IMPACT OF EXCHANGE RATE, INFLATION AND GDP PER CAPITA ON TOURISM REVENUE: A CASE STUDY IN THAILAND

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DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 14847.

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ABSTRACT

Thailand's economy depends heavily on tourism, which is one of the primary sources of foreign exchange revenue in the nation. However, changes in macroeconomic factors like GDP per capita, inflation and exchange rates frequently have an impact on the performance of the tourism industry. The purpose of this study is to look into how these three important factors affect Thailand's tourism industry in the short and long term between 1993 and 2023. This study employs econometric methods such as the Granger Causality test, Autoregressive Distributed Lag (ARDL) model, Error Correction Model (ECM) and Augmented Dickey-Fuller (ADF) test to ascertain the relationships between the variables using annual time series data obtained from the World Bank.

By making goods and services comparatively cheaper for international tourists, exchange rate depreciation generally increases Thailand's competitiveness as a travel destination, boosting inbound tourism income. However, high inflation reduces this benefit by raising tourism-related expenses, decreasing demand and making Thailand less competitive in terms of pricing when compared to nearby travel destinations. In the meantime, it has been demonstrated that GDP per capita and tourist revenue are positively correlated, indicating that higher income levels promote more discretionary spending on travel-related activities.

When implementing strategies to increase Thailand's resilience against external economic shocks, governments, tourist stakeholders, and business owners can all benefit from the insightful information this study offers. This research advances our understanding of how macroeconomic factors interact to influence revenue from tourism in a developing but tourism-dependent country like Thailand by covering research gaps and combining GDP per capita, inflation, and exchange rates into an overall analytical framework.

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LIST OF ABBREVIATIONS

UNWTO	United Nations World Tourism Organization
GDP	Gross Domestic Product per capita
TAT	Tourism Authority of Thailand
PPP	Purchasing -Power-Parity Theory
THB	Thai Baht
ADR	Average Daily Rate
CPI	Consumer Price Index
VAR	Vector Autoregression
IMF	International Monetary Fund
ADF	Augmented Dickey-Fuller
ARDL	Autoregressive Distributed Lag
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum of Squares
TR	Tourism Revenue
INF	Inflation Rate
ER	Exchange Rate
USD	United States Dollar
ECM	Error Correction Model
PP	Phillips-Perron
MLR	Multiple Linear Regression
ECT	Error Correction Term
AIC	Akaike Information Criterion
SBC	Schwarz Bayesian Criterion
OLS	Ordinary Least Squares
VIF	Variance Inflation Factor

BPG	Breusch-Pagan-Godfrey
GLS	Generalized Least Squares
WLS	Weighted Least Squares
HQC	Hannan-Quinn Criterion
VMA	Vector Moving Average
SVAR	Structural Vector Autoregression

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CHAPTER 1: RESEARCH OVERVIEW

1.1 Research Background

What is tourism? UNWTO (2008) defined tourism as a social, cultural and economic phenomenon in which people go to nations or places outside of their usual environment for personal, business or professional reasons. People involved in such activities are called tourists, who could be within the country or outside the country, which is known as domestic tourism or international tourism.

Several reasons make tourism one of the major and largest industries in Thailand, including the rich history and culture of Thailand, Thai festivals, Thailand's delicious and diverse cuisines, affordable travel costs and the climate of Thailand (Johannessen, 2017; Cindy, 2025). According to Kaosa-ard et al. (1998), Thailand was ranked tenth in worldwide tourism receipts and the 19th most visited global destination in terms of international tourist arrivals in the earlier year. Around 7.44 million international visitors had visited Thailand in 1996, a 201,389 million baht collective expenditure had proved that this was the country's main source of foreign exchange in the year (Kaosa-ard et al., 1998).

Figure 1.1 was generated based the data from UNWTO (2022), showing the international tourist arrivals in Thailand from 1995 to 2021. Thailand's international tourist arrivals kept increasing over time from 1995 to 2019, before the COVID-19 pandemic, from 6.95 million tourists to 39.92 million tourists. Especially from 2009 to 2019, there was a significant and rapid increase in international tourists from 14.45 million to 39.92 million, which was around 176.62%, and followed by a sharp decline

to 6.73 million in 2020 due to the COVID-19 pandemic and continued to drop to 511,000 tourists in 2021 (UNWTO, 2022).

Figure 1.1: Thailand International Tourist Arrivals, 1995 to 2021.

Source: UNWTO, 2022.

The international tourists brought revenues to Thailand during the tourism activities. Figure 1.2 was generated regarding the data from World Data (2018). Thailand's tourism revenues kept increasing over time from 1995 to 2019, from $9.26 billion to $64.37 billion approximately. The tourism revenues showed a significant and rapid growth from $12.1 billion to $64.37 billion, approximately 432% growth from 2005 to 2019, and followed by a sharp decline to $15.36 billion in 2020 due to the COVID-19 pandemic and continued to drop to $5.28 billion in 2021 (World Data, 2018). While comparing Figure 1.1 and Figure 1.2, it shows a similar trend in both figures.

Figure 1.2: Thailand Tourism Revenues, 1995 to 2021.

Source: World Data, 2018.

Hieu and Yen (2019) claimed that Thailand is the best performer with respect to the economic contribution of tourism among the sample Southeast Asian countries, which included Indonesia, Malaysia, Singapore and Vietnam, during the period 2008 to 2017. Based on Figure 1.3 generated with the data provided in the study of Hieu and Yan (2019), Thailand's tourism contribution to GDP in real price has once declined from $57.73 billion in 2008 to $53.51 billion and $50.82 billion in 2009 and 2010. It then rose sharply from $55.68 billion to $73.45 billion from 2011 to 2013, and declined to $71.45 billion in 2014, followed by a steady rise from $82.77 billion in 2015 to $95 billion in 2017.

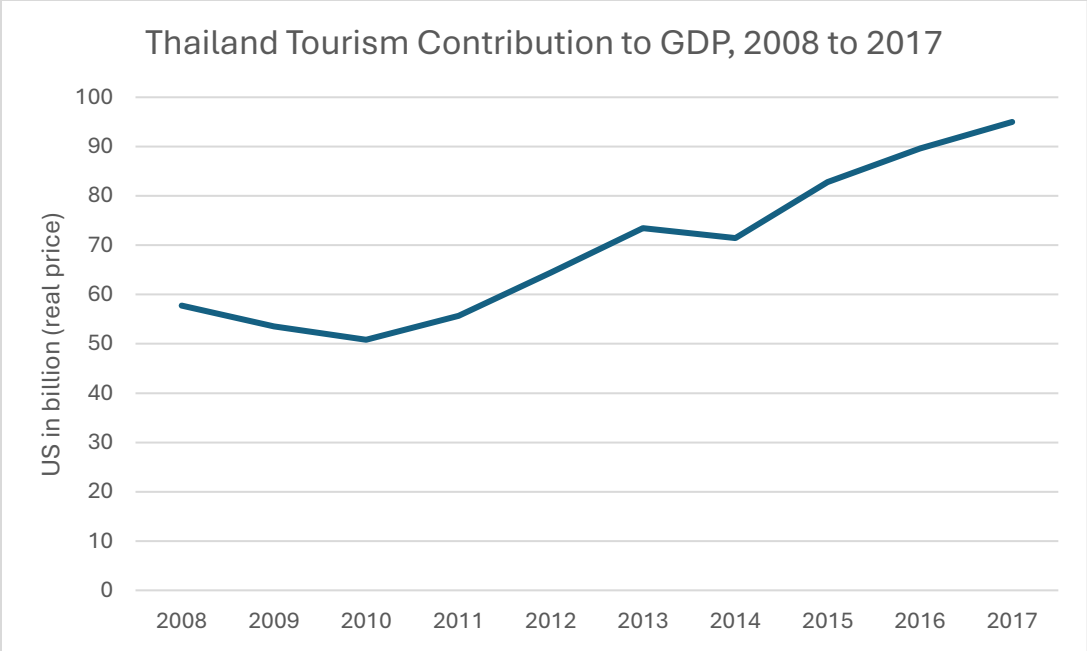

Figure 1.3: Thailand Tourism Contribution to GDP, 2008 to 2017.

Source: Hieu and Yen, 2019.

The news article from TTR Weekly (2023) mentioned that the Tourism Authority of Thailand (TAT) had set its target to recover 50%, 80% and 100% respectively in 2022, 2023, and 2024. In fact, 10,378,457 international tourists had arrived in Thailand from 1 January 2023 to 27 May 2023, around 52% of the targeted 25 million visitors, generating 428 billion baht (TTR Weekly, 2023).

1.2 Research Problem

As Tourism was the major industry in Thailand, it is quite sensitive to the macroeconomic variables such as exchange rate, inflation, and income levels shown by GDP per capita.

Theoretically, when the exchange rate is high, it means the country's currency is weak, which will affect more tourists as the travel costs are cheaper and thus create more tourism revenues. It always shows a positive relationship. However, what we observe from the real world was different to the theory. When Thailand's exchange rate was high in the 1990s to the early 2000s, the tourism revenue was low; however, when the exchange rate started to decrease and became moderate, the tourism revenue increased. Thus, we aimed to examine the actual impact through a 30-year series analysis in this paper.

When the inflation rate is high, the price of goods and services will increase, causing the tourists' spending power to decrease and leading to a reduction in tourism revenue. From what we observed, when there were big fluctuations, such as the Asian Financial Crisis and the Global Recession, the tourism revenue did have a smaller growth rate. However, long-term studies focusing on Thailand are limited; thus, we aimed to fill this gap by conducting such studies.

When income increases and basic needs are fulfilled, people are more likely to spend more on tourism, which would lead to an increase in tourism revenue. Several studies from higher-income countries have shown that GDP per capita has a positive effect on tourism growth. However, Thailand's GDP per capita has always fallen behind the world average over the past 30 years, which raises an important question: Does it have the same relationship in a country where income levels are relatively lower, but tourism

is a key driver of the economy? Since long-term studies focusing on Thailand are limited, we aim to test whether the GDP per capita in Thailand has the same positive effect on tourism revenue as observed in higher-income countries.

1.3 Research Objectives

1. To examine a significant relationship between the exchange rate and tourism revenue in Thailand.
2. To examine a significant relationship between the inflation rate and tourism revenue in Thailand.
3. To examine a significant relationship between the GDP per capita and the tourism revenue in Thailand.

1.4 Research Questions

1. What is the relationship between the exchange rate and the tourism revenue in Thailand?
2. What is the relationship between the inflation rate and the tourism revenue in Thailand?
3. What is the relationship between the GDP per capita and the tourism revenue in Thailand?

1.5 Research Significance

This study aims to examine the relationship between the exchange rate, inflation rate, GDP per capita and tourism revenue in Thailand. This study is significant for several reasons. First of all, it gives an up-to-date and comprehensive study of how major macroeconomic variables, such as the exchange rate, inflation rate and GDP per capita, affect Thailand's tourism revenue. It is important to understand these economic links for the tourism industry's long-term growth, as tourism is one of the major industries in Thailand.

In the other hand, policymakers, such as the Ministry of Tourism and the Bank of Thailand, will benefit from this study, as it could assist them to develop more effective monetary, fiscal, and tourism-related policies by having a clearer understanding of how exchange rate, inflation rate and GDP per capita influence the tourism revenue. For example, managing the inflation rate and maintaining currency stability may increase Thailand's attractiveness as a tourism destination.

Moreover, this study also emphasises the role of economic trends in driving travel demand for businesses and tourism stakeholders. The findings can help with strategic planning, pricing, and investment decisions, particularly during the moments of economic uncertainty or external shocks such as the COVID-19 pandemic. In addition, the study's time series technique, which employs long-term data, provides a historical perspective that can be used to forecast and manage risk.

Lastly, academically, this study fills a gap in the existing literature by focusing on the long-term impact of those economic factors on tourism revenue in Thailand, a country that is highly dependent on tourism but has only limited research. The findings may also be used as a reference for comparative studies in other tourist-dependent

economies, contributing to broader discussions about sustainable tourism development in emerging countries.

1.6 Chapter Summary

This chapter has provided an overview of Thailand's tourism industry and emphasised the significance of macroeconomic variables that may influence tourism revenue. The problem statement, research objectives, and questions have all been properly stated. The following chapter will give a review of important literature to help construct the theoretical framework for this investigation.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In order to investigate the relationship between the chosen independent and dependent variables, we will explore relevant previous research and theories in this chapter. To give a clear perspective, a conceptual framework has been built based on this. The purpose of this study is to fill the identified research gaps, and the next part will present the theories that were generated to direct the analysis.

2.2 Underlying Theories

2.2.1 Purchasing-Power-Parity Theory (PPP) - Exchange rate

According to this theory, exchange rates need to stabilise over time in order to bring the costs of comparable goods and services in various nations into line. In terms of tourism, Thailand would become more affordable for international visitors if the Thai Baht (THB) declined, which might increase tourism-related income. The fundamental idea behind PPP is that exchange rates should be adjusted over time to balance the purchasing power of various currencies. This way, a basket of commodities, like hotel stays or meals at restaurants, would cost the same amount everywhere when converted to a single currency

(Krugman et al., 2018). This suggests that Thailand might become a cheaper travel destination for foreign visitors if the Thai Baht (THB) declines. For instance, tourists from the United States may find Thailand's attractions, lodging, and services relatively less expensive if the Thai baht depreciates versus the US dollar, which would increase demand for travel. This idea, however, makes the assumption that price changes occur almost instantly, which is rarely the case in reality. Prices in Thailand's tourist industry are very frequently sticky, which means that, because of contractual obligations or competitiveness in the market, hotels and tour operators may put off changing their rates (Dogru et al., 2019). Price-conscious travellers now have the chance to profit from exchange rate declines before prices increase. However, PPP ignores structural elements that are specific to Thailand, like its emphasis on cultural experiences that cannot be traded (like temple visits or traditional festivals), which are less affected by changes in exchange rates than material products. Additionally, regional rivals like Vietnam and Indonesia influence Thailand's competitiveness by deliberately devaluing their currencies to draw visitors, making PPP less universally applicable. Therefore, Purchasing-Power-Parity Theory can be used to identify how the exchange rate affects tourism revenue in Thailand.

2.2.2 Cost-Push Inflation Theory - Inflation

The Cost-Push Inflation Theory illustrates how rising production costs result in increased consumer prices and decreased destination competitiveness, giving a crucial framework for examining how inflation affects Thailand's tourism revenue. In their important economics book, Samuelson and Nordhaus (2009) describe how enterprises in the tourism sector ultimately raise prices for customers as a result of rising costs for inputs like hotel operations,

transportation, and food services. This leads to a great deal of economic vulnerability in Thailand, where tourism accounts for 18–20% of GDP (Bank of Thailand, 2022). Inflation was one of the most significant negative factors affecting tourist arrivals, second only to serious political upheavals. Although Thailand's natural and cultural attractions offer some price elasticity, the researchers found that ongoing inflation steadily reduces Thailand's competitive advantage over neighbouring countries like Vietnam and Cambodia. Small and medium-sized tourism businesses are especially at risk because they lack the economies of scale to absorb cost increases, which forces them to either lower service quality or raise prices above competitive levels, both of which have a detrimental effect on visitor satisfaction and rates of repeat business. According to the Bank of Thailand's 2022 annual report, which emphasised tourism as a major growth driver and a channel for inflation transmission, these dynamics present Thai authorities with difficult policy choices as they attempt to maintain the growth of the tourism sector while controlling inflation through monetary policy. Due to Thailand's unique economic structure and worldwide inflationary pressures, the country's most significant economic sector continues to be vulnerable, necessitating close observation of the situation. Therefore, Cost-Push Inflation Theory can be used to identify how inflation affects tourism revenue in Thailand.

2.2.3 Income elasticity of demand - GDP per capita

The income elasticity of demand framework, which believes that tourism is a normal good, demand rises as consumer incomes rise, can be used to analyse the link between GDP per capita and Thailand's tourism earnings. Given that key tourist source markets like China, Europe, and the United States have different income levels that have a direct impact on their outbound tourism

expenditure, this argument is especially significant to Thailand. This relationship is supported by empirical data (Luis et al., 2004) discovered that a 1% increase in GDP per capita in the countries of origin causes a 0.5% to 1.2% increase in demand for international travel, with emerging Asian economies exhibiting even greater sensitivity. Particularly for Thailand, Songsakul et al. (2022) showed that over 30% of the growth in tourism earnings between 2010 and 2019 came from rising incomes in China, Thailand's biggest source of tourists. Similarly, Croes and Vanegas (2008) adapted Engel's Law to tourism, demonstrating that long-haul destinations like Thailand earn disproportionately as households in developed economies (such as the U.S. and EU) devote a bigger part of their income to discretionary expenditure. However, this income sensitivity also leads to vulnerability: Thailand's tourist revenue drops dramatically as a result of lower discretionary travel expenditures during economic downturns in important countries such as the 2008 financial crisis or China's recent recession (World Bank, 2023). These factors highlight how income elasticity promotes both growth and instability in the tourist industry, which is why Thailand's tourism authorities keep a careful eye on GDP developments in source markets. Therefore, the Income Elasticity of Demand Theory can be used to identify how GDP per capita affects tourism revenue in Thailand.

2.3 Review of Variables

2.3.1 Dependent Variable – Tourism Revenue

Many countries are trying to take advantage of their natural resources and attractions, which foster economic growth and sustain this sector. These include its rich cultural heritage, its unique landscapes, and its convenient shopping and entertainment options (Sheng, 2011). Divide tourism revenue by the total number of foreign visitors to determine tourism revenue per foreign visitor. To increase the amount of money that may be made from tourism, it is essential to use the potential of the industry properly. Thailand has a substantial tourism potential within this system. According to research by Balaguer and Cantavella-Jorda (2002), found that while tourism and economic growth have a positive relationship, and real GDP and tourist income have a positive relationship.

According to research by Fayissa et al. (n.d.), which used panel data from 42 African countries, the tourism industry's revenues significantly boosted the continent's economic growth. According to research by Kreishan (2011) found a positive correlation between tourism spending and Jordan's long-term economic performance from 1970 to 2009. Furthermore, according to the research by Tang (2011) conducted a study that used Granger causality tests to investigate the relationship between tourism-driven development in Malaysia. The results showed a unidirectional cause-and-effect relationship: economic growth Granger-causes tourism development, but not the other way around. The lack of reverse causality, however, suggests that although tourism boosts economic expansion, economic expansion by itself does not always encourage additional tourism development in Malaysia.

In their study, Assadzadeh and Nasab (2012) employed the Granger and Hsiao causality tests to investigate the positive relationship between Iran's GDP and tourism-related earnings between 1968 and 2007. The findings showed a bidirectional causal link, indicating that over time, tourism revenue and GDP had a beneficial effect on one another.

According to the research by Aleemi (2015) studied how Pakistan's economic growth was positively impacted by tourism revenue from 1981 to 2013 by foreign exchange profits, which produced both direct and indirect job possibilities. The tourism industry plays a significant role in national economies and is correlated with the amount of money visitors spend in various locations and on various goods. Revenues from tourism contribute significantly to the economy, particularly in nations where the industry is growing. As a result, the research's hypotheses now incorporate the revenue generated by the tourism industry.

2.3.2 Independent Variable – Exchange Rate

The following succinctly summarises the main studies that look at the connection between exchange rates and tourism and are used in this investigation of the literature on the tourism economy. According to the research (Webber, 2001), the exchange rate is thought to be a major determinant in estimating the demand for tourism, which refers to how the exchange rate affects tourism. The study specifically showed that while a stronger currency appreciation may lower tourism demand because of higher relative prices, a weaker domestic currency depreciation tends to increase inbound tourism by

making a place cheaper for foreign visitors. Because unstable currency fluctuations can cause uncertainty for both tourists and industry stakeholders, this link emphasises the significance of exchange rate stability in economies that rely heavily on tourism.

Despite having little knowledge of the relative costs, Stabler et al. (2009) contend that travellers should consider the exchange rate and that a low exchange rate regime could encourage travel. Foundational studies in tourist economics have shown that the exchange rate is a key factor in determining the demand for travel. A weaker baht (THB) has historically increased arrivals from important markets like China and Europe, making this relationship particularly obvious in price-sensitive countries like Thailand (World Bank, 2023). Furthermore, according to the research from Stabler et al. (2009), even travellers who are not highly price-sensitive react to exchange rate signs, pointing out that a 5% drop in the actual exchange rate might temporarily increase demand for travel by 2% to 3%.

According to the research from Luis et al. (2004), panel data analysis was used to try to understand the connection between economic growth and tourism revenues in Latin America between 1985 and 1998. They showed that exchange rate depreciation had a stronger effect, with a 10% currency depreciation increasing tourism revenues by 3.2-4.1% due to improved price competitiveness. They discovered a positive but relatively modest relationship, with a 1% improvement in purchasing power parity (PPP) resulting in a 0.4-0.6% increase in tourism revenues. The study did point out, as well, that this beneficial effect might be reduced in high-inflation circumstances, as shown in the 1990s in countries like Brazil and Argentina, when inflation weakened the depreciation's competitive benefits. Nonetheless, a study found a modest association between tourism revenues and purchasing power parity and foreign exchange rates. The study "Exchange Rates Impact On Tourism" by Gallego et

al. (2014) looked at how exchange rate arrangements, or systems, affect travel abroad. The weighted conventional (gravity) model has been estimated using tourism and exchange data, and it covers the years 1995–2004 and is regarded as a major tourist destination in 60 countries, 30 of which are OECD countries. Because exchange rate stability decreased traveller uncertainty, their analysis found that fixed exchange rates enhanced tourism inflows by 12–15% as compared to more flexible regimes. In OECD nations, whose fixed or set exchange rate arrangements resulted in 8–10% higher tourism revenues, the effect was most obvious. Therefore, fixed exchange regimes are found to have a good effect on tourism, while less flexible exchange rates are used to encourage travel mobility.

2.3.3 Independent Variable – Inflation Rate

The two primary causes of inflation are cost-side and demand-side factors. Demand-side inflation is the kind of inflation that results from rising demand generally. A fall in interest rates, an increase in available cash, a rise in government spending, a decrease in taxes, an increase in exports, or an increase in investment spurred by the expected increase are all examples of factors that enhance overall demand. Potential causes of demand-side inflation include future wages. However, inflation that starts with an increase in costs, such as a pay raise or a rise in the price of raw materials like oil, is known as cost-oriented inflation (Kırca & Özer, 2020). In developed destinations, a 1% increase in general demand (as shown by GDP growth) corresponds to a 0.4-0.6% increase in tourism prices; but, in developing markets, such as Thailand, supply limitations have a greater impact (0.8-1.2%) (Kırca & Özer, 2020). According to Kırca & Özer's (2020) comparative analysis, a 1% total price increase from cost factors reduces arrivals 2.3 times more severely than equal demand-driven

inflation, indicating that cost-push inflation lowers tourist competitiveness more quickly than demand-pull inflation.

The demand for tourism in developing countries is significantly influenced by inflation. The primary internal and external elements influencing international travel are pricing and worldwide economic trends (Parvin, 2022). A 1% increase in general inflation usually results in a 0.6–1.2% decrease in tourist arrivals in developing countries such as Thailand, according to empirical studies. Price-elastic markets, such as low-cost travellers, exhibit significantly greater reactions, with a decline of up to 1.8% per 1% inflation (Parvin, 2022). The price elasticity of demand shows that there is a constant negative correlation between travel demand and rising travel prices. According to Hanafiah and Harun (2010), the number of visitors and inflation are inversely correlated. A 10% increase in tourism-specific costs (such as hotel rates and airfares) reduces arrivals in Southeast Asia by 7–9%, according to Hanafiah and Harun (2010), as travellers move to less expensive destinations like Vietnam or Indonesia.

According to Arbel and Strebel (1980), mentioned that regression analysis may have been used for the first time to examine the relationships between inflation and demand for travel as well as between inflation and hotel pricing, profitability, and occupancy. Due to different price elasticities, a one percentage point increase in yearly inflation decreased demand for leisure travel by 0.9% while increasing demand for business travel by 0.3%. Asymmetric effects were seen in hotel profitability: 10% inflation raised average daily rates (ADR) by 6.1% while decreasing occupancy rates by 4.2%, resulting in a net 1.8% drop in total revenue. It was emphasised by Gee et al. (1997) that rising land costs would be a major factor in the rise in inflation as the tourism sector expanded. Land prices in gateway cities (like Cancún and Orlando) grew 12–15% more quickly due to the tourism boom than baseline inflation. A 1% rise in the GDP of tourism resulted in: Construction costs (hotels, infrastructure) increased by

0.8%. Wages in the service industry increased by 0.5%. Due to secondary demand impacts, the overall CPI inflation rate was 0.3%.

According to Tribe (2011), the increase in leisure and tourism drives up the price of goods and services as well as real estate. Tang (2011) examined the relationships between Malaysia's tourism demand, inflation, unemployment, and crime rates using annual data from 1970 to 2008. CPI inflation rose by 0.25 percentage points a year for every 1% increase in tourism GDP. During economic booms, this inflation-tourism elasticity was 3.2 times greater (0.32%) than during recessions (0.1%). Remarkably, for every 10% increase in tourism, unemployment decreased by 1.4%, somewhat counteracting inflationary pressures. Furthermore, Yong's (2014) study, which examined the connections between inflation, innovations, and demand for tourism in 14 European countries, discovered that there were positive correlations between the two. In highly innovative locations (like Switzerland), a 1% increase in tourists only resulted in 0.08% inflation. Greece and other low-innovation economies saw 0.34% inflation as a result of the same growth. Adoption of technology decreased the inflationary impact of tourism by 58–72%. The study conducted by Atay Kayış and Aygün (2016) found a long-term correlation between tourism revenue and inflation using VAR analysis on Turkey's annual data for the years 2003–2011. After three years, a 10% increase in tourism earnings resulted in 1.9% higher inflation. On the other hand, a 1% increase in inflation decreased future tourism revenue by 0.7% due to a decline in competitiveness. Summertime (elasticity = -0.9) had a stronger inflation-tourism feedback loop than winter (elasticity = -0.4).

According to the research (Kırca & Özer, 2020) examined the effects of both domestic and international tourism demand (as indicated by overnight stays) on regional inflation and Turkey's total tourist demand using annual panel data from 2004 to 2013. Parvin (2022) studied how oil prices, inflation, exchange

rates, institutional quality, and trade balance affected visitors to Bangladesh between 1995 and 2019. However, over time, changes in either direction may occur in the prices of goods and services. Wirdayanti, Reniati, and Saputra (2022) looked at the effects of leverage, firm size, inflation rate, and cash holding on firm value in the hotel, restaurant, and tourism sub-sector companies listed on the Indonesian Stock Exchange for the years 2017–2020. Leverage had a negative and significant influence on firm value, according to the researchers' use of regression analysis. This suggests that higher debt levels reduced company valuations since they increased financial risk. On the other hand, there was a positive and significant correlation between firm size and firm value, suggesting that larger businesses in this industry often had higher market valuations. Although there was a negative correlation between the inflation rate and company value, this link was statistically insignificant, suggesting that the impact of inflation was not very strong during the study period. Interestingly, cash holdings significantly and favourably impacted firm value, demonstrating how increased liquidity reserves improved investor trust and financial flexibility.

Inflation was incorporated into the research model during its development. In other words, one of the key elements influencing the desire for travel is inflation. There are studies in the literature that link inflation and tourism in other nations, but none that experimentally examine these four variables have been discovered in Thailand. Because of this, the study also included the inflation variable.

2.3.4 Independent Variable – GDP per Capita

Gross Domestic Product (GDP) is defined as the total monetary value of end products and services generated in a specific time frame, while GDP per capita is the mean of individual income tabulated by dividing nominal GDP by the population in the nation (Mankiw, 2021). According to the World Bank (2025b) and the International Monetary Fund (IMF), the nominal GDP per capita in the year 2019 (pre-pandemic) is approximately $7,800, which accounted for 12.1% of the Annual GDP of Thailand. However, the tourism sector collapsed in the year 2020 to 2021 by declining to 1.5% of GDP due to severe COVID-19 pandemic conditions. The tourism sector rebounded in the year 2023 accounting for 10.3% of GDP, with GDP per capita recovered to $7,297 due to changes in tourism policy of visa waivers to specific countries.

The growth of GDP per capita is closely connected to the foreign spendings by foreign visitors, including hotels, airlines, services, and food industries. The employment rate and income showed an increasing trend, with up to a 20% workforce increase in tourism industries reported in the Economic Impact Report: Thailand in 2024. Empirical studies confirm this cyclical relationship in which tourist spending generates employment (WTTC, 2024), and subsequent income growth raises GDP per capita (Brida et al., 2011). Higher GDP per capita, in turn, funds infrastructure upgrades that enhance Thailand's competitiveness as a destination, perpetuating the cycle (Henderson, 2008). The tourism infrastructure maturation leads to the improvement of a satisfactory travel experience, where foreign travellers will tend to revisit and complete the cycle.

2.4 Conceptual Framework

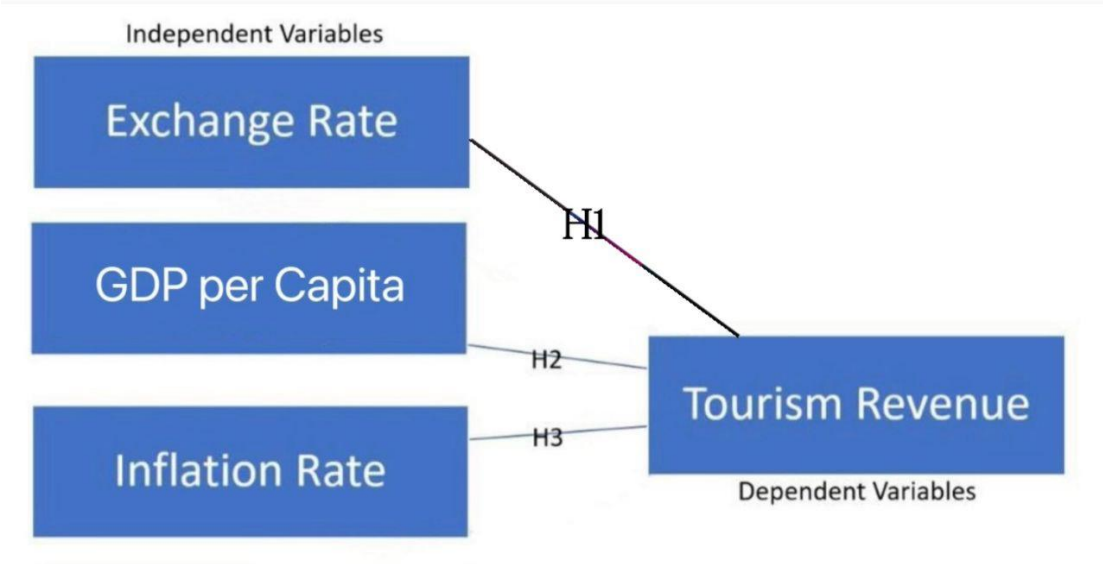

Figure 2.1: Proposed Model of the Impact of Exchange Rate, Inflation and GDP per Capita on Tourism Revenue: A Case Study in Thailand.

Source: Author's Own Illustration.

This framework will be used in this study to assess how accurate the suggested relationships are. In the next section, hypotheses will be developed based on this framework to direct this investigation. This approach demonstrates how tourism revenue in Thailand is directly impacted by these independent variables.

2.5 Hypothesis

2.5.1 Exchange Rate and Tourism Revenue

Thailand becomes a cheaper travel destination when the Thai Baht (THB) depreciates, lowering the relative cost of tourism services (such as hotels, tours, and eating) for international tourists. The Purchasing Power Parity (PPP) theory, which holds that changes in exchange rates affect price competitiveness between nations, is consistent with this (Krugman et al., 2018). For instance, visitors from the US can exchange their dollars for more baht if the THB depreciates against the US dollar, hence reducing their costs. A 15% peso depreciation in Mexico boosted tourism income by attracting 12% more U.S. tourists (Stronge & Redman, 1982). A 6.2% increase in tourist arrivals, especially from price-sensitive countries like China, was associated with a 10% depreciation of the Thai baht. Devaluation typically draws tourists, but its effects are contingent on price stickiness (delayed price adjustments) and rivalry from regional rivals such as Vietnam, which may strategically discount their own currencies.

Hypothesis 1:

H0: There is no significant relationship between exchange rates and tourism revenue.

H1: There is a significant relationship between exchange rates and tourism revenue.

2.5.2 GDP per Capita and Tourism Revenue

Thailand tourism sector resurges due to changes in tourism policies to several countries including Visa exemption for China, Taiwan, India, Russia and Kazakhstan, bilateral agreement for Saudi Arabia and UAE, and targeted marketing campaigns to Vietnam, Cambodia, and Scandinavia by promoting eco-tourism and ease the border crossing process (TAT, 2024; Bank of Thailand, 2023; WTTC, 2024). The maturation of tourism sectors in Thailand soared after policy changes, especially during important festivals that extended the tourist seasons, increased the spending niche of visitors and enhanced branding of the country (Cohen, 2023). The high demand for manpower in direct and indirect industries multiplies the employment rate and boosts the wages of the locals, affecting the GDP per capita increase (Sritama, 2024). Meanwhile, uneven development, by losing border security, affected public safety in Thailand. The condition promotes the formation of security gaps for exploitation by crime syndicates. The GDP per capita difference might be one of the major factors of poverty in surrounding countries, driving illicit economies, including human trafficking, scams, and arms smuggling from and into Thailand (Rittiboonchai, 2023).

Hypothesis 2:

H0: There is no significant relationship between GDP per capita and tourism revenue.

H1: There is a significant relationship between GDP per capita and tourism revenue.

2.5.3 Inflation Rates and Tourism Revenue

Because inflation raises domestic prices for necessities like lodging, food, and transportation, it reduces the spending power of tourists. Thailand may appear more affordable on paper due to a weak THB; however, this benefit may be offset in practice by rising inflation. In Brazil, advantages from currency depreciation were offset by inflation exceeding 10%, which resulted in an 8% decrease in tourism expenditures. A 5% THB depreciation countered by a 3.5% inflation rate diluted the cost savings for European tourists during Thailand's 2018 tourism boom. Though traditionally stable prices have been made possible by Thailand's mild inflation (1–4%), sector-specific surges (such as Phuket's peak-season hotel rates) may discourage repeat business. Regression analysis may have been used for the first time in 1980 by Arbel and Strebel's study to examine the relationships between inflation and demand for travel as well as between inflation and hotel pricing, profitability, and occupancy. It was emphasised by Gee et al. (1997) that rising land costs would be a major factor in the rise in inflation as the tourism sector expanded.

Hypothesis 3:

H0: There is no significant relationship between inflation and tourism revenue.

H1: There is a significant relationship between inflation and tourism revenue..

2.6 Research Gap

The entire research study shows that the relationships between GDP per capita, inflation, exchange rates and tourism revenue have been proven in a variety of regional and worldwide settings. Research has clearly shown that low inflation, strong source-market GDP and currency depreciation all generally increase demand and income from tourism.

Additionally, studies conducted in Thailand in particular have looked at these factors independently or dependently. The empirical research on the simultaneous and comparable effects of these three important macroeconomic factors on Thailand's tourism revenue within a single, integrated model is, however, severely lacking. The majority of current research typically looks at these aspects in a bivariate way or using other methodological frameworks, which leaves out their complicated relationships and possible multicollinearity. For example, although one study may examine the impact of inflation and another the impact of currency rates, Thailand is not fully represented for the unusual situation in which internal inflation practically negative merges with a declining Thai baht that acts theoretically positive.

By creating a multivariate econometric model that continuously examines the impact of the exchange rate, inflation rate and GDP per capita on Thailand's tourism revenue, this study seeks to close this gap. Policymakers in the Thai tourist and economic sectors will benefit from this method's more precise and nuanced understanding of which variable has the biggest impact, how they could interact to increase or lessen one another's effects and more accurate, integrated insights. The results will answer the question of how these elements work together, rather than separately, to influence tourism revenue.

2.7 Conclusion

To avoid any misunderstanding of the study, the information discussed in Chapter 2 is crucial. This chapter provides a comprehensive explanation of the link between dependent variables and independent variables. However, Chapter 3 discusses the suitable research methods to support the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the research methodology and theoretical framework adopted are presented in an organised manner to enhance clarity. We apply rigorous econometric techniques to analyse how macroeconomic factors influence tourism revenue in Thailand. This study focuses on using time series analysis to examine the relationship between tourism revenue in Thailand and key macroeconomic variables—exchange rate, inflation rate, and GDP per capita. To ensure methodological rigour, we adopt time series econometric techniques aligned with best practices. Stationarity of the variables is tested using the Augmented Dickey-Fuller (ADF) method. Based on the results, the Autoregressive Distributed Lag (ARDL) model and bounds testing are applied to assess the long-run equilibrium among variables. While other tests, such as the Johansen method exist, we chose the ARDL approach due to its flexibility with mixed I(0) and I(1) variables and its robustness in small samples. Following this, we apply diagnostic tests to ensure the reliability and accuracy of the model estimations. Granger Causality, Impulse Response Analysis, and CUSUM and CUSUMSQ tests are utilised to reinforce the findings and ensure the robustness of the results.

3.2 Research Design

This study analyses economic factors that affect tourism revenue in Thailand by using secondary time series datasets through a quantitative methodology. The analysis traces total tourism revenue as its dependent measure, while the exchange rate and inflation rate, and GDP per capita represent independent elements. Moreover, the ARDL model is selected for its dual capacity to capture short-term dynamics and long-term equilibria, particularly given the dataset's mixed integration orders and limited sample size. A total of 31 annual observations are collected, covering the period from 1993 to 2023. Then, our research draws data from reliable institutions such as the World Bank. This scope ensures sufficient depth and reliability for assessing the dynamic interactions between economic conditions and Thailand's tourism performance.

3.3 Data Collection

First, we collected annual time series data for 31 observations focused on Thailand from 1993 to 2023. Moreover, we sourced tourism revenue (TR), GDP per capita (GDP), and the inflation rate (INF) from the World Bank (2023). In addition, we acquired exchange rate (ER) information from the World Bank and defined USD as the annual average THB per USD rate.

To ensure consistency, the EViews 12 software served as our analytical platform where we transferred data from Microsoft Excel after standardising all series. In cases where values were missing, we utilised linear interpolation or forward filling techniques that maintained the time series through preserving whole years according to Gujarati & Porter (2009). Furthermore, we conducted natural log transformations on all variables

that resulted in stabilised variance, which enabled coefficient interpretation as elasticities (Wooldridge, 2013).

For estimation and testing, EViews 12 became our platform to verify stationarity using ADF and PP tests while executing ARDL models and performing bounds tests and ECM tests. Additionally, Granger causality and impulse response analyses functioned together with our research procedures to obtain reliable results and dynamic views. The analysis meets all necessary sample size and lag length specifications for the selected econometric methods, even though it uses a single time series in one country.

3.4 Data Processing

Step 1: Review current journals on the relevant topic to develop an understanding of the topic and select variables to be discovered.

Step 2: Collect data from reliable sources such as the World Bank Data

Step 3: Compute time series data by arranging different data sources into an Excel table, following the years from 1993 to 2023.

Step 4: Run the data in EViews to analyse the relationship between variables.

Step 5: Interpret the result generated by EViews.

3.5 Data Description

Table 3.1: Variable Measurement

Indicator Name	Index Terms	Variable Description	Sources
Tourism Revenue	TR	International Tourism Receipts (US$)	World Bank
Exchange Rate	ER	Official Exchange Rate (THB per US$)	World Bank
Inflation	INF	Consumer Price Index	World Bank
GDP Per Capita	GDP	Gross Domestic Product per Capita (Constant 2015 US$)	World Bank

Table 3.1 summarises variable description, index terms, and sources.

Tourism revenue (TR) serves as our research variable, and we measure it through the total annual receipts from international tourists in Thailand expressed in US Dollar currency before using natural logarithms to straighten the data, while enabling easier coefficient interpretations as elasticities. TR data was obtained from the World Bank since it contains the most complete data on tourism statistics.

For our first independent variable, we acquire exchange rate (ER) data in US dollars, which we transform into log data for analysis. The baht strengthening by 1% makes Thailand relatively more expensive to visitors, which reduces tourism revenue according to Narayan (2004). Data regarding exchange rates originates from the World Bank (2023).

Next, INF serves as the independent variable where we analyse annual CPI change values expressed in logs. Our analysis shows that moderate levels of inflation create minimal impact on tourism, but substantial price declines through inflation will reduce consumer spending power and decrease tourists (Dritsakis, 2004). We retrieve our INF data from the World Bank (2023).

Lastly, GDP per capita (GDP) serves as a domestic income indicator which also reflects the overall conditions of the economy. The measure presents income statistics averaged over each population member using constant U.S. dollar values. The relationship between GDP per capita and domestic income levels and overall economic stability becomes established through better infrastructure and enhanced services that make countries more appealing to international visitors (Tang & Tan, 2015). GDP data were obtained from the World Bank (2023).

The selection of TR, ER, INF, and GDP variables was made based on their theoretical authenticity under demand-side determinants of tourism theory and their validated empirical use in research literature. We analyse the short-term and long-term relationship between these variables through an ARDL analysis according to Pesaran, Shin, and Smith (2001).

3.6 Theoretical Model

The Demand-side Determinants of Tourism Theory is employed in this study, which is grounded in classical economic demand theories and empirical findings that macroeconomic factors — especially exchange rates, income, and inflation — have a significant impact on tourism demand and revenue.

Khandaker and Islam (2017) carried out a cross-country analysis and identified strong empirical support that the overall exchange rate variability and income levels directly influence international tourism demand. They also examined data on political stability, and the fluctuations in exchange rates among various economies and support that favourable macroeconomic policies and stable exchange rates are conducive to tourism revenues, thus lending support for our theoretical framework.

A weakening baht, in the Thai context, makes Thailand cheaper as a tourist destination for foreigners, increasing the number of people coming in. High levels of inflation can encourage tourisms revenue leakages, that are given as causing loss of clusters foreign exchange from the country they are based, through increased costs in living and travel for tourists who may cut-stay, while the rise of per-capita GDP indicating higher income thus more potential for tourism spending.

In order to estimate the immediate and long-run influences, the Autoregressive Distributed Lag (ARDL) model, based on Pesaran, Shin and Smith (2001), is used. ARDL is suitable for small-sample studies of a mix of I(0) and I(1) variables and permits to estimation of both the short-run dynamics and the long-run equilibrium relations. The long-run relationship among the variables is specified in log-linear form as:

$$ln\,(TR_t) = \alpha + \beta_1 \ln(ER_t) + \beta_2 \ln(INF_t) + \beta_3 \ln(GDP_t) + \varepsilon_t \quad (1)$$

Here, α is the intercept, β are elasticities, and ε the error term. This log-log form allows direct interpretation of coefficients as percentage effects.

3.7 Model Specification

This study develops an econometric model to explore the short-run and long-run dynamics between Thailand's tourism revenue (TR) and three core macroeconomic indicators: exchange rate (ER), inflation rate (INF), and GDP per capita (GDP). This study utilises the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001) because it functions well with small sample sizes while also accommodating variables that integrate at different I(0) and I(1) levels. I(0) and I(1), but not I(2).

The ARDL model specification Is given as:

$$\Delta lnTR_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \, \Delta lnTR_{t-i} + \sum_{i=0}^{q_1} \gamma_i \, \Delta lnER_{t-i} + \sum_{i=0}^{q_2} \delta_i \, \Delta lnINF_{t-i} + \sum_{i=0}^{q_3} \phi_i \, \Delta lnGDP_{t-i} + \lambda_1 lnTR_{t-1} + \lambda_2 lnER_{t-1} + \lambda_3 lnINF_{t-1} + \lambda_4 lnGDP_{t-1} + \varepsilon_t \quad (1)$$

Where:

- Δ denotes first differences,
- ln indicates natural logarithm transformation,
- α_0 is the constant term,
- ε_t is the white noise error term,

- $\lambda_1 to \lambda_4$ represent long-run relationships, and
- β_i , γ_i , δ_i , ϕ_i represent short-run coefficients.

Upon confirming cointegration via the bounds test, the Error Correction Model (ECM) is constructed as:

$$\Delta lnTR_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \, \Delta lnTR_{t-i} + \sum_{i=0}^{q_1} \gamma_i \, \Delta lnER_{t-i} + \sum_{i=0}^{q_2} \delta_i \, \Delta lnINF_{t-i} + \sum_{i=0}^{q_3} \phi_i \, \Delta lnGDP_{t-i} + \psi ECM_{t-1} + \varepsilon_t \quad (2)$$

Where $ECM_{t-1}$is the error correction term derived from the long-run relationship, and ψ represents the speed of adjustment back to equilibrium.

3.8 Empirical Model

The empirical model pertains to the creation of a statistical framework grounded in observations from real-world data and theoretical principles. Such a model can enhance the understanding of the connection between transportation infrastructure and economic growth by offering statistical evidence (Mohmand et al., 2016). This research investigates the relationship between the exchange rate and tourism revenue in Thailand over a long period. The ARDL model serves as the main analytical framework to capture both short-run dynamics and long-run equilibrium relationships. In addition, complementary tests such as Granger causality and impulse response analysis are employed to enhance the robustness of our findings.

3.8.1 Modelling Framework Overview

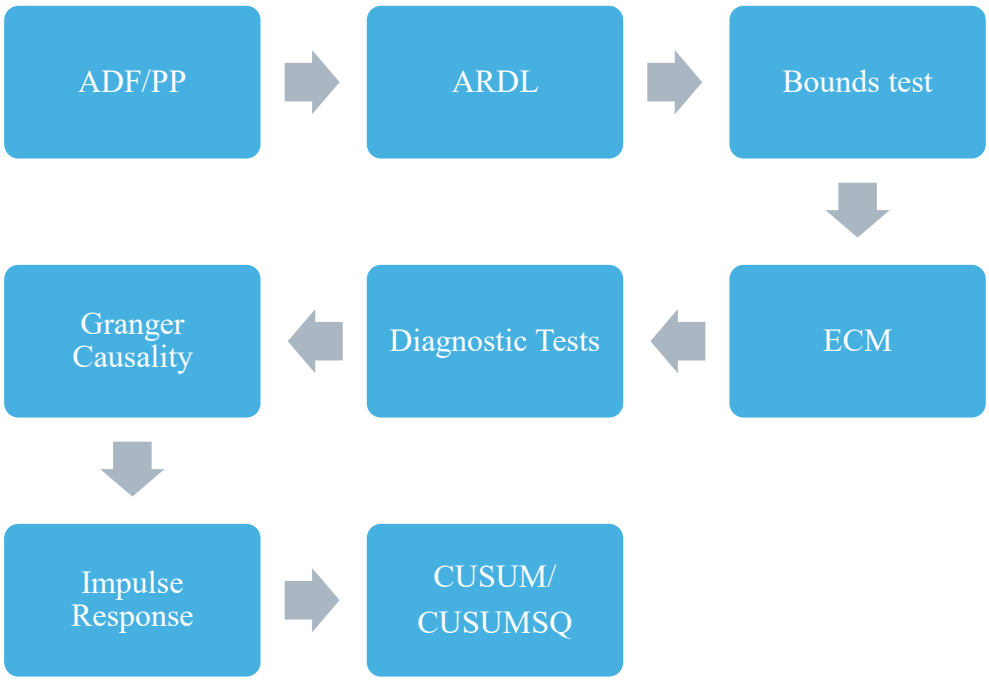

Figure 3.1 Modelling Framework Process

The empirical modelling process of this study is depicted through Figure 3.6 to facilitate methodological clarity. The figure presents the process steps along with econometric tools which helped analyse tourism revenue relationships with macroeconomic indicators in Thailand.

3.8.2 Multiple Linear Regression (MLR)

A Multiple Linear Regression model establishes the baseline for empirical analysis to measure static direct associations between tourism revenue by using exchange rate, inflation and GDP per capita variables. The specification uses natural log transformation for all involved variables. The logarithmic transformation serves an essential role since it enables researchers to interpret regression coefficients as elasticities. This initial MLR step allows comparison with dynamic models to assess whether ARDL adds explanatory power. The coefficient measures that a single per cent shift in any independent variable directly affects tourism revenue by a similar percentage amount, subject to fixed other conditions. A log-log form specification assists in macroeconomic research because it stabilises series variance while minimising outliers and enables researchers to interpret relationships that were initially multiplicative (Luetkepohl & Xu, 2009).

The baseline model can be formally expressed as:

$$ln\ ln\ (TR_t)\ = \beta_0 + \beta_1\ ln\ ln\ (ER_t)\ + \beta_2\ ln\ ln\ (INF_t)\ + \beta_3\ ln\ ln\ (GDP_t)\ + \varepsilon_t \qquad (3)$$

where β_0 represents the intercept, while β_1, β_2, and β_3 quantify the elasticity of tourism revenue with respect to the exchange rate, inflation, and GDP per capita, respectively. The error term ε_t captures the unexplained variation. This initial regression analysis provides Dehwar (2012) with a simple representation of variable interrelations when all relationships remain fixed and static. The double-log form transformation serves macroeconomic analysis purposes by both lowering outliers' impact and stabilising the series variability while converting multiplicative relations into simpler additive relationships, which are more understandable (Gujarati & Porter, 2009). We perform MLR because

it suits the prediction requirements by allowing early warning while assisting variable assessment.

Furthermore, through our initial MLR baseline establishment, we create conditions that will later support evaluations between MLR and models such as ARDL. The established baseline using MLR allows researchers to determine if dynamic modelling and long-term relationships uncover new explanatory information which exceeds the static framework's ability to explain. According to studies in tourism economics, the first step of running regressions shows fundamental importance in understanding variable relationships (Dritsakis, 2004). Overall, a diagnosis through MLR functions simultaneously as a necessary diagnostic tool and remains central to the entire modelling plan.

3.8.3 Unit Root Tests

Stationarity is assessed using the Augmented Dickey–Fuller (ADF) test (Dickey & Fuller, 1979) and the Phillips–Perron (PP) test (Phillips & Perron, 1988). These tests use the null hypothesis of a unit root versus stationarity, although serial correlation and heteroskedasticity among the residuals are treated differently. The ADF test establishes whether the time series data points follow a stationary pattern or whether they possess unit roots, which cause spurious regression findings according to Enders (2015). Each of the variables, tourism revenue, exchange rate inflation and GDP per capita, undergoes the Augmented Dickey-Fuller (ADF) test to determine their integration status.

The ADF test builds upon the standard Dickey-Fuller methodology through the use of lagged variable differences to deal with serial correlation effects of a

higher order. A crucial adjustment for test statistics generation takes place because of its effects on reliability (Phillips & Perron, 1988). The ADF test received its extension from Zivot and Andrews (1992) to recognise potential structural breaks in the observed data, which could stem from economic reforms alongside global financial crises, as well as major policy shifts affecting Thailand's tourism industry. The presence of breaks in data affects the statistical trend together with the level of the series, while incorrect handling of such breaks could lead to misleading stationarity results.

The ADF test is based on the following regression equation:

$$\Delta y_t = \alpha + \beta_t + \gamma y_t^{-1} + \delta^1 \Delta y_t^{-1} + \delta^2 \Delta y_t^{-2} + \ldots + \delta_p^{-1} \Delta y_t^{-}{}_p^{+1} + \varepsilon_t \quad (4)$$

This model contains Δy_t as a first-difference series at time t, and the constants are α and β along with γ as the coefficient of lagged levels and δ_i as coefficients for lagged differences and ε_t as the error term. The ADF test depends on two hypotheses, where H^0 states that γ equals zero, which demonstrates unit root non-stationarity and the alternative H^1 suggests γ is less than zero, indicating stationarity. The ADF test consists of comparing its computed statistic to determined critical values. A statistic below these values leads to rejecting the null hypothesis, which proves the series to be stationary.

Phillips-Perron (PP) test Phillips and Perron (1988) proposed a nonparametric alternative to the test due to ADF test that likewise tests the null of a unit root in a time series. Compared to the ADF test, the PP test does not need the incorporation of extra lagged difference terms in an attempt to overcome serial correlation. Rather, it corrects serial correlation and skewness in the error term by use of Newey-West adjusted standard errors.

The PP test regression equation is similar to the usual Dickey-Fuller test:

$$\Delta y_t = \alpha + \beta_t + \gamma y_t^{-1} + \varepsilon_t \qquad (5)$$

The PP test alters the t-statistic of γ by using correction factors that are based on the long-run variance in ε_t. The change renders the PP test more consistent in small samples with serial correlation and heteroskedasticity (Phillips & Perron, 1988). Nevertheless, it is found that, according to Perron (1989), the power of the PP test might be lower than the ADF test when using finite samples, and that the results may differ with the method of bandwidth selection.

Both ADF and PP tests may be used in empirical applications to cross-check the properties of stationarity of the data in question (Ng & Perron, 2001). Although the same null and alternate hypotheses are used in both tests, they are presented without duplication because of the different ways in which these tests treat autocorrelation and heteroskedasticity in presenting evidence concerning the integration order of the variables.

With the application of the two tests, this study is expected to enhance reliability in the analysis of whether each variable is stationary or not at the level or whether the variable is I or not, thus assisting in the correct econometric modelling technique to be used.

3.8.4 Autoregressive Distributed Lag (ARDL) Model

The ARDL approach analyses both brief and lasting interconnections between tourism income and exchange rates with consumer price growth and GDP per

capita. We preferred this model due to its ability to handle small sample sizes and variables of mixed integration orders, which really suits the characteristics of our data sets. Since the ARDL framework operates best when the analytical variables consist of processes ranging from I(0) to I(1), the model proves effective for macroeconomic time series analysis. The ARDL model provides researchers with model specification flexibility as it allows different lag lengths on each variable per Pesaran, Shin, and Smith (2001). This flexibility is provided when dealing with macroeconomic data that requires analysing time-lagged responses. Such an ability to handle time delays becomes essential when economic impacts emerging from exchange rate devaluation spread out step by step over multiple stages.

The ARDL error correction model systematically reconceives the relationship between variables into equilibrium and convergence patterns. The formulated error correction model of our ARDL analysis appears as follows:

$$\Delta \ln(Tourism\ Revenue_t) = \alpha + \Pi[\ln(Tourism\ Revenue_{t-1}) - \lambda_1 \ln(Exchange\ Rate_{t-1}) - \lambda_2 \ln(Inflation_{t-1}) - \lambda_3 \ln(GDP\ per\ Capita_{t-1})] + \sum_{i=1}^{}(p - 1)\ \Gamma_i\ \Delta\ln(Tourism\ Revenue_{t-i}) + \sum_{j=0}^{}(q - 1)\ \beta_j\ \Delta\ln(Other\ Variables_{t-j}) + \varepsilon_t \quad (6)$$

The square-bracketed term describes the error correction term (ECT) that reveals the long-run equilibrium relations of variables. Tourism revenue adjustment velocity to its long-run stability can be observed from the size of the parameter Π. The summation terms are composed of parameters Γ_i and β_j show distributed lag effects because they represent the short-run effects from previous changes in the variables.

Numerous extensive literatures in the economic growth and tourism fields advocate for the use of the ARDL approach. Narayan (2004) establishes that

ARDL models yield superior results than traditional cointegration methods under two conditions, which are small sample data sizes and mixed order integration variables. Empirical tourism economics applications leverage ARDL models to analyse dual short-run and long-run effects between exchange rates and inflation changes, which delivers a detailed understanding of periodical sector influence.

The research determines the ideal lag lengths for the ARDL model through information criteria based on Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) to achieve both simplification and robustness in model specification. The research methodology plays an essential role because it enables both the detection of long-term equilibrium relationships as well as the assessment of equilibrium correction speed, which has significant implications for policy. The model's adequacy needs verification with diagnostic assessment tests that examine autocorrelation as well as heteroskedasticity and normality. The execution of the ARDL model estimation happens through EViews to deliver precise and efficient results computation.

The existence of a long-run relationship is tested by using the Bounds Testing Approach introduced by Pesaran et al. (2001), which is used in a post-ARDL approach. The cointegrating rank test checks for cointegration between the level variables by comparing the calculated F-statistic with the critical bound. An outcome greater than the upper bound verifies long-run cointegration, while any less than the lower bound implies no long-run relationship. This, in turn, aids in validating whether there is long-run cointegration between tourism earnings and macroeconomic drivers with which to interpret findings from the model.

3.8.5 Error Correction Model (ECM) based on ARDL

Once the existence of cointegration is verified through the ARDL Bounds Test, we proceed to estimate the Error Correction Model (ECM) based on ARDL to capture both immediate adjustments and enduring elasticities. The ECM method permits researchers to estimate directly both short-run elasticities and the speed of adjustment simultaneously. It provides a beneficial approach to annual data analysis by enabling the inclusion of variables that are either I(0) or I(1) without additional pre-differencing methods, which both maintains long-run insights and enhances results accuracy (Pesaran et al., 2001). In unrestricted form, the ARDL-based ECM is specified as:

$$\Delta \ln(TourismRev_t) = \alpha + \sum_{i-1}^{p} \beta i \, \Delta \ln(TourismRev_{t-i}) + \sum_{j=0}^{q} \gamma j \Delta \ln(X_{t-j}) + \phi ECT_{t-1} + \varepsilon_t \qquad (7)$$

where X_t represents the vector of macroeconomic regressors—exchange rate, inflation rate, and GDP per capita—β_i and γ_j denote short-run coefficients, and ECT_{t-1} is the lagged error correction term reflecting deviations from long-run equilibrium (Pesaran et al., 2001). The parameter ϕ determines how fast adjustment happens and shows a negative significance. A negative and significant value of ϕ shows that short-run equilibrium automatically stabilises into its long-term trajectory through subsequent periods according to Nkoro and Uko (2016).

The ARDL-ECM method starts through selecting appropriate lag orders p and q using AIC and SBC criteria. The determination of optimal parameters p and q becomes possible through minimisation of both Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) (Akaike, 1974; Schwarz, 1978). After determining lag lengths, the model conducts a levels-based long-run relationship estimation that produces ECT_{t-1} residuals. Next, an ECM estimate

runs on first-differenced data with ECT_{t-1} , enabling simultaneous inference on short-run elasticities ($\gamma\_(j$)) and the speed of convergence (ϕ) (Kripfganz & Schneider, 2023).

On the other hand, the ARDL-ECM method proves useful in empirical tourism research. According to Pashtoon, Zaki, and Haqbin (2022), Thailand represented their sample, where an ARDL-ECM analysis demonstrated tourism to be substantially connected to GDP growth with an error correction coefficient measuring –0.40, which indicates 40 per cent annual correction of imbalances. Through a Mediterranean sample analysis, Dritsakis (2012) discovered solid long-run tourism elasticities on seven different Mediterranean countries, and Arslanturk, Balcilar, and Ozdemir (2011) tracked time-dependent short-run effects of exchange rate changes on tourism revenue in this small open economy. The model effectively separates instantaneous reactions like short-term inflation responses from strategic policy-relevant long-term impacts according to these applications.

Furthermore, two sets of coefficients require evaluation to understand ARDL-ECM results. The analysis shows short-run elasticity values γ_j which demonstrate temporary reactions of tourism revenue after one per cent changes in each macro variable (Narayan et al. 2010). Proceedings in Proença & Soukiazis (2008) and Sequeira & Campos (2005) demonstrate that long-run coefficients derived through normalisation with the dependent variable's coefficient reveal lasting elasticities needed for policy decisions about both exchange rate stability and inflation control to drive tourist sector development across various years. On top of this, the negative error correction coefficient proves the cointegrating relation and enables equilibrium corrections that stop permanent shocks from changing the tourism sector's growth path (Kreishan, 2015).

3.8.6 Diagnostic Tests

When developing a time series regression, it is required to fulfil the criteria of the Gauss-Markov since these represent the option to make valid considerations of the impact of macroeconomic variables on tourism revenue. In the presence of heteroskedasticity or autocorrelation, OLS estimators lose efficiency, and the validity of standard errors and hypothesis tests is compromised. In an effort to check robustness, a number of tests are conducted as a diagnostic test. Residual autocorrelation is measured by the use of the Breusch-Godfrey LM test. The Jarque-Bera test is applied to examine whether residuals are normally distributed. The Variance Inflation Factor (VIF) test is used to measure the possibility of multicollinearity among regressors. Lastly, CUSUM and CUSUMSQ tests are used in tracking changes of parameter stability with time so that the stability of long-run relations is guaranteed.

3.8.6.1 Heteroskedasticity

Heteroskedasticity shows through changing variance of regression residuals during multiple observations, but it does not remain constant (Gujarati & Porter, 2009). Heteroskedasticity affects OLS coefficient estimates by making them no longer BLUE estimators while simultaneously making standard errors unreliable, which results in improper confidence intervals and test statistics (Purdue University, 2014). The two types of heteroskedasticity include conditional patterns from unpredictable volatility in financial return series and

unconditional patterns from predictable structural patterns such as seasonal demand cycles (Hayes, 2019). Heteroskedasticity severity in small datasets usually increases because outliers drive up the residual distribution in particular parts of the data (Purdue University, 2014).

A starting point for heteroskedasticity detection involves visual assessment through graphical representation of squared residuals against fitted values, yet hypothesis tests provide concrete results about heteroskedasticity presence. The Breusch–Pagan–Godfrey (BPG) test builds an auxiliary model that uses explanatory variables as predictors for the squared residuals while deriving an $LM = n \times R^2_{aux}$. Lagrange multiplier value, which follows a chi-square distribution with degrees of freedom matching the number of regressors (Reed College, 2010; Reed College, 2010). White's test enables heteroskedasticity and specification error detection through the inclusion of multiplicative and squared predictor variables in an auxiliary regression (Reed College, 2010). The BPG and White tests represent the standard choice in heteroscedasticity testing since they offer both general applicability and simple implementation according to Gujarati & Porter (2009).

Two principal solutions exist for addressing heteroskedasticity when the problem is confirmed. When administrators know the variance function's form, they can use GLS or WLS to maximise efficiency through inverse weighting of error variance observations according to Reed College (2010). The most widespread remedy for heteroskedasticity in research involves heteroskedasticity-consistent (HC) standard errors introduced by White (1980), which modify the covariance matrix estimation without demanding variance structure information while still preserving valid inference (Reed College, 2010).

3.8.6.2 Autocorrelation

The existence of autocorrelation between time series data residuals causes OLS assumptions regarding uncorrelated disturbances to fail because the residuals show correlations throughout time. Autocorrelation affects the accuracy of OLS standard error calculations by causing estimation inefficiency and standard error bias, which generates false confidence in model inference (Gujarati & Porter, 2009). The generation of serial correlation occurs mainly through three sources: missing dynamic terms, functional form errors or natural persistence within the data generation process.

The traditional method of detecting autocorrelation involves using Durbin–Watson statistics to evaluate first-order serial correlation through the approximate relationship $DW \approx 2(1-\hat{p})$ (Durbin & Watson, 1950). $DW \approx 2(1-\hat{p})$; values substantially below 2 indicate positive autocorrelation, and values above 2 indicate negative autocorrelation (Durbin & Watson, 1950). However, because the Durbin–Watson test is invalid when lagged dependent variables appear among the regressors, the Breusch–Godfrey Lagrange multiplier test provides a more general diagnostic by including p lags of the residuals in the auxiliary regression and testing $nR_{aux}^2 \sim \chi_p^2$ under the null hypothesis of no serial correlation (Breusch, 1978; Godfrey, 1978). Newey–West heteroskedasticity and autocorrelation consistent (HAC) standard errors produce valid estimations of a covariance matrix through positive semi-definite matrix estimation that does not need explicit heteroskedasticity or serial correlation models (Newey & West, 1987). ARDL model estimates using heterogeneous data can generate accurate and valid results that support policy-formulated decisions about Thailand's tourist sector when professionals correct the heteroskedasticity and autocorrelation issues (Pesaran & Shin, 1999).

The ARDL model makes reliable and efficient tourism revenue elasticity estimates when heteroskedasticity and autocorrelation are properly diagnosed and addressed, which ensures the foundation of the econometric analysis for policy conclusions concerning exchange rate and GDP per capita, and inflation effects.

3.8.6.3 Normality Test

In the assurance of residuals from the model of ARDL-ECM are normally distributed, the Jarque-Bra statistic is utilized in this paper to test the skewness and kurtosis against the normality threshold (Jarque-Bera, 1980). A non-significant result implies that residuals follow a normal distribution, thereby supporting the accuracy of coefficient estimates. This is in line with the best econometric tourism demand modelling practices normality condition enhances the strength of long-run equilibrium outcomes (Narayan, 2004).

3.8.6.4 Multicollinearity Test

The Variance Inflation Factor (VIF) test is used in testing multicollinearity between the independent variables. A VIF more than 10 normally denotes problematic multicollinearity (Gujarati and Porter, 2009). Although time-series macroeconomic indicators usually share certain correlations because of the joint behaviours of the long-term factors, the level of collinearity will be extremely high, which will overestimate the standard errors and the estimates

of the coefficients. Therefore, VIF diagnostics can prevent the statistical dependency of the explanatory ability of exchange rates, inflation, and GDP per capita. Similar concerns have been recognised in the empirical tourism economics literature in which the GDP-related variables have frequently been found to be correlated with lagged demand, yet still provide valid long-run inferences. (Dritsakis, 2004; Hanafiah and Harun, 2010).

3.8.6.5 Granger Causality Test

This test, developed by Clive Granger, examines how previous values within one temporal sequence could assist in predicting another time series, so it indicates predictive directional connections instead of actual causes (Granger, 1969). We chose this test over newer frequency-domain approaches because it is well-established and aligns with our annual data frequency. The Granger causality test produces four possible empirical results, which indicate how two time series interact, when one variable influences another in only one direction and when this influence reverses direction and when two variables engage in mutual feedback between them and when no predictive relationships exist (Gujarati & Porter, 2009). This test works well with annual data while providing straightforward interpretations about how variables relate to each other. A preliminary assessment of stationarity uses the Augmented Dickey–Fuller test and the PP test to determine stationarity before the estimation process. Non-stationary series require differencing until stationarity is reached. The successful integration order analysis arises from using the ADF unit root null hypothesis together with the PP stationarity null hypothesis (Kwiatkowski et al., 1992).

The analysis proceeds by verifying stationarity before the unrestricted model evaluates its two related time-lagged variables. The unrestricted regression model for two stationary series $X_t$and Y_t takes this equation form:

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{j=1}^{q} \beta_j X_{t-j} + \varepsilon_t \qquad (8)$$

whereas the restricted regression omits the lagged X terms (Gujarati & Porter, 2009). Next, an F-statistic based on comparing the explained sum of squares between unrestricted and restricted models is used to test $H0 : \beta_1 = \beta_2 = \cdots = \beta_q = 0$ which determines if X causes Y through Granger causality (Gujarati & Porter, 2009).

Besides, the selection of proper lag orders p and q remains essential since it allows the model to detect fundamental time patterns and prevents accidental overfitting. A range of lags undergoes information criteria evaluation to find the best lag combination using Akaike (AIC), Bayesian (BIC), and Hannan-Quinn (HQC). For conflicting criterion results, the method selects the longer lag to avoid missing out on relevant dynamics (Bauer, 2023).

Formally, the hypotheses tested are:

H0: The coefficients on all lagged values of X in the Y equation are zero (no predictive causality from X to Y).

H1: At least one lagged coefficient of X is nonzero (predictive causality exists).

The rejection of H0 occurs with F-test p-values less than 5% significance level to signify that historical X variable values effectively enhance Y forecast accuracy (Granger, 1969).

Finally, Thailand's tourism revenue data and each macroeconomic variable, exchange rate and inflation rate and GDP per capita, will undergo pairwise Granger causality analysis to determine whether exchange rate movements predict tourism revenue independently or if there are reciprocal effects between the variables. Two research studies based in Thailand presented different results about causal relationships. According to Harasarn and Chancharat (2016), the connection between Thailand's international tourist arrivals and its economic development was explored. Their research established Granger causality that tourism receipts drive economic growth because tourism development processes work independently to advance Thailand's GDP. Another case in point is the dual-frequency Granger causality analysis performed by Enilov and Wang (2022) investigated the tourism and economic growth relationship between various nations worldwide. The analysis by investigators demonstrated that both GDP per capita and tourism receipts influence each other simultaneously across multiple international settings.

3.8.7 Impulse Response Analysis

First and foremost, the evaluation of macroeconomic shocks on tourism revenue benefits from using Impulse Response Functions. Within a Vector Autoregression (VAR) framework, IRFs trace the time path of tourism revenue in response to a one-time, one-standard-deviation shock to an exogenous variable, such as exchange rate fluctuations or inflationary pressures. Through this method, researchers can measure both the shock intensity together with the time period it affects the tourism sector. We focus on orthogonalized IRFs via Cholesky decomposition for clarity in interpretation**.** The computation process for IRFs necessitates transforming a VAR model into its Vector Moving Average (VMA) representation form. The transformation enables researchers to

express endogenous variables both present and forthcoming only through existing and preceding error terms, which makes systems response analysis less complicated (Elder, 2003). The VMA representation takes the form:

$$Y_t = \mu + \sum_{s=0}^{\infty} \Phi_s \, \varepsilon_{t-s} \qquad (9)$$

where Y_t is a vector of endogenous variables, μ is a vector of constants, Φ_s represents the matrices of impulse response coefficients at lag s, and ε_{t-s}. The error terms exist as vectors, which are denoted as ε_{t-s}. The system's response to shocks exists through time within the matrices Φ_s that detects both time-dependent and time-delayed results.

Shocks need to be orthogonalized to single out the innovative impact of a particular variable. The modelling technique uses Cholesky decomposition to build recursive structures within VAR or implements generalised IRFs that do not depend on variable arrangement (Pesaran & Shin, 1998). Different time-series analysis methods exist for applications based on the formulated hypotheses regarding the simultaneous connection between variables.

The examination of macroeconomic factors which affect tourism revenue substantially relies on the utilisation of impulse response functions in tourism economic research. Using a SVAR (Structural VAR) model, researchers studied how tourism responds to exchange rates and oil prices and economic growth rates, including other macroeconomic events in Malaysia. Research results show that these economic disturbances create direct effects on tourism income levels because of the tourism industry's vulnerability to broader economic conditions (Ali et al., 2018).

Moreover, the use of IRFs in this investigation uncovered detailed time-sensitive information about the effect evolution of these shock impacts.

Policymakers in the tourism industry, together with stakeholders, depend on these analyses to create strategies that handle damaging effects and use beneficial economic conditions.

3.8.8 Stability Tests: CUSUM & CUSUMSQ

Research using the Autoregressive Distributed Lag (ARDL) model requires testing the stability of estimated coefficients because this protects the validity of conclusions about macroeconomic variables and tourism revenue. The presence of structural breaks combined with parameter instability results in incorrect model interpretations because it causes the model's conclusions to be invalid.

The majority of researchers use CUSUM and CUSUMSQ tests for evaluating whether regression coefficients remain stable across time. These tests aid in identifying major changes that would render our conclusions unjustifiable. Besides, they evaluate recursive residuals combined with their squares through cumulative sums plotted against time for monitoring deviations from stability. The null hypothesis of parameter stability stands unchallenged when the statistics in the 5% significance boundaries demonstrate no deviations. This demonstrates that model coefficients show stability throughout the study duration.

The main strength of the CUSUM test lies in its ability to detect gradual changes in the regression intercept, which allows it to identify consistent variations in dependent variable mean levels. The CUSUMSQ test demonstrates superiority

in identifying instantaneous variations of error term variance alongside slope coefficient changes caused by abrupt economic events or policy modifications (Turner, 2010).

Tourism economic research requires the implementation of these stability tests for proper analysis. The relationships between macroeconomic variables affecting tourism revenue, such as exchange rates, inflation, and income change, because of significant economic structural changes, including financial crises and important policy reforms. The CUSUM and CUSUMSQ tests help researchers determine if their estimated relationships remain stable without needing model re-specification because of structural shifts.

Research shows the tests successfully work when used in previous studies. The Turkish tourism demand function stability was assessed through the CUSUM and CUSUMSQ tests in Halicioglu (2004), which validated the estimated elasticities in the model. Policymakers, together with stakeholders, need validated models because they use them to make decisions about tourism development and economic planning.

The CUSUM statistic is as below:

$$W_t = \sum_{i=k+1}^{t} \frac{e_i}{\hat{\sigma}_n} \qquad (10)$$

where e_i represents the recursive residuals and $\hat{\sigma}_n$ is the estimated standard deviation of the residuals.

The CUSUMSQ statistic is calculated as:

$$W_t^* = \frac{\sum_{i=k+1}^{t} e_i^2}{\sum_{i=k+1}^{n} e_i^2} \qquad (11)$$

These equations enable the visual assessment and stability determination of temporal regression coefficients through cumulative summation plots.

3.9 Conclusion

In conclusion, the evaluation process for understanding macroeconomic variables' impacts on tourism revenue in Thailand has been presented throughout this chapter. We chose the ARDL model along with diagnostic and stability tests because it works effectively for mixed stationary variables. The chosen robust time-series techniques provide a framework to detect short-run variations and long-run equilibrium associations. The following chapter will analyze empirical results through the specified models while interpreting the findings obtained from the analysis performed in this research.

CHAPTER 4: DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the empirical findings by starting with the preliminary diagnostic analysis, such as multicollinearity and the test of unit root, so the validity of the variables used can be ensured. The best lag length is then chosen, after which the ARDL model is estimated to test the short run and long run relationship between tourism revenue and its macroeconomic determinants, exchange rate, inflation and GDP per capita. The robustness of the estimated model is checked using diagnostic tests, and cointegration is examined by using the ARDL bounds test. Understanding of results is made by focusing on the key economic events that occurred in Thailand during the last 31 years, and it is related to the observed historical patterns discussed in Chapter 1.

4.2 Unit Root Test

Table 4.1: Unit Root Tests for the Overall Sample

	ADF			PP		
Variables	Intercept With Constant	Intercept With Constant & Trend	Intercept Without Constant & Trend	Intercept With Constant	Intercept With Constant & Trend	Intercept Without Constant & Trend
Level						
LnTR	-1.3903	-1.2179	0.2684	-1.3903	-1.2179	0.2684
LnER	-3.9218 ***	-4.7954***	0.5961	-2.1649	-2.0137	0.5258
LnINF	-3.5481**	-3.9019*	-1.1702	-3.7494***	-3.8486**	-2.2494**
LnGDP	-0.9435	-1.7612	3.4295	-0.9397	-2.0395	3.4637
1st Difference						
LndTR	-1.7902	-1.4872	-2.0488	-1.7902	-1.4872	-1.4872**
LndER	-2.1649	-2.0137	0.5258	-4.0760***	-4.2188**	-4.0970***
LndINF	-7.0134***	-4.2053**	-4.5324***	-8.0759***	-7.0913***	-8.0296***
LndGDP	-4.2349***	-4.1474**	-3.4868***	-4.1378***	-4.0250**	-3.4868***

*Notes: *, **, *** represent the significance at 10%, 5%, and 1% levels, respectively. The null hypotheses in ADF is the presence of unit root while null hypotheses in PP is the presence of stationary. LnTR is Total tourism revenue (THB), LnER is Exchange Rate, LnINF is Inflation, LnGDP is GDP Per Capita.*

Unit root reliability tests were implemented to gain information on the integrated nature of the variables before proceeding with the estimation of the models, since non-stationary time series will provide a spurious regression result and erroneous statistical inference unless they are properly differenced (Granger & Newbold, 1974; Enders, 2015). The methods used in this research were the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979) and the Phillips-Perron (PP) test (Phillips & Perron, 1988), which are supplementary tools that were used. The joint use of the tests is compatible with an established econometric practice whose common finding across parametric and

non-parametric models leads to a steadier inference as to stationarity characteristics of macroeconomic time series (Ng & Perron, 2001; Schwert, 2002).

ADF test is an extension of the usual Dickey-Fuller procedure in the sense that the regression is augmented with lagged differences of the dependent variable to allow the test to be more valid in a wide range of autoregressive processes (Said & Dickey, 1984). Nevertheless, the finite-sample performance of the ADF test could depend on the specific lag length since lag length could influence size and power characteristics of the test (Elliott, Rothenberg, & Stock, 1996). In order to reduce this sensitivity, the PP test was used concomitantly. The PP methodology utilises a non-parametric adjustment to the traditional t-statistic that is robust to all types of heteroskedasticity and all its error serial structure without any specification of a lag structure (Phillips and Perron, 1988). This feature tempts the PP test, especially to be used in small-sized data and in scenarios where there are residual autocorrelations, albeit hard to parameterise (Perron, 1989).

The empirical results, as presented in Table 4.1, indicate that at the level form, lnER and lnINF exhibit stationarity under certain deterministic specifications, whereas lnGDP and lnTR fail to reject the null hypothesis of a unit root at conventional significance levels in both the ADF and PP frameworks. Upon first differencing, the null of a unit root is rejected at the 1% or 5% levels across all variables in both tests, indicating that the series are integrated of order one, I(1). The consistency of these results across ADF and PP tests substantially reduces the likelihood of erroneous classification of integration orders due to test-specific biases, thereby satisfying the preconditions for the application of the Autoregressive Distributed Lag (ARDL) bounds testing approach (Pesaran, Shin, & Smith, 2001).

In summary, the joint application of ADF and PP not only provides robustness through methodological complementarity but also aligns with best-practice recommendations in applied time series econometrics for macroeconomic research, where structural breaks, small sample sizes, and potential error-term heteroskedasticity can compromise the reliability of single-test inference (Schwert, 2002; Perron, 1989).

4.3 Bounds Test

Table 4.2: Panel A. Long-run Coefficients (Levels Equation)

Variable	Coefficient	Standard Error	t-Statistic	p-value
lnER	-0.5841	0.3323	-1.7580	0.0967
lnINF	-0.0974**	0.0437	-2.2257	0.0399
lnGDP	3.1378***	0.2320	13.5239	0.0000
Constant (C)	-0.2206	1.2056	-0.1830	0.8570

*Notes: Significance: ***, **, * denote 1%, 5%, and 10% levels. Variables: lnTR (dependent), lnER, lnINF, lnGDP.*

The long-run coefficients reveal that GDP per capita has a very powerful and significant positive influence on tourism revenue and that it adheres to the income-elastic demand theory of geography. The exchange rate has a negative value (−0.584), which is slightly significant at the 10% level, implying that therefore an appreciation of the baht increases Thailand's competitiveness in tourist attractions. The difference between the inflation rates and significant levels shows that negative and significant inflation levels at 5% affect health and well-being as rising consumer prices lower competitiveness and decrease the desire to come in by tourists.

Table 4.3: Panel B. Bounds Test

Test Statistic	Value
F-statistic	9.5631***

*Notes: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively*

The result in the bounds test indicates that it has an F-statistic of 9.56, exceeding the upper limit of the critical values at the 1% level. This proves the existence of a long-run equilibrium between tourism revenue, exchange rate, GDP per capita and inflation.

Table 4.4: Panel C. Error Correction Representation (ECM)

Variable	Coefficient	Standard Error	t-Statistic	p-value
lnTR(-1)	-0.5043***	0.1083	-4.657	0.0002
lnER	-0.2946*	0.1676	-1.7579	0.0967
lnINF	-0.0491***	0.0232	-2.1211	0.0489
lnGDP	1.5825***	0.3375	4.6884	0.0002
Constant (C)	-0.1113	0.6075	-0.1831	0.8568

*Notes: Significance: ***, **, * denote 1%, 5%, and 10% levels.*

According to the ECM outcome, the error correction term = -0.504 and is statistically significant ($p<0.01$), which means that nearly half of the disequilibrium on an annual basis has been adjusted. This represents an expeditious adaptation rate to the long-run equilibrium. The impact of GDP per capita changes on tourism revenue is positive and strong in the short run, but the inflation levels have a high impact as they decrease the tourism revenues. Variations in the exchange rate do not change by huge margins, and this means that the tourists are receptive to long-term changes in currency movements rather than short-term volatility.

4.4 Correlation LM Test

Table 4.5: Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.6238	Prob. F(2,5)	0.5493
Obs*R-squared	1.6892	Prob. Chi-Square(2)	0.4297
Durbin-Watson	2.5973		

*Notes: Residual serial correlation tested on the estimated ARDL(1,0,0,0) model for lnTR using annual data; test order and statistics as reported in the table. Null: No serial correlation in the residuals. Significance: ***, **, * denote rejection of the null at 1%, 5%, and 10% levels, respectively. Variables: Residuals from the lnTR equation (ARDL model).*

We assess residual independence using the Breusch–Godfrey (BG) Lagrange Multiplier test, which is appropriate in dynamic regressions with lagged dependent variables and more general ARMA error structures than the Durbin–Watson test permits (Breusch, 1978; Godfrey, 1978). For the estimated ARDL(1,0,0,0) model, the BG results report F = 0.6238, p = 0.5493 and Obs*R^2 = 1.6892, p = 0.4297 for 2 auxiliary lags, indicating that the null hypothesis of no serial correlation cannot be rejected at any conventional level. This finding is consistent with the Durbin–Watson statistic reported alongside the main regression (DW = 2.597), which does not suggest problematic positive autocorrelation in the residuals.

Econometrically, the absence of serial correlation implies that the OLS estimators in the conditional ARDL equation are consistent and asymptotically efficient under standard assumptions and the conventional standard errors and associated t/F tests reported in Table 4.2 are valid for inference (Lütkepohl, 2005; Enders, 2015). Substantively, this improves the plausibility of the short-run exchange rate, inflation and GDP per capita in predicting the dynamics of tourism revenue in Thailand, as the estimated significance is not clouded by unknown residual persistence that may otherwise bias inference tests

4.5 Heteroskedasticity Test

Table 4.6: Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.6275	Prob. F(4,17)	0.6494
Obs*R-squared	2.8301	Prob. Chi-Square(4)	0.5866
Scaled explained SS	1.3251	Prob. Chi-Square(4)	0.8571

*Notes: Residual heteroskedasticity tested on the estimated ARDL(1,0,0,0) model for lnTR using annual data; statistics (e.g., Obs*R², F-statistic) as reported in the table. Null: Homoskedastic residuals (constant variance). Significance: ***, **, * denote rejection of the null at 1%, 5%, and 10% levels, respectively. Variables: Residuals from the lnTR equation (ARDL model).*

We test the stability of variance by the BPG test that identifies the presence of systematic associations between the squared error term and the regressors (Breusch & Pagan, 1979). For the ARDL(1,0,0,0) specification, the BPG outputs F = 0.6275, p = 0.6494, Obs*R^2 = 2.8302, p = 0.5866, and Scaled Explained SS = 1.3251, p = 0.8571, all pointing to a failure to reject homoskedasticity.

The practical implication has dual implications. One, together with the above BG result, the lack of both serial correlation and heteroskedasticity is an indication of the classical linear model assumptions validity of the model in the conditional ARDL, as well as the reliability of the standard errors and p-values that are stated in Table 4.2.

Second, the heteroskedasticity is not evident; therefore, there is no urgent need to replace heteroskedasticity-robust or HAC standard errors in this case; the results on the significance of exchange rate (marginal at 10%), inflation (5%), and the GDP per capita (1%) will be understood at face value (Enders, 2015; Wooldridge, 2013). To draw policy implications from tourism economics, this increases confidence in inferred sensitivities that represent true underlying relationships over artefacts of misspecifying the variance.

4.6 Residual Normality Test

Table 4.7: Residual Normality Test

Statistic	Value
Mean	-1.02×10^{-15}
Median	0.000381
Std. Dev.	0.034338
Skewness	−0.327214
Kurtosis	2.568210
Jarque-Bera	0.563492
Probality	0.754465

Jarque-Bera statistic (0.563, p=0.754) values indicate that the hypotheses are normally distributed. Skewness (-0.327) and kurtosis (2.568) are close to the expected values of a normal distribution. Within the framework of this research, estimation also suggests that normality does not mean indiscrimination of ARDL-ECM and VECM estimates leading to reliable and consistent estimators. This is in line with earlier econometric researches on tourism demand modelling (Narayan, 2004; Tang, 2011) in which the residual normality was applied to support the reliability of long-run equilibrium estimates.

4.7 Multicollinearity Diagnostics Test (VIF)

Table 4.8: Multicollinearity Diagnostics Test (VIF)

Variable	Variance	VIF
lnTR(−1)	0.011727	15.379
lnER	0.028083	1.618
lnGDP	0.113927	14.201
lnINF	0.000536	1.440
Constant (C)	0.369108	-

VIF test indicates that lnTR(-1) and lnGDP (15.38 and 14.20, respectively) are larger than the conventional threshold number of 10, whereas lnER (1.62) and lnINF (1.44) are lower than the picker values.

The high collinearity between the GDP per capita and the lagged dependent variable is naturally rated high, bearing in mind that the two exhibited similar common trends in terms of the long-run growth patterns. This is also characteristic of time-series diagrams or macroeconomic data, in which the directional variables will often work with a tendency towards correlation within their own dynamics. Though high levels of VIF can exaggerate the standard errors, cointegration tests have already established the safety of long-term relationships, which indicate that the role of GDP per capita as a determinant of tourism goods is still applicable, as stated in the research results. Dritsakis (2004) and Hanafiah and Harun (2010) also found similar results as the GDP growth variables tended to have a strong correlation with the lagging surfaces of demand and still made valid long-run inferences.

Conversely, the values of VIF of the exchange rate and inflation variables are in acceptable ranges. This shows that these two variables have independent explanatory content, devoid of any over-dependence in a linear sense with the other regressors. As a practical factor, the exchange rate offers exclusive data on the international price competitiveness of Thailand, and the inflation conveys domestic cost pressures on the tourists, as an independent variable. The fact that these variables do not have a multicollinearity value at all enhances the trust in estimating their coefficients because their effect on the tourism revenue is not hidden by the impact of similarities with the other regressors.

Exchange rate and inflation are independent and strong predictors in the model, although the GDP per capita and the lagged dependent variable are also intersecting through shared tendencies in the economy. The balance confirms the validity of the estimated long-run relationships, so demand-side (income) and price-side (exchange rate and inflation) fundamentals are adequately fitted.

4.8 Granger Causality Test

Table 4.9: Granger Causality Test

Cause	Effect	Obs	F-stat	p-value	Result
ER	TR	25	0.4375	0.5152	n.s.
TR	ER	25	4.4682	0.0461	*
GDP	TR	25	0.7200	0.4053	n.s.
TR	GDP	25	0.1331	0.7187	n.s.
INF	TR	20	0.1117	0.7423	n.s.
TR	INF	20	0.1880	0.6701	n.s.

*Notes "n.s." = not significant; * = $p < 0.05$.*

Based on the Granger Causality test results, the pairwise Granger-causality test shows a unidirectional link from tourism revenue to the exchange rate, with no reverse predictability. This implies that tourism receipts innovations would lead to the baht movements, arguably through balance-of-payments and foreign-exchange-supply linkages. None of the Granger connections is identified between tourism revenues and either inflation or GDP per capita. In contrast, inflation Granger causes the exchange rate, and evidence supports the pass-through of import prices, but there is no relationship between the exchange rate and inflation. Collectively, these results are consistent with the ARDL/ECM estimates presented above. Depreciation was not a consistently strong factor in increasing tourism earnings; exchange-rate shocks flow almost entirely into prices but not into tourism revenue. The above results prompt the following IRF examination, in which the size and duration of shocks are measured.

4.9 Impulse Response Function

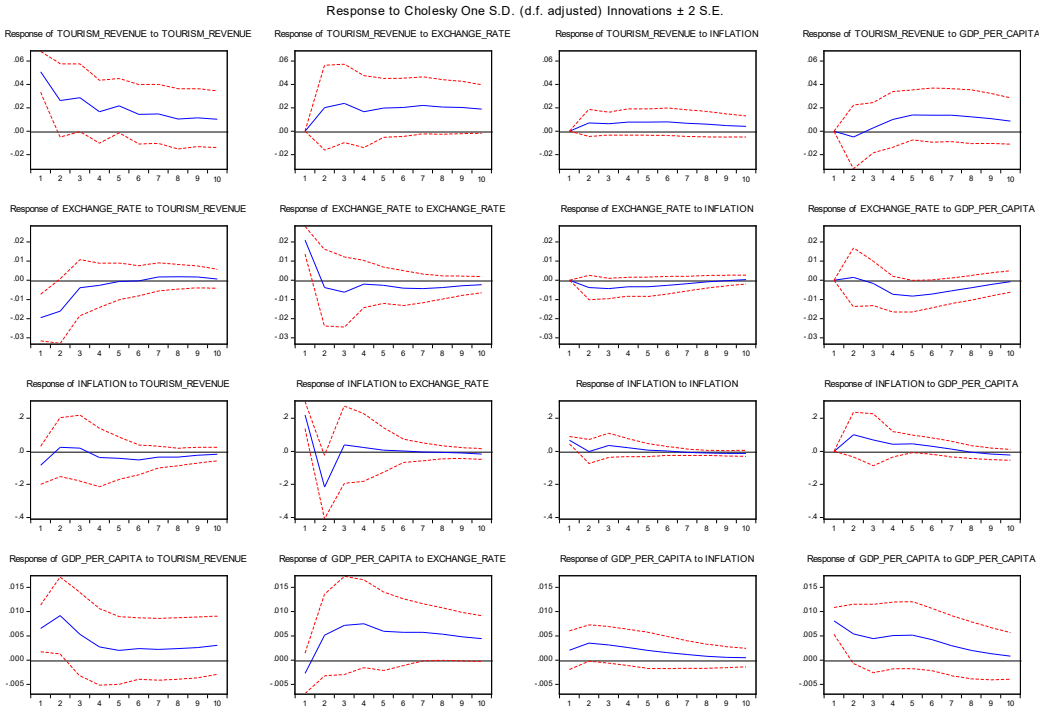

Figure 4.1: Impulse Response Function.

Extending these indications, the impulse-reaction functions measure the magnitude of jolt and duration of jolts on the variables, such as lnTR, lnER, lnINF and lnGDP, and explain whether short-run responses are offset within a short period or translate medium-term.

There is evident short-run persistence in a positive tourism revenue shock, which will eventually converge at equilibrium, indicating the temporary nature of the revenue shocks, but the possibility of the temporary nature gaining momentum in immediate terms, which was similar to what Dritsakis (2004) had argued that tourism demand shocks may dissipate without structural policy support.

The short-run gain in tourism revenue coming as a result of such an exchange rate shock indicates that an unfortunate depreciation of the currency can temporarily help Thailand improve its price competitiveness (UNWTO, 2023). The effect, however, goes away as quickly, and this means that the exchange rate manipulation cannot be solely relied upon to maintain revenue growth without corresponding initiatives in service quality and destination attractiveness.

The effect of shock inflation is that it produces a temporary positive nominal revenue impact, presumably because of price pass-through impacts, but by no more than a modest amount, followed by a turnaround in an even shorter period. This corroborates what Lee et al. (2020) and Kim (2016) report that long-run inflation has an inhibitive effect on tourism competitiveness.

The impact of GDP per capita shocks on tourism revenue has the most robust and lasting positive impact in line with economic theory and empirical evidence that increasing income levels lead to an increase in domestic tourism expenditure and the ability to invest in tourism infrastructure development (UNWTO, 2019).

On the whole, the IRF outcomes indicate that although exchange rate and inflation shocks affect tourism revenue in the short-run, the rise in income is prone to have a stronger, long-lasting effect. This underlines the need to promote macroeconomic stability and long-term growth policies in order to ensure the sustainability of Thailand’s tourism industry.

4.10 Stability Tests: CUSUM & CUSUMSQ

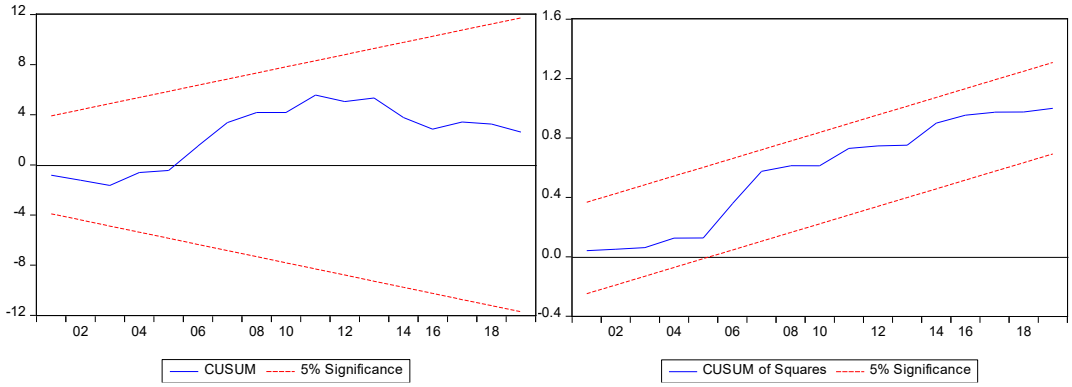

Figure 4.2: Plot of Cumulative Sum (CUSUM) and CUSUM of Squared Test

The ARDL(1,0,0,0) form is tested to be stable using the recursive-residual tests according to Brown, Durbin and Evans (1975). The trajectory of the CUSUM is completely beneath the significance zones at the level of 5% throughout the recursive control field, which signals stability of the estimated coefficients and non-existence of statistically identifiable modifications to the respective mean. Even though there is an upward trend towards the middle of the sample, the track is not close enough to the critical bands to indicate either parameter non-constancy or a change of regime. The companion CUSUM of Squares statistic also remains between the 5% limits all the time, meaning there are no sudden shifts in the second moment of the disturbance process, such as no break in the variance. When combined, the two statistics are complementary to each other, which implies that the conditional model is dynamically well specified in the adjusted sample of estimation.

The attainment of such stability outcomes supports the diagnostics outcomes mentioned above (none of the serial correlation on Breusch-Godfrey LM, none of the heteroskedasticity on Breusch-Pagan-Godfrey), and it makes more credible the economic interpretation of both the short-run and long-run elasticities estimated in the

ARDL-ECM. Specifically, the negative and significant term of the error correction presents valid cointegration, and the stability of the parameters justifies the estimated effects. A marginally negative ER, negative inflation and strongly positive GDP per capita are not likely to be structures that reflect a structural break in the trimmed sample. In practice, the model is stable in predicting macroeconomic conditions in relation to Thai tourism revenue during the period of estimation; this explains how the results inferred using the ARDL framework establish the process of modelling the linkage between macro conditions against the Thai tourism revenue (Pesaran, Shin & Smith, 2001).

4.11 Conclusion

This chapter includes the results of an empirical study that was performed in accordance with the econometric approach developed in Chapter 3. The testing of long-run relationship in tourism revenue, exchange rate, GDP per capita and inflation in Thailand was confirmed by the results of the unit root and bounds test. The ARDL estimation process demonstrated that the exchange rate depreciation has a significant negative effect on the tourism revenue in both the long run as well as short run, and GDP per capita has a significant positive effect. Reliability of the model was verified by diagnostic checks. Granger causality analysis also indicated the exchange rate variations based on the tourism revenue, which also explains the macroeconomic stability of Thailand, since the tourism sector is the driving force behind the growth. All in all, the results are good and solid empirical evidence that shows the interrelation between tourism development and macroeconomic fundamentals, thus preconditioning the policy-oriented discussion in the following chapter.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATIONS

5.1 Introduction

This chapter discusses the major findings from Chapter 4, which are covered in Chapter 5.2. Furthermore, we examine some policy implications based on the key findings in Chapter 5.3. Chapter 5.4 lists out the limitations of our research, and Chapter 5.5 examines the recommendations based on those limitations.

5.2 Discussion of Major Findings

In this study, we intend to examine the long-run relationship between exchange rate, inflation rate, GDP per capita and tourism revenue in Thailand by using the data from 1993 to 2023.

Based on the results in Chapter 4, in both short-run and long-run, the exchange rate shows a negative effect on Thailand's tourism revenue, which aligns with the study from Rookayyah et al. (2024). This suggested that a higher exchange rate value, which means a depreciation of the Thai baht, does not strongly attract tourists to travel to Thailand and making lesser tourism revenue, showing a different outcome compared to several past study on other countries from Tung and Thung (2022), Ali soofi et al. (2018), and Chaivichayachat (2019), which suggested a positive relationship between

exchange rate depreciation and tourism revenue. This is likely because the major period of Thai baht depreciation occurred during times of economic and financial crisis, such as the Asian Financial Crisis in 1997 to 1998, and the COVID-19 pandemic in 2020 to 2021, which implies that Thailand's tourism sector is more depends on the stability and quality of its services than cheaper exchange rates.

Next, the inflation rate shows a negative impact in both short-run and long-run, which is aligns with the studies in different countries from Mubarrok et al. (2025), Nguyen and Nguyen (2021), and Athari et al. (2020). In short-run, the cost of goods and services such as accommodation, food, and transport will rise when the inflation rate rises, and making Thailand less attractive to international tourists. In long-run, the high inflation rate would undermine Thailand's competitiveness in the tourism market, especially compared with regional alternatives.

Lastly, the GDP per capita shows the strongest and most significant positive impact on both short-run and long-run, which shows a similar result with Ali soofi et al. (2018) and Athari et al. (2020). This has supported that when people have more income and have fulfilled their basic needs, they are more likely to spend their money on leisure, such as travel (Singla, 2017). Besides, in long-run, the growth of GDP per capita shows economic stability, which will attract international tourists to travel in Thailand, and encourages continuous growth in tourism revenue.

5.3 Implications of the Study

5.3.1 Policymakers

As the tourism sector in Thailand seems to depend more on its stability, the Bank of Thailand and the Ministry of Finance can coordinate to maintain the stability of the exchange rate and keep the inflation within a targeted level, which could be 2% over the long term as a slow and steady price increases will help to encourage business activity, suggested by the Federal Reserve (Ross, 2024).

Besides, to support the tourism-related businesses, the policymakers may introduce tax incentives or subsidies for them to cushion the revenue losses during the economic downturns. Moreover, as the GDP per capita has the strongest and most significant positive impacts on Thailand's tourism revenue, raising the basic salaries, providing better job opportunities and investing in infrastructure could lead the GDP per capita to grow, boost domestic tourism, and strengthen the overall spending power in the economy.

5.3.2 Businesses and Tourism Stakeholders

In order to reduce the foreign exchange rate risk, businesses could use virtual accounts for local payments, which allow the businesses to hold, receive, and pay in multiple currencies without needing a physical bank presence in every

country and can bypass the need for expensive cross-border wire transfers (Insights Team, 2025). Besides, to reflect to the exchange rate fluctuations and the inflation rates, and to keep the competitiveness of Thailand's tourism sector against rival destinations, businesses and tourism stakeholders, such as hotels, airlines, and travel agencies, could adopt flexible pricing strategies, target new sources of markets and niche tourism, such as eco-tourism, medical tourism, or luxury tourism.

5.3.3 Academic Contribution

In the sights of academics, this study has provided long-term evidence on how the exchange rate, inflation rate and GDP per capita affect Thailand's tourism revenue, which has fulfilled the gap of a lack of long-term studies focusing on Thailand's tourism revenue. This study can serve as a reference and guidance for future research in other tourism-dependent countries and offer a framework for future researchers to examine similar macroeconomic-tourism relationships.

5.4 Limitations of the Study

There are some limitations in our study that need to be highlighted. First, the study only uses annual macroeconomic data from 1993 to 2023, which might not properly reflect unexpected shocks or short-term changes in the demand for travel. Although annual data offers an accurate overview, it may cover up significant dynamics because it eliminates seasonal fluctuations and the immediate effects of situations like political upheavals or health emergencies. Second, structural gaps in the data cannot be

accounted for in the ARDL model, despite its effectiveness in analysing cointegration between variables with different integration orders. For example, the model does not consider the COVID-19 pandemic to be an exogenous shock, but rather as a component of the larger time series that produced extraordinary disruptions to world tourism. Third, the analysis skips qualitative components that could offer a deeper understanding of the factors influencing tourism income, such as government policies, quality of tourism infrastructure and shifting visitor preferences, instead concentrating only on macroeconomic variables.

Additionally, Thailand's specialised economic and tourism environment might restrict how broadly the results can be applied. Although the findings provide insightful information for comparable emerging economies, they might not be applicable to nations with distinct tourism models, such as those that depend on domestic or high-end travel. Additionally, the survey does not break down tourist revenue by visitor nationality or purpose, such as business versus leisure, which could provide insight into complex demand trends. Despite these limitations, the study presents a strong basis for understanding macroeconomic factors that affect tourism revenue, and the limits highlighted here provide a guide for further improvements.

5.5 Recommendations for Future Research

There are some recommendations for future research. For instance, future research should address the current limitations by incorporating higher-frequency data such as quarterly or monthly to better capture short-term volatility and seasonal trends in tourism demand. This would allow for more precise modelling of how sudden events such as pandemics or policy changes can affect tourism revenue. Extending the analysis to include qualitative variables such as visa policies, air connectivity and destination

marketing efforts could also enhance the explanatory power of the model. For example, Thailand's recent visa exemptions for Chinese tourists likely boosted arrivals, but such factors are absent in the current macroeconomic framework. Advanced econometric techniques, such as Nonlinear ARDL, could be employed to explore asymmetric effects, for instance whether tourism demand responds differently to currency appreciation versus depreciation.

Comparative cross-country studies are another interesting approach to find best practices in macroeconomic management and tourism policy, especially when compared to regional rivals like Vietnam and Indonesia. Additionally, machine learning methods could be used to forecast travellers' demand in different economic conditions, providing policymakers with more useful information. Lastly, in order to evaluate how COVID-19 has permanently changed travellers' behaviour and the resilience of economies that depend on tourism, post-pandemic research is essential. Future research can fill up these gaps and offer a more thorough understanding of how macroeconomic variables interact with tourism performance, which will ultimately lead to better business and policy initiatives.

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Appendices

Appendix 1.1: Thailand International Tourist Trips, 1995 to 2021.

Year	Number of tourists	Receipts	% of GNP
2021	511,000	5,276.00 m $	1.0 %
2020	6,725,000	15,360.00 m $	3.1 %
2019	39,916,000	64,371.00 m $	11.83 %
2018	38,178,000	61,383.00 m $	12.11 %
2017	35,592,000	57,057.00 m $	12.50 %
2016	32,530,000	48,459.00 m $	11.72 %
2015	29,923,000	44,851.00 m $	11.18 %
2014	24,810,000	38,451.00 m $	9.4 %
2013	26,547,000	41,765.00 m $	9.9 %
2012	22,354,000	34,565.00 m $	8.7 %
2011	19,230,000	30,924.00 m $	8.3 %
2010	15,936,000	23,796.00 m $	7.0 %
2009	14,150,000	19,811.00 m $	7.0 %
2008	14,584,000	22,510.00 m $	7.7 %
2007	14,464,000	20,625.00 m $	7.8 %
2006	13,822,000	16,624.00 m $	7.5 %
2005	11,567,000	12,103.00 m $	6.4 %
2004	11,737,000	13,054.00 m $	7.6 %
2003	10,082,000	10,456.00 m $	6.9 %
2002	10,873,000	10,388.00 m $	7.7 %
2001	10,133,000	9,378.00 m $	7.8 %
2000	9,579,000	9,935.00 m $	7.9 %
1999	8,651,000	9,416.00 m $	7.4 %
1998	7,843,000	7,954.00 m $	7.0 %
1997	7,294,000	9,052.00 m $	6.0 %
1996	7,244,000	10,367.00 m $	5.7 %
1995	6,952,000	9,257.00 m $	5.5 %

Appendix 1.2: Thailand Tourism Revenue, 1995 to 2021.

Figure 2. Tourism contribution to GDP of Indonesia, Malaysia, Singapore, Thailand and Vietnam

Source: world travel and tourism council data elaborated by author

Appendix 1.3: Tourism Contribution to GDP of Indonesia, Malaysia, Singapore, Thailand and Vietnam.

UNIT ROOT TEST RESULTS TABLE (ADF)

Null Hypothesis: the variable has a unit root

		At Level			
		Ln(EXCHANGE_RATE)	Ln(GDP_PER_CAPITA)	Ln(INFLATION)	Ln(TOURISM_REVENUE)
With Constant	t-Statistic	-3.9218	-0.9435	-3.5481	-1.3903
	Prob.	***0.0059***	***0.7599***	***0.0333***	***0.5706***
		***	n0	**	n0
With Constant & Trend	t-Statistic	-4.7954	-1.7612	-3.9019	-1.2179
	Prob.	***0.0035***	***0.6981***	***0.0576***	***0.8846***
		***	n0	*	n0
Without Constant & Trend	t-Statistic	0.5961	3.4295	-1.1702	0.2684
	Prob.	***0.8396***	***0.9996***	***0.2102***	***0.7558***
		n0	n0	n0	n0
		At First Difference			
		d(Ln(EXCHANGE_RATE))	d(Ln(GDP_PER_CAPITA))	d(Ln(INFLATION))	d(Ln(TOURISM_REVENUE))
With Constant	t-Statistic	-3.7487	-4.2349	-7.0134	-1.7902
	Prob.	***0.0087***	***0.0025***	***0.0000***	***0.3760***
		***	***	***	n0
With Constant & Trend	t-Statistic	-2.3261	-4.1474	-4.2053	-1.4872
	Prob.	***0.4069***	***0.0145***	***0.0223***	***0.8057***

		n0	**	**	n0
Without Constant & Trend	t-Statistic	-4.1461	-3.4868	-4.5324	-2.0488
	Prob.	***0.0002***	***0.0011***	***0.0002***	***0.0410***
		***	***	***	**

Notes:

b: Lag Length based on SIC

c: Probability based on MacKinnon (1996) one-sided p-values.

UNIT ROOT TEST RESULTS TABLE (PP)

Null Hypothesis: the variable has a unit root

At Level

		Ln(EXCHANGE_RATE	Ln(GDP_PER_CAPITA	Ln(INFLATION	Ln(TOURISM_REVENUE
With Constant	t-Statistic	-2.1649	-0.9397	-3.7494	-1.3903
	Prob.	***0.2225***	***0.7612***	***0.0097***	***0.5706***
		n0	n0	***	n0
With Constant & Trend	t-Statistic	-2.0137	-2.0395	-3.8486	-1.2179
	Prob.	***0.5705***	***0.5570***	***0.0313***	***0.8846***
		n0	n0	**	n0
Without Constant & Trend	t-Statistic	0.5258	3.4637	-2.2494	0.2684
	Prob.	***0.8237***	***0.9997***	***0.0264***	***0.7558***
		n0	n0	**	n0

At First Difference

		d(Ln(EXCHANGE_RATE)	d(Ln(GDP_PER_CAPITA)	d(Ln(INFLATION)	d(Ln(TOURISM_REVENUE)
With Constant	t-Statistic	-4.0760	-4.1378	-8.0759	-1.7902
	Prob.	***0.0038***	***0.0032***	***0.0000***	***0.3760***
		***	***	***	n0
With Constant & Trend	t-Statistic	-4.2188	-4.0250	-7.0913	-1.4872
	Prob.	***0.0123***	***0.0191***	***0.0001***	***0.8057***
		**	**	***	n0
Without Constant & Trend	t-Statistic	-4.0970	-3.4868	-8.0296	-2.0488
	Prob.	***0.0002***	***0.0011***	***0.0000***	***0.0410***
		***	***	***	**

Appendix 4.1: Unit Root Tests for the Overall Sample

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LN_TOURISM_REVENUE)
Selected Model: ARDL(1, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 08/14/25 Time: 19:27
Sample: 1993 2023
Included observations: 22

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.111271	0.607542	-0.183150	0.8568
LN_TOURISM_REVENUE(-1)*	-0.504327	0.108293	-4.657055	0.0002
LN_EXCHANGE_RATE**	-0.294595	0.167581	-1.757928	0.0967
LN_GDP_PER_CAPITA**	1.582495	0.337530	4.688455	0.0002
LN_INFLATION**	-0.049108	0.023151	-2.121192	0.0489

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_EXCHANGE_RATE	-0.584134	0.332273	-1.757993	0.0967
LN_GDP_PER_CAPITA	3.137836	0.232021	13.52393	0.0000
LN_INFLATION	-0.097373	0.043749	-2.225716	0.0399
C	-0.220634	1.205622	-0.183004	0.8570

EC = LN_TOURISM_REVENUE - (-0.5841*LN_EXCHANGE_RATE + 3.1378
*LN_GDP_PER_CAPITA -0.0974*LN_INFLATION -0.2206)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	9.563063	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
			Finite Sample: n=35	
Actual Sample Size	22	10%	2.618	3.532
		5%	3.164	4.194
		1%	4.428	5.816
			Finite Sample: n=30	
		10%	2.676	3.586
		5%	3.272	4.306
		1%	4.614	5.966

Appendix 4.2: Bound Test

Dependent Variable: ln(TOURISM_REVENUE)
Method: ARDL
Date: 08/13/25 Time: 13:35
Sample (adjusted): 1996 2019
Included observations: 22 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): ln(EXCHANGE_RATE INFLATION
GDP_PER_CAPITA

Fixed regressors: C
Number of models evalulated: 8
Selected Model: ARDL(1, 0, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
ln(TOURISM_REVENUE(-1)	0.495673	0.108293	4.577146	0.0003
ln(EXCHANGE_RATE	-0.294595	0.167581	-1.757928	0.0967
ln(INFLATION	-0.049108	0.023151	-2.121192	0.0489
ln(GDP_PER_CAPITA	1.582495	0.337530	4.688455	0.0002
C	-0.111271	0.607542	-0.183150	0.8568

R-squared	0.987921	Mean dependent var	10.29944
Adjusted R-squared	0.985079	S.D. dependent var	0.312441
S.E. of regression	0.038165	Akaike info criterion	-3.497103
Sum squared resid	0.024761	Schwarz criterion	-3.249138
Log likelihood	43.46813	Hannan-Quinn criter.	-3.438690
F-statistic	347.6141	Durbin-Watson stat	2.597259
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Appendix 4.3: ARDL Test

Breusch-Godfrey Serial Correlation LM Test:

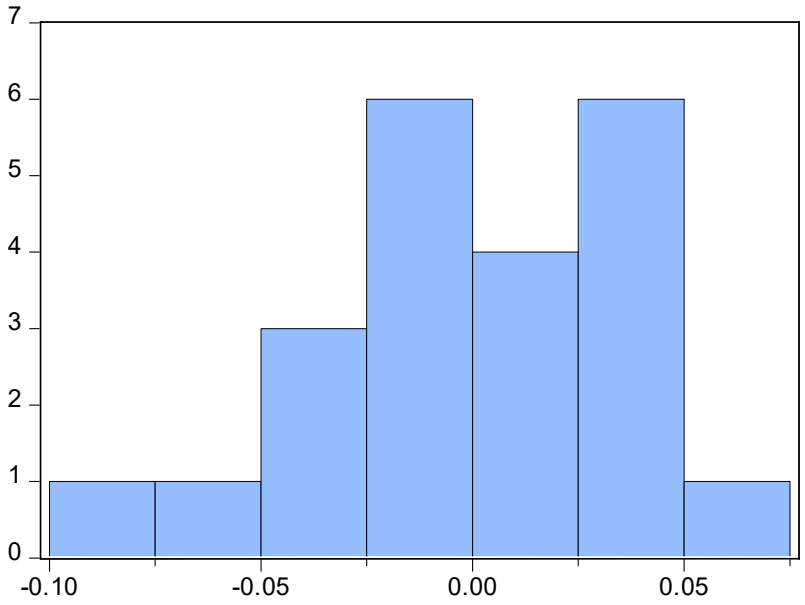
F-statistic	0.623764	Prob. F(2,15)	0.5493
Obs*R-squared	1.689217	Prob. Chi-Square(2)	0.4297

Appendix 4.4: Correlation LM Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.627453	Prob. F(4,17)	0.6494
Obs*R-squared	2.830160	Prob. Chi-Square(4)	0.5866
Scaled explained SS	1.325066	Prob. Chi-Square(4)	0.8571

Appendix 4.5: Heteroskedasticity Test



Series: Residuals	
Sample 1996 2019	
Observations 22	
Mean	-1.02e-15
Median	0.000381
Maximum	0.060693
Minimum	-0.076324
Std. Dev.	0.034338
Skewness	-0.327214
Kurtosis	2.568210
Jarque-Bera	0.563492
Probability	0.754465

Appendix 4.6: Residual Normality Test

Variance Inflation Factors
Date: 09/06/25 Time: 16:37
Sample: 1993 2023
Included observations: 22

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LN_TOURISM_REVENUE(-1)	0.011727	18668.02	15.37867
LN_EXCHANGE_RATE	0.028083	1012.679	1.618152
LN_GDP_PER_CAPITA	0.113927	23076.70	14.20066
LN_INFLATION	0.000536	2.124689	1.439701
C	0.369108	5575.133	NA

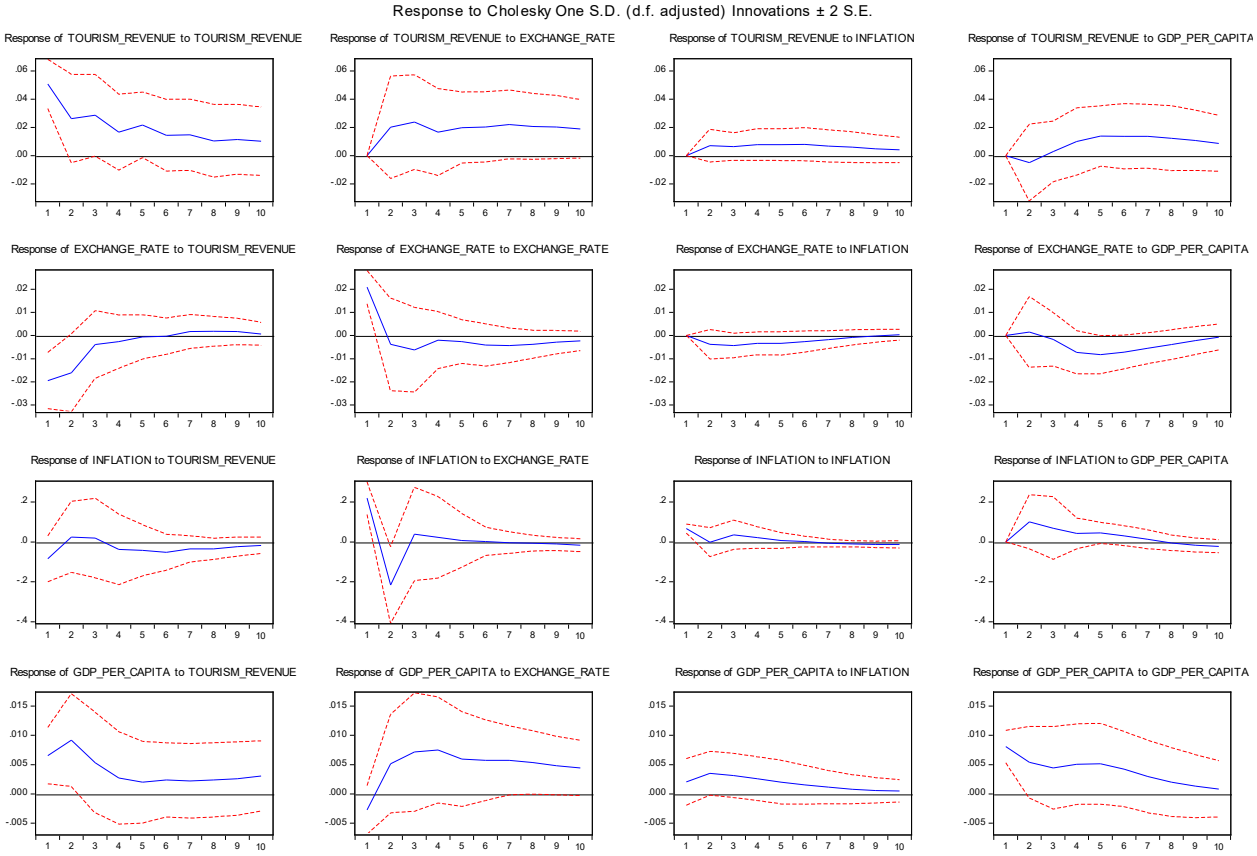
Appendix 4.7: Multicollinearity Diagnostics Test (VIF)

Pairwise Granger Causality Tests
Date: 08/20/25 Time: 00:32
Sample: 1993 2023
Lags: 1

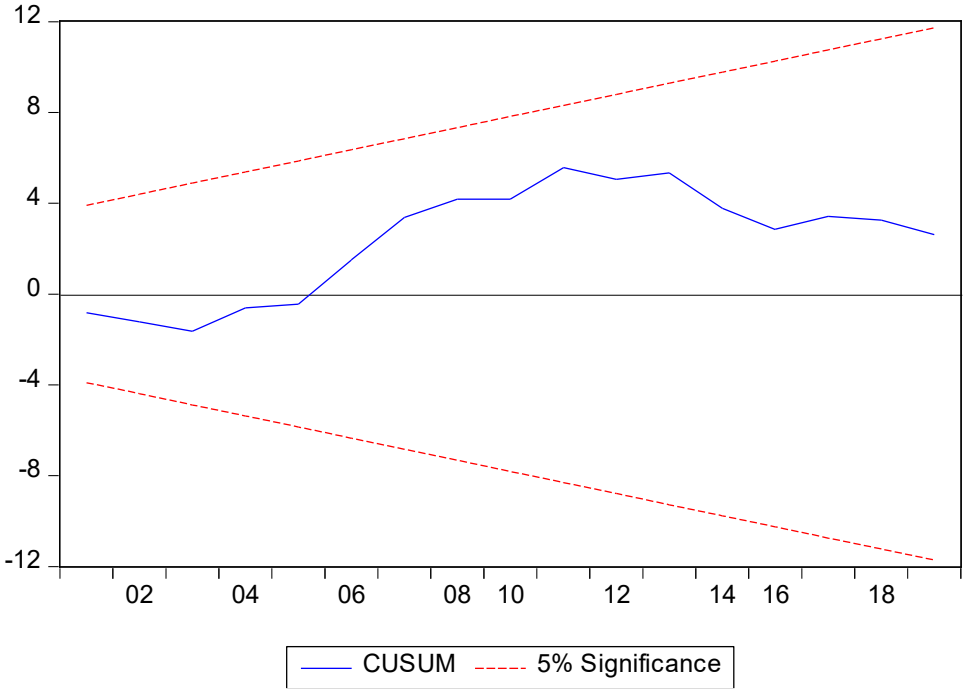
Null Hypothesis:	Obs	F-Statistic	Prob.
EXCHANGE_RATE does not Granger Cause TOURISM_REVENUE	25	0.43750	0.5152
TOURISM_REVENUE does not Granger Cause EXCHANGE_RATE		4.46821	0.0461
GDP_PER_CAPITA does not Granger Cause TOURISM_REVENUE	25	0.72004	0.4053
TOURISM_REVENUE does not Granger Cause GDP_PER_CAPITA		0.13310	0.7187

INFLATION does not Granger Cause TOURISM_REVENUE	20	0.11167	0.7423
TOURISM_REVENUE does not Granger Cause INFLATION		0.18795	0.6701
GDP_PER_CAPITA does not Granger Cause EXCHANGE_RATE	30	0.96228	0.3353
EXCHANGE_RATE does not Granger Cause GDP_PER_CAPITA		1.61164	0.2151
INFLATION does not Granger Cause EXCHANGE_RATE	24	0.01383	0.9075
EXCHANGE_RATE does not Granger Cause INFLATION		6.09263	0.0222
INFLATION does not Granger Cause GDP_PER_CAPITA	24	1.39920	0.2501
GDP_PER_CAPITA does not Granger Cause INFLATION		0.19943	0.6598

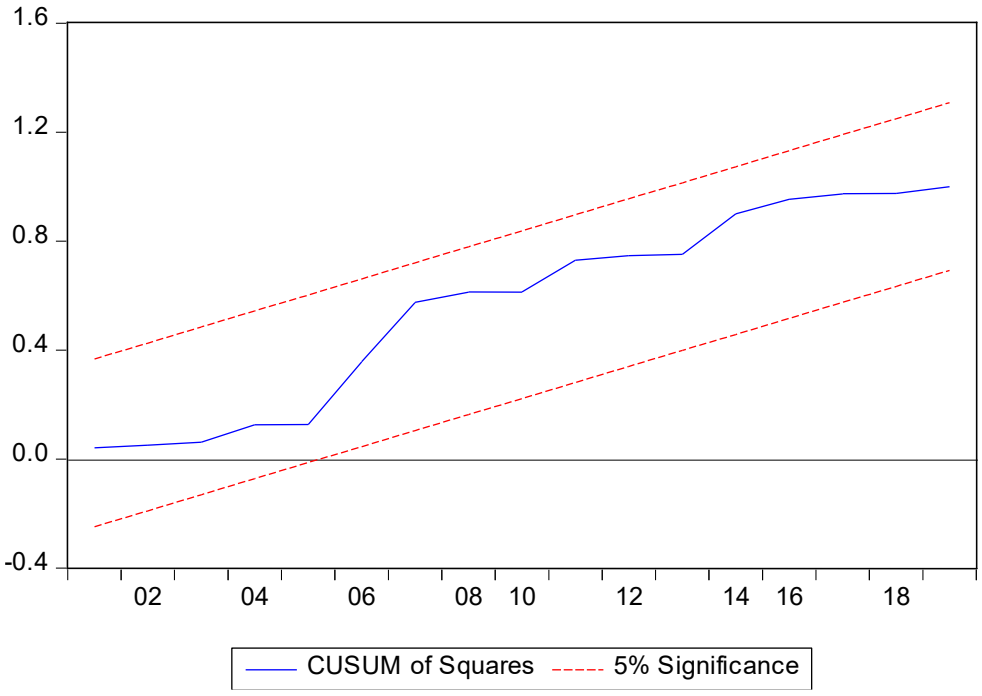
Appendix 4.8: Granger Causality Test



Appendix 4.9: Impulse Response Function



Appendix 4.10: Plot of Cumulative Sum (CUSUM)



Appendix 4.11: Plot of CUSUM of Squared Test