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Empirical Study On International Tourism Receipts And GDP Of Nepal An ARDL Bounds Testing Approach

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Abstract
This study aims to examine the influence of international tourism earnings on the Gross Domestic Product (GDP) of Nepal. The research utilizes the Autoregressive Distributed Lag (ARDL) bounds testing approach to analyze the relationship between tourism earnings and GDP over the period of 1987 to 2020. The analysis finds out that there is a long run cointegration in the data. The results of the study reveal that there is no short-term impact of tourism on GDP. This suggests that variations in tourism spending or receipts, even if they occur temporarily, do not result in significant fluctuations in the overall economic output of the country in the short term. To further investigate the relationship, a Granger causality test is employed to determine the presence and direction of causality between tourism earnings and GDP. The Granger causality test outcomes demonstrate a unidirectional causality, with GDP having a causal influence on tourism earnings, but not the reverse. This implies that Nepal's GDP growth drives tourism earnings, rather than the other way around. The coefficient of the error correction model indicates that 14.925% of any movement into disequilibrium is corrected within one year. These findings have important implications for policymakers in Nepal, providing insights for the formulation of strategies that promote tourism as a driver of economic development. To achieve a causal relationship between tourism and GDP, policymakers should consider formulating and implementing policies and initiatives that align with the objective of tourism-led economic growth.

Keyword: *GDP, ARDL, Cointegration, Unidirectional.*

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I. Introduction

Tourism is one of the mainstays of Nepalese economy. It is also a major source of foreign exchange and revenue. Possessing 8 of the 10 highest mountains in the world, Nepal is a hotspot destination for mountaineers, rock climbers and people seeking adventures. The Hindu, Buddhist and other cultural heritage sites of Nepal, and around the year fair weather are also strong attractions. Nepal is the country of the Mount Everest, the highest mountain peak in the world, and the Birthplace of Gautama Buddha- Lumbini. Mountaineering and other types of adventure tourism and ecotourism are important attractions for visitors. There are other important religious pilgrimage sites throughout the country for the followers of various sects and religions (Welcome in nepal,2022). Tourism is a crucial industry for Nepal, and it plays a significant role in the country's economic development. The contribution of tourism to Nepal's GDP has increased significantly over the years, and it is now one of the major sources of foreign exchange earnings. The number of tourists has increased significantly over the years, with a few fluctuations. In the early 2000s, the number of tourists declined due to political instability in the country.

However, since 2007/08, there has been a steady increase in the number of tourists visiting Nepal. The highest number of tourists was recorded in 2018/19 with 1,173,072 visitors, followed by 2019/20 with 1,197,191 visitors. However, due to the COVID-19 pandemic, the number of tourists dropped to 230,085 in 2020/21. Tourism is a crucial industry for Nepal, and the increase in the number of tourists has led to a significant contribution to the country's economy. Tourism foreign exchange earnings can have a significant impact on a country's GDP. When tourists visit a country, they spend money on various goods and services, such as accommodation, transportation, food, souvenirs, and recreational activities. This spending generates revenue, which then contributes to the country's overall GDP. Additionally, when tourism is a thriving industry, it creates job opportunities for locals, leading to increased income and consumer spending, which further supports economic growth. Therefore, a rise in tourism foreign exchange earnings can contribute to an increase in GDP, while a decline can led to a decrease in GDP. This is why many countries, including Nepal, place a great emphasis on developing and promoting their tourism industry as a means of boosting economic development. Tourism revenue make an important impact on economics, resulting in job creation, foreign currency reserve, higher investment and growth (Mello, Pack & Sinclair, 2002).

Keynes (1936) states that supply of output or production depends upon effective demand. Effective demand depends upon the consumption expenditure, business investment, government expenditure and net export. In this context this study investigates the relationship between international tourism receipts (TR), private investment (PI), foreign grants (FG), exports (EXP), imports (IMP), and Nepal's GDP (Y). Despite several notable studies on the impact of tourism on GDP in Nepal, including Jeyapraba & Senthilnathan (2021), Oh (2003), Gautam (2011), Balaguer & Cantavella (2002), Dritsakis (2004), and Dash, Tiwari, & Sing (2018), this specific regression model has not been employed in previous research.

II. Literature Review

The relationship between tourism and economic growth has been a widely researched topic in the field of economics. Various study has been conducted in analyzing the relation between tourism receipts and GDP. Jeyapraba & Senthilnathan (2021) study aimed to identify the relationship between tourism and economic growth in Sri Lanka, using time series data from 1977 to 2012. The study found a Uni-directional causal relationship between GDP and tourism receipts, indicating that economic growth has a significant impact on tourism earnings, but not the other way around. A recent conducted using the Autoregressive Distributed Lag (ARDL) model from the data 1973-2013, aimed to investigate the impact of tourism on economic growth in India while controlling for other variables such as physical capital, human capital, tourism receipts, and real exchange. The study found that tourism has a positive impact on GDP in both the short and long run periods. Specifically, the results showed that a 1% increase in tourism receipts leads to an increase of 0.15% in GDP (Dash, Tiwari, & Sing, 2018). The analysis about the relationship between tourism earning and economic growth exhibited the significant relationship between the variables. Using the concepts and methods of the unit root test, co-integration, Granger causality test and error correction method, the study confirms that there exists short-term dynamic relationship as well as long-run co integrating relationship and bidirectional causal relation between tourism income and GDP (Gautam, 2011). His finding suggests that policy should be focused to develop tourism sector in order to achieve high economic growth. A study conducted to examines the tourism-led growth hypothesis in Thailand using quarterly data from 2006 to 2017. The findings indicate a positive long-term relationship between tourism receipts and real GDP, supporting the hypothesis. However, the short-term dynamics reveal an unstable relationship, as any deviations from the long-term equilibrium are not corrected. Therefore, while the overall results suggest that the tourism-led growth hypothesis holds for Thailand, further analysis is needed to understand the underlying factors contributing to this instability (Jirnyakul, 2019). A study conducted on the relationship between international tourism and economic growth in Thailand from 1997 to 2018 revealed a significant positive impact on both short and long-term economic growth. This finding suggests that the growth of international tourism can be considered as a contributor to the economic development of Thailand (Rahmatullah, 2022). Author finds the causal relationship between tourism receipts and GDP in Pakistan using the ARDL model. They find evidence of a long-run relationship between the two variables, suggesting that tourism can contribute to economic growth in Pakistan from the data taken 1971-2008.Overall, the findings of the study highlight the importance of promoting tourism as a potential source of economic growth in Pakistan while taking necessary measures to avoid potential negative impacts (Khan & Hye, 2013). The outcomes of Granger causality test imply the one-way causal relationship of economic- A study conducted to examine the impact of tourism and economic growth in Sri Lanka through Autoregressive distributed lag model (ARDL) bound testing approach from the observation period 1969-2009. Analysis reveals that tourism has a positive impact on economic growth in Sri Lanka in the short-run and long run (P & P. K, 2013). The study investigates the causal relations between tourism growth and economic expansion for the Korean economy by using Engle and Granger two-stage approach and a bivariate Vector Autoregression driven tourism growth. The hypothesis of tourism-led economic growth is not held in the Korean economy (Oh, 2003). A Multivariate Auto Regressive (VAR) model was applied to analyze the relationship between tourism and economic growth in Greece for the period 1960: I to 2000: IV. The results of the co-integration analysis suggest that there is one co-integrated vector among real gross domestic product, real effective exchange rate, and international tourism earnings. Granger causality tests based on Error Correction Models (ECMs) have indicated a 'strong Granger causal' relationship between international tourism earnings and economic growth, a 'strong causal' relationship between the real exchange rate and economic growth, and simply 'causal' relationships between economic growth and international tourism earnings, as well as between the real exchange rate and international tourism earnings (Dritsakis, 2004). This paper empirically examines the impact of tourism on economic growth of Nepal by using time series data of 1976-2020 and applying autoregressive distributed lag (ARDL) approach. Real GDP was used as proxy measure of economic growth, which was the outcome variable whereas the variable of interest was tourism receipts. The result of ARDL model shows that tourism has no significant impact on economic growth of Nepal in both short-run and long-run. In such context of tourism and growth relationship, tourism-led growth hypothesis is rejected for Nepal (Bhattarai & Karmacharya, 2022).

The empirical results have been estimated by applying annual data for the period of 1974/'75 to 2002/'03. The different models in linear and log-linear forms have justified that exports growth leads to economic growth

(Sharma & Bandh, 2005).The impact of imports and exports on gross domestic product (GDP) in Nepal using a multiple linear regression model that exports and import have a positive and significant impact on GDP in Nepal, with a coefficient of 0.052060 and 0.098775 respectively (Pandey, 2022).A study conducted on six countries (Algeria, Argentina, Burundi, Kenya, Mexico, and Peru) reveals negative elasticities of export to GDP, approximately around -0.20. This suggests that a 1% increase in exports leads to a corresponding decrease of approximately 0.20% in GDP. The negative effects observed in these countries can be attributed to a combination of factors, including their economic structure, political instability, and economic instability (Pereira & Xu, 2000). The test results using the autoregressive distributed lag model indicates that in the short and long run, there is the effect of export and import on economic growth. In the long run, every 1% of the decline in import lead to the 1.17% increase of the economic growth, while 1% increase in export lead to the 1.83% increase of the economic growth (Millia & Syarif, et al. 2021). A study examining the impact of private physical capital investment on the GDP of Pakistan has revealed a significant influence on economic growth. The results indicate that a 1% change in private physical capital investment can result in an approximate 43% change in economic growth (Ali, 2015). The findings of a study conducted on developing countries indicate that the coefficient of private investment is 0.158. This suggests that a 1% increase in private investment leads to a 0.158% increase in economic growth (Reinhart,1989). A study examining the impact of foreign aid on the GDP of Nepal has revealed a positive relationship, with a coefficient of 0.093. This indicates that a 1% increase in foreign aid results in a 0.093% increase in Nepal's GDP (Pradhan & Phuyal, 2020). Study conducted on foreign aid effect on GDP of Nepal reveals that foreign aid has a positive and statistically significant effect on per capita real GDP in the long-run. However, in the case of short-run dynamics, the immediate impact of changes of aid has a negative impact in the changes of per capita real GDP, possibly due to lack of absorptive capacity and aid volatility. Thus, there seems to be a paradox between short-run and long-run effects of aid (Bhattarai,2009).

Data and methodology

This study employs a deductive approach and adopts a causal relationship research design. It is grounded in the Keynesian approach concept. The study utilizes time series data obtained from the Ministry of Finance and the Central Bank of Nepal spanning from 1987 to 2020.

Empirical model and diagnostic checking

The research methodology used in this study aims to investigate the impact of international tourism receipts on Nepal's GDP, while considering other important factors such as private investment in gross capital formation, foreign grants, exports, and imports. Definitional equation of Keynesian economic theory was applied, which focuses on the overall demand in the economy. The definitional equation provides a clear and straightforward representation of the relationship between aggregate demand (AD) and aggregate output/aggregate supply. It states that GDP (Y) is equal to aggregate demand (AD), which consists of consumption (C), investment (I), government spending (G), and net exports (NX). This equation offers a concise and intuitive understanding of the factors that determine the level of economic output.

$Y = C + I + G + X - M$

Where C = Consumption, I = Investment, G= Government expenditure, M= Imports, X = Exports, Y = Outcome

The model is expressed as equation (1).

$GDPt=\beta+\beta1TR+\beta2PI+ \beta3FG +\beta4EXP + \beta5IMP+ \mu t$…. (1)

Where;

GDP=gross domestic product.

TR= foreign exchange earnings from tourism receipts.

PI= Gross private investment in fixed capital formation.

FG= Foreign grant.

EXP= Export.

IMP=Import.

β=Intercept.

$\beta1$…, $\beta5$ are coefficient; μ is the error term; and t represent time.

In accordance with economic theory, it is expected that (i) $\beta1$, $\beta2$, $\beta3$, $\beta4$, are positive and $\beta5$ is negative.

In these equations according to Keynesian model tourism receipts leads to an increase in consumer spending (C); Gross private investment in capital formation (PI) can stimulate economic growth by providing additional investment funds (I) for businesses which drives economic growth; foreign grants will increase government spending (G) in the economy, thereby increasing the level of aggregate demand (Y); exports (X) will increase the level of aggregate demand (Y) and import will decrease the aggregate demand Y.

This study uses the Autoregressive Distributed Lag (ARDL) model to estimate the long-term equilibrium relationship between the variables and Error Correction Mechanism (ECM) to determine the impact of tourism on GDP. The authors employed the ARDL model due to several reasons. Firstly, the regressors exhibited stationarity at different levels, and the sample size was relatively small. In such cases, the ARDL procedure can be applied. In contrast, Johansen cointegration techniques necessitate that all variables in the system have an equal order of integration. Additionally, the ARDL procedure holds particular advantages when working with limited data samples. In contrast, Johansen cointegration techniques require larger data samples to yield reliable results. Consequently, the ARDL approach carries greater statistical significance in determining the cointegration relationship, especially within small samples and in the presence of different levels of stationarity (Ozturk & Acaravci, 2011).

The ARDL model is a statistical method used to check if there is a long-term relationship between different variables. It includes both past values of the dependent variable and past values of the independent variables as explanatory factors. The ARDL method can use different lag lengths for different variables. The ARDL method is simpler than other methods, and it does not require as many decisions about which variables to include. Furthermore, the ARDL approach allows the use of different optimal lags for the different variables, which is not possible in the standard. The advantage of using ARDL technique instead of the conventional Johansen (1998) and Johansen and Juselius (1990) cointegration approach are that while the latter estimates the long run relationships within the context of a system of equations, and former employs only a single reduced form equation (Pesaran and Shin 1995). In addition, the ARDL method avoids configuring a larger number of specifications in the standard cointegration test.

Since Time series data can be sensitive to certain statistical issues, and one of these is called unit root problems. To avoid unreliable results caused by this issue, the authors used ADF unit root tests on the data. These tests check whether the variables in the data are stationary, which means they don't change much over time and are more reliable to analyze. The variables can be a combination of "I (0)" and "I (1)" series, which represent whether they are stationary or not. By conducting these tests, the researchers can make sure their analysis is based on reliable data.

The ARDL approach to cointegration is done in equation (2).

$\Delta GDPt=\beta+\beta 1\Delta TR+\beta 2\Delta PI+\beta 3\Delta FG+\beta 4\Delta EXP+\beta 5\Delta IMP+\beta 6GDPt\text{-}1+\beta 7\Delta TRt\text{-}1+\beta 8\Delta PIt\text{-}1+\beta 9\Delta FGt\text{-}1+\beta 10\Delta EXPt\text{-}1+\beta 11\Delta t\text{-}1+ECTt\text{-}1$

To determine the ideal number of lags for each variable, a lag length test is performed by estimating a single equation Vector Autoregressive (VAR) model and using a lag length criterion. This is then followed by estimating a single equation unrestricted error correction (EC) model using the identified number of lags for each variable, as shown in Equation (3). It's worth noting that this model differs from the unrestricted error correction model in Equation (2), which includes all the variables including the dependent variable without difference.

$\Delta GDPt=\beta o+\Sigma\beta 1\Delta GDPt\text{-}1+\Sigma\beta 2\Delta TRt\text{-}i+\Sigma\beta 3\Delta PIt\text{-}i+\Sigma\beta 4\Delta FGt\text{-}i+\Sigma\beta 5\Delta EXPt\text{-}i+\Sigma\beta 6\Delta IMPt\text{-}i+\beta 7GDPt\text{-}1+\beta 8TRt\text{-}i+\beta 9PIt\text{-}i+\beta 10FGt\text{-}i+\beta 11EXPt\text{-}i+\beta 12FGt\text{-}1+\beta 13IMPt\text{-}1+vt$

Here, Δ is first difference operator, p is the optimal lag length, an all the variables remain the same. After conducting the lag length test and estimating the optimal number of lags for each variable, F-statistics are calculated and compared with Pesaran's critical values at a 5% level of significance. These critical values depend on whether the variables are I (0), I (1), or a mixture of both. If the F-statistics exceed the upper bound value, the null hypothesis of no cointegration is rejected, indicating that there is a long run relationship among the variables, regardless of the order of integration of the variables. On the other hand, if the F-statistics fall below the lower bound value, the null hypothesis of no cointegration is not rejected. If it falls between the bounds, the result is inconclusive.

If it is established that the variables are cointegrated, there may be disequilibrium in the short run. The error correction mechanism is then used to correct the disequilibrium. The short run dynamics can be derived by estimating the error correction term (ECT) with the lags specified in the equation.

$\Delta GDPt=\beta o+\Sigma\beta 1\Delta GDPt\text{-}1+\Sigma\beta 2\Delta TRt\text{-}i+\Sigma\beta 3\Delta PIt\text{-}i+\Sigma\beta 4\Delta FGt\text{-}i+\Sigma\beta 4\Delta FGt\text{-}i+\Sigma\beta 5\Delta EXPt\text{-}i+\beta 6IMPt\text{-}1+\ \beta 7IMPt\text{-}1+\beta 8ECTt\text{-}1$ …………… (4)

Where ECTt-1 is the error correction term defined by equation 5

$ECTt=\Delta GDPt\text{-}\beta o\text{-}\Sigma\beta 1\Delta GDPt\text{-}1\text{-}\Sigma\beta 2\Delta TRt\text{-}i\text{-}\Sigma\beta 3\Delta PIt\text{-}i\text{-}\Sigma\beta 4\Delta FGt\text{-}i\text{-}\Sigma\beta 5\Delta EXPt\text{-}i\text{-}\Sigma\beta 6\Delta IMPt\text{-}i\text{-}+\beta 7GDPt\text{-}1$ …………… (5)

All coefficient of the short run equation relates to the short run dynamics of the model's convergence to equilibrium, and β8 in equation 4 represent speed of adjustment.

Descriptive statistics

Descriptive statistics are essential in understanding the characteristics of a given data set. They provide a concise summary of the data and help researchers to identify patterns and relationships within the sample. In this study, descriptive statistics are used to summarize the sample of the population under investigation**.**

Table 1

The Result of descriptive statistics

	LNGDP	LNTR	LNEXP	LNPI	LNFG	LNIMP
Mean	11	7.27	8.21	9.15	6.9	9.67
Median	10.89	7.06	8.62	9.15	7.03	9.51
Maximum	12.87	8.92	9.18	11.49	8.43	11.86
Minimum	8.94	5.12	6.02	6.67	4.99	7.23
Std deviation	1.18	0.99	0.92	1.39	1.13	1.33
Skewness	0.02	-0.1	-0.14	-0.04	-0.27	-0.06
Kurtosis	1.88	2.31	1.80	2.04	1.71	2.08
Jarque-B	1.72	0.7	1.3	1.26	2.69	1.17
Probability	0.42	0.7	0.54	0.53	0.26	0.55
Sum	363.01	240.21	270.96	302.02	227.93	319.43
Sum sq dev	44.66	31.52	27.56	62.38	41.36	56.68
Observation	33	33	33	33	33	33

Note: Authors calculation using the data derived from the sources described in section 3.

The mean values for the variables range from 6.9 to 11, indicating variation in their central tendencies. Based on this information, the data seems suitable for regression analysis, as it contains the necessary variables and observations for modeling relationships and making predictions. The Jarque-Bera test is a goodness-of-fit test that assesses whether the distribution of the data is normal. A p-value is calculated to determine the probability of obtaining the test statistic if the null hypothesis is true. If the p-value is less than a significance level (usually 0.05), the null hypothesis is rejected, indicating that the data is not normally distributed.

Unit root test

A unit root test is a statistical test used to determine whether a time series variable is stationary or non-stationary (Gujarati,2009). A stationary time series is one in which the statistical properties such as the mean, variance, and autocorrelation remain constant over time.

Table 2

The result of ADF test

		ADF (constant)		ADF (Constant & Trend)		Integrated/ or Non-Integrated
Variables		At level	At First difference	At level	At First difference	
LNGDP		0.63	0**	0.5	0*	I (1)
LNTR		0.39	0***	0.1	0**	I (1)
LNEXP		0**	0**	0.62	0**	I (0)
LNPI		0.78	0***	0.31	0***	I (1)
LNFG		0.6	0***	0.96	0***	I (1)
LNIMP		0.99	0**	0**	0***	I (1)
	Notification: (*) significance at 10%, (**) Significance at 5%, (***) at 1% and (no) Not significant					

Note: Authors calculation using the data derived from the source described in section 3.

The results of the unit root tests in the table 2 show that four variables, LNGDP, LNTR, LNPI, and LNFG, LNIMP are non-stationary at the 5% level of significance with p-values greater than 0.05. This suggests that these variables have a unit root, indicating non-stationarity. However, after taking the first differences, LNGDP, LNTR, LNPI, LNFG, LNIMP become stationary. This indicates that these variables exhibit a trend and can be made stationary by taking first differences.

On the other hand, LNEXP is already stationary at level. This suggests that the variable is stationary and does not require differencing to achieve stationarity.

In summary, the results of the unit root tests show that some variables in the dataset are non-stationary and require differencing to achieve stationarity. The information obtained from these tests is important for selecting appropriate modeling techniques and for obtaining reliable results.

Lag length criterion

The choice of lag length is often determined by model selection criteria such as AIC (Akaike Information Criterion) and SCI (Schwarz Information Criterion). These criteria take into account the goodness-of-fit of the model and its complexity**.**

Table 3
VAR optimal Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SCI	HQ
0	-7.101497	NA	9.38E-08	0.845258	1.122804	0.935731
1	170.9797	275.7386	1.03E-11	-8.321268	-6.37844*	-7.687957
2	218.7016	55.41907*	6.40e-12*	-9.077524*	-5.469427	-7.901375*

*Notifications: *indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: final prediction error, AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information Criterion*

Note: Authors calculation using the data derived from the sources described in section 3. Result from table 3 as per criteria the maximum lag length of variables is two.

. Akaike's information criterion (AIC) and final prediction error (FPE) are superior than the other criteria under study in the case of small sample (60 observations and below), in the manners that they minimize the chance of under estimation while maximizing the chance of recovering the true lag length (Liew, 2004). This, in turn, will improve the accuracy of the model's predictions and capture the underlying system's dynamics.

ARDL Co-integration test

Cointegration is a statistical property that indicates the presence of a long-run relationship between two or more non-stationary variables.

Table 4
ARDL Bound Test

F-Bound Test	Null Hypothesis: No levels relationship			
Test Statistic	Value	Signif	I (0)	I (1)
F- Statistics	30.93826		Asymptotic	
K	5	10%	2.08	3
		5%	2.39	3.38
		2.50%	2.7	3.73
		1%	3.06	4.15

Note: Authors calculation using the data derived from the source described in section 3.

In above F bound test result, F-statistic value of 30.93826 which is greater than the upper bound critical values at all significance levels (1%, 2.5%, 5%, and 10%). This suggests that we can reject the null hypothesis of no co-integration and conclude that the variables are co-integrated at all significance levels.

Therefore, based on the F-bound test results, we can conclude that there is evidence of co-integration between the variables in the ARDL model.

Long run and short run dynamics

Table 5
Long-run result of ARDL (1,0,1,0,0,0) Model

The long-run bound test results indicate that the variable LNPI is significant at the 5% level of significance, as indicated by its probability value of 0.0362. On the other hand, the variables LNTR and LNFG are found to be insignificant at the 5% level but become significant when considering a higher threshold, the 10% level of significance. The variables LNEXP and LNIMP are not statistically significant at either the 5% or 10% level of significance

Variable	Coefficient	Std error	t-statistics	Prob
LNTR	0.104878	0.286053	1.959086	0.0658
LNPI	0.236993	0.41621	-2.253817	0.0362
LNFG	0.548824	0.316345	1.751946	0.0968
LNEXP	-0.373127	0.219541	1.438178	0.1675

LNIMP	0.356877	0.499144	1.696221	0.1071
C	4.483876	0.321824	13.79192	0

Note: Authors calculation using the data derived from the source described in section 3.

The coefficient of LNTR is estimated to be 0.104878%, indicating that a 1% increase in tourism receipts leads to a corresponding 0.104878% increase in GDP. This result is consistent with previous studies by Dash, Tiwari, and Sing (2018) as well as P & P. K (2013).

The coefficients of LNEXP and LNIMP, which represent exports and imports, respectively, exhibit unexpected results. The positive coefficient of 0.356% implies that a 1% increase in imports leads to a 0.356% increase in GDP, while the negative coefficient of 0.373127% suggests that a 1% increase in exports results in a 0.373127% decrease in GDP. These findings contradict the relationship typically expected in the Keynesian framework.

Previous studies, such as Nguyen (2017), Pereira (2000), and Kartikasari (2017), have consistently reported similar findings, revealing negative coefficients associated with exports. These studies provide supporting evidence for the adverse effects of excessive exports of low value-added and labor-intensive goods on the economy. However, it is important to note that some studies, like Sharma & Bandh (2005) and Pandey (2022), have presented inconsistent results by observing positive coefficients between exports and GDP.

Furthermore, the coefficient of LNIMP, which represents imports, demonstrates a positive value of 0.35. This indicates that a 1% increase in imports leads to a 0.356% increase in GDP. This finding is consistent with the research conducted by Pawlos (2004) and Pandey (2022), suggesting that the importation of intermediate and capital goods has a positive impact on the economy. Specifically, the importation of intermediate goods in the long run has a significant and positive effect on real GDP growth. However, it is important to note that there are inconsistent results found in the research conducted by Millia, Syarif, et al. (2021). They might have observed different outcomes in their study.

The coefficients of LNFG and LNPI are both positive, indicating that a 1% increase in the logarithm of these variables will lead to corresponding increases in the dependent variable. Specifically, a 1% increase in the logarithm of foreign grant will result in a 0.548824 increase in the dependent variable, while a 1% increase in the logarithm of foreign grants will lead to a 0.236993 increase in the dependent variable. These findings are consistent with previous studies such as Pradhan & Phuyal (2020), Bhattarai (2009), Ali (2015), and Reinhart (1989).

Finally, the intercept term (C) is statistically significant at the 5% level, indicating that there exists a long-run relationship among the variables. Overall, the results suggest that the variables are co-integrated, and can be used to model the long-run relationships among them**.**

Error correction model regression

Table 6

The results of the ARDL Error Correction Model (ECM) regression indicate that the independent variable D(LNEXP) is statistically significant at the 5% level. This suggests that it has a short-run relationship with the dependent variable. The coefficient of D(LNEXP) implies that a 1% increase in the logarithm of export (the variable represented by LNEXP) will result in a 0.111368% increase in the dependent variable during the current period

Variable	Coeff	std error	T-stat	Prob
D(LNEXP)	0.111368	0.03787	2.940776	0.0071
CointEq (-1) *	-0.149255	0.009071	-16.45326	0.0000
R squared 0.565229				

Note: Authors calculation using the data derived from the source described in section 3.

Furthermore, the coefficient of CointEq (-1) is negative and statistically significant at the 5% level. This suggests that the system exhibits an error correction mechanism, where the dependent variable adjusts to restore the equilibrium relationship between the variables in the long run. In other words, if there is a deviation from the long-run equilibrium, the dependent variable will respond in the short run to bring the system back to equilibrium in the long run.

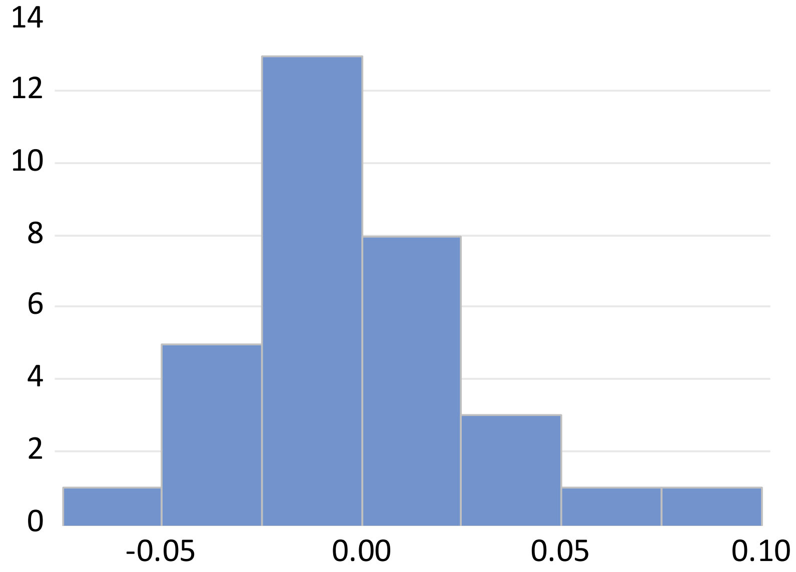
The error correction term in the model captures the short-run dynamics of the adjustment process towards the long-run equilibrium. It is estimated to be 14.925%, indicating that about 14.925% of the deviation from the long-run equilibrium is corrected in each period.

Post estimation test

The classical assumption test is used to determine whether the estimation results of a regression model are biased or not. The goal is to ensure that the model meets the assumptions of the best linear unbiased estimator (BLUE). If the assumptions are met, then the regression results can be analyzed and the conclusions can be drawn. The classical assumption test includes several tests, such as the normality test, autocorrelation test, heteroscedasticity test, multicollinearity test, and linearity test (Brooks, 2008). The ARDL model does not require multicollinearity test because there is different level of data in the use of the model (Farray & Glauber, 1967). Therefore, the classical assumption test used in this study considered of an autocorrelation test, normality test, heteroscedasticity test, and linearity test

Normality test

Table 7



Series: Residuals	
Sample 2 33	
Observations 32	
Mean	8.19e-16
Median	-0.007795
Maximum	0.091001
Minimum	-0.065527
Std. Dev.	0.033424
Skewness	0.701822
Kurtosis	3.430776
Jarque-Bera	2.874382
Probability	0.237594

Note: Authors calculation using the data derived from the source described in section 3

The Jarque-Bera test for normality of residuals yields a test statistic of 2.874382 and a p-value of 0.237594. Since the P-value is greater than the significance level of 0.05, we cannot reject the null hypothesis that the residuals are normally distributed

Heteroskedasticity test

Table 8

Heteroskedasticity Test Breusch-pagan-Godfrey

F-Statistics	0.481074	Prob F (7,24)	0.8387
Obs *R squared	3.937534	Prob.Chi-squareF (12)	0.7869
Scaled explained	2.691918	Prob.Chi-squareF (12)	0.912

Note: Authors calculation using the data derived from the source described in section 3

In this test, we can see that the F-statistic is 0.481074, and the associated probability value (p-value) is 0.8387. Since the p-value is greater than the significance level of 0.05, we cannot reject the null hypothesis of homoskedasticity. Based on the results of the Breusch-Pagan-Godfrey test, we can conclude that there is no evidence of heteroskedasticity in the regression model.

LM test

Table 9

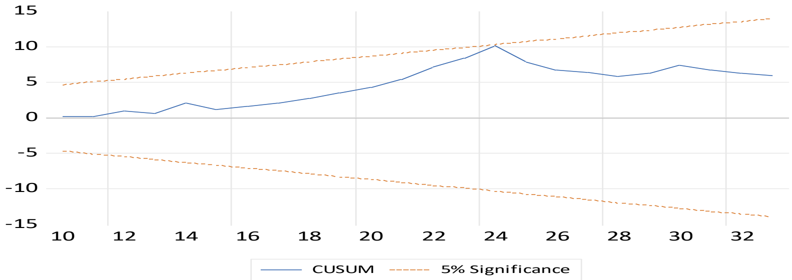
Breusch-godfrey serial correlation LM Test

Null hypothesis: no serial correlation at up to 2 lags			
F-Statistics	0.019787	Prob F (2,22)	0.9804
Obs *R squared	0.057458	Prob. Chi-square (2)	0.9717

Note: Authors calculation using the data derived from the source described in section 3

The term serial correlation for autocorrelation may be defined as a correlation between members of the series of observation ordered in time. The null hypothesis of this test is that there is no serial correlation at up to 2 lags, which means that the errors are not correlated with each other. In this test, we can see that the F-statistic is 0.019787, and the associated p-value is 0.9804. Since the p-value is greater than the significance level of 0.05, we cannot reject the null hypothesis of no serial correlation at up to 2 lags.
Overall, based on the results of the Breusch-Godfrey serial correlation LM test, we can conclude that there is no evidence of autocorrelation (serial correlation) in the regression model up to 2 lags.

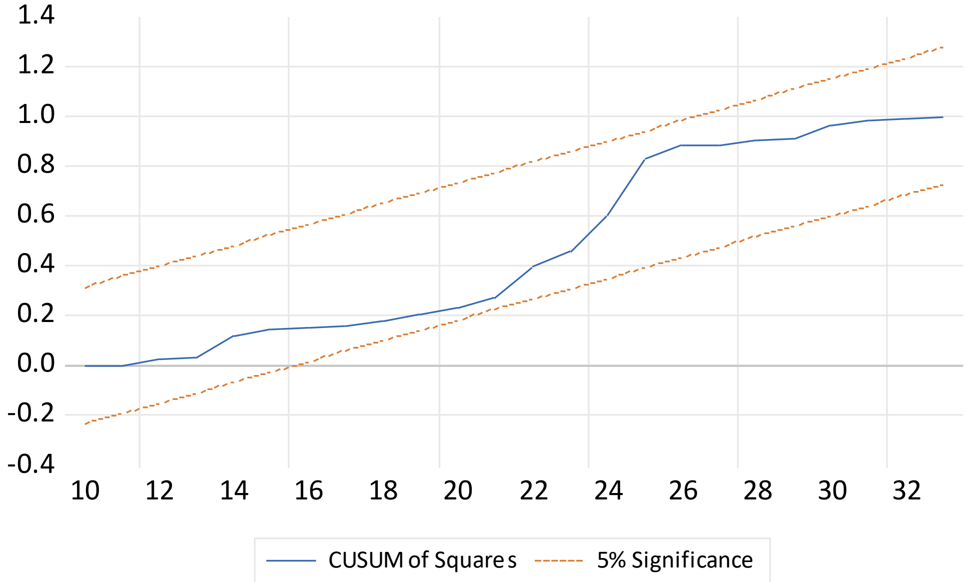
CUSUM test



Note: Authors calculation using the data derived from the source described in section 3

The line graph of your CUSUM test chart does not cross the threshold line or one of the confidence bounds, it suggests that there is no evidence of a significant change in the mean of your ARDL model over time. This result is generally a good indication that authors ARDL model is providing a stable and reliable estimation

CUSUM Square test



Note: Authors calculation using the data derived from the source described in section 3

CUSUM square test chart line remains below the threshold line, it suggests that your ARDL model is a good fit for the data and is able to capture the relevant patterns and trends in the time series

Ramsey reset test
Table 10

	Value	df	Probability
t-Statistics	1.466508	23	0.1561
F- Statistics	2.150645	(1,23)	0.1561

Likelihood ratio	2.860459	1	0.0908

Note: Authors calculation using the data derived from the source described in section 3

The results of the Ramsey Reset Test indicate that the inclusion of nonlinear terms in the regression model did not yield statistically significant improvements. The t-statistic value of 1.466508, with 23 degrees of freedom and a corresponding probability of 0.1561, suggests that the added nonlinear terms did not have a significant impact on the model's fit. This implies that there is no strong evidence to support the existence of omitted variables or nonlinear relationships between the variables in the original linear regression model.

Granger Causality test

The Granger causality test is a statistical hypothesis test used to determine whether one time series can be used to predict another time series. In other words, the test aims to establish whether the past values of one time series provide any predictive power for future values of another time series (Gujarati, Basic Econometrics, 2009)

Table 11

Pairwise Granger causality Test		
Sample 1 33		
Lags 1		
Null Hypothesis	Observation	F-Statistics
LNTR does not Granger Cause LNGDP	31	0.23462
LNGDP does not Granger Cause LNTR		5.78556

Note: Authors calculation using the data derived from the source described in section 3

The test results indicate that LNGDP Granger causes LNTR, with an F-Statistics of 5.78556 and a probability value of 0.0083, which is less than the significance level of 0.05. Thus, we reject the null hypothesis and conclude that there is sufficient evidence to suggest that LNGDP Granger causes LNTR.
In summary, the test results indicate that there is a unidirectional causal relationship between LNGDP and LNTR, where LNGDP Granger causes LNTR but not the other way around.

III. Conclusion and implication

Using the ARDL approach to cointegration and error correction model, this study aimed to investigate the impact of international tourism receipts on Nepal's GDP within the Nepalese economy from 1987/88 to 2019/20. The ARDL test indicated the presence of cointegration between GDP and key macroeconomic factors, including exports, imports, foreign grants, and gross capital formation by the private sector.

The findings of this study revealed a unidirectional Granger causality, indicating that GDP causes tourism receipts. This result aligns with the findings of previous studies conducted by Jeyapraba & Senthilnathan (2021) and Oh (2003), but differs from the results of Gautam (2011), Balaguer & Cantavella (2002) and Dritsakis (2004), and Dash, Tiwari, & Sing (2018). Specifically, the author found that economic growth has a significant impact on tourism earnings, whereas tourism earnings do not significantly influence economic growth.

The finding that GDP Granger causes tourism receipts emphasizes the importance of implementing sustainable long-term solutions to support the tourism industry in Nepal. Policymakers should focus on investing in infrastructure, education and training, entrepreneurship and innovation, and sustainable tourism practices. By doing so, they can create a favorable environment for tourism growth and ensure that the tourism industry continues to contribute to economic growth over the long term.

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