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Economic Theory

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ECONOMETRIC MODELING TO DETERMINE THE IMPACTS OF TOURISM AND HOSPITALITY SECTOR DEVELOPMENT ON ECONOMIC GROWTH: A THEORETICAL FRAMEWORK

Abstract

This study employs dynamic cointegration and causal analysis to investigate the relationship between the development of the tourism and hospitality sector and economic growth in Bangladesh, based on time series data from 1972 to 2023. The findings confirm the existence of a long-run cointegration relationship between the development of the tourism-hospitality sector and economic growth, as demonstrated by the results of the Johansen and Juselius test and the VEC model estimation. The error correction term is statistically significant when economic growth is treated as the endogenous variable, further supporting this finding. GMM estimates indicate that a 100% increase in the development of the tourism-hospitality sector leads to a 0.46% rise in economic growth. The short-run effect of the variable tourism development is negative and not statistically signifi-

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cant. When per capita real GDP deviates from its equilibrium level, it adjusts by 61.86% within the first year, which is statistically significant, with full convergence in less than two years. Estimated elasticities imply that the tourism-hospitality sector development will contribute to more economic growth over time. The CUSUM and CUSUMSQ tests show that the model can be used for policy-making. The estimated impulse response function shows that a one-standard-deviation shock in tourism-hospitality sector development leads to a positive economic growth response over the next ten years. These findings suggest that the development of the tourism-hospitality sector has a lasting and favorable impact on Bangladesh's long-term economic growth. The government and other stakeholders should therefore implement effective measures to support this sector to accelerate the country's overall economic development.

Key Words:

cointegration, economic growth, error correction term, Granger causality, long-run and short-run elasticities, response function, tourism and hospitality sector development, unit root, VEC model.

JEL: C23, C32, C33, O50, O55, O57, Q40.

7 figures, 8 tables, 24 formulas, 42 references.

Problem Statement

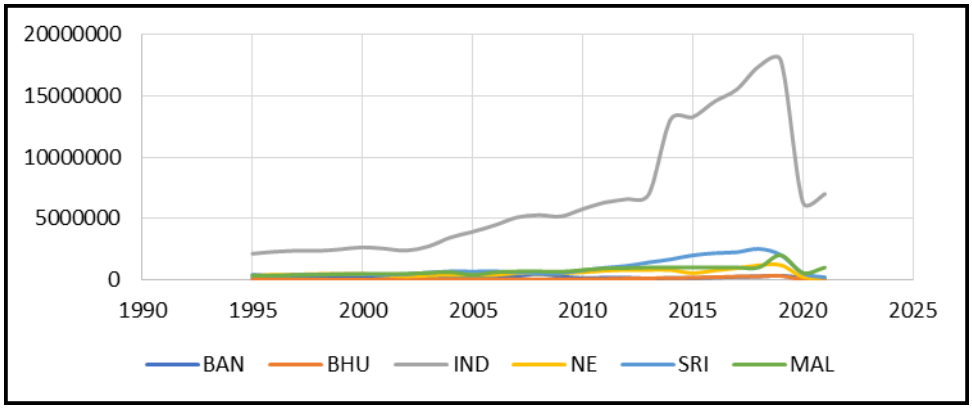
Economic growth and development are crucial for enhancing the welfare of individuals in the least developed, developing, and some European countries. In recent years, the tourism and hospitality sector has emerged as a significant economic driver for these nations, leading to substantial investments in its development. Over the past few decades, numerous Asian countries, including Bhutan, Cambodia, China, India, Malaysia, Nepal, the Philippines, Singapore, Thailand, and Vietnam, have implemented various policy frameworks to promote sustainable development and economic growth in this sector. As a result, these coun-

tries' tourism and hospitality sectors have contributed significantly to their economic growth, helped reduce unemployment rates, and increased women's empowerment and other socio-economic developments. In comparison, Bangladesh's progress remains limited.

Bangladesh is one of the fastest-growing economies in South Asia, with an average growth rate of 4.96% in its gross domestic product and 3.10% in its per capita gross domestic product (constant 2015 US$). Bangladesh's economy is the second largest in South Asia and ranks 41st globally (Asian Development Bank, 2025). Despite this, the country's travel and tourism sector is lagging behind. According to the Tourism Development Index 2024, Bangladesh ranks 109th out of 119 countries, with a score of 3.19 out of 7, which is the lowest among the five South Asian countries (Travel and Tourism Development Index, 2024). The positions of other South Asian countries are as follows: 39th for India (4.25), 105th for Nepal (3.34), 101st for Pakistan (3.41), and 76th for Sri Lanka (3.69) (Travel and Tourism Development Index, 2024). In terms of tourist arrivals, out of a total of 8.562 million international tourists who visited South Asia in 2021, Bangladesh received only 0.135 million tourists, which makes it the third least attractive destination in South Asia after Nepal (0.015 million) and Bhutan (0.072 million). In contrast, India and the Maldives led the region with 7.010 million and 1.00 million tourists, respectively (see Figure 1).

Figure 1

Number of international tourist arrivals in six South Asian countries

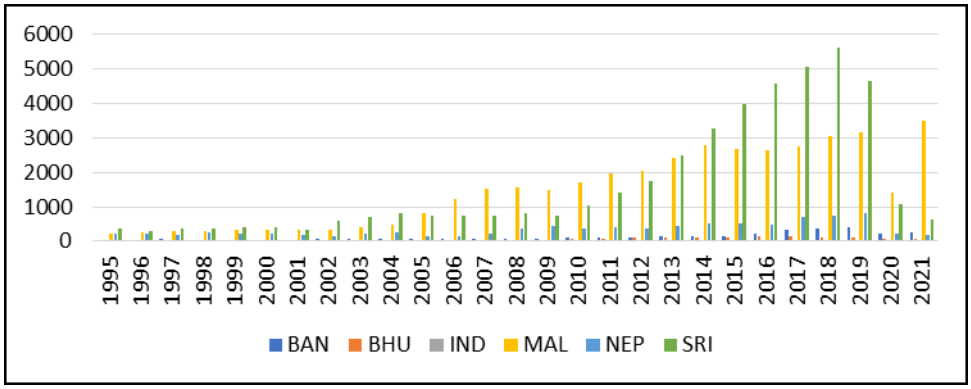


Source: made by the authors based on data from WorldData Info (n.d.).

In terms of tourism revenue, Bangladesh's tourism and hospitality sector generated only $273.08 million in 2021, which is negligible compared to other Asian countries. Among South Asian countries (excluding Afghanistan and Pakistan), tourism revenues are the lowest in Bangladesh and the highest in India (see Figure 2).

Figure 2

Revenues from tourism in six South Asian countries (in millions USD)



Source: made by the authors based on data from WorldData Info (n.d.).

According to the World Travel and Tourism Council (2025) and the Census & Economic Information Center (CEIC), Bangladesh earned about $2.01 million from the travel and tourism sector in 1972. By 2021, these earnings had increased to $273.0 million, which is 135.82 times higher than in 1972. Notably, the highest level of tourism earnings was recorded in 2019 at $391 million. Thus, it can be said that due to the pandemic, tourism revenue dropped from $391 million in 2019 to $218 million in 2020, but has since shown signs of recovery, reaching $271 million in 2021. The growth rates for tourism revenue were 9.06% over the period from 1995 to 2021 and 10.02% over the period from 1972 to 2021. This implies that in recent years, the growth rate of tourism revenue in Bangladesh has not increased significantly, and the amount remains low relative to other South Asian and Southeast Asian countries.

These figures clearly indicate that the tourism and hospitality sector in Bangladesh is not fully developed. However, it should be emphasized that the country has the potential to be another popular tourist destination. To achieve

this, Bangladesh needs to formulate and implement different policies that enhance foreign earnings, which may also help some European countries in policy making regarding the tourism sector's development. The policies should be formulated based on the analytical results of dynamic relationships.

Therefore, ***the principal purpose of this study*** is to examine the impacts of the tourism and hospitality sector development on economic growth in Bangladesh. Specifically, it aims to detect, using modern econometric techniques, whether a long-run cointegration relationship exists between the two. To this end, the study estimates the impulse response function in order to analyze how economic growth responds to a one-standard-deviation shock in tourism development. The estimated results will serve as the basis for developing policy recommendations for the advancement of Bangladesh's tourism and hospitality sector.

This study is organized as follows. The following section presents the literature review. The third section describes the data sources, defines the variables, and outlines the econometric methodology. The fourth section provides the results, including findings from unit root tests with and without structural breakpoints, cointegration analysis, and estimation of vector error correction model, as well as GMM estimation and impulse response function prediction. This section also includes a discussion of the findings. The fifth section presents policy implications based on the results of this study, and the final section concludes.

Literature Review

Many countries around the world heavily rely on the tourism-hospitality sector as an important source of foreign currency earnings and as a driving force for economic growth, employment generation, and socio-economic development through poverty reduction and cultural and infrastructure development. According to Blake et al. (2006), the tourism sector can increase investment in cultural infrastructure and human capital development. Punia (1994) and Andriotis (2002) assert that tourism leads to industrial development through the spillover effect, creates employment opportunities, and generates positive externalities. Several empirical works have been done regarding Bangladesh's tourism and hospitality sector. For example, Tuhin and Majumder (2011) conducted a study about the tourism industry development in Bangladesh and found that the tourism sector has a vital influence on economic development. Ali and Mohsin-e-Sifat (2008) examined different aspects of tourism marketing strategies with special reference to Bangladesh and concluded that tourism is a leading industry in the service sector at the global level, as well as a major provider of jobs and a significant generator of foreign exchange at the national level. Though tourism has not assumed a significant role in the national economy yet, it is hoped that the tourism sector will grow to contribute significantly to the national economy in the future (Hassan et al.,

2013). Ali (2013) carried out a study on the socio-economic impacts of tourism development in Cox's Bazar of Bangladesh and found that tourism has a positive socio-economic impact on Cox's Bazar, which has the largest sea beach. Redwan (2014) emphasized the significance of tourism in Bangladesh as well as its advantages for socioeconomic growth. The benefits of tourism are multifaceted and include GDP contribution, employment creation, profits in foreign currencies, infrastructure development, investment opportunities, poverty reduction, government revenue, and cultural development. If the nation can implement effective promotion measures by increasing the allocation for this purpose, the trend in arrivals and profits can be significantly increased (Horaira & Devi, 2021). To this purpose, the nation must also hire innovative individuals, and the standard of the promotional materials must also be improved. This study found significant influences of tourism on socio-economic development in the context of Bangladesh. This study also showed that the tourism sector plays a significant role in earning tourism revenue. Roy and Roy (2015) illustrated a rundown of the Bangladesh tourism industry and added some new theoretical approaches regarding the effect of the tourism industry. Rahman (2016) scrutinised the impact of tourism on the day-to-day livelihood of the Rangamati district in Bangladesh. Sultana (2016) examined how tourism influences diverse components of the Bangladesh economy by analysing secondary data. Akter et al. (2017) carried out a study in order to find out the determinants of the tourism demand of Bangladesh. The Rodrigue's modified Gravity model was applied through GLS regression analysis based on 4-year panel data from 2009-2012 of 30 origin countries. This study found that tourist arrivals are positively correlated with per capita GDP and population and negatively associated with distance, exchange rate, and CPI. The findings of this study direct to potential market for Bangladeshi tourism resulting from short distance, higher GDP per capita of origin country and lower inflation rate reflected through CPI in Bangladesh. Amin et al. (2017) illustrated the difficulties and predicted the prospective features of rural tourism in the context of Bangladesh, a country with a total count of 86038 villages, as an appropriate place to offer green fields, wildlife, wetlands, river beds, and rural festivals, arts and crafts to tourists from home and abroad. The plausible unpropitious effects should also be kept in mind. Mondal (2017) conducted a study on SWOT analysis and strategies to develop sustainable tourism in Bangladesh. This study showed that existing tourism activities in Bangladesh are unsustainable. To develop a sustainable tourism industry to attract tourists, this study suggests different WT (weaknesses-threats) strategies, such as ensuring the safety and security of tourists, effective planning for sustainable economic benefits, strict implementation of environmental regulations for ecological sustainability, alerting people about the importance of sustainable tourism development, and infrastructure development. Perhaps the findings of this study would be important in the effort to develop and promote a sustainable tourism industry in beautiful Bangladesh. Sayeda (2017) evaluated the prospects of economic, cultural, social, and environmental effects of mass tourism in the context of Bangladesh. They focus particularly on the context of Cox's Bazar and its surrounding areas. Mass tourism is attracted to convenient and economical tour-

ism activities that cater to large numbers of tourists, regardless of their socio-economic status. This method could generate a large volume of tourism revenue. According to the paper, the theory of sustainable tourism, which aims to collect socio-cultural and natural resources of a tourism destination, can be applied to promote sustainable tourism in Cox's Bazar and its surrounding areas. Bhuiyan and Darda (2018) emphasize the future possibilities of halal tourism in Bangladesh. Bangladesh is the fourth-largest Muslim-populated country in the world, and it has many Muslim shrines and congregations. Thus, Bangladesh has a huge potential for enhancing halal tourism. Kobra et al. (2018) discussed the good and bad features of promotional activities related to investment in Bangladesh's tourism industry. Through interviews with 120 governmental and non-governmental stakeholders regarding their views on the tourism sector, the study identified insufficient investment and a lack of integration among various authorities as the main obstacles to this sector's development. Habib et al. (2019) investigated the relationship between economic growth, tourism revenue, and financial development in Bangladesh using time series data from 1995-2006. Their findings reveal that tourism revenue and financial development positively affect the country's economic growth in the long run. Variance decomposition and impulse response function also support this positive association. The Granger Causality test results indicate a unilateral direction in the short run from economic growth to tourism revenue. Increased credit from the financial sector to support infrastructure investment and promote Bangladesh, as well as ensuring proper security for foreign visitors, could increase tourism revenues, thereby stimulating economic growth in the country. Khan et al. (2021) applied the NADRL model to study the impact of tourism development on economic growth in Bangladesh and found that when tourism receipts increase by 1%, economic growth will increase by about 0.19%. In contrast, it will decrease by about 0.66% in response to a 1% decline in tourism receipts. Thus, there is a positive association between tourism receipts and economic growth in Bangladesh. Hossain and Kanon (2023) proposed a parametric model to determine the tourism demand of Bangladesh from tourist-generating countries. They found that the relative tourism price levels, economic growth of the tourist-generating country, bilateral trade between Bangladesh and the tourist-generating country, the human development index of Bangladesh, political unrest in Bangladesh, and infrastructure development of Bangladesh are important factors affecting the number of tourist arrivals in Bangladesh from different tourist-generating countries.

Research gaps from the literature

The literature review reveals that very few studies have examined the relationship between tourism development and economic growth in Bangladesh. To date, no research has conducted a dynamic cointegration and causality analysis between these variables in this context. Also, not a single study has been conducted to find out the short-run and long-run impacts of tourism development on Bangladesh's economy using modern econometric techniques. Therefore, this

study aims to fill these gaps. Its findings could have important implications for Bangladesh. Moreover, the study employs sophisticated econometric methods to establish the linkage between economic growth and the tourism sector, thereby contributing to the existing body of knowledge.

Methodology

Data and variables

The main purpose of this study is to detect whether a long-run cointegration relationship exists between the development of the tourism-hospitality sector and economic growth in Bangladesh. Thus, for empirical analysis, annual time series data on tourism revenue (TR), per capita gross domestic product (PGDP), and gross domestic product (GDP) covering the period from 1972 to 2023 were collected from secondary sources, as detailed in Table 1.

Table 1

Data Sources

Variable	Description	Source
PGDP	Per capita gross domestic product (in constant 2015 U.S. dollars)	World Bank Development Indicators (WDI)
TR	Tourism revenue (in millions of U.S. dollars)	World Tourism Organization; Bangladesh Bureau of Statistics; Economic and Social Commission for Asia and the Pacific by the United Nations; WorldData Info
GDP	Gross Domestic Product	World Bank Development Indicators (WDI)

Sources: World Bank (n.d.), WorldData Info (n.d.), World Tourism Organisation (2014).

The definitions and explanations of dependent and independent variables used in this study are as follows:

Per capita gross domestic product (PGDP): Used as an indicator variable for economic growth in Bangladesh, PGDP is defined as total gross domestic product divided by total population. For period *t*, PGDP is given by:

$$\mathrm{PGDP_t} = \frac{\mathrm{GDP_t}}{\mathrm{Total\ Population_t}};\ \mathrm{t} = 1, 2, 3,.....,\mathrm{T} \qquad (1)$$

Tourism development (TD_t): Bangladesh's tourism and hospitality sector development (TD_t) is defined as tourism revenue as a percentage of gross domestic product. For period *t*, TD is given by:

$$\mathrm{TD_t} = \frac{\mathrm{Tourism\ Revenue\ at\ time\ t\ (TR_t)}}{\mathrm{GDP_t}};\ \mathrm{t} = 1, 2, 3,.....,\mathrm{T} \qquad (2)$$

Tourism Revenue (TR_t): Tourism revenue at time t is defined as expenditures by international inbound visitors, including payments to national carriers for international transport, and any other prepayments for goods or services received in Bangladesh from different tourist-generating countries. For this study, tourism revenue is expressed in millions of U.S. dollars.

Gross domestic product (GDP_t): GDP_t is defined as the total market value of all final goods and services that are produced within a period *t*, by the factors of production in the country, regardless of who owns them. It is given by:

$$GDP_t = C_t + I_t + G_t + (Ex_t - Im_t), \qquad (3)$$

where C_t is personal consumption expenditure at time *t*, I_t is gross private domestic investment at time *t*, G_t is government expenditure on goods and services at time *t*, and Ex_t and Im_t are total export and import volumes of Bangladesh at time *t*.

Econometric methodology

To investigate the dynamic cointegration and causal relationships between economic growth (PGDP) and tourism development revenue (TD), the following non-linear regression equation is considered:

$$\mathrm{PGDP_t} = \mathrm{A_0 TD_t^{\beta_1} e^{\varepsilon_t}}, \qquad (4)$$

where $PGDP_t$ is the per capita real GDP (constant 2015 $) at time *t*, used as an indicator variable for the economic growth of Bangladesh; TD_t is the tourism development index of Bangladesh at time *t*; and ε_t is a white noise error term. The logarithmic transformation of Equation (4) is given by:

$$\ln\mathrm{PGDP_t} = \beta_0 + \beta_1 \ln\mathrm{TD_t} + \varepsilon_t, \qquad (5)$$

where $\beta_0 = \ln(\mathrm{A_0})$

The procedure of the dynamic cointegration and causal analysis involves the following steps. In the first step, the existence of a unit root problem in each variable is examined with and without structural break(s). If a unit root problem is present, then in the second step, the long-run cointegration relationships between the variables are tested. If a long-run cointegration relationship between the variables is observed, a VEC model is estimated to determine the causal relationships between the variables at the third step. In the final step, the GMM technique is applied to examine the short-run and long-run impacts of the variable TD on economic growth (PGDP). Finally, the impulse response function is estimated to know the responses of the variable PGDP to a one-standard-deviation shock to the variable TD over the next ten years.

Research Results and Discussion

Some fundamental statistics

To know the behavior of the individual variables, several fundamental descriptive statistics were calculated, including the mean, median, standard deviation (Std. Dev.), coefficient of variation (CV in %), skewness, kurtosis, and range. Inferential statistics were also calculated: testing the hypothesis of their zero population mean individually, calculating 95% confidence interval estimations (CIE) for the population mean of these variables individually, and determining growth rates (GR in %) of each variable. The Jarque-Bera test was applied to test the normality of each variable, and the t-test statistic was used to test the significance of the population mean for each variable. The calculated values are reported in Table 2 below.

From the estimated results in Table 2, it was found that the mean values of the variables PGDP, GDP, TR, and TD were $773.2475, $106054.7680 million, $82.8754 million, and 0.0551, respectively. The estimated skewness values indicated that all variables were positively skewed, and the kurtosis results showed that the frequency distributions of PGDP, GDP, TR, and TD were leptokurtic. The Jarque-Bera test results supported that these variables were not normally distributed at the 5% significance level. The t-test results showed that all variables were significantly different from their zero mean individually at any significance level. The 95% confidence intervals for the population means of PGDP, GDP, TR, and TD were [657.3657, 889.1293], [83289.86, 128819.7], [53.5316, 112.2192], and [0.0447, 0.0654], respectively. Based on the estimated coefficients of variation (CV), to earn 100% of PGDP, GDP, TR, and TD, one had to bear risks of 53.8473%, 77.1017%, 127.1798%, and 67.3321%. The estimated coefficients of variations (CV in %) for these variables are also shown in Figure 3.

Table 2

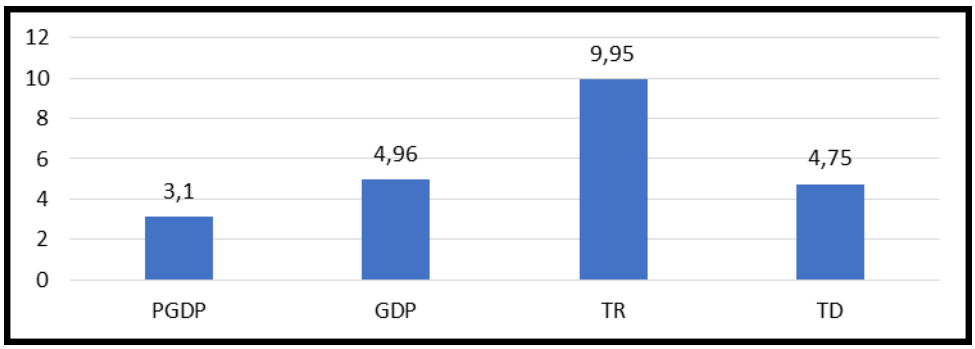
Descriptive statistics

Descriptive Statistics	PGDP	GDP	TR	TD
Mean	773.2475	106054.7680	82.8754	0.0551
Median	599.7173	73893.07	49.00000	0.0572
SD	416.2400	81770.0311	105.4008	0.0371
CV (in %)	53.8473	77.1017	127.1798	67.3321
Skewness	1.1697	1.183991	1.6295	0.8286
Kurtosis	3.2209	3.2437	4.55800	3.5435
Jarque-Bera Test Prob	11.9636* (0.0025)	12.4852* (0.0019)	28.27404 [0.0000]	6.5905* [0.0371]
t-test (μ=0) (Prob)	13.3960* (0.0000)	9.3527* (0.0000)	5.6700* [0.0000]	10.7079 [0.0000]
95% Conf. Interval	[657.3657, 889.1293]	[83289.86, 128819.7]	[53.5316 112.2192]	[0.0447, 0.0654]
Growth Rate (in %)	3.10	4.96	9.95	4.75
Maximum	1869.164	323280.0	391.0000	0.1562
Minimum	385.8425	26756.90	2.0100	0.0075
Range	1483.3215	296523.1	388.99	0.1487
Sample Size (T)	52	52	52	52

Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

Figure 3

Coefficients of variation (CV in %) of the variables

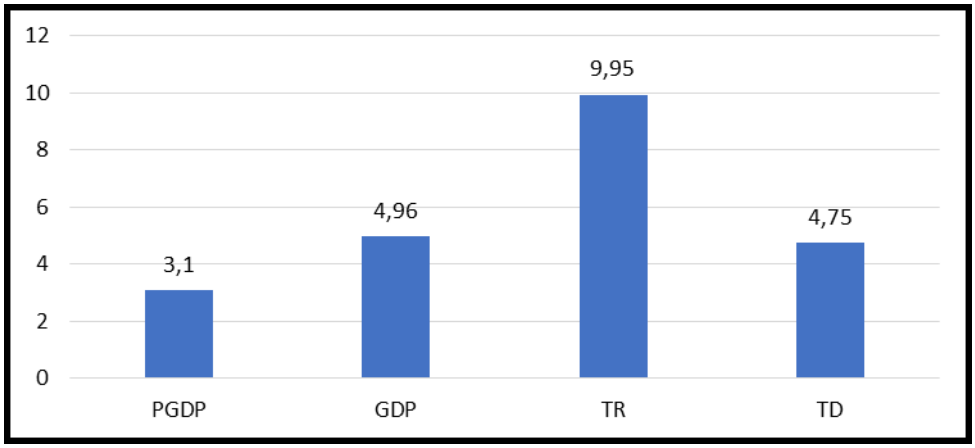


Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d).

Figure 3 shows that the risk is highest for the variable TR, followed by GDP, TD and PGDP. The estimated growth rate (in %) of PGDP, GDP, TR, and TD were 3.10%, 4.96%, 9.95%, and 4.75%, respectively. To illustrate the behaviour of each variable, its growth rates (GR in %) are presented graphically in Figure 4.

Figure 4

Growth rates (GR%) of different variables



Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

Figure 4 shows that the growth rate is highest for the variable TR at 9.95%. The growth rates for GDP, TD, and PGDP are 4.96%, 4.75%, and 3.1%, respectively.

Unit root tests

Unit root tests without structural break(s)

It is very common for a time series variable to have a unit root problem. The application of the usual techniques of regression analysis is highly misleading in the conclusion when a time series contains a stochastic trend (Stock & Watson, 1988; Nelson & Kang (1981); Granger & Newbold (1974). In particular, if the dependent variable and at least one independent variable contain a stochastic trend and are not co-integrated, the regression results are spurious (Phillips, 1986; Granger & Newbold, 1974). Therefore, to identify the correct specification of the model, it is necessary to investigate the presence of a stochastic trend in each time series variable. To test for unit root problems, several econometric techniques have been developed, say: Dickey-Fuller (DF, 1979) test, the Augmented Dickey-Fuller (ADF, 1987) test, the Phillips-Perron (PP, 1988) test, the Kwiatkowski–Phillips–Schmidt–Shin (KPSS, 1992) test, the Ng-Perron (2001) test, among others. In this study, the Augmented Dickey-Fuller (ADF, 1987) and the Phillips-Perron (PP, 1988) tests were applied. For robustness of the results, the Kwiatkowski–Phillips–Schmidt–Shin (KPSS, 1992) test was also used. Let x_t denote the series under investigation for a unit root problem; to test whether it contains a unit root, the following three different cases were considered, without structural break(s):

Case 1: Model with only a constant term:

$$\Delta X_t = \alpha_0 + \theta X_{t-1} + \sum_{i=1}^{m} \phi_i \Delta X_{t-i} + \varepsilon_t \quad (6)$$

C**ase 2:** Model with constant and trend terms:

$$\Delta X_t = \alpha_0 + \alpha_1 t + \theta X_{t-1} + \sum_{i=1}^{m} \phi_i \Delta X_{t-i} + \varepsilon_t \quad (7)$$

Case 3: Model without constant and trend terms:

$$\Delta x_t = \theta x_{t-1} + \sum_{i=1}^{m} \delta_i \Delta x_{t-i} + \varepsilon_t \quad (8)$$

Here, Δ stands for the first difference, and the lagged difference terms on the right-hand side of equations (6), (7), and (8) are designed to correct for serial correlations of the disturbance terms. The lagged differences are selected using

the AIC, SBC, and HQC criteria. If $\theta = 0$, the series x_t is said to have a unit root problem and is therefore an I(1) process governed by a stochastic trend. Since the estimated θ does not have the usual asymptotic distribution, the values tabulated by MacKinnon (1991) are used; these values are more accurate than those originally tabulated by Fuller (1976) and Dickey-Fuller (1987). We can also use the Phillips-Perron test. Phillips and Perron (1988) generalised the following results to the case when the random error term u_t is serially correlated and possibly heteroscedastic as well. The Phillips-Perron test for the null hypothesis: $H_0: \rho = 1 \Rightarrow H_0: \rho - 1 = \theta = 0$ is given by:

$$Z_\rho = T[\hat{\rho} - 1] - \tfrac{1}{2}\left[T^2 \frac{\hat{\sigma}_\rho^2}{s^2}\right]\left[\lambda^2 - \gamma_0\right], \quad (9)$$

where the estimated autocovariance of the OLS residuals e_t's are given as:

$$\hat{\gamma}_0 = \frac{1}{T}\sum_{t=1}^{T} e_t^2;\ s^2 = \frac{1}{T-2}\sum_{t=1}^{T} e_t^2;\ \hat{\gamma}_j = \frac{1}{T}\sum_{t=j+1}^{T} e_t e_{t-j};\ \lambda^2 = \hat{\gamma}_0 + 2\sum_{j=1}^{q}\left[1 - \frac{j}{(q+1)}\right]\hat{\gamma}_j$$

Under the null hypothesis, the KPSS test statistic is the Lagrange multiplier (LM) or score statistic for testing the null hypothesis $H_0: \sigma_u^2 = 0$ and is given by:

$$KPSS = \frac{\left(T^{-2}\sum_{t=1}^{T} S_t^2\right)}{\hat{\sigma}^2}, \quad (10)$$

where $S_t = \sum_{j=1}^{t} \hat{\varepsilon}_j$, $\hat{\varepsilon}_j$ is the OLS residual of a regression equation of y_t on D_t, that is, from the equation $y_t = \beta' D_t + \varepsilon_t$; $\hat{\sigma}^2$ is a consistent estimate of the long-run variance of ε_t using $\hat{\varepsilon}_t$, which may involve correction for autocorrelation based on the Newey-West formula. Under the null hypothesis that y_t is stationary, Kwiatkowski, Phillips, Schmidt, and Shin show that the KPSS statistic converges to a function of standard Brownian motion, which depends on the form of the deterministic terms D_t in the equation: $y_t = \beta' D_t + c_t + \varepsilon_t$, but not their coefficient values β. In particular, if $D_t = 1$ then:

$$KPSS \xrightarrow{L} \int_0^1 U_1(r)dr \quad (11)$$

where $U_1(r) = W(r) - rW(1)$, and W(r) is a standard Brownian motion for r ∈ [0, 1]. If $D_t = [1, t]'$ then:

$$KPSS \xrightarrow{L} \int_0^1 U_2(r)dr \quad (12)$$

where $U_2(r) = W(r) - r(2-3r)W(1)+6r(r^2-1)\int_0^1 W(s)ds$.

The critical values of the KPSS test statistic must be obtained from the asymptotic distributions of (11) and (12), based on simulation methods.

If a time series variable is integrated of order one, we have to investigate the 2nd order unit root. The equation is given by:

$$\Delta^2 X_t = \beta_0 + \lambda \Delta X_{t-1} + \sum_{i=1}^{m} \gamma_i \Delta^2 X_{t-i} + \varepsilon_t \quad (13)$$

where Δ^2 is the second-difference operator. If $\lambda = 0$, the series X_t is said to be integrated of order two or I(2). Let *d* represent the number of times that X_t needs to be differenced to reach stationarity. In this case, X_t is said to be integrated of order *d*, denoted by I(d). The test results are given in Table 3.

Table 3

Standard unit root test results without structural break(s)

Case 1: Model with only a constant term (level form)						
Variable	ADF Test	Prob.	PP Test	Prob.	KPSS Test	Prob.
lnPGDP	5.3718	1.0000	7.1867	1.0000	0.9330*	0.4630
lnTD	-1.9065	0.3272	-1.9407	0.3116	0.8097*	0.4630
Case 2: Model with constant and trend terms (level form)						
Variables	ADF Test	Prob.	PP Test	Prob.	KPSS Test	Prob.
lnPGDP	-0.2244	0.9908	0.1484	0.9970	0.2527*	0.1460
lnTD	-2.9954	0.1437	-2.4225	0.3641	0.0527	0.1460
Case 3: Model without constant and trend terms (level form)						
Variable	ADF Test	Prob.	PP Test	Prob		
lnPGDP	2.2455	0.9959	6.8671	1.0000		
lnTD	-1.7715	0.0728	-1.6751	0.0885		
Case 1: Model with only a constant term (differenced form)						
Variable	ADF Test	Prob.	PP Test	Prob.	KPSS Test	Prob
ΔlnPGDP	-1.8857	0.3361	-6.7819*	0.0000	0.8572*	0.4630
ΔlnTD	-5.9272*	0.0000	-5.8960*	0.0000	0.0841	0.4630

Case 1: Model with only a constant term (2nd differenced form)						
Variable	ADF Test	Prob.	PP Test	Prob.	KPSS Test	Prob
$\Delta^2 \ln PGDP$	- 0.5086*	0.0000	-33.4359*	0.0001	0.2374	0.4630

Notes: *p < 0.01 denotes significant at 1% level, **p < 0.05 denotes significant at 5% level. Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

To examine the order of integration, we applied the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests to the logarithmic forms of the variables economic growth (lnPGDP) and tourism development (lnTD). The results of the ADF, PP, and KPSS tests indicate that the null hypothesis of a unit root cannot be rejected at the 5% level of significance for either variable. Therefore, it can be concluded that both variables are non-stationary. These tests were also applied to investigate the second-order unit root problem for each variable. The test results suggest that there is no second-order unit root problem in each variable. Accordingly, all variables are integrated of order 1, that is, I(1). Therefore, it can be said that the shocks (innovations) to these series are permanent and will have long-term effects on economic development.

Unit root tests with structural break(s)

Perron (1989) pointed out that the ADF and PP tests perform especially poorly when there is a break in the deterministic trend, which drives the asymptotic distribution of the test statistic that incorporates such a break. However, Perron's method has received some criticism because his breakpoint is chosen based on a pre-test examination of the data, which leads his procedure to overstate the likelihood of the trend-breaking alternative hypothesis. Therefore, in this section, we discuss the unit root tests with breakpoint(s). Zivot and Andrews (1992), among others, introduced methods to endogenously search for a breakpoint and test for the presence of a unit root when the time series process has a breaking trend. We applied the Zivot-Andrews technique to test for the stationarity of these variables. In the Zivot-Andrew test, the null hypothesis is:

$$x_t = \alpha_0 + x_{t-1} + \varepsilon_t \quad (14)$$

The selection of the possible breakpoint is viewed as the outcome of an estimation procedure designed to fit $\{x_t\}$ by a trend-stationary process with a one-

time break in the trend occurring at an unknown point in time. This procedure searches for the break that gives the most weight to the trend stationary alternative. Let the possible break point in the sample be T_b, which lies between 1 and T, that is, $1 < T_b < T$, the regression equations are specified as follows:

Model (A):

$$\Delta x_t = \alpha_0 + \alpha_1 t + \alpha_2 x_{t-1} + \alpha_3 d_t^i + \sum_{j=1}^{k} \varphi_j \Delta x_{t-j} + \varepsilon_t \quad (15)$$

Model (B):

$$\Delta x_t = \alpha_0 + \alpha_1 t + \alpha_2 x_{t-1} + \alpha_3 d_t^i t + \sum_{j=1}^{k} \delta_j \Delta x_{t-j} + \varepsilon_t \quad (16)$$

Model (C):

$$\Delta x_t = \alpha_0 + \alpha_1 t + \alpha_2 x_{t-1} + \alpha_3 d_t^i + \alpha_4 d_t^i t + \sum_{j=1}^{k} \delta_j \Delta x_{t-j} + \varepsilon_t \quad (17)$$

where x_t is the series under investigation for a unit root and Δ stands for the first difference, and the lagged difference terms appear on the right-hand side of the Equations (15), (16), and (17). Here,

$$d_t^i = \begin{cases} 0, & \text{for } t = 1, 2, \ldots\ldots, (i-1) \\ 1, & \text{for } t = i, i+1, \ldots\ldots, T \end{cases} \quad (18)$$

Model (A) allows for a breakpoint in the intercept; model (B) allows for a breakpoint in the trend function; and model (C) includes the hybrid of the two. In each model, the *k* extra regressors were included to eliminate possible nuisance-parameter dependencies in the asymptotic distributions of the test statistic caused by serial correlation in the error terms. As for the procedure for determining the break and computing the test statistic, here an OLS was applied to each model with a breakpoint at T_b, where T_b ranges from 1 to T-1 for models (A) and (B), and from 1 to T-2 for model (C). For each value of T_b, the number of extra regressors *k* was determined using the procedure suggested by Campbell and Perron (1991). Let F_i denote the F-statistic for testing the null hypothesis $H_0: \alpha_3 = 0$, for model (A), in which there is no break at the intercept, and $H_0: \alpha_3 = 0$, for model

(B), in which there is no trend break in period t, and $H_0: \alpha_3 = \alpha_4 = 0$ for model (C), in which there is no time trend break in the period *t = i*. For each model, for *i* = 3, 4, 5, ..., (T-1), the respective F-statistics $F_2, F_3, ..., F_{T-1}$ were estimated, and the breakpoints for models (A), (B), and (C) were determined accordingly. Here, we used EViews 12 to detect unit root problems with intercept breaks, trend breaks, and both intercept and trend breaks using the Augmented Dickey-Fuller test. The results are given in Table 4.

Table 4

Unit root test results with structural breaks

Variable	Model A		Model B		Model C	
	ADF Test	Prob.	ADF Test	Prob	ADF Test	Prob
lnPGDP	-1.1762 (2004)	0.9801	-2.9975 (1999)	0.4095	-3.1672 (1998)	0.9324
lnTD	-3.1442 [1985]	0.6251	-2.6242 [1979]	0.5550	-4.0246 [1985]	0.1538
Variables are in Differenced Form						
Variable	Model A		Model B		Model C	
	ADF Test	Prob.	ADF Test	Prob	ADF Test	Prob
ΔlnPGDP	-11.9287* (2004)	< 0.01	-11.4678* (1984)	< 0.01	-12.3304* (1977)	< 0.01
ΔlnTD	-6.2812* (1984)	< 0.01	-5.8772* (2018)	< 0.01	-5.8428* (1981)	< 0.01

Note: *p < 0.01 denotes significant at 1% level. Values within the parentheses are the breakpoints. Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

From the test results (see Table 4), it can be said that both variables are integrated of order one with intercept break, trend break, and both intercept and trend breaks. Finally, it can be concluded that all the variables are integrated of order one, i.e., I(1).

Cointegration test

To investigate the cointegrating relationship among the variables, we also applied Johansen and Juselius's test. Since Johansen and Juselius's multivariate cointegration methodology is fairly well documented, a brief reminder of this method is given below. Here, the model is given by:

$$\Delta X_t = B_0 + \Pi X_{t-p} + \sum_{i=1}^{p} B\Delta X_{t-i} + \eta_t \quad (19)$$

where X_t represents a vector of endogenous I(1) variables; B_0 represents a vector of constant terms; B is a matrix of coefficients; η_t is a vector of residuals; and *p* denotes the lag length. All variables in Equation (19) are deemed to be potentially endogenous. The long-run equilibrium relationship among X_t is determined by the rank of Π (say r). If *r* is zero, the variables in level form do not have any cointegration relationship and Equation (19) can be transformed into a VAR model of p^{th} order. If 0 < r < n, then there are $n \times r$ matrices of α and β such that:

$$\Pi = \alpha\beta' \quad (20)$$

The strength of the cointegration relationship is measured by $(\alpha\beta')$, known as the cointegration vector, and $\beta' X_t$ is I(0) although X_t are I(1). The cointegrating rank was found using the trace and the maximum eigenvalue tests. The lag length of the unrestricted vector autoregressive (VAR) model in Equation (19) was determined based on the AIC and SBIC criteria. Also, the adjusted likelihood ratio (LR) test is most commonly used. The test results are reported in Table 5.

Table 5

Johansen and Juselius cointegration test results

Case-1: No Intercept and trend in CE and VAR						
Hypothesized Number of CE	Trace Statistic	0.05 Critical Value	Prob	Max-Eigen Statistic	0.05 Critical Value	Prob
None*	50.2804*	12.3209	0.0000	45.8028**	11.2248	0.0000
At most 1*	4.4775*	4.1299	0.0408	4.4775*	4.1299	0.0408

Case-2: Intercept (no trend) in CE and VAR						
Hypothesized Number of CE	Trace Statistic	0.05 Critical Value	Prob	Max-Eigen Statistic	0.05 Critical Value	Prob
None*	40.3048*	15.4947	0.0000	32.7916**	14.4626	0.0000
At most 1*	7.5132*	3.8415	0.0061	7.5132*	3.8415	0.0061

Notes: *p < 0.01 denotes significant at 1% level, **p < 0.05 denotes significant at 5% level. Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

From the trace test and max-eigenvalues test results in Table 5, it can be concluded that there exist two long-run cointegration relationships between the variables.

Causality analysis – VECM

The cointegration relationship indicates the existence of causal relationships between variables; however, it does not indicate the direction of causal relationships between variables. Therefore, it is common to use the Engle and Granger test procedure to detect a causal relationship between variables. Due to the presence of a co-integration relationship, the augmented form of the Granger causality test involved the error correction term ECM_{t-1} and was formulated in a multivariate m^{th} order vector error correction (VEC) model, which is given below:

$$\begin{bmatrix} \Delta \ln PGDP_t \\ \Delta \ln TD_t \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \end{bmatrix} + \sum_{k=1}^{m} \begin{bmatrix} \theta_{11k} & \theta_{12k} \\ \theta_{21k} & \theta_{22k} \end{bmatrix} \begin{bmatrix} \Delta \ln PGDP_{t-k} \\ \Delta \ln TD_{t-k} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \end{bmatrix} ECM_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (21)$$

Here, the appropriate lag length in the vector error correction model (VECM) is *m* in the level form of variables. The appropriate lag length was selected using the Schwarz-Bayesian Information Criterion (SBIC) and Akaike Information Criterion (AIC) criteria for Equation (21). $C's, \theta's,$ and $\lambda's$ are the parameters to be estimated, and ECM_{t-1} is the one-period lagged error correction term derived from the long-run cointegrating equation. The causality results have been provided in Table 6.

Table 6

Causality results

	ΔlnPGDP	ΔlnTD	ECM(−1) [t-test]
ΔlnPGDP		1.6089 (0.2024)	-2.6899** (0.0103)
ΔlnTD	0.2574 (0.8556)		

Note: *p < 0.01 denotes significant at 1% level, **P < 0.05 denotes significant at 5% level. Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

From the causality analysis results in Table 6, it can be concluded that there is no short-run unidirectional causality between these two variables. The significance and negative sign of the test statistic of $ECM(-1)$ denote the existence of long-run causality between tourism development and economic growth. It was found that the error correction term is statistically significant when $\Delta \ln PGDP$ is treated as the endogenous variable, indicating that there exists a long-run relationship between the variables in the form of Equation (4), which is also confirmed by the results of the Johansen and Juselius (JJ,1990) co-integration test.

Short-run and long-run elasticities of economic growth

Since a co-integrating vector was found to exist between the variables, the following co-integration ARDL (m, p) model was projected here to find the long-run impacts of tourism development (TD) on economic growth (PGDP):

$$\ln PGDP_t = \delta_0 + \sum_{i=1}^{m} \delta_{1i} \ln PGDP_{t-i} + \sum_{i=0}^{p} \delta_{2i} \ln TD_{t-i} + \varepsilon_t \qquad (22)$$

The selection of the orders of lags in the above models is very sensitive, and was done by using two criteria: AIC and SBIC. Equation (22) was estimated using the GMM method, and the results are presented in Table 7.

Table 7

Long-run elasticities of economic growth

Dependent Variable (lnPGDP)	Coefficient	t-Test	Probability
Constant	-0.1857	-2.1504*	0.0369
lnTD	0.0046	0.4621	0.6462

* Indicates significant at 5% level, ** indicates significant at 10% level. Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

From the estimated results in Table 8, it was found that a 100% increase in tourism development leads to an increase in economic growth by 0.46% in the long run. It is not statistically significant. The appropriate instruments for Equation (24) were selected on a trial-and-error basis to have the best p-value for the J-statistic. The short-run association among the variables can be calculated considering the following error correction model:

$$\Delta \ln PGDP_t = \gamma_0 + \sum_{i=1}^{m} \gamma_{1i} \Delta \ln PGDP_{t-i} + \sum_{i=0}^{p} \gamma_{2i} \Delta \ln TD_{t-i} + \lambda ECM_{t-1} + \omega_t \quad (23)$$

where ECM_{t-1} is the error correction term, which is obtained from the following estimated co-integration equation:

$$ECM_t = \ln PGDP_t - \delta_0 - \sum_{i=1}^{m} \delta_{1i} \ln PGDP_{t-i} - \sum_{i=0}^{p} \delta_{2i} \ln TD_{t-i} \quad (24)$$

Here, the parameter λ represents the speed of adjustment for the short-run to reach the long-run equilibrium, where $|\lambda| < 1$. The short-run coefficient of economic growth with respect to TD, and the diagnostic test results are given in Table 8.

Table 8 shows that the coefficient of ECM (-1) is statistically significant, indicating that the speed of adjustment from the short run to the long-run equilibrium is statistically significant. The error correction term is -0.6186, with the expected sign suggesting that when per capita real GDP is above or below its equilibrium level, it adjusts by almost 61.86% within the first year, and the adjustment is statistically significant. The full convergence process to reach its equilibrium level takes less than 2 years. Thus, the speed of adjustment is very high in the case of any shock to economic growth in Bangladesh.

Table 8

Short-run elasticities of economic growth

Dependent Variable (Δ lnPGDP)	Coefficient	t-Test	Probability
Constant	0.03616*	5.34790	0.0000
ΔlnTD	-0.00395	-0.63043	0.5316
ECM{-1}	-0.6186*	-7.25524	0.0000
Sensitivity Analysis: The Short-run Diagnostic Test Results			
LM Test for Autocorrelation		0.1155	0.7339
LM test for Heteroscedasticity		0.6684	0.7159
ARCH Test		0.0005	0.9825
F-Test for Stability of the Model		0.8760	0.5776
JB Test for Normality of Errors		2.6689	0.2633

*: indicates significant at 5% level, **: indicates significant at 10% level. Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

It was found that the variable tourism development hurts economic growth in the short run; however, this effect is not statistically significant at all. It was also found that the long-run elasticity of economic growth with respect to tourism development (see Table 8) is higher than the short-run elasticity, implying that tourism development will contribute more substantially to economic growth in Bangladesh over a longer period of time. This is a good sign for the country's economy. Therefore, it can be concluded that, in the long run, tourism development will help improve the standard of living of the people living in Bangladesh by reducing poverty and generating employment.

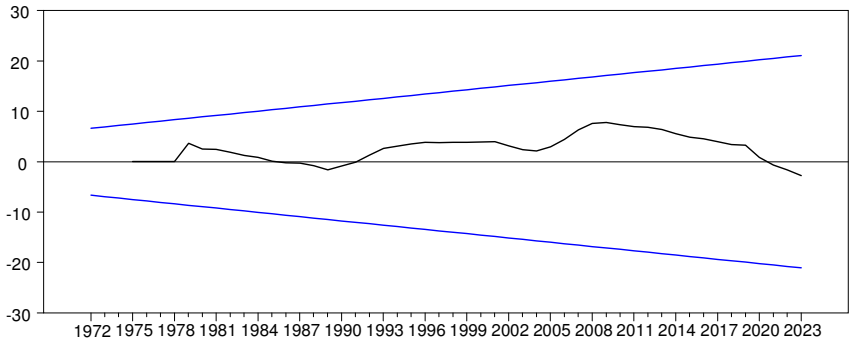
Sensitivity Analysis: Diagnostic tests for serial correlation, autoregressive conditional heteroscedasticity, heteroscedasticity, functional form misspecification, and non-normal errors were conducted, with the results reported in Table 8. These tests indicate that there are no problems with autocorrelation, heteroscedasticity, multicollinearity, or autoregressive conditional heteroscedasticity in the short-run model. The test results also support that there is no problem with the normality of random error terms in Equation (23). The test results indicate that there is no problem with serial correlation.

The CUSUM and CUSUMSQ tests

Finally, the stability of the long-run parameters together with the short-run movements for the equations were examined using the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) tests. The graphs of these tests are presented in Figure 5 and Figure 6 below.

Figure 5

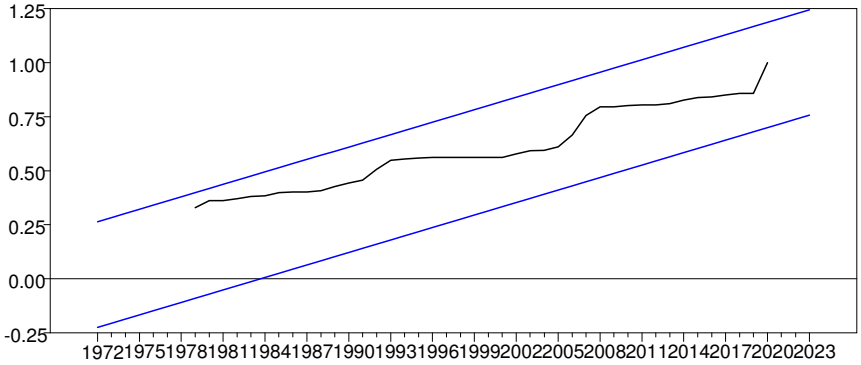
Plot of cumulative sum of recursive residuals



Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

Figure 6

Plot of the cumulative sum of squares of recursive residuals



Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

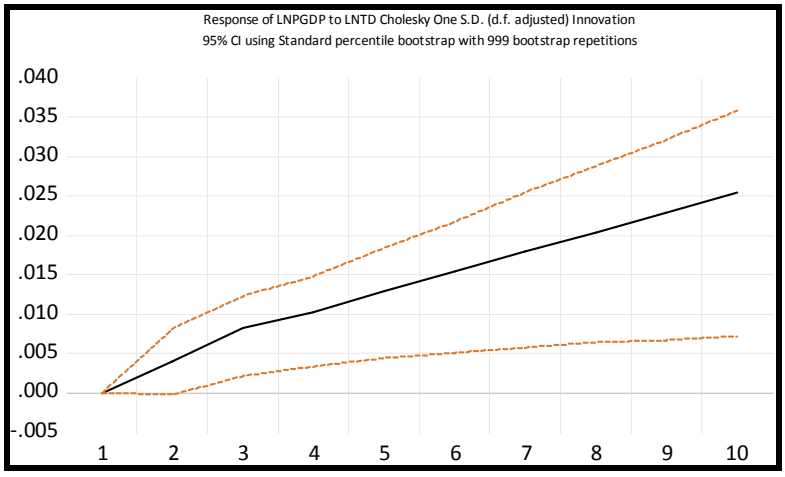
Figures 5 and 6 indicate that the CUSUM and CUSUMSQ test results are within the critical bounds, implying that all the coefficients in the error correction model are stable. Therefore, the preferred economic growth model can be used for policy decision-making purposes, such that the impact of policy changes, considering the explanatory variable of the economic growth model, will not cause major distortion in the level of economic growth, since the parameters in this equation seem to follow a stable pattern during the estimation period.

Impulse response analysis

The impulse response function shows how one variable changes in response to a one-standard-deviation shock or innovation in another variable. In this study, we estimated the responses of economic growth with respect to a one-standard-deviation shock (innovation) in tourism development. The results are depicted in Figure 7.

Figure 7

Responses of economic growth due to a one-standard-deviation shock (innovation) in tourism development



Source: calculated by the authors based on data from the World Bank Group (n.d.) and WorldData Info (n.d.).

From Figure 7, it can be said that a standard deviation shock (innovation) in tourism development (lnTD) leads to a positive economic growth response over the next ten years. Since it was found that tourism development contributes to our economic growth significantly, it can be concluded that, to accelerate this growth, the government and other stakeholders should invest more money in the tourism sector of Bangladesh.

Policy Implications

Based on the findings of this study, the following policies are recommended for the development of the tourism sector, which may become a driving force for national economic growth.

First, the existence of a long-run equilibrium relationship between Bangladesh's tourism and hospitality sector development and economic growth indicates that the two variables are mutually dependent. This finding suggests that the tourism sector has a positive impact on the national economy. The impulse response function shows that economic growth reacts positively to a one-standard-deviation innovation in tourism development over the next 10 years. Therefore, it can be concluded that the government and other stakeholders in the tourism and hospitality sector[1] should take effective measures to develop the sector, which could, in turn, stimulate long-term economic growth in Bangladesh. These measures should primarily aim to increase domestic investment and foreign direct investment in the tourism sector.

Second, Bangladesh is a country of natural beauty with an abundance of opportunities. Therefore, to advance the tourism sector, the Bangladesh government and other stakeholders can implement policies based on these abundant opportunities and natural beauty.

Third, Bangladesh has experienced frequent hartals (strikes) and blockades since the Liberation War due to ongoing political conflicts between the ruling party and various opposition parties. This problem has become more acute in recent years and continues to persist. Political turbulence has created a critical environment for the economy. The diffusion channels of political turmoil are widespread, with impacts ranging from an ordinary seller losing regular sales to the annulment of business trips. Political turmoil negatively affects international tourist arrivals in Bangladesh from different tourist-generating countries for both busi-

[1] Bangladesh Tourism Board (BTB), Bangladesh Parjatan Corporation (BPC), Bangladesh Embassies abroad, Bangladesh International Hotel Association (BIHS), National Hotel Association of Bangladesh, Transport providers, Tour Operators Association of Bangladesh (TOAB), travel agents, local government, Biman Bangladesh Airline (BBA), Media, Ministry of Civil Aviation and Tourism, Tourists Information Centre (TIC) and NGOs, etc.

ness and leisure trips. Thus, in the long run, political turmoil has a negative impact on tourism revenue and economic growth. Therefore, all political parties should give up exercising such types of political activities as hartals (strikes) and blockades for the sake of the people in this society. Political leaders should resolve all kinds of problems through dialogue and consensus. Adherence to democratic rules and regulations could play an important role in increasing international tourist arrivals from different tourist-generating countries. As a result, the tourism sector will develop and contribute to economic growth in Bangladesh through employment generation, poverty reduction, and socio-economic development.

Fourth, local communities and tourism service providers play a vital role in the development of the tourism-hospitality sector in Bangladesh. However, they have been negatively affected by the epidemic. Thus, the government and other stakeholders must take the necessary measures to provide them with adequate financial support. As a result, they will be able to provide quality services to international tourists, which may play an important role in the sustainable development of the tourism sector in Bangladesh.

Fifth, to increase tourism demand in Bangladesh, it is essential to provide quality services to international tourists. Therefore, the government and other stakeholders should develop various institutions to train skilled personnel in tourism and hospitality management. They should also implement measures to strengthen the industry's capacity to attract international tourists.

Sixth, the government should take the necessary steps to improve environmental performance with regard to air, water, land, built environments, sanitary conditions, safety, noise pollution, national health conditions, and transportation systems.

Seventh, the tourism master plan should emphasize improving naval tourism, which is being developed as part of the coordinated efforts to develop Bangladesh's tourism industry.

Eighth, the government should take the necessary steps to develop domestic transportation and security systems so that tourists, both national and international, can travel within the country at any time without fear of any kind of negative occurrences.

Ninth, the growth rate of the variable tourism revenue was found to be the highest. Therefore, policies should be reformed to accelerate tourism revenue. For sustainable national economic development, emphasis should also be given to the development of other sectors, such as leather, textiles, footwear, jute, and handicrafts. As a result, national economic growth will increase at a faster rate, and the standard of living of the people in Bangladesh will improve.

Tenth, the variables PGDP and GDP were found to be Gamma-distributed, implying that Bangladesh has the highest number of low-income people. There-

fore, policies should be reformed to shift the PGDP and GDP distributions from the left to the right. As a result, the development will be sustainable.

Conclusions

This study investigated the dynamic co-integration and causal relationships between economic growth (PGDP) and Bangladesh's tourism and hospitality sector development (TD) using modern econometric techniques based on time series data for the period 1972 to 2023. The analysis proceeded in several steps. In the first step, the ADF, PP, and KPSS test results indicated that all the time series variables are integrated of order one with and without structural breaks. In the second step, Johansen and Juselius (1990) multivariate co-integration test results indicated that the explanatory variable tourism development is coalescing with economic growth to achieve their steady-state equilibrium in the long run; deviations may occur in the short run. In the third step, the Granger causality test results of the VEC model found no unidirectional short-run causal relationship between tourism development and economic growth. The error correction terms were found to be statistically significant when economic growth (PGDP) was treated as the endogenous variable, indicating that there exists a long-run relationship among the variables in the form of Equation (4), which is also confirmed by the results of the Johansen and Juselius (JJ,1990) co-integration test. Finally, the study estimated the long-run and short-run elasticities of economic growth with respect to tourism development (TD) and found that the coefficient of ECM (-1) was statistically significant at any significance level, which implies that the speed of adjustment from the short run to reach the long-run equilibrium is significant. The error correction term was -0.6186with the expected sign, indicating that when per capita real GDP is above its equilibrium level, it will be adjusted by almost 61.86% within the first year, and the adjustment is statistically significant. The full convergence process to reach its equilibrium level will take less than 2 years. The long-run elasticity of economic growth with respect to tourism development was found to be higher than the short-run elasticity, implying that tourism development will give rise to more economic growth in Bangladesh over time. Diagnostic test results indicated no autocorrelation, heteroscedasticity, and autoregressive conditional heteroscedasticity issues in the short-run model. The test results also confirmed that there is no problem with the normality of random error terms in Equation (23). The CUSUM and CUSUMSQ test results suggest that policy changes considering the explanatory variables of the economic growth equation will not cause major distortion in economic growth. From the estimated values of the impulse response function, it can be said that economic growth responds positively to a one-standard-deviation shock (innovation) in tourism development over the next ten years.

From the analytical results, it is recommended that the government and other stakeholders take the following necessary measures to support the development of the tourism and hospitality section in Bangladesh: (1) increase both domestic and foreign investment in tourism; (2) implement tourism policies based on the country's abundant opportunities and natural beauty; (3) address political instability through dialogue and consensus to increase the country's attractiveness for international tourists, as political turmoil impacts tourism revenue and economic growth in a negative way; (4) provide financial support to local communities and service providers, especially those affected by recent crises, to improve the quality of services offered to tourists; (5) enhance training programs for skilled personnel in tourism and hospitality management; (6) improve the country's environmental performance; (7) develop transportation and security systems; (8) emphasize the development of the naval tourism to accelerate tourism revenue growth; (9) support other key sectors such as leather, textiles, footwear, jute, and handicrafts to ensure the country's sustainable economic development; and (10) take measures to increase income levels among the population to ensure inclusive and sustainable growth. Thus, if the right policies and strategies are put in place, the tourism industry can advance Bangladesh's tourism and hospitality sector, generating foreign currency earnings, increasing employment, reducing poverty, and fostering cultural and infrastructure development, and contributing to overall socio-economic development in Bangladesh.

Finally, the authors believe that this research study will greatly contribute to the students, researchers and institutions of some European countries in policy-making regarding the development of their tourism sectors, which may play a significant role in fulfilling their future objectives and stimulating economic growth.

References

Akter, H., H., Akhtar, S., & Ali, S. (2017). Tourism demand in Bangladesh: Gravity model analysis. *Tourism, 65*(3), 346-360. https://hrcak.srce.hr/file/275672

Ali, M. M., & Sifat-e-Mohsin, C., (2008). Different aspects of tourism marketing strategies with special reference to Bangladesh: An analysis. *Khulna University Business Review – A Journal of Business Administration Discipline*, *6*(1/2) 91-106. https://doi.org/10.35649/KUBR.2008.6.12.8

Ali, M. B. (2013). Socio-economic impacts of tourism development: An empirical study on Cox's Bazar. *Asian Journal of Business and Management*, *1*(4), 205–211. https://www.ajouronline.com/index.php/AJBM/article/view/567

Amin, S. B., Murshed, M., & Rahman, S. (2017, February 7). Role of rural tourism development in Bangladesh economy. *The Daily Sun*. https://www.dailysun.com/printversion/details/204066

Andriotis, K. (2002). Options in tourism development: Conscious versus conventional tourism. *Anatolia: An International Journal of Tourism and Hospitality Research, 13*(1), 73-85. https://doi.org/10.1080/13032917.2002.9687016

Asian Development Bank. (2025). *Basic statistics 2025* [Dataset]. https://data.adb.org/dataset/basic-statistics

Bhuiyan, A. H., & Darda, A. (2018). Prospects and potentials of halal tourism development in Bangladesh. *Journal of Tourismology, 4*(2), 93–106. https://dergipark.org.tr/en/pub/iuturizmoloji/issue/41370/524660

Blake, A., Sinclair, M. T., & Campos Soria, J. A. (2006). Tourism productivity: Evidence from the United Kingdom. *Annals of Tourism Research, 33*(4), 1099-1120. https://doi.org/10.1016/j. annals.2006.06.001

Campbell, J. Y., & Perron, P. (1991). Pitfalls and opportunities: What macroeconomists should know about unit roots. In O. J. Blanchard & S. Fischer (Eds.), *NBER Macroeconomics Annual 1991* (pp. 141–201). MIT Press.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*(366a), 427-431. https://doi.org/10.1080/01621459.1979.10482531

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*(4), 1057–1072. https://doi.org/10.2307/1912517

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica, 55*(2), 251–276. https://doi.org/10.2307/1913236

Fuller, W. A. (1976). *Introduction to Statistical Time Series*. Wiley. https://doi.org/10.1002/9780470316917

Habib, S. S., Sharif, M. S., & Hossain, M. A. (2019). Nexus between economic growth, tourism revenue and financial development in Bangladesh: A time series analysis. *Macrothink Institute, Business and Economic Research, 9*(3), 134-149. https://doi.org/10.5296/ber.v9i3.15068

Hassan, M. R., Ullah, M. M., & Chowdhury, M. S. A. (2013). Impact of tourism in Bangladesh economy. *World Journal of Social Sciences, 3*(6), 45-57. https://tinyurl.com/2pzdc896

Horaira, M. A., & Devi, A. (2021). Cultural tourism in Bangladesh, a potential and profound tourism destination: Developing a model for cultural tourism development in Bangladesh. *International Tourism and Hospitality Journal*, 4(10), 1-22. https://doi.org/10.37227/ITHJ-2021-08-1187/

Hossain, M.S. and Kanon, K.S. (2023, November). *A parametric model of tourism demand of Bangladesh* (Research Project, No. 56). Bureau of Business Research, Faculty of Business Studies, University of Dhaka. ISBN: 978-984-35-5268-6.

Granger, C. W. J., & Newbold, P. (1974). Spurious regressions in econometrics. *Journal of Econometrics, 2*(2), 111–120. https://doi.org/10.1016/0304-4076(74)90034-7

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration – with application to the demand for money. *Oxford Bulletin of Economics and Statistics, 52*(2), 169-210. https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x

Khan, A., Amin, S., Ahmed, A., & Sultana, T. (2021). Tourism development and economic growth in Bangladesh: New evidence from nonlinear autoregressive distributed lag. *International Journal of Economics and Financial Issues, 11*(2), 100-107. https://doi.org/10.32479/ijefi.11040

Kobra, M. K., Bhuiyan, K. H., & Zayed, N. M. (2018). Well and woes of tourism promotion in Bangladesh: Investment perspective. *Academy of Accounting and Financial Studies Journal, 22*(3), 1-8. https://www.abacademies.org/articles/well-and-woes-of-tourism-promotion-in-bangladesh-investment-perspective-7256.html

Kwiatkowski, D., Phillips, P. C. B., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics, 54*(1–3), 159–178. https://10.1016/0304-4076(92)90104-Y

MacKinnon, J. G. (1991). Critical values for cointegration tests. In R. F. Engle & C. W. J. Granger (Eds.), *Long-run economic relationships: Readings in cointegration* (pp. 267–276). Oxford University Press.

Mondal, M. S. H. (2017). SWOT analysis and strategies to develop sustainable tourism in Bangladesh. *UTMS Journal of Economics*, 8(2), 159-167. https://www.econstor.eu/bitstream/10419/195304/1/1011397595.pdf

Nelson, C. R., & Kang, H. (1981). Spurious periodicity in inappropriately detrended time series. *Econometrica, 49*(3), 741–751.

Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica, 57*(6), 1361–1401. https://doi.org/10.2307/1913712

Phillips, P. C. B. (1986). Understanding spurious regressions in econometrics. *Journal of Econometrics, 33*(3), 311–340. https://doi.org/10.1016/0304-4076(86)90001-1

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*(2), 335–346.

Punia, B. K. (1994). *Tourism management: Problems and prospects*. A. P. H. Publishing Corporation.

Rhaman, M. R. (2016, May). *The socio-economic importance of tourism and its impact on the livelihood in South Asia: Case Rangamati, Bangladesh* [Bachelor`s thesis]. Centria University of Applied Sciences. https://www.theseus.fi/bitstream/handle/10024/116404/Rezaur_Rhaman.pdf?sequence=1&isAllowed=y

Redwan, S. (2014). *Tourism & socio-economic development: Focus on Bangladesh, a destination country*.

Roy, S. C., & Roy, M. (2015). Tourism in Bangladesh: Present status and future prospects. *International Journal of Management Science and Business Administration, 1*(8), 53–61. https://doi.org/10.18775/ijmsba.1849-5664-5419.2014.18.1006

Sayeda, T. (2017). The effects of mass tourism: An evaluative study on Cox's Bazar, Bangladesh. *IOSR Journal of Humanities and Social Science, 22*(5), 31–36. https://doi.org/10.9790/0837-2205023136

Stock, J. H., & Watson, M. W. (1988). Variable trends in economic time series. *Journal of Economic Perspectives, 2*(3), 147–174.

Sultana, S. (2016). Economic contribution of tourism industry in Bangladesh. *Journal of Tourism, Hospitality and Sports*, 22, 45-54. https://core.ac.uk/download/pdf/234696876.pdf

Tuhin, W. K. M., & Majumder, M. T. H. (2011). An appraisal of the tourism industry development in Bangladesh. *European Journal of Business and Management, 3*(3), 287-298. https://www.iiste.org/Journals/index.php/EJBM/ article/view/284/166

World Tourism Organization. (2014). *UNWTO tourism highlights: 2014 edition*. https://doi.org/10.18111/9789284416226

World Travel and Tourism Council. (2025, April 28). *Bangladesh travel & tourism economic impact factsheet*. https://researchhub.wttc.org/product/factsheet-bangladesh-travel-tourism-economic-impact

WorldData Info. (n.d.). *Tourism in Bangladesh*. https://www.worlddata.info/asia/bangladesh/tourism.php

World Bank Group. (n.d.). *Data: Indicators* [Interactive database]. http://data.worldbank.org/indicator/

World Economic Forum. (2024, May). *Travel & Tourism Development Index 2024: Insight Report*. https://www3.weforum.org/docs/WEF_Travel_and_Tourism_Development_Index_2024.pdf

Zivot, E., & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil price shock, and the unit root hypothesis. *Journal of Business & Economic Statistics, 10*(3), 251–270. https://doi.org/10.1080/07350015.1992.10509904

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