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# Examining the Relationship between Tourism and Economic Growth in Southeast Asia: A Vector Autoregressive Model Approach

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## Abstract

The article investigates the relationship between tourism and economic growth in four developing countries in Southeast Asia for the past two decades (1997-2016) by employing a structural vector autoregressive model. We found that there are directional causalities between GDP, arrivals, and inflation and other variables in the short-run. However, we stated that there are not directional causalities between receipts, exchange rate, and air transport and other variables in the short-run. These imply that GDP, the number of international tourist arrivals, and inflation rate have causal relationships with other variables in the short-run, while receipts from international tourists, exchange rate, and the number of air transport departures have no causal relationships with other variables. Further, from the results of the Johansen co-integration test, we also found that there is only one co-integration among variables at the 5% critical value. This suggests that there is a causal relationship among variables in the long run.

**Keywords:** Tourism, Economic Growth, Southeast Asia, Vector Autoregressive Model

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## Introduction

Tourism has been considered as one of the fastest growing economic sectors in the world in recent years (Jayathilake, 2013; and Bhuiyan, 2015). Due to expansion of the globalization, travel and tourism have played a crucial role in the global economy, which have become a fundamental source of foreign exchange revenues for many countries (Giap *et al*., 2016).

The rapid growth in tourism arrivals for Asia and the Pacific, especially in sub regions such as Northeast Asia, South Asia, and Southeast Asia has presented an important contribution to economic growth for developing countries (Bhuiyan, 2015). By 2017, the total contribution of travel and tourism (T&T) to the gross domestic product (GDP) of Southeast Asia reached US$329.5 billion (or 12 percent of GDP) in 2017, and is predicted to grow by 5.8 percent in 2018. In the same time, the direct contribution of T&T to GDP of this region accounted for USD135.8 billion (or 4.9 percent of GDP), and is projected to rise by 5.9 percent to USD143.9 billion in 2018. In 2017, T&T created 14.4 million jobs (or 4.7 percent of total employment) in Southeast Asia and is forecasted to increase by 3 percent annually to 20 million jobs (or 5.6 percent of total employment) in 2028. The revenue from visitors travelling to the region is predicted to rise 5.4 percent per annum over the period of 2018-2028 and reach US$243.2 billion in 2028 (World Travel & Tourism Council, 2018).

However, tourism in Southeast Asia has to face new challenges such as the degradation of environment due to a fast growth of visitor arrivals (Bhuiyan, 2015). For example, carbon dioxide emissions of the region have tripled since 1990 and the growth rate of emissions is higher than that of the world (Sherafatian-Jahromi *et al*., 2017). Moreover, organization of private local and foreign tourism enterprises in the aspect of tourism management decisions in the region, shortage of skilled human resources, and domination of the large number of small and medium enterprises have been identified as the main challenges faced by the tourism sector in Southeast Asia (Mazumder *et al*., 2013). Besides, the region must deal with recent obstacles, including economic uncertainties associated with financial globalization, rapid urbanization, high levels of informal employment, and highly unequal gender division of labours (Cook and Pincus, 2014).

There are a number of existing studies examining the correlation between tourism and economic growth in Southeast Asia (Kadir and Karim, 2012; Shih and Do, 2016; Valeriani *et al*., 2017; and Rooyen, 2018). However, these studies only investigate the causality between tourism and economic growth in the context of either local or national levels, but none of these uses the vector autoregressive (VAR) model to estimate the relationship between tourism and economic growth in the regional level. This research, therefore, is carried out to narrow down the gaps of previous studies. Specifically, a VAR model is employed to test the relationship among GDP and five other variables, consisting of receipts from international tourists, the number of international tourist arrivals, inflation rate, exchange rate, and the number of air transport departures, in four developing countries of Southeast Asia for the past two decades (1997-2016). The VAR model is applied in this research since it interprets the endogenous variables solely by their own history, apart from deterministic regressors and therefore this method incorporates non-statistical a priori information (Pfaff, 2008).

The rest of this paper is organized as follows. Section 2 presents literature review. Methods are presented in section 3. Section 4 presents results and discussion. Finally, conclusion and policy implications are summarized in section 5.

# Literature Review

**Concepts of economic growth**

Economic growth can be measured by increasing aggregate product, either total or per capita, without reference to changes in the structure of the economy or in the social and cultural value system (Robinson, 1972). Economic growth is a long-run concept, which can be obtained by using efficient resources as well as increasing the production capacity of a country (Haller, 2012). Economic growth is the continuous improvement in the capacity to meet the demand for goods and services, which are results of increasing production scale and improving productivity (BIS and DFID, 2011).

**Empirical studies in the relationship between tourism and economic growth**

The theme on the relationship between tourism and economic growth has been considered by scholars in recent years. Bashagi and Muchapondwa (2009) examined determinants affecting international tourism demand for Tanzania between 1996 and 2006 by employing an autoregressive distributed lag model. Suggestions to facilitate tourism demand for this country include stabilizing macroeconomics, diversifying tourism products, and improving customer satisfaction. Likewise, Bento and Santos (2012) estimated the correlation between tourism and economic growth in Portugal from 1997 to 2010 by the augmented Granger causality model. Results stated that there is a strong one-way directional causality between tourism and economic growth and therefore the government should invest in tourism to enhance economic growth. A study by Wang *et al*. (2012) examined the causal relationship between domestic tourism and economic growth in China by employing the co-integration analysis and Granger causality test for time series data from 1984 to 2009. They found that there are long-term and stable equilibrium relationships between the development of China's domestic tourism and economic growth. However, the results from the error correction model showed that there are short-term disequilibrium relationship between the domestic tourism and economic growth in this country.

Further, Liu *et al*. (2016) investigated the relationship among international tourism, economic growth, and energy consumption in Taiwan over the period of 1965-2010. Results addressed that there is no reciprocal causal relationship between economic growth and international tourism development. Results also demonstrated that there is a bi-directional causality between economic growth and energy consumption and a bi-directional causality between international tourism development and energy consumption. Similarly, Onder *et al*. (2009) assessed determinants affecting the international tourism demand in Izmir, Turkey using the time series data between 1980 and 2005. They found that the prices and income of the tourist-generating country are the main drivers of the demand for tourism in Izmir. A study by Phiri (2014) investigated the correlation between tourism and economic growth in South Africa between 1995 and 2014. His results from the linear framework supported the hypothesis in the tourism-led growth. By contrast, there is no bi-directional causality between tourist receipts and economic growth for the non-linear framework.

There are a number of studies on the causality between tourism and economic growth in Southeast Asia. Kadir and Karim (2012) investigated the relationship between tourism and economic growth in Malaysia by using panel time-series approach from 1998 to 2005. Their results indicated that there are short-run and long-run relationships between tourism and economic growth and therefore tourism infrastructures and facilities should be improved to economic growth in this country. Likewise, Shih and Do (2016) examined the relationship between tourism and economic growth in Viet Nam over the period of 1995-2013 by employing the tourism-led growth hypothesis (TLGH). Results stated that tourism has played a crucial role in facilitating economic growth in this country. Valeriani *et al*. (2017) investigated the correlation between tourism and economic growth in Bangka Belitung Islands province, Indonesia for eleven years (2005-2015) by using a multiple linear regression. Results showed that goods-service expenditure and tourism business unit do not affect the economic growth, while infrastructure expenditure has a negative impact on economic growth, and private investment and labour positively affect economic growth. Lastly, Rooyen (2018) tested the causality between tourism and economic growth in Thailand from 2012 to 2016. Results addressed that there is a very strong positive relationship between the number of tourist arrivals to Thailand and consumption and employment of the economy.

## Methods

**Data and sources**

A panel dataset for the causality between tourism and economic growth in Southeast Asia is gathered from the database in World Development Indicators released by the World Bank (WB). Due to limitations in human and financial resources, four developing countries in Southeast Asia, including Indonesia, Malaysia, Thailand, and Viet Nam, are chosen for the study. A panel dataset is collected for the past two decades (1997-2016). Thus, a total of 80 observations are entered for data analysis. The panel data is used for this research because of the following advantages: (1) it benefits in terms of obtaining a large sample, giving more degree of freedom, more information, and less multicollinearity among variables; and (2) it may overcome constraints related to control individual or time heterogeneity faced by the cross-sectional data (Baltagi, 2005; and Hsiao, 2014).

**The vector autoregressive (VAR) model**

The VAR model is used to examine the causality between tourism and economic growth in four countries in Southeast Asia for the past two decades (1997-2016). Specifically, the relationship among GDP and five other variables, consisting of receipts from international tourists, the number of international tourist arrivals, inflation rate, exchange rate, and the number of air transport departures, in four developing countries of Southeast Asia, is tested by the VAR model. The VAR model is chosen for this study because it explains the endogenous variables solely by their own history, apart from deterministic regressors and therefore this method incorporates non-statistical a priori information (Pfaff, 2008). Moreover, the VAR model is a popular method in economics and other sciences since it is a simple and flexible model for multivariate time series data (Suharsono *et al*., 2017).

The specification of a VAR model can be defined as follows (Pfaff, 2008):

$$Y_t = A_1Y_{t-1} + \cdots + A_pY_{t-p} + \mathcal{E}_t \quad (1)$$

Where: $Y_t$ denotes a set of K endogenous variables (GDP, receipts from international tourists, the number of international tourist arrivals, inflation rate, exchange rate, and the number of air transport departures); $A_i$ represents (K x K) coefficient matrices for i = 1,…, p; and $\mathcal{E}_t$ is a K-dimensional process with $E(\mathcal{E}_t) = 0$.

An important characteristic of the AVR model is stability and therefore it generates stationary time series with time invariant means, variances and covariance structure, given sufficient starting values. The stability of an empirical VAR model can be analyzed by considering the companion form and computing the eigenvalues of the coefficient matrix. A VAR model may be specified as follows (Pfaff, 2008):

$$\mathcal{E}_t = A\mathcal{E}_{t-1} + V_t \quad (2)$$

Where: $\mathcal{E}_t$ denotes the dimension of the stacked vector; A is the dimension of the matrix ($K_p$ x $K_p$); and $V_t$ represents (KP x 1).

The VAR process is stable if the eigenvalue of A is greater than 1.

**Table 3.1: Description of covariates in the VAR model**

| Variable definitions | Label | Unit |
|---|---|---|
| GDP | $Y_1$ | US$ |
| Receipts from international tourists | $Y_2$ | US$ |
| The number of international tourism arrivals | $Y_3$ | person |
| Inflation rate | $Y_4$ | % |
| Exchange rate | $Y_5$ | LCU/US$ |
| The number of air transport departures | $Y_6$ | flight |

*Notes:* US$ means United States Dollar

LCU denotes the local currency unit

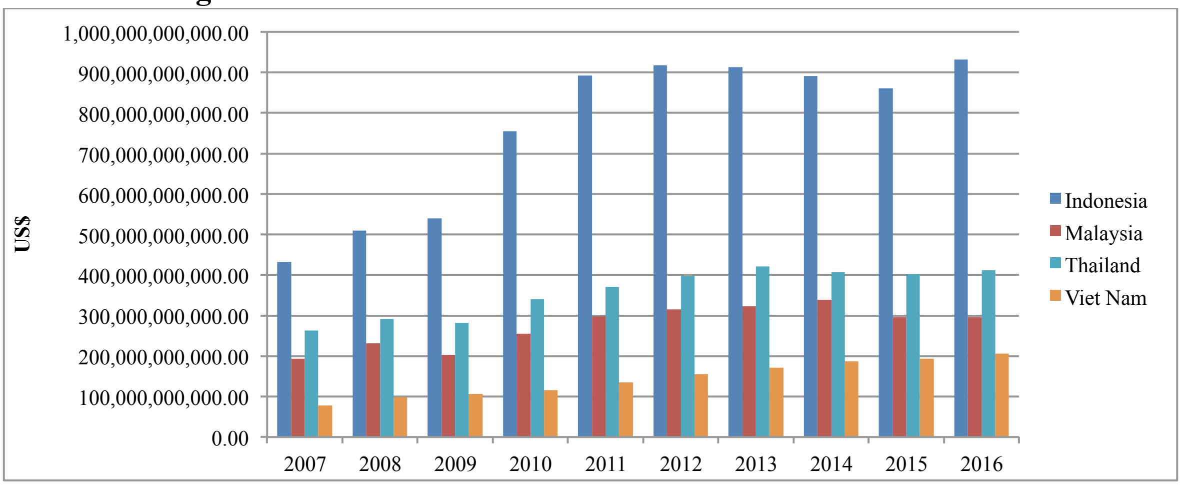
In this study, the procedure of a VAR model includes six steps, consisting of (1) performing the unit root test; (2) determining lag length; (3) estimating the VAR model; (4) testing the Granger causality; (5) checking the stability of eigenvalues; and (6) implementing the Johansen test for co-integration. The VAR model is estimated by the Stata MP 14.2 software.

# Results and Discussion

**Economic growth and tourism in Southeast Asia: An overview**

In Southeast Asia, Indonesia is predicted to be the fastest growing economy with an average annual growth rate by 6 percent over the period of 2014-2018, followed by the Philippines with 5.8 percent. Economic growth of two countries is the result of rising domestic demand, strong infrastructure spending, and reforms in economic structure. In the same period, real GDP of Malaysia and Thailand is projected to increase by 5.1 percent and 4.9 percent annually, respectively. Both countries should improve productivity to overcome the middle-income trap. The growth of Singapore is predicted to rise by 3.3 percent per annum and this reflects a sustainable development of the economy by increasing productivity and innovation. Real GDP growth of Lao PDR is predicted to increase by 7.7 percent, followed by Cambodia and Myanmar with 7 percent for each. Economic growth of Viet Nam is projected to rise by a smaller rate compared to their counterparts due to slower external demand from advanced economies and weak macroeconomic management policies (OECD, 2013).

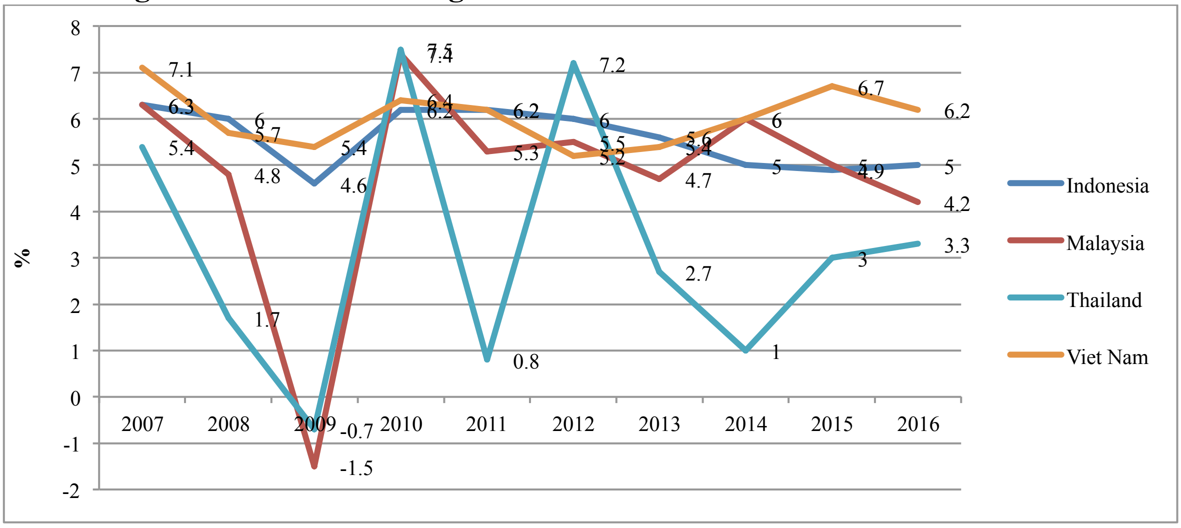
**Figure 4.1: GDP values of selected countries in Southeast Asia**




*Source:* World Bank, 2018

GDP of four countries tended to increase over a past decade (2007-2016), in which the strongest value of GDP belongs to Indonesia, followed by Thailand, the Philippines, Malaysia, Viet Nam, and Myanmar. For example, by 2016, GDP of Indonesia reached more than US$932 billion, followed by Thailand (US$411 billion), Malaysia (US$296 billion), and Viet Nam (US$205 billion) (Figure 4.1).

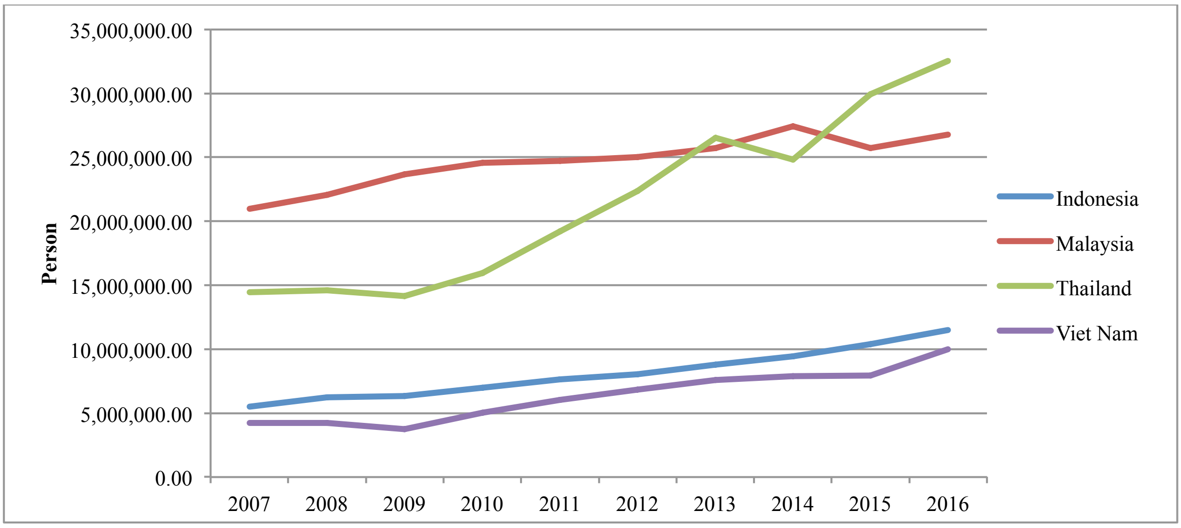
**Figure 4.2: Annual GDP growth of selected countries in Southeast Asia**




*Source:* World Bank, 2018

For a decade (2007-2016), annual growth rates of GDP in Southeast Asian countries strongly fluctuated, in particularly Malaysia and Thailand. For example, starting at 6.3 percent in 2007, GDP growth rate of Malaysia significantly fell to minus 1.5 percent in 2009. In the same period, annual GDP growth of Thailand rapidly dropped by more than 6 percent from 5.4 percent in 2007 to minus 0.7 percent in the next two years. Over the period of 2009-2011, annual GDP growth of countries tended to go down due to negative effects from the global financial crisis (Figure 4.2).

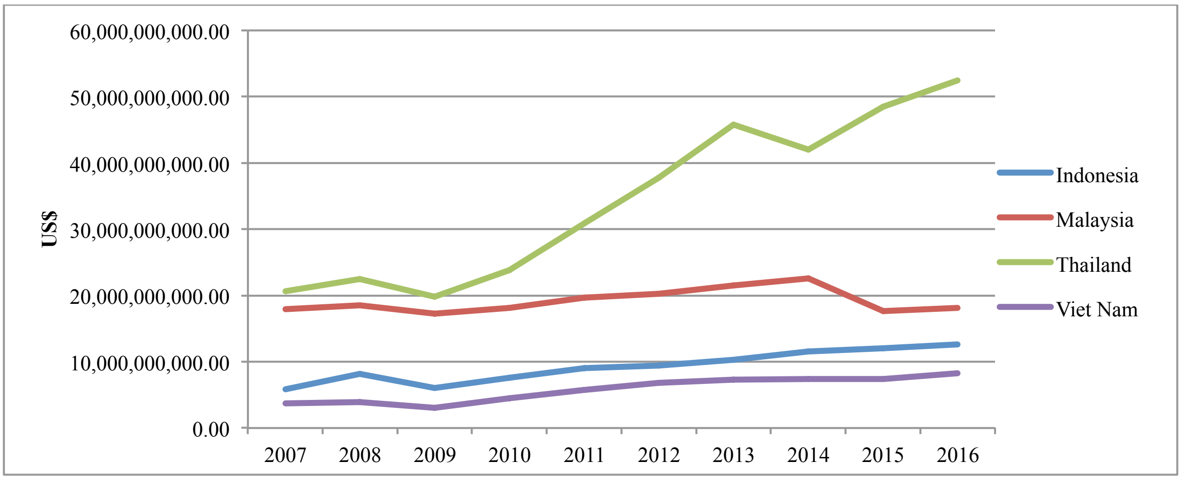
**Figure 4.3: Number of international tourist arrivals to selected countries in Southeast Asia**




*Source:* World Bank, 2018

The number of international tourist arrivals to four countries tended to increase for a decade (2007-2016), especially in Malaysia and Thailand. For instance, by 2016, Thailand welcomed 32.5 million of international tourists, followed by Malaysia (26.7 million), Indonesia (11.5 million), and Viet Nam (10 million). The number of international tourists in 2016 of Viet Nam is higher than that in 1997 by 2.4 times, followed by Thailand (2.2 times), Indonesia (2.1 times), and Malaysia (1.3 times) (Figure 4.3).

**Figure 4.4: Receipts from international tourists of selected countries in Southeast Asia**




*Source:* World Bank, 2018

Similar to the trend of the number of international tourists, receipts from international visitors presented an upward tendency for a decade (1997-2016), especially in Thailand. Receipts from international visitors of Thailand significantly increased, especially from 2009 onward and by 2016 this country gained nearly US$53 billion from international tourists. Receipts from international tourists of the rest three countries dramatically rose in the same period. By 2016, receipts from international tourists of Malaysia reached US$18 billion, followed by Indonesia (US$12.5 billion), and Viet Nam (US$8.2 billion) (Figure 4.4).

**Table 4.1: Characteristics of economic growth and tourism in selected countries in Southeast Asia**

| Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| GDP | 2.56e+11 | 2.29e+11 | 2.68e+10 | 9.32e+11 |
| Receipts from international tourists | 1.16e+10 | 1.10e+10 | 0 | 5.25e+10 |
| The number of international tourists | 1.12e+07 | 8027398 | 1520000 | 3.25e+07 |
| Inflation rate | 5.50 | 7.44 | -1.7 | 58.4 |
| Exchange rate | 6659.54 | 7433.43 | 2.8 | 21935 |
| The number of air transport departures | 226045.3 | 173272.4 | 28999 | 823735 |

*Source:* Author's calculation, 2018
*Note:* SD denotes standard deviation

For the past two decades (1997-2016), the average value of GDP of four countries reached US$256 billion. In the same period, the average of inflation rate, exchange rate, and number of air transport departures of four countries accounted for 5.5 percent, 6659, and about 226,000 flights, respectively. On average, four countries have welcomed about 11.2 million of international visitors with the revenue accounted for US$11.6 billion (Table 4.1).

### The relationship between tourism and economic growth in Southeast Asia

As mentioned in the methodology section, there are five steps in the procedure of the VAR model, including (1) performing the unit root test; (2) determining lag length; (3) estimating the VAR model; (4) testing the Granger causality; (5) checking the stability of eigenvalues; and (6) implementing the Johansen test for co-integration.

### Implementation of the Unit Root Test

The unit root test is carried out to check the stationarity or non-stationarity of the time series variables (Shadab, 2018). In this research, the Augmented Dickey-Fuller (ADF) test is used to examine the stationarity of GDP, receipts from international tourists, the number of international tourist arrivals, inflation rate, exchange rate, and the number of air transport departures with the hypothesis as follows:

Null hypothesis ($H_0$): The variables contain a unit root

Alternative hypothesis ($H_a$): The variables do not contain a unit root

**Table 4.2: The ADF test for the unit root**

| Variables | Level | 1st difference | 2nd difference |
|---|---|---|---|
| LnGDP | T-statistic: -2.25 | T-statistic: -2.49 | T-statistic: -2.57 |
| | P-value: 0.18 | P-value: 0.11 | P-value: 0.09 |
| | Critical values: | Critical values: | Critical values: |
| | 1% level: -3.53 | 1% level: -3.54 | 1% level: -3.54 |
| | 5% level: -2.90 | 5% level: -2.90 | 5% level: -2.90 |
| | 10% level: -2.58 | 10% level: -2.58 | 10% level: -2.58 |
| LnReceipts | T-statistic: -2.74 | T-statistic: -2.85 | T-statistic: -2.99 |
| | P-value: 0.06 | P-value: 0.05 | P-value: 0.03 |
| | Critical values: | Critical values: | Critical values: |
| | 1% level: -3.53 | 1% level: -3.54 | 1% level: -3.54 |
| | 5% level: -2.90 | 5% level: -2.90 | 5% level: -2.90 |
| | 10% level: -2.58 | 10% level: -2.58 | 10% level: -2.58 |
| LnArrivals | T-statistic: -2.38 | T-statistic: -2.53 | T-statistic: -2.38 |
| | P-value: 0.14 | P-value: 0.10 | P-value: 0.14 |
| | Critical values: | Critical values: | Critical values: |
| | 1% level: -3.53 | 1% level: -3.54 | 1% level: -3.54 |
| | 5% level: -2.90 | 5% level: -2.90 | 5% level: -2.90 |
| | 10% level: -2.58 | 10% level: -2.58 | 10% level: -2.58 |
| LnInflation | T-statistic: -5.00 | T-statistic: -4.34 | T-statistic: -3.17 |
| | P-value: 0.00 | P-value: 0.00 | P-value: 0.02 |
| | Critical values: | Critical values: | Critical values: |
| | 1% level: -3.53 | 1% level: -3.54 | 1% level: -3.54 |
| | 5% level: -2.90 | 5% level: -2.90 | 5% level: -2.90 |
| | 10% level: -2.58 | 10% level: -2.58 | 10% level: -2.58 |
| LnExchange rate | T-statistic: -1.30 | T-statistic: -1.36 | T-statistic: -1.35 |
| | P-value: 0.62 | P-value: 0.59 | P-value: 0.60 |
| | Critical values: | Critical values: | Critical values: |
| | 1% level: -3.53 | 1% level: -3.54 | 1% level: -3.54 |
| | 5% level: -2.90 | 5% level: -2.90 | 5% level: -2.90 |
| | 10% level: -2.58 | 10% level: -2.58 | 10% level: -2.58 |
| LnAir transport | T-statistic: -2.27 | T-statistic: -2.44 | T-statistic: -2.48 |
| | P-value: 0.17 | P-value: 0.13 | P-value: 0.11 |

| | | |
|---|---|---|
| Critical values:<br>1% level: -3.53<br>5% level: -2.90<br>10% level: -2.58 | Critical values:<br>1% level: -3.54<br>5% level: -2.90<br>10% level: -2.58 | Critical values:<br>1% level: -3.54<br>5% level: -2.90<br>10% level: -2.58 |

*Source:* Author's calculation, 2018

Results in Table 4.2 show that we cannot reject the null hypothesis because P-values of all variables are greater than critical values at 1%, 5%, and 10%, respectively and these imply that variables exhibit a unit root (Table 4.2).

**Determination of the Lag Length**

The objective of this step is to specify the optimal lag for the VAR model. If the lag is used too little, then the residual of the regression will not show the white noise process and as the result, the actual error could not be accurately estimated by the model (Suharsono *et al.*, 2017).

**Table 4.3: Selection of the lag length**

| Lag | LL | LR | df | p | FPE | AIC | HQIC | SBIC |
|---|---|---|---|---|---|---|---|---|
| 0 | -602.76 | | | | 0.889 | 16.910 | 16.985 | 17.099 |
| 1 | -292.25 | 621.03 | 36 | 0.000 | 0.000* | 9.284 | 9.813* | 10.612* |
| 2 | -274.17 | 36.15 | 36 | 0.462 | 0.000 | 9.782 | 10.764 | 12.249 |
| 3 | -261.11 | 26.12 | 36 | 0.887 | 0.001 | 10.419 | 11.859 | 14.024 |
| 4 | -236.74 | 48.73 | 36 | 0.076 | 0.002 | 10.743 | 12.631 | 15.486 |
| 5 | -207.77 | 57.95 | 36 | 0.012 | 0.003 | 10.938 | 13.279 | 16.819 |
| 6 | -162.60 | 90.32 | 36 | 0.000 | 0.003 | 10.683 | 13.478 | 17.703 |
| 7 | -67.96 | 189.28 | 36 | 0.000 | 0.001 | 9.054 | 12.302 | 17.212 |
| 8 | 1.71 | 139.37* | 36 | 0.000 | 0.000 | 8.118* | 11.819 | 17.415 |

Endogenous: LnGDP LnReceipts LnArrivals LnInflation LnExhangerate LnAirtransport
Exogenous: Constant
Number of observations = 72

*Source:* Author's calculation, 2018

*Notes:* * denotes lag order selected by the criterion; LL means log likelihood values; LR represents sequential modified LR test statistics; FPE denotes final prediction error; AIC means Akaike information criterion; SC denotes Schwarz information criterion; HQIC represents Hannan-Quinn information criterion; and SBIC means Schwarz's Bayesian information criterion.

As seen in Table 4.3, results suggest that the optimal lag length in this case is the lag 1 because this value is recommended by FPE, HQIC, and SBIC indicators. Thus, lag 1 is chosen to run the VAR model in the next step.

**Estimation of the VAR model**

**Table 4.4: Estimation of the VAR model**

| Variables | Coefficient | Standard Error | t | P-value |
|---|---|---|---|---|
| LnGDP | | | | |
| LnGDP (L1) | 1.134*** | 0.15 | 7.11 | 0.000 |
| LnReceipts (L1) | 0.004 | 0.01 | 0.41 | 0.682 |
| LnArrivals (L1) | -0.155 | 0.18 | -0.86 | 0.391 |

| | | | | |
|---|---|---|---|---|
| LnInflation (L1) | 0.180*** | 0.06 | 2.82 | 0.006 |
| LnExchange rate (L1) | -0.050* | 0.02 | -1.72 | 0.089 |
| LnAir transport (L1) | -0.261* | 0.14 | -1.77 | 0.081 |
| Constant | 2.122 | 2.37 | 0.89 | 0.374 |
| LnReceipts | | | | |
| LnGDP (L1) | 0.888 | 1.35 | 0.66 | 0.514 |
| LnReceipts (L1) | 0.774*** | 0.09 | 7.97 | 0.000 |
| LnArrivals (L1) | -0.491 | 1.53 | -0.32 | 0.750 |
| LnInflation (L1) | 1.532*** | 0.54 | 2.83 | 0.006 |
| LnExchange rate (L1) | -0.328 | 0.24 | -1.32 | 0.191 |
| LnAir transport (L1) | -0.842 | 1.25 | -0.67 | 0.504 |
| Constant | -0.280 | 20.17 | -0.01 | 0.989 |
| LnArrivals | | | | |
| LnGDP (L1) | 0.265* | 0.14 | 1.87 | 0.066 |
| LnReceipts (L1) | 0.005 | 0.01 | 0.49 | 0.624 |
| LnArrivals (L1) | 0.628*** | 0.16 | 3.89 | 0.000 |
| LnInflation (L1) | 0.128** | 0.05 | 2.25 | 0.028 |
| LnExchange rate (L1) | -0.071*** | 0.02 | -2.73 | 0.008 |
| LnAir transport (L1) | -0.240* | 0.13 | -1.82 | 0.072 |
| Constant | 2.104 | 2.12 | 0.99 | 0.325 |
| LnInflation | | | | |
| LnGDP (L1) | -0.117 | 0.30 | -0.39 | 0.697 |
| LnReceipts (L1) | 0.053** | 0.02 | 2.48 | 0.016 |
| LnArrivals (L1) | -0.627* | 0.34 | -1.84 | 0.070 |
| LnInflation (L1) | 0.158 | 0.12 | 1.31 | 0.193 |
| LnExchange rate (L1) | 0.057 | 0.05 | 1.04 | 0.302 |
| LnAir transport (L1) | 0.274 | 0.27 | 0.98 | 0.329 |
| Constant | 9.367** | 4.48 | 2.09 | 0.040 |
| LnExchange rate | | | | |
| LnGDP (L1) | -0.306 | 0.47 | -0.64 | 0.523 |
| LnReceipts (L1) | 0.017 | 0.03 | 0.52 | 0.604 |
| LnArrivals (L1) | 0.273 | 0.54 | 0.51 | 0.615 |
| LnInflation (L1) | -0.198 | 0.19 | -1.04 | 0.301 |
| LnExchange rate (L1) | 1.026*** | 0.08 | 11.70 | 0.000 |
| LnAir transport (L1) | -0.042 | 0.44 | -0.10 | 0.924 |
| Constant | 3.828 | 7.10 | 0.54 | 0.592 |
| LnAir transport | | | | |
| LnGDP (L1) | 0.380** | 0.15 | 2.52 | 0.014 |
| LnReceipts (L1) | 0.007 | 0.01 | 0.73 | 0.469 |
| LnArrivals (L1) | -0.284 | 0.17 | -1.66 | 0.101 |
| LnInflation (L1) | 0.078 | 0.06 | 1.29 | 0.200 |
| LnExchange rate (L1) | -0.051* | 0.02 | -1.84 | 0.069 |
| LnAir transport (L1) | 0.578*** | 0.13 | 4.13 | 0.000 |
| Constant | -0.219 | 2.25 | -0.10 | 0.923 |

*Source:* Author's calculation, 2018

*Notes:* L1 means lag 1

***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively

Based on results in Table 4.4, we can derive equations for variables as follows:

LnGDP = 2.122 + 1.134LnGDP(-1) + 0.004LnReceipts(-1) – 0.155LnArrivals(-1) + 0.180LnInflation(-1) – 0.050LnExchange rate(-1) – 0.261LnAir transport(-1).

LnReceipts = -0.280 + 0.888LnGDP(-1) + 0.774LnReceipts(-1) – 0.491LnArrivals(-1) + 1.532LnInflation(-1) – 0.328LnExchange rate(-1) – 0.842LnAir transport(-1).

LnArrivals = 2.104 + 0.265LnGDP(-1) + 0.005LnReceipts(-1) + 0.628LnArrivals(-1) + 0.128LnInflation(-1) – 0.071LnExchange rate(-1) – 0.240LnAir transport(-1).

LnInflation = 9.367 - 0.117LnGDP(-1) + 0.053LnReceipts(-1) – 0.627LnArrivals(-1) + 0.158LnInflation(-1) + 0.057LnExchange rate(-1) + 0.274LnAir transport(-1).

LnExchange rate = 3.828 – 0.306LnGDP(-1) + 0.017LnReceipts(-1) + 0.273LnArrivals(-1) – 0.198LnInflation(-1) + 1.026LnExchange rate(-1) – 0.042LnAir transport(-1).

LnAir transport = -0.219 + 0.380LnGDP(-1) + 0.007LnReceipts(-1) – 0.284LnArrivals(-1) + 0.078LnInflation(-1) – 0.051LnExchange rate(-1) + 0.578LnAir transport(-1).

**Testing the Granger Causality**

The Granger causality Wald test is employed to examine the causal relationship between a variable and other variables. In this study, six hypotheses need to be tested as follows:

Testing the relationship between GDP and other variables ($H_1$):

Null hypothesis ($H_0$): GDP does not cause receipts, arrivals, inflation, exchange rate, and air transport

Alternative hypothesis ($H_a$): GDP cause receipts, arrivals, inflation, exchange rate, and air transport

Testing the relationship between receipts and other variables ($H_2$):

Null hypothesis ($H_0$): Receipts does not cause GDP, arrivals, inflation, exchange rate, and air transport

Alternative hypothesis ($H_a$): Receipts causes GDP, arrivals, inflation, exchange rate, and air transport

Testing the relationship between arrivals and other variables ($H_3$):

Null hypothesis ($H_0$): Arrivals does not cause GDP, receipts, inflation, exchange rate, and air transport

Alternative hypothesis ($H_a$): Arrivals causes GDP, receipts, inflation, exchange rate, and air transport

Testing the relationship between inflation and other variables ($H_4$):

Null hypothesis ($H_0$): Inflation does not cause GDP, receipts, arrivals, exchange rate, and air transport

Alternative hypothesis ($H_a$): Inflation causes GDP, receipts, arrivals, exchange rate, and air transport

Testing the relationship between exchange rate and other variables ($H_5$):

Null hypothesis ($H_0$): Exchange rate does not cause GDP, receipts, arrivals, inflation, and air transport

Alternative hypothesis ($H_a$): Exchange rate causes GDP, receipts, arrivals, inflation, and air transport

Testing the relationship between air transport and other variables ($H_6$):

Null hypothesis ($H_0$): Air transport does not cause GDP, receipts, arrivals, inflation, and exchange rate

Alternative hypothesis ($H_a$): Air transport causes GDP, receipts, arrivals, inflation, and exchange rate

**Table 4.5: Results of the Granger Causality Wald test**

| Hypotheses | F-Statistic | Probability |
|---|---|---|
| $H_1$ | 2.915 | 0.018 |
| $H_2$ | 1.968 | 0.093 |
| $H_3$ | 2.860 | 0.020 |
| $H_4$ | 3.855 | 0.003 |
| $H_5$ | 0.578 | 0.716 |
| $H_6$ | 2.279 | 0.055 |

*Source:* Author's calculation, 2018

For the $H_1$, we can reject the null hypothesis because the probability is less than the critical value ($0.018 < 0.05$) and this implies that GDP causes receipts, arrivals, inflation, exchange rate, and air transport. For the $H_2$, we cannot reject the null hypothesis since the probability is greater than the critical value ($0.093 > 0.05$) and this suggests that receipt does not cause GDP, arrivals, inflation, exchange rate, and air transport. For the $H_3$, we can reject the null hypothesis because the probability is less than the critical value ($0.02 < 0.05$) and this implies that arrivals causes GDP, receipts, inflation, exchange rate, and air transport. For the $H_4$, we can reject the null hypothesis because the probability is less than the critical value ($0.003 < 0.05$) and this reflects that inflation causes GDP, receipts, arrivals, exchange rate, and air transport. For the $H_5$, we cannot reject the null hypothesis because the probability is greater than the critical value ($0.716 > 0.05$) and this implies that exchange rate does not cause GDP, receipts, arrivals, inflation, and air transport. For the $H_6$, we cannot reject the null hypothesis because the probability is greater than the critical value ($0.055 > 0.05$) and this implies that air transport does not cause GDP, receipts, arrivals, inflation, and exchange rate (Table 4.5).

Based on results of hypotheses testing, we can conclude that there are directional causalities between GDP, arrivals, and inflation and other variables. By contrast, there are not directional causalities between receipts, exchange rate, and air transport and other variables.

**Examination of Eigenvalue Stability**

The purpose of this assignment is to check stability of the eigenvalues in the VAR model.

**Table 4.6: Eigenvalue stability condition**

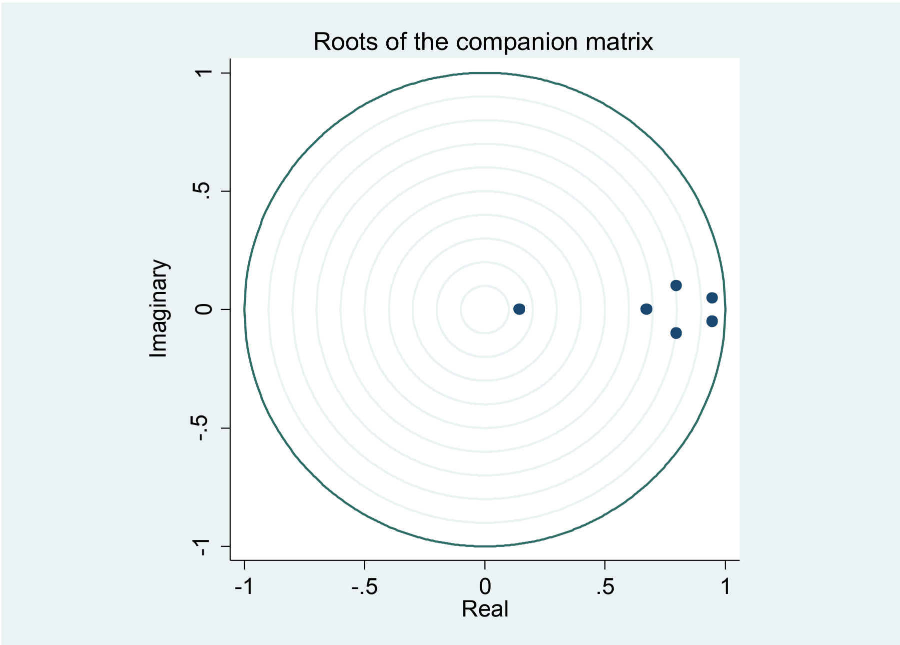
| Eigenvalue | Modulus |
|---|---|
| 0.945 + 0.048 | 0.947 |
| 0.945 – 0.048 | 0.947 |

| | |
|---|---|
| 0.796 + 0.099 | 0.802 |
| 0.796 – 0.099 | 0.802 |
| 0.670 | 0.670 |
| 0.144 | 0.144 |

*Source:* Author's calculation, 2018

All the eigenvalues lie inside the unit circle and we can conclude that the VAR model satisfies stability condition (Table 4.6 and Figure 4.5).

**Figure 4.5: Checking the stability of eigenvalues in the VAR model**




*Source:* Author's calculation, 2018

**Performance of the Johansen co-integration test**

The Johansen co-integration test is performed in order to determine the long-run relationship among variables. The hypothesis to be tested can be identified as follows:

Null hypothesis ($H_0$): There is no co-integration among variables

Alternative hypothesis ($H_a$): There is co-integration among variables

In this study, the Johansen co-integration test is carried out by both trace and max statistic tests. Both trace and max tests are all likelihood-ratio-type tests, which operate under different assumptions in the deterministic part of the data generation process. In some situations, the trace tests tend to have more distorted sizes compared to that of the maximum eigenvalue tests (Lutkepohl *et al*., 2001).

**Table 4.7: Results of trace statistic in the Johansen co-integration test**

| Maximum rank | LL | Eigenvalue | Trace statistic | 5% critical value | 1% critical value |
|---|---|---|---|---|---|
| 0 | -351.04 | | $102.16^{*1}$ | 94.15 | 103.18 |
| 1 | -328.88 | 0.43 | $57.85^{*5}$ | 68.52 | 76.07 |
| 2 | -317.49 | 0.25 | 35.06 | 47.21 | 54.46 |

| | | | | | |
|---|---|---|---|---|---|
| 3 | -309.47 | 0.18 | 19.02 | 29.68 | 35.65 |
| 4 | -303.16 | 0.14 | 6.41 | 15.41 | 20.04 |
| 5 | -300.93 | 0.05 | 1.95 | 3.76 | 6.65 |
| 6 | -299.96 | 0.02 | | | |

*Source:* Author's calculation, 2018

*Notes:* *[1] and *[5] denote the number of co-integrations (ranks) chosen to accept the null hypothesis at 1% and 5% critical values, respectively

**Table 4.8: Results of max statistic in the Johansen co-integration test**

| Maximum rank | LL | Eigenvalue | Max statistic | 5% critical value | 1% critical value |
|---|---|---|---|---|---|
| 0 | -351.04 | | 44.31 | 39.37 | 45.10 |
| 1 | -328.88 | 0.43 | 22.78 | 33.46 | 38.77 |
| 2 | -317.49 | 0.25 | 16.04 | 27.07 | 32.24 |
| 3 | -309.47 | 0.18 | 12.60 | 20.97 | 25.52 |
| 4 | -303.16 | 0.14 | 4.46 | 14.07 | 18.63 |
| 5 | -300.93 | 0.05 | 1.95 | 3.76 | 6.65 |
| 6 | -299.96 | 0.02 | | | |

*Source:* Author's calculation, 2018

Based on results in Table 4.7, we cannot reject the null hypothesis in the rank zero (no co-integration) because trace statistic is less than the 1% critical value (102.16 < 103.18) and this suggests that there is no co-integration among variables. Similarly, we cannot reject the null hypothesis in the rank 1 (one co-integration) because trace statistic is less than the 5% critical value (57.85 < 76.07) and this reflects that there is only one co-integration among variables. Therefore, we can conclude that there is only one co-integration among variables at the 5% critical value.

## Discussion

Based on results of the Granger causality Wald test, we found that there are directional causalities between GDP, arrivals, and inflation and other variables. However, we stated that there are not directional causalities between receipts, exchange rate, and air transport and other variables. These imply that GDP, the number of international tourist arrivals, and inflation rate have causal relationships with other variables in the short-run, while receipts from international tourists, exchange rate, and the number of air transport departures have no causal relationships with other variables. Further, from the results of the Johansen co-integration test, we also found that there is only one co-integration among variables at the 5% critical value. This suggests that there is a causal relationship among variables in the long-run.

Our findings are consistent with conclusions of Kadir and Karim (2012) and Shih and Do (2016) because these studies argued that there is a causal relationship between tourism and economic growth in the long-run. However, Kadir and Karim (2012) and Shih and Do (2016) found that there is a causality between tourism and economic growth in the short-run, while we only found that there is a causal relationship between the number of international tourist arrivals and economic growth, but we also found that there is no causal relationship between receipts from international tourists and economic growth in four developing countries in Southeast Asia. Different results can be interpreted by differences in the scope and the time-series data. For instance, our research examines the relationship between tourism and economic growth in four developing countries in Southeast Asia for the past two decades (1997-2016), while their studies focus on investigating the relationship between tourism and economic growth in the national level using the time-series data under a decade (Kadir and Karim, 2012 in Malaysia, and Shih and Do, 2016 in Viet Nam). Our results in the causal relationship between receipts from international tourists and economic growth are consistent with arguments of Valeriani *et al*. (2017). Indeed, our results in the causal relationship between the number of international tourists and economic growth are similar to conclusions of Rooyen (2018).

## Conclusions and Policy Implications

The article aims to investigate the causal relationship among six variables (GDP, receipts from international tourists, number of international tourist arrivals, inflation rate, exchange rate, and the number of air transport departures) in four developing countries of Southeast Asia for the past two decades (1997-2016) by employing a VAR model. We found that there are directional causalities between GDP, arrivals, and inflation and other variables in the short-run. However, we stated that there are not directional causalities between receipts, exchange rate, and air transport and other variables in the short-run. These imply that GDP, the number of international tourist arrivals, and inflation rate have causal relationships with other variables in the short-run, while receipts from international tourists, exchange rate, and the number of air transport departures have no causal relationships with other variables. Further, from the results of the Johansen co-integration test, we also found that there is only one co-integration among variables at the 5% critical value. This suggests that there is a causal relationship among variables in the long-run.

Policies in both the short-run and long-run should be recommended to governments of these countries in Southeast Asia in order to enhance economic growth and ensure a sustainable development for the tourism. In the short-run, encouragement of international tourist arrivals and maintenance of stable macroeconomics are consistent strategies. In the long-run, it is necessary to diversify and improve the quality of tourist services, implement a flexible exchange rate, and invest more in air transport services. For example, aviation mitigation policies would have a positive relationship with tourism demand in developing countries (Gossling *et al*., 2008). In order to develop tourism, it is necessary to transparent tourist objectives and emerge these goals into national plans with the participation of governments, local communities, and tourism entrepreneurship (Mazumder *et al*., 2013). Finally, implementation of actions in the ASEAN Tourism Strategic Plan, consisting of positioning and branding ASEAN in its markets, networks with multi and bi-lateral international partners, and development and marketing of ASEAN sub-regional destinations (ASEAN, 2017).

## Limitation of the Study and Direction for the Future Research

The research is unable to avoid limitations. The importance of tourism to the economy of each country in Southeast Asia should be specifically analyzed. Further, impacts of tourism on economic growth should be assessed in both the regional and national levels. Therefore, further research should be carried out to fill in these gaps.

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