalid et al. (2020) highlighted. According to Mansfeld and Pizam (2006), terrorist attacks and security concerns impede tourism. Research, including that by Hyndman (2015) and Saha and Yap (2014), suggests that military conflicts deter tourism due to a lack of security and peace. Murray (2005) notes that law enforcement agencies are crucial in combating terrorism and perceived security threats, primarily upholding law and order. Deger and Sen (1995) observe that security needs, both internal and external, spur military spending, which is seen as a response to perceived security risks. Lee (2006) associates security issues closely with the tourism sector. Walters et al. (2019) assert that security threats influence tourists' decision-making. Khalid et al. (2020) mention that military expenditures reflect a country's investment in security. Heavy investment in security and military spending, as per Khalid et al. (2020) and Saha and Yap (2014), is aimed at countering terrorism and protecting national interests, boosting tourists' confidence. Nassani et al. (2017) emphasize the need for countries to ensure tourist safety through military spending and to develop policies for tourist safety at destinations. Their study found a positive correlation between military spending and tourism activities. Nadeem et al. (2020) explore the relationship between military expenditures and tourism in Pakistan. The study uses an ARDL bounds testing approach to cointegration with data from 2002Q1 to 2016Q4. The key findings indicate that military expenditures adversely impact tourism in the short and long run.

2.4. Research gap necessitating the study

Given the above studies, it can be concluded that the destination's image heavily influences the tourist's choice of location. A tourist's destination image is a collection of associations, values, and images about a location (Sloboda, 2003; Karamelikli et al., 2020; Adedoyin et al., 2022). Governments can provide a safe and secure environment for tourists by providing reliable and adequate security. Thus, on this basis, we examine the

asymmetric impact of terrorism and military expenditure on tourism development in the case of India, which previous studies have not investigated. Second, most empirical research in literature uses a linear approach to explore the relationship between terrorism and tourism. Only a few researchers have explored using non-linear analysis to investigate the causality nexus between the two variables. As a result, we see a research gap in the literature when it comes to applying non-linear/asymmetric economic modelling to examine the nexus between terrorism, military expenditure, and tourism development in the case of India. Hence, the rationale for this study. The current research seems to be the first to investigate the non-linear asymmetric terrorism-tourism development nexus and the military expenditure-tourism development nexus in a combined study applying the NARDL estimation approach, thus making it a ground-breaking piece of research.

3. Overview of data and variable description

The present study utilizes thirty-eight years of annual time series data from 1980 to 2017 to explore the asymmetric impact of terrorism incidents and military expenditure in the pathway of tourism development in India, considering gross capital formation and net foreign direct investment inflows as control variables. It was impossible to extend the analysis beyond the mentioned period due to the non-availability of tourism data before 1980 and terrorism data after 2017. Based on the previous literature justification, the multivariate framework considers the underlying series of variables. The number of foreign tourist arrivals in India, including nations from Pakistan and Nepal as a proxy of international tourism, number of terrorist incidents as a proxy of terrorism, military expenditure (% of GDP), gross capital formation measuring in constant trillion LCU (Local currency) and foreign direct investment (FDI) net inflows (% of GDP). The data for terrorism has been sourced from the Global Terrorism Database. The data for military expenditure, gross capital formation, and FDI have been obtained from the World Bank. International tourism data has been taken from the Indiastat database. We consider the log transformation of all factors taken into consideration to address the issues of heteroscedasticity, data crispness, and interpretation of coefficient as elasticity. Table 1 entails the detailed specification of the variables, and and Table A1 (in the Appendix) tabulates the descriptive statistics of the variables.

Table 1
Variables description and justification

Variable	Definition	Source
TA	Foreign tourist arrivals in India, including nations from Pakistan and Nepal	Indiastat: Socio-Economic Statistical Data
TI	Number of terrorist incidents	Global Terrorism Database
ME	Military expense (% of GDP)	World Bank
GCF	Gross capital formation (constant trillion LCU)	World Bank
FDI	Foreign direct investment, net inflows (% of GDP)	World Bank

Note. All the data are annual data spanning from 1980 to 2017.

4. Methodology and modelling

Different econometric techniques were employed to unveil the clear and discerning depiction of this study's chosen topic. Econometric methods such as the conventional unit root test techniques such as Augmented Dickey-Fuller (Dickey & Fuller, 1979) and the Phillips-Perron (Phillips & Perron, 1988) unit root test were employed to examine the stationary properties in the time series data. The result tabulated in Table A2 (in the Appendix) reveals that all the variables are non-stationary at the level but integrated into I (1). Additionally, using Zivot and Andrews' (2002) unit root test on the single structural break, we discovered that all variables become stationary at the first difference. In contrast, gross capital creation becomes stationary at both levels

and the first difference (Table A3). However, it is crucial to note that we did not include the break dummy in the model since the estimated results were insignificant, and our model is stable without the break dummy.

The prerequisite criteria for applying NARDL is that the studied variables must be integrated of I(1) or fractionally integrated, and there should be non-linear dependencies among the data series. Brock et al.'s (BDS) test has been included in the econometric approach to identify the non-linear dependencies among the data series. The outcome of this technique is illustrated in Table 2 and provides conclusive evidence of rejecting the null hypothesis (H0: residuals are independent and identically distributed across various dimensions) at a 1% significance level. This further provides the inference of non-linear dependencies among the underlying variables. As the variables are integrated into I(1) and the existence of non-linear dependencies, as evidenced by the BDS test, we applied the NARDL bounds test of cointegration to explore the asymmetric association among the underlying variables.

Table 2
BDS non-linearity test results

BDS statistics					
Series	Dimension 2	Dimension 3	Dimension 4	Dimension 5	Dimension 6
lnTA	0.176***	0.285***	0.348***	0.384***	0.405***
lnTI	0.118***	0.181***	0.227***	0.261***	0.285***
lnME	0.147***	0.241***	0.301***	0.338***	0.361***
lnGCF	0.184***	0.307***	0.389***	0.442***	0.477***
in FDI	0.136***	0.219***	0.276***	0.327***	0.358***

*** denotes a 1% significance level. ** denotes a 5% significance level. * denotes a 10% significance level.

As asymmetric dependencies exist among the variables, the recently developed NARDL approach, designed by Shin et al. (2014), was employed to evaluate the asymmetric effect of terrorism and military expenditure in the pathway of Indian tourism development in both the short and long run, in the presence of gross capital formation and FDI as control variables. The NARDL framework allows for jointly investigating the asymmetric cointegration and asymmetric short and long-run elasticity in a single equation platform, even for a smaller sample size of data. This framework yields the variables to be integrated into I(1) or fractionally integrated into I(0) and I(1). The process of formulating the non-linear ARDL model involved decomposing terrorism incidents and military expenditure into two additional sets of variables depending on positive and negative changes and incorporating those variables in equation (1) as follows:

$$lnTA_t = \alpha_0 + \alpha_1 lnTI\_POS_t + \alpha_2 lnTI\_NEG_t + \alpha_3 lnME\_POS_t + \alpha_4 lnME\_NEG_t + \alpha_4 lnGCF_t + \\ + \alpha_6 lnFDI_t + \varepsilon_t \quad (1)$$

whereas in the natural logarithm taken across all variables to reduce the effect of an outlier in the data series, $lnTI\_POS_t$ and $lnTI\_NEG_t$ represent the positive and negative-sum process variation in terrorist incidents, respectively. Similarly, $lnME\_POS_t$ and $lnME\_NEG_t$ indicate the positive and negative-sum process variation in military expenditure, respectively. Both *lnGCF* and *lnFDI* indicate the natural log of gross capital formation and net inflows of foreign direct investment in India, and ε_t Indicates other determinants of tourism development whose effects are assumed to be constant.

$$lnTI\_POS_t = \sum_{j=1}^{t} \Delta lnTI\_POS_j = \sum_{j=1}^{t} \max(\Delta lnTI_j, 0) \quad (2)$$

$$lnTI\_NEG_t = \sum_{j=1}^{t} \Delta lnTI\_NEG_j = \sum_{j=1}^{t} \min(\Delta lnTI_j, 0) \quad (3)$$

$$lnME\_POS_t = \sum_{j=1}^{t} \Delta lnME\_POS_j = \sum_{j=1}^{t} \max(\Delta lnME_j, 0) \quad (4)$$

$$lnME\_NEG_t = \sum_{j=1}^{t} \Delta lnME\_NEG_j = \sum_{j=1}^{t} \min(\Delta lnME_j, 0) \quad (5)$$

The NARDL model can be defined as follows:

$$\Delta lnTA_t = \alpha_0 + \beta_1 lnTA_{t-1} + \beta_2 lnTI\_POS_{t-1} + \beta_3 lnTI\_NEG_{t-1} + \beta_4 lnME\_POS_{t-1} + \beta_5 lnME\_NEG_{t-1} + \beta_6 lnGCF_{t-1} + \beta_7 lnFDI_{t-1} + \sum_{i=1}^{k_1} \lambda_{1i}\ \Delta lnTA_{t-i} + \sum_{i=0}^{k_2}(\gamma_i^+\ \Delta lnTI\_POS_{t-i} + \gamma_i^-\Delta lnTI\_NEG_{t-i}) + \sum_{i=0}^{k_3}(\varphi_i^+\ \Delta lnME\_POS_{t-i} + \varphi_i^-\Delta lnME\_NEG_{t-i}) + \sum_{i=0}^{k_4} \lambda_{2i}\,\Delta lnGCF_{t-i} + \sum_{i=0}^{k_5} \lambda_{2i}\,\Delta lnFDI_{t-i} + \varepsilon_t \quad (6)$$

whereas Δ is the first difference operator, α_0 is the constant term, k1-k5 is the lag lengths associated with each variable, $\sum_{i=0}^{k_2} \gamma_i^+$ + and $\sum_{i=0}^{k_2} \gamma_i^-$ capture the short-run positive and negative impact of terrorism incidents on tourism, $\sum_{i=0}^{k_3} \varphi_i^+$ and $\sum_{i=0}^{k_3} \varphi_i^-$ capture the short-run positive and negative impact of military expenditure on tourist arrivals, ε_t is the white noise error term. Further, the long-run impact of positive and negative changes in terrorism incidents on international tourism can be estimated as $\alpha_1 = \beta_2/\text{-}\beta_1$, $\alpha_2 = \beta_3/\text{-}\beta_1$. Similarly, the long-run impact of positive and negative changes in military expenditure on international tourism can be estimated as $\alpha_3 = \beta_4/\text{-}\beta_1$, $\alpha_4 = \beta_5/\text{-}\beta_1$.

The estimation procedure of the NARDL bounds test of cointegration can be done by following the subsequent processes: (i) the first step is to employ Akaike Information Criteria (AIC) to determine the optimal lag order; (ii) then the F test is administered to explore the asymmetric association among the variables in equation 6. The null hypothesis of no cointegration (H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7$) is then tested against the alternative hypothesis of (H_a: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7$). The conclusion on the asymmetric association among the underlying variables can be drawn if the estimated F statistics exceed the upper critical bounds value designed by Pesaran et al. (2001). The null hypothesis of no cointegration will be accepted if the estimated F statistics fall below the lower critical bounds value. Finally, we can be introduced to the inconclusive situation if the estimated F statistics fall within the upper and lower bounds of essential values; (iii) The third step consists of investigating the short-run asymmetry ($\sum_{i=0}^{k_2} \gamma_i^+ = \sum_{i=0}^{k_2} \gamma_i^-$; $\sum_{i=0}^{k_3} \varphi_i^+ = \sum_{i=0}^{k_3} \varphi_i^-$) and long-run asymmetry ($\alpha_1=\alpha_2$; $\alpha_3=\alpha_4$) by employing standard Wald test measures; (iv) finally, to examine the asymmetric cumulative dynamic multiplier effect on TA_t in response to 1% change in TI_POS_t, TI_NEG_t, ME_POS_t, and ME_NEG_t, respectively are as follows:

$$K_b^+ = \sum_{j=0}^{b} \frac{\phi lnTA_{t+j}}{\phi lnTI\_POS_t}, K_b^- = \sum_{j=0}^{b} \frac{\phi lnTA_{t+j}}{\phi lnTI\_NEG_t}, b = 1,2,3 \ldots\ldots\ldots \quad (7)$$

Noting that $b \to \infty$, $K_b^+ \to \alpha_1$, $K_b^- \to \alpha_2$

$$K_b^+ = \sum_{j=0}^{b} \frac{\phi lnTA_{t+j}}{\phi lnME\_POS_t}, K_b^- = \sum_{j=0}^{b} \frac{\phi lnTA_{t+j}}{\phi lnME\_NEG_t}, b = 1,2,3 \ldots.. \quad (8)$$

Noting that $b \to \infty$, $K_b^+ \to \alpha_3$, $K_b^- \to \alpha_4$

The error correction model of Eq. 6 can be represented as follows:

$$\Delta lnTA_t = \sum_{i=1}^{k_1} \lambda_{1i}\ \Delta lnTA_{t-i} + \sum_{i=0}^{k_2}(\gamma_i^+\ \Delta lnTI\_POS_{t-i} + \gamma_i^-\Delta lnTI\_NEG_{t-i}) + \sum_{i=0}^{k_3}(\varphi_i^+\ \Delta lnME\_POS_{t-i} + \varphi_i^-\Delta lnME\_NEG_{t-i}) + \sum_{i=0}^{k_4} \lambda_{2i}\,\Delta lnGCF_{t-i} + \sum_{i=0}^{k_5} \lambda_{2i}\,\Delta lnFDI_{t-i} + \theta_i ECT_{t-1} + \varepsilon_t \quad (9)$$

In equation 9, θ_i represents the coefficient of the error correction term (ECT) that indicates the speed of adjustment towards the long-run equilibrium pathway after the shock in the short run. This study also performed several post-diagnostic tests to verify the model's robustness.

Finally, the spectral Granger-causality of Breitung and Candelon (2006) was used to investigate the causal linkage among the outlined variables. This study employed the Granger causality in the frequency domain strategy to illustrate short-, medium-, and long-run causality, simplifying the prediction of the parameters at specified periods. The frequency domain analysis uses the spectral density function to highlight periodic fluctuations in data series (Gorus & Aydin, 2019). However, because this method can only be used with a specified timeline, the model with an infinite horizon cannot be approximated. The equation of Breitung and Candelon (2006) is described as follows:

$$X_t = a_1\chi_{t-1} + \ldots\ldots\ldots\ldots\ldots + a_p\chi_{t-p} + b_1Y_{t-1} + \ldots\ldots\ldots\ldots + b_pY_{t-p} + \varepsilon_{1t} \quad (10)$$

The preceding equation's linear constraint is based on the null hypothesis of (on $M_{y \to x}(\omega) = 0$). We assume $\omega_i = 0.05$, $\omega_i = 1.5$, and $\omega_i = 2.5$ for long, medium, and short-term causality. In lag p, time t, and a and b are the parameters to be estimated.

5. Results and discussions

Table 3 below illustrates the outcome of the NARDL bounds testing procedure. The estimated F-statistics are much higher than the upper bounds F critical value at the 5% level of significance, implying the null hypothesis of the asymmetric cointegration (H_0: no existence of asymmetric cointegration) can be rejected at the 1% significance level, and inferring the existence of asymmetric association among the underlying variables for the mentioned period.

Table 3
Bounds test for NARDL

Estimated model	**lnTA = *f*(lnTI_POS, lnTI_NEG, lnME_POS, lnME_NEG, lnGCF, lnFDI)**	
Bound test F- statistics	4.124**	
Optimal lag length	2, 2, 2, 2, 2, 2, 1	
Pesaran et al. (2001) Critical values		
Significance level	Lower bound I(0)	Upper bound I(1)
1%	3.6	4.9
2.5%	3.19	4.38
5%	2.87	4
10%	2.53	3.59

Note. _POS and _NEG denote the cumulative sum of positive and negative changes in the series.
** denotes a 5% level of significance.

After establishing the asymmetric association among the variables employed in the model, we found the asymmetric long and short-run coefficient estimates using the NARDL equation framework (7). The results are outlined in Table 4. Results reported that the positive shock on the partial sum of terrorism lowers international tourism, indicating a 1% increase in terrorism reduces tourism growth by 0.17%. Our result is further supported by the research findings of Feridun (2011) for Turkey and Buigut et al. (2017) for 15 countries. Also, our result provides evidence that the negative shock on the partial sum of terrorism incidents intensifies international tourism, and a 1% decrease in terrorism enhances international tourism by 0.23%. The study results align with the earlier research of Karamelikli et al. (2020) for Turkey. As an emerging economy, India's contribution to GDP from the tourism industry cannot be deniable. In light of the obtained findings, our study further stimulates the importance of integrating the terrorism-tourism nexus in the prevailing growth policy for India, as increasing terrorism not only negatively impacts the tourism industry but is also indirectly responsible for slowing down the economic pace of the country.

Subsequently, we augmented military expenditure in our present model and investigated the asymmetric long-run coefficient estimates of military spending. The result, outlined in Table 4, provides evidence that a positive shock on the partial sum of military expenditure improves international tourism. In contrast, a negative shock on the same worsens tourism development. Our findings align with the empirical study by Khalid et al. (2020) for a panel of 188 nations. Our findings further provide the insight that in the wake of armed conflict/ terrorism incidents, policy measures on increasing government spending on military expenditure without reducing the share of financial resource allocation in the tourism industry may lead to the 'patriotic effect' of ensuring the safety, security, and communal integrity in the tourist destinations that ultimately influence the tourism industry in a positive direction.

Moreover, gross capital formation was related to the penetration of tourism development; a 1% increase in gross capital formation was observed to increase international tourism by 0.19%. Our findings further strengthen the need for government support and policies favouring enhanced capital accumulation in tourist destinations. This is essential for protecting and enriching the heritage and natural resources to accelerate frequent visits of foreign tourists. In addition, FDI has been found to benefit India's pathway to international tourism growth. A 1% increase in FDI was found to be associated with the corresponding 0.07% increase in international tourism in India. Our findings align with the earlier empirical findings by Munir and Iftikhar (2021) for Nepal and Sri Lanka. Our results further necessitate government policy intervention to introduce robust policy measures that ensure sufficient FDI inflow in the tourism sector. This helps institutional and infrastructure development in tourist destinations, increasing their attractiveness to tourists.

Table 4
NARDL long and short-run results

Variables	Coefficient	t-statistics	Prob.
Long run results			
lnTI_POS	-0.17**	-2.92	0.012
lnTI_NEG	0.23***	7.71	0.000
lnME_POS	1.29**	2.31	0.037
lnME_NEG	-0.27*	-1.59	0.089
lnGCF	0.19*	1.35	0.095
in FDI	0.07***	3.12	0.007
Short run results			
Δ (lnTI_POS)	0.02	0.59	0.558
Δ (lnTI_POS(-1))	0.12***	3.07	0.008
Δ (lnTI_NEG)	-0.01	-0.31	0.763
Δ (lnTI_NEG(-1))	-0.16***	-3.73	0.002
Δ (lnME_POS)	1.15**	2.96	0.011
Δ (lnME_POS(-1))	0.96***	3.74	0.002
Δ (lnME_NEG)	-2.32***	-5.28	0.001
Δ (lnME_NEG(-1))	-2.07***	-5.49	0.003
Δ (lnGCF)	-0.05	-0.38	0.707
Δ (lnGCF(-1))	-0.35**	-2.69	0.017
Δ (lnFDI)	0.06***	4.08	0.001
ECT(-1)	-1.25***	-6.27	0.000
Constant	17.35***	6.23	0.000
R^2	0.818		
F-statistics [Prob.]	6.44 [0.000]		

Note. _POS and _NEG denote the cumulative sum of positive and negative changes in the series.
*** denotes a 1% significance level. ** denotes a 5% significance level. * denotes a 10% significance level.

Table 4 also highlights the short-run coefficient estimates and suggests that positive (negative) shock on the partial sum of military expenditure fosters (worsens) international tourism in the short run. The result is

statistically significant at a 1% significance level. Both the positive shock and negative shock on the partial sum of terrorism incidents were found to be insignificant in the short run. It was also observed that the short-run coefficients associated with military expenditure are more substantial than the long-run coefficients. FDI was also found to assist international tourism development in the short run. The error correction term was also found to be negative and significant at the 1% significance level, inferring that time series modelling was converging, and the error was corrected to reach the long-term equilibrium of tourism development.

We also employed a post-diagnostic test to ensure the robustness and validity of the NARDL estimations. We employed the Jarque-Bera normality test, the Breusch-Godfrey serial correlation LM test, the Breusch-Pagan-Godfrey heteroscedasticity test, and the Ramsey RESET test. In Table A4, our results are found to pass all the below-mentioned diagnostic tests. The results, as shown in Figure A1, are evidence that both the plots of CUSUM and CUSUMQ are well within the critical limit at a 5% significance level. Hence, we concluded that the NARDL estimations passed the stability test. The Wald test results in Table A5 provide evidence of an asymmetric association between terrorism incidents and international tourism, as well as military expenditure and international tourism, in both the short- and long-run.

This study also augmented dynamic multiple variations, and the results are portrayed in Figures A2 and A3. Figure A2 infers that the overall response of international tourism is similar in the case of positive and negative shocks in the partial sum of terrorism incidents. However, global tourism responds more to positive shock in the partial sum of military expenditure than its negative counterpart, as shown in Figure A3.

The findings of the NARDL technique have further been validated with the outcomes from ARDL, CCR, FMOLS, and DOLS techniques (the results are shown in Tables A6 & A7). The findings from ARDL, Fully Modified Ordinary Least Squares (FMOLS), Dynamic OLS, and Canonical Cointegration Regression (CCR) techniques demonstrate that the sign and statistical significance of the coefficient of the employed variables are consistent with the findings from the NARDL estimations. However, the Wald test revealed significant long-term asymmetry, while the BDS test indicated non-linear relationships among the variables. Therefore, we presented and analyzed the results of the NARDL model for policy recommendations.

The results for spectral causality between tourism and terrorism are presented in Figure 1a. The causal relationship across different frequency domains is plotted against the critical values at the 1%, 5%, and 10% levels (represented by dashed lines). It can be observed that the causal relationship between tourist arrivals and positive terrorism is highly significant at the lowest frequency level, whereafter, it starts following a downward curve until 0.64 frequency level and after that becomes insignificant. It shows that tourist arrival is unidirectionally causally linked with positive shock on the partial sum of terrorism incidents in the long-term; however, the relationship is not significant in the medium to short-term period. Further, in Figure 1b, the causal relationship between tourism and military expenditure is graphically represented. It can be observed that the causal relationship between TA and LME_POS is significant in the long-term frequency zone, whereas TA to LME_NEG is significant in the medium-term and short-term frequency zone. Both the relationships are unidirectional in the respective significance zone frequencies. This result, therefore, identifies that international tourism responds to positive shocks in military expenditure, and the impact is long-term significant, whereas adverse shocks have short- and medium-term significance.

In Figure 1c, the relationship between positive and negative shocks of terrorism and tourism is graphically represented. The results highlight that LTI_POS is causally linked with LME_NEG, thereby underlining that if military expenditure shock is negative, terrorism will lead to positive shock. Further, LME_POS also leads to LTI_POS in the long term, whereas LME_POS leads to LTI_NEG in the medium to short-term frequencies. Although military expenditure is increased, it will also lead to increased terrorism incidents in the long term since over-expenditure on military equipment can lead to armed conflict in the long run. In contrast, military expenditure will reduce the medium to short-term impact of terrorism incidents and

improve the general public's and tourists' safety. The spectral causality relationship between GCF and other variables is represented in Figure 1d. The result highlights that GCF is causally linked with tourist arrival in all frequency domains, thereby underscoring the importance of infrastructure development. However, it can also be visualized that GCF leads to LTI_POS and LME_POS in the long run. Therefore, it can be inferred that although increased capital formation would lead to increased terrorism incidents, it should be curbed by positive shocks through military expenditure, increasing international tourism arrival. The spectral causal relationship between Tourism and FDI is also presented in Figure 1e. In the short-run and medium-run frequency, bidirectional causality is visible, whereas in the long-run, the causal relationship is not statistically significant.

Figure 1a
Tourism vs terrorism

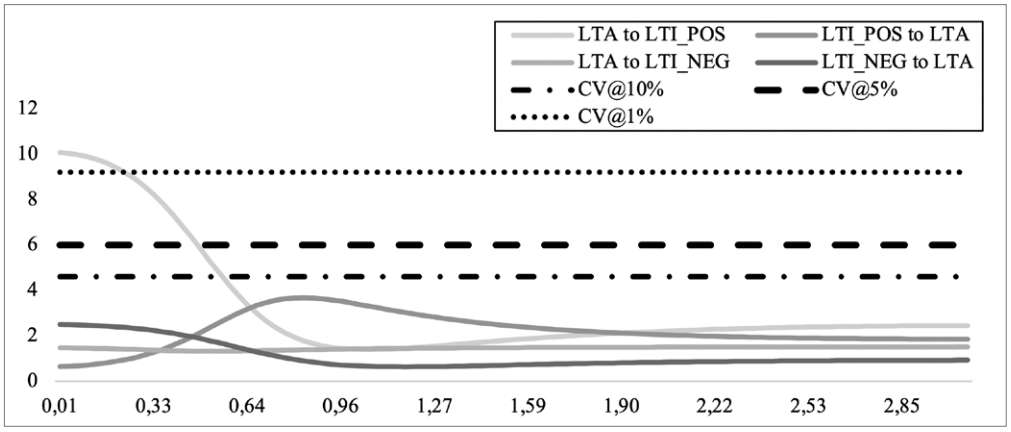


Figure 1b
Tourism vs military expenditure

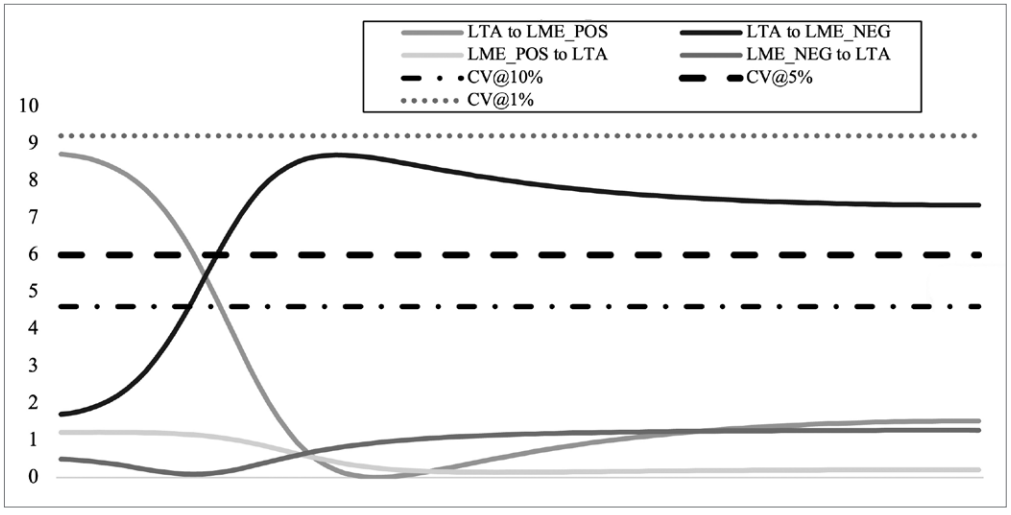


Figure 1c
Terrorism vs. military expenditure

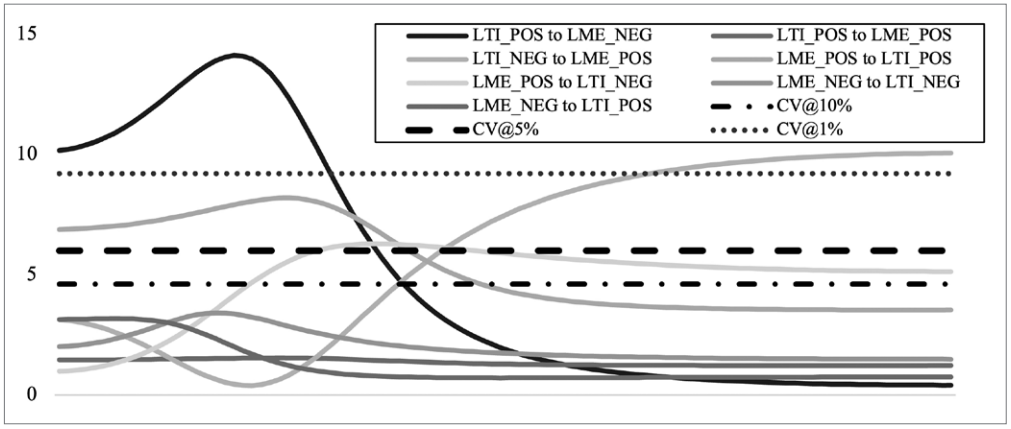


Figure 1d
Gross capital formation vs. others

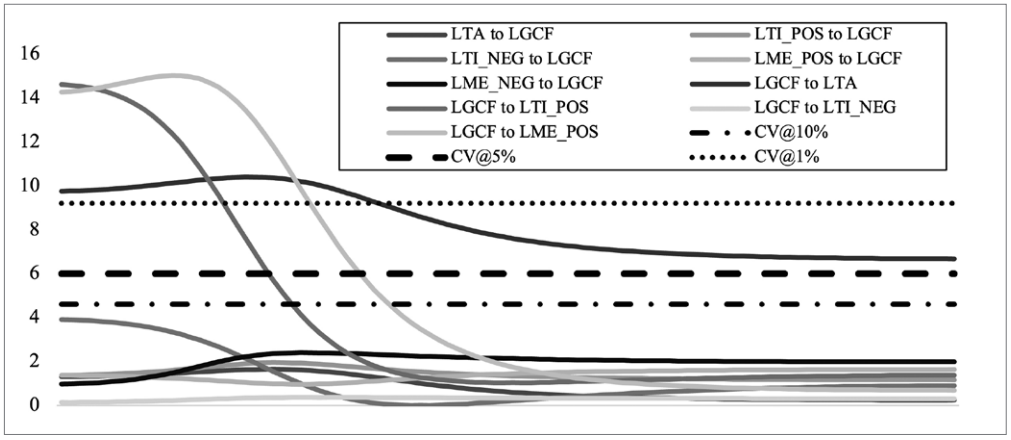
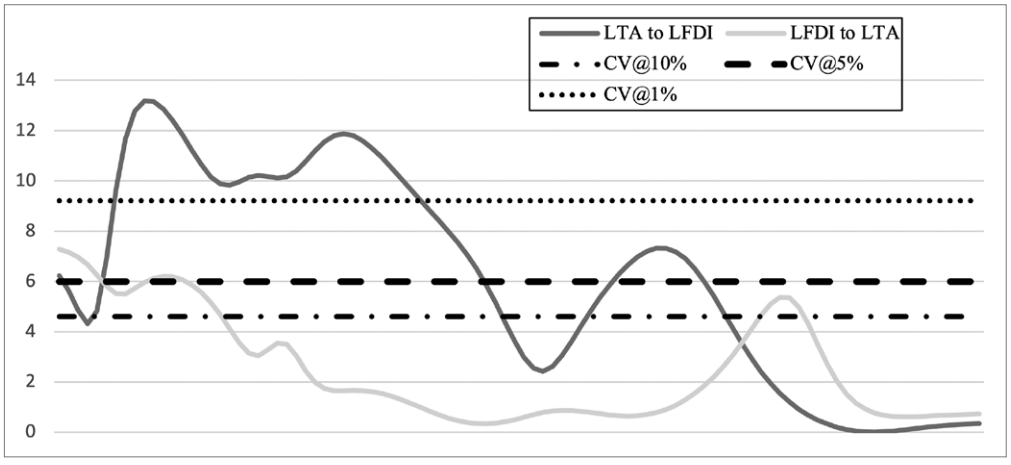


Figure 1e
Tourism vs. FDI



6. Conclusions and policy implications

This study explores the asymmetric effects of terrorism and military expenditure on India's tourist sector in the presence of gross capital formation and net foreign direct investment inflows. The NARDL model and frequency domain causality tests are used in this work to address this research gap, using 38 years of annual time series data from 1980 to 2017. The long-term findings show that a positive shock to the partial sum of terrorist episodes reduces foreign tourists. Still, a negative shock to the partial sum of terrorism incidents increases it. On the other hand, positive shocks to the partial total rise in military expenditure international tourist arrivals, whereas adverse shocks cause tourist arrivals to deteriorate. Furthermore, gross capital formation and net FDI inflows are positively linked to tourist arrivals, and the short-run coefficients resemble the long-run coefficients. This study used certain diagnostic checks to evaluate the robust estimation and discovered that all the findings meet the classical linear regression assumption and that conclusions are robust for policy implications.

The frequency domain causality test was also used in this study to examine the causal relationship between variables. The findings reveal that in the long run, tourist arrival is unidirectionally connected with positive shock on the partial sum of terrorism incidents. At the same time, the relationship is not significant in the medium to short term. Furthermore, positive shocks in military spending have a long-term influence on tourist arrivals, but adverse shocks have a short- and medium-term impact. Moreover, the findings show that gross capital formation and net FDI inflows are unidirectionally associated with tourist arrivals in all frequency domains.

This article's results are pertinent and significant to policy. First, we have seen the Indian tourist industry collapse in the face of terrorism; thus, policymakers should guarantee that enough resources are held for security and defence, eventually protecting tourists from any terrorism incidents. To build a conducive atmosphere for India's tourism sector to grow, the allotted resources should be used efficiently to control and avoid future terrorism. The military industry, which is mainly responsible for maintaining peace and harmony in the nation and is one of the vital armed forces in preventing terrorist operations both within and outside the country's borders, should be given priority in the case of allocated resources and provided with sufficient expenditure to purchase military equipment. Subsequently, to maintain national integrity, peace, and harmony and stabilize tourism growth, Indian policymakers should have emphasised increasing military spending and allocating financial resources to tourist destinations to attract and increase foreign visitors by ensuring safety in all tourist destinations. Second, Indian authorities should avoid relying solely on military strength to resolve conflicts. When there is armed conflict, as the second largest country globally, Indian government diplomacy combined with a reasonable amount of security investment should help resolve situations quickly. In this case, a moderate military budget reduces the detrimental effects of armed conflict on foreign tourism.

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Appendix

Table A1
Descriptive statistics of studied variables

Variables	lnTA	lnTI	lnME	lnGCF	lnFDI
Mean	14.84	5.27	1.06	2.36	-1.09
Median	14.68	5.24	1.03	2.25	-0.48
Maximum	16.12	6.93	1.44	3.81	1.29
Minimum	13.99	2.31	0.85	1.05	-5.95
Std. deviation	0.65	1.16	0.15	0.91	1.82
Skewness	0.45	-0.78	0.92	0.16	-0.76
Kurtosis	1.87	3.38	3.14	1.63	2.61
Jarque-Bera	3.29	4.08	5.42	3.13	3.87
Probability	0.19	0.13	0.04	0.21	0.14
Observations	38	38	38	38	38
Correlation matrix					
	lnTA	lnTI	lnME	lnGCF	lnFDI
lnTA	1.00				
lnTI	0.74	1.00			
lnME	-0.73	-0.45	1.00		
lnGCF	0.98	0.75	-0.75	1.00	
lnFDI	0.85	0.58	-0.76	0.89	1.00

Table A2
Unit root test

Variables	Form	ADF (t-statistics)		PP (t-statistics)		Order of integration
		Intercept	Trend + intercept	Intercept	Trend + intercept	
lnTA	Level	1.68 (0.999)	-1.66 (0.749)	1.63 (0.999)	-1.76 (0.703)	I(1)
	First difference	-4.47*** (0.001)	-4.86*** (0.002)	-4.47*** (0.001)	-4.77*** (0.003)	
lnTI	Level	-2.47 (0.132)	-2.98 (0.151)	-2.45 (0.137)	-2.91 (0.171)	I(1)
	First difference	-6.76*** (0.000)	-6.73*** (0.000)	-6.94*** (0.000)	-6.92*** (0.000)	
lnME	Level	-1.17 (0.675)	-2.95 (0.159)	-1.36 (0.592)	-2.41 (0.371)	I(1)
	First difference	-4.48*** (0.001)	-4.41*** (0.006)	-4.29*** (0.002)	-4.21*** (0.011)	
lnGCF	Level	0.29 (0.975)	-2.71 (0.237)	0.32 (0.976)	-2.71 (0.239)	I(1)
	First difference	-6.91*** (0.000)	-6.81*** (0.000)	-6.91*** (0.000)	-6.82*** (0.000)	
LnFDI	Level	-1.35 (0.598)	-2.83 (0.197)	-1.07 (0.715)	-2.89 (0.174)	I(1)
	First difference	-6.51*** (0.000)	-6.41*** (0.000)	-7.39*** (0.000)	-7.52*** (0.000)	

Note. Probability value is given in parenthesis.
*** denotes a 1% level of significance. ** denotes a 5% level of significance.

Table A3
Zivot and Andrews' single structural break unit root test

Variable	Level		First difference	
	t-statistics	Time break	t-statistics	Time break
LTA	-2.38	2008	-4.01***	2009
LTI	-1.19	1995	-3.64***	1993
LME	-2.10	1993	-4.53**	1990
LGCF	-3.38**	2001	-5.68***	2004
LFDI	-.178	1996	-4.33***	1993

Note. We considered the break in the intercept.
*** denotes a 1% level of significance. ** denotes a 5% level of significance. * denotes a 10% level of significance.

Table A4
Diagnostic tests for Asymmetry ARDL

Diagnostic test	Statistics	Decision
Jarque-Bera test	χ^2: 0.537 Prob: 0.764	Error terms are normally distributed
Breusch-Godfrey serial correlation LM test	F: 0.524 Prob: 0.482	No serial correlation
Breusch-Pagan- Godfrey test	F: 0.793 Prob: 0.691	No heteroskedasticity
Ramsey RESET test	F (1): 0.972 Prob: 0.342	Model is correctly specified

Table A5
Wald test for the long-run and short-run asymmetry

Variables	Long run asymmetry		Short run asymmetry	
	F-stat	P-value	F-stat	P-value
lnTI	6.13**	0.012	5.52*	0.007
lnME	2.36*	0.094	2.61*	0.081

*** denotes a 1% level of significance. ** denotes a 5% level of significance. * denotes a 10% level of significance.

Table A6
ARDL long run results

Variables	Coefficient	t-statistics	Prob.
lnTI	-0.13**	-0.73	0.048
lnME	1.01***	3.23	0.008
lnGCF	0.57*	4.77	0.001
lnFDI	0.24***	5.61	0.001

*** denotes a 1% level of significance. ** denotes a 5% level of significance. * denotes a 10% level of significance.

Table A7
Results of FMOLS, DOLS and CCR techniques

Variable	FMOLS		DOLS		CCR	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
lnTI	-0.09*	0.08	-0.05**	0.03	-0.01**	0.05
lnME	0.19**	0.04	0.36*	0.09	0.21**	0.03
lnGCF	0.82***	0.00	0.76***	0.00	0.88*	0.07
lnFDI	0.07***	0.01	0.07**	0.02	0.08***	0.01

*** denotes a 1% level of significance. ** denotes a 5% level of significance. * denotes a 10% level of significance.

Figure A1
The plot of CUSUM and CUSUM of Square test at 5% level of significance

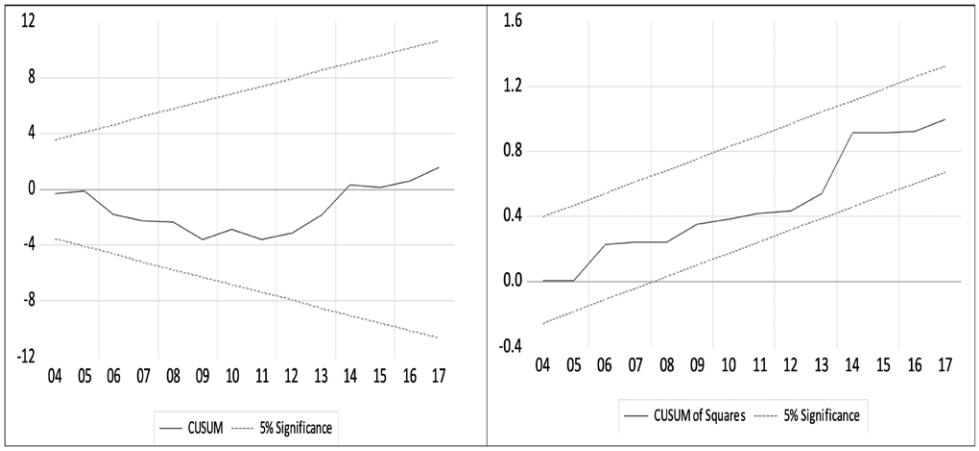

Figure A2
Dynamic multipliers graph for lnTI

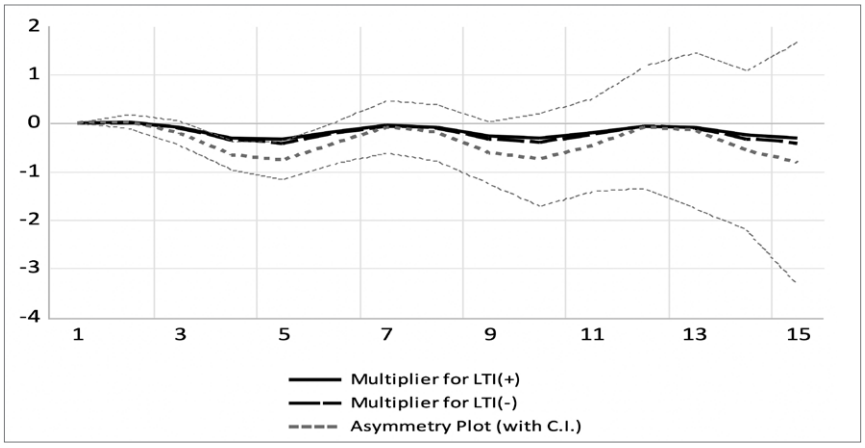

Figure A3
Dynamic multipliers graph for lnME