Chapter 3

Modeling and Analysis of Demand by Malaysian and Japanese Tourists to Thailand

This study focuses on the East Asian tourist group, which consists of the biggest share in the market with 52.63%.

Overall, the number of international tourist arrivals in Thailand rose dramatically with 4.65% growth. This translates from the overall 2007 market of Malaysia with the highest rate (1,540,080), followed by Japan (1,277,638), Korea (1,083,652), and China, which came in fourth (907,117). (Tourism Authority of Thailand, 2007)

Even though Korea remained an important tourism market for Thailand, we still ignored the country as it was not one of the higher market shares nor did it provide one of the majorities of international tourist arrivals in Thailand.

Considering the number of tourist arrivals and Thailand international tourism receipts, it was found that the majority of tourists coming to Thailand are from Malaysia and Japan. This study can be used to compare with American and UK markets for making policy because of the difference in tourist behaviors.

For tourism demand, empirical models of tourism demand have borrowed heavily from consumer theory which predicts that the optimal consumption level depends on the consumer's income level, the prices of goods, the prices of related goods (substitutes and complements goods) and other demand shifters.

For our tourism model we use the number of tourist arrivals as the dependent variable because high frequency expenditure data is unavailable.

This chapter is a revised version from the original paper presented at the Second Conference of the Thailand Econometric Society, Chiang Mai, Thailand in Appendix A.

Abstract

International tourism plays an important role for Thailand in generating income, employment and tax revenues, and in contributing to regional and economic development. Tourism also contributes to the economies of developing countries that are heavily engaged in such tourism activities. For Thailand, careful planning of the tourism sector is critical as capital costs can be very high and investment decisions can have long term consequences. Solving the problems related to the balance of payment is a critical issue for Thailand, as a result of heavy borrowing combined with poor investment decisions. Thus, an understanding of the nature of tourism demand is critical for the formulation of the national tourism development program. It is also important for many underdeveloped countries, where tourism is a significant source of export revenues. Thailand's inbound tourism market is heavily dependent on Asia. In particular, Malaysia and Japan have been and remain the two major sources of Thailand's international visitors. Therefore, a careful analysis of the demand of Malaysian and Japanese tourists is crucial to enhance Thailand's tourism policy. Various time series models will be used to construct univariate and multivariate tourism demand models for Malaysian and Japanese tourists to Thailand.

Keywords: International tourism, Malaysian and Japanese tourists, Univariate and multivariate tourism demand models

3.1 Rational backgrounds and hypotheses of the research

3.1.1 Rational Backgrounds

Tourism is considered as an important sector in several countries. It is one of the major sources of economic development. This has been made possible because of the rapid expansion of international tourism, which is mainly attributed to high growth rates of income in developed and newly industrialized countries. As a labor-intensive industry, it absorbs an increasing percentage of the workforce released from the agricultural and the manufacturing industries, and then prevents large-scale unemployment. Therefore, aside from generating income and alleviating the problems economically, this also creates employment, which also translates in increased income, savings, investment and economic growth (Lim, 1997, 835) (This topic can be referred from topic of rational backgrounds in chapter 1).

3.1.2 Research Questions and Hypotheses

1. How best to estimate elasticity of demand for Malaysian and Japanese tourists in relation to such factors as income, own-price or relative price elasticity of demand compared with British tourists and American tourists

2. How best to measure the reaction and satisfactions of Malaysian and Japanese tourists by considering various factors compared with British tourists and American tourists (i.e. GDP per capita, relative price etc)

3. How best to distinguish behaviors between Malaysian, Japanese, British or American tourists in terms of short haul, medium haul and long haul

Therefore, the hypotheses of the research are set up as:

Hypo 1. Malaysian and Japanese tourists' demands respond spontaneously to changes in GDP per capita compared with UK tourists and American tourists.

Hypo 2. Malaysian and Japanese tourists' demands respond spontaneously to changes in relative price compared with UK tourists and American tourists.

Hypo 3. Malaysian and Japanese tourists' demands respond spontaneously to changes in relative price with the respect to the price level observed in competing countries (Singapore, Indonesia and Philippines) compared with UK tourists and American tourists.

Hypo 4. Malaysian and Japanese tourists' demands respond spontaneously to changes in nominal exchange rate compared with UK tourists and American tourists.

Hypo 5. Malaysian and Japanese tourists' demands respond spontaneously to changes in occupancy rate compared with UK tourists and American tourists.

3.2 Research Methodology and Literature Review

3.2.1 Conceptual Framework

Tourism Demand

Empirical models of tourism demand have borrowed heavily from consumer theory which predicts that the optimal consumption level depends on the consumer's income level, the prices of goods, the prices of related goods (substitutes and complements goods) and other demand shifters.

For our tourism model, we use the number of tourist arrivals as the dependent variable because high frequency expenditure data is unavailable.

The model: the theory of demand suggests that for an individual location, the demand for tourism will be expressed as follows (C. Ouerfelli, 2008, 128-130):

$$\mathbf{N = N\,(GDP, RP, CP, EX, OC, \xi_i)} \tag{3.1}$$

Where

N = Number of Malaysian or Japanese tourist arrivals to Thailand

GDP = GDP per capita of Malaysian and Japanese tourists.

RP = Relative price of tourist goods and services in Thailand compared with the price level of Malaysia and Japan.

$$= \frac{CPI_{thailand}}{CPI_{japan} EX_{japan/thailand}} \text{ and } \frac{CPI_{thailand}}{CPI_{malaysia} EX_{malaysia/thailand}}$$

CP = Relative price of tourist goods and services in Thailand with respect to the price level observed in competing countries (Singapore, Indonesia and Philippines).

$$= \frac{weighted\ CPI_{sing,indo,phillip}}{CPI_{japan} EX_{japan/weighted\ sing,indo,phillip}} \text{ and } \frac{weighted\ CPI_{sing,indo,phillip}}{CPI_{malaysia} EX_{malaysia/weighted\ sing,indo,phillip}}$$

EX = Nominal exchange rate, expressed in terms of the price of Thailand currency in the Malaysian currency unit and the Japanese currency unit.

OC = Occupancy rate of Malaysian and Japanese tourists.

Favorable natural and climate conditions and/or rich cultural heritage do not automatically guarantee the choice of destination. To assure client loyalty, tourism operators must guarantee an adequate infrastructure and most important hospitality.

The Thailand tourist package is essentially composed of accommodation and transport. Hotel capacity or occupancy rate is an important component of the tourist supply. It may affect the potential demand in two ways (i) it reflects the product's quality and expresses the destination's notoriety; and (ii) the quality and the quantity of this variable can be divided by the tourism professionals and managed according to tourist expectation.

ξ_i = other relevant factors pertaining to Thailand.

The following derivatives are expected to apply: income elasticity of demand (ε_{GDP}), own-price elasticity of demand (ε_{PR}), cross-price elasticity of demand (ε_{CP}), nominal exchange rate elasticity of demand (ε_{CP}) and occupancy rate elasticity of demand (ε_{OC}).

Assuming constant elasticity within the empirically relevant range, we may suppose that the functional form is log-linear. We can construct the tourism demand model which comprises demand determinants as follows:

$$NOM = \alpha_0 + \alpha_1 GDPM + \alpha_2 RPM + \alpha_3 CPM + \alpha_4 EXM + \alpha_5 OCM + \varepsilon_M \quad (3.2)$$
$$NOJ = \beta_0 + \beta_1 GDPJ + \beta_2 RPJ + \beta_3 CPJ + \beta_4 EXJ + \beta_5 OCJ + \varepsilon_J \quad (3.3)$$

Including UK and American tourists demand model

$$NOUK = \gamma_0 + \gamma_1 GDPUK + \gamma_2 RPUK + \gamma_3 CPUK + \gamma_4 EXUK + \gamma_5 OCUK + \varepsilon_{UK} \quad (3.4)$$
$$NOUS = \phi_0 + \phi_1 GDPUS + \phi_2 LRPUS + \phi_3 LCPUS + \phi_4 LEXUS + \phi_5 LOCUS + \varepsilon_{US} \quad (3.5)$$

In log-form

$$LNOM = \alpha_0 + \alpha_1 LGDPM + \alpha_2 LRPM + \alpha_3 LCPM + \alpha_4 LEXM + \alpha_5 LOCM + \varepsilon_M \quad (3.6)$$
$$LNOJ = \beta_0 + \beta_1 LGDPJ + \beta_2 LRPJ + \beta_3 LCPJ + \beta_4 LEXJ + \beta_5 LOCJ + \varepsilon_J \quad (3.7)$$
$$LNOUK = \gamma_0 + \gamma_1 LGDPUK + \gamma_2 LRPUK + \gamma_3 LCPUK + \gamma_4 LEXUK + \gamma_5 LOCUK + \varepsilon_{UK} \quad (3.8)$$

$$LNOUS = \phi_0 + \phi_1 LGDPUS + \phi_2 LRPUS + \phi_3 LCPUS + \phi_4 LEXUS + \phi_5 LOCUS + \varepsilon_{US} \quad (3.9)$$

3.2.2 Econometrics Framework

For analyzing the elasticity of demand we use econometrics frameworks as follows:

3.2.2.1 Unit Root Tests

Augmented Dickey and Fuller Tests (ADF)

To test for the long run frequency, Dickey and Fuller (1979) proposed a procedure based on the following auxiliary regression:

$$\Delta y_t = \alpha + \beta t + \delta y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-k} + \varepsilon_t \quad (3.10)$$

where $\Delta y_t = (1-L)$ designates the first different filter, ε_t is the error term and α , β and δ are the parameters to be estimated.

Phillips and Perron Tests

The Phillips-Perron test is a unit root test. It is used in time series analysis to test the null hypothesis that a time series is I (1). It builds on the Dickey-Fuller test, but unlike the Augmented Dickey-Fuller test, which extends the Dickey-Fuller test by including additional lagged variables as regressors in the model on which the test is based, the Phillips-Perron test makes a non-parametric correction to the t-test statistic to capture the effect of autocorrelation present when the underlying autocorrelation process is not AR(1) and the error terms are not homoscedastic.

3.2.2.2 Seasonal Unit Root Test

There are several alternative ways to treat seasonality in a non-stationary sequence.

HEGY tests

The seasonal pattern of a series can change over time. Hence, the series exhibit non-stationary seasonality. A simple model that can describe the variation of the series is the seasonal random walk model given by

$$y_t = y_{t-s} + \varepsilon_t$$

This model assumes s unit roots at seasonal frequencies. The series y_t is then an integrated seasonal process at the correspondent frequency $\omega_j = 2\pi j / s, j = 1,...., s/2,$ noted $I_{\omega_j}(1)$ where s is the number of time periods in a year. If s = 4, then the series has four roots with modulus one: one at a zero frequency, one at π (two cycles per year) and $\pi/2$ (one cycle per year). Evidence of unit roots at seasonal frequencies implies that the stochastic seasonality is non-stationary. Hylleberg, Engle, Granger, and Yoo (1990) proposed a strategy that tests for unit roots in quarterly data (i.e., to deduce the appropriate different operator that must be applied to the series to achieve stationary status)

The test equation for the presence of seasonal unit roots is given by:

$$(1 - L^4)y_t = \pi_1 y_{1t-1} - \pi_2 y_{2t-1} - \pi_3 y_{3t-2} + \pi_4 y_{3t-1} + \mu_t + \varepsilon_t, \quad (3.11)$$

where

$$y_{1t-1} = (1 + L + L^2 + L^3)y_{t-1} = y_{t-1} + y_{t-2} + y_{t-3} + y_{t-4}$$

$$y_{2t-1} = (1 - L + L^2 - L^3)y_{t-1} = y_{t-1} - y_{t-2} + y_{t-3} - y_{t-4}$$

$y_{3t-1} = (1 - L^2)y_{t-1} = y_{t-1} - y_{t-3}$ so that $y_{3t-2} = y_{t-2} - y_{t-4}$

The deterministic component μ_t includes seasonal dummies, a trend and a constant term, and ε_t is a normally and independently distributed error term with a zero mean and constant variance.

Testing for unit roots implies testing the significance of the estimated π_t. Form the t-statistics for the null hypothesis $\pi_1 = 0$; the appropriate critical values are reported in Hylleberg et al. (1990). If you do not reject the hypothesis $\pi_1 = 0$; conclude that $a_1 = 1$ so that there is a nonseasonal unit root. Next form the t-test for the hypothesis $\pi_2 = 0$. If you do not reject the null hypothesis, conclude that $a_2 = 1$ and there is root with a semiannual frequency. Finally, perform the F-test for the hypothesis $\pi_3 = \pi_4 = 0$. If the calculated value less than the critical value reported in Hylleberg et al. (1990) conclude that π_3 and/or π_4 is zero so that there is a seasonal unit root. Be aware that the three null hypotheses are not the alternative; a series may have nonseasonal, semi-annual, and a seasonal unit root.

At the five % significance level, Hylleberg et al. (1990) reports that the critical values using 100 observations are:

Table 3.1 the critical values at the 5% significant level for HEGY test

	$\pi_1 = 0$	$\pi_2 = 0$	$\pi_3 = \pi_4 = 0$
Intercept	-2.88	-1.95	3.08
Intercept plus Seasonal Dummies	-2.95	-2.94	6.57
Intercept plus Seasonal Dummies plus time	-3.53	-2.94	6.60

3.2.2.3 Cointegration analysis and error correction model

To investigate the long-term relationship between economic variables and number of tourist arrivals, cointegration and error correction models will be employed. These models are useful because they provide long-run and short-run estimations for the purpose of long-term tourism planning and short-term business forecasting (Song and Witt, 2000).

The first step in testing cointegration is to ensure that all economic variables have the same order of integration. The order of integration can be tested using the unit root tests and the seasonal unit root tests.

Johansen's (1995) cointegration procedure will be employed in this study. To illustrate the procedure,

For Malaysian tourists, let $Z_t = \begin{bmatrix} LNOM_t \\ LGDPM_t \\ LRPM_t \\ LCPM_t \\ LEXM_t \\ LOCM_t \end{bmatrix}$ and Japanese tourists, let $Z_t = \begin{bmatrix} LNOJ_t \\ LGDPJ_t \\ LRPJ_t \\ LCPJ_t \\ LEXJ_t \\ LOCJ_t \end{bmatrix}$

For UK tourists, let $Z_t = \begin{bmatrix} LNOUK_t \\ LGDUK_t \\ LRPUK_t \\ LCPUK_t \\ LEXUK_t \\ LOCUK_t \end{bmatrix}$ and American tourists, let $Z_t = \begin{bmatrix} LNOUS_t \\ LGDUS_t \\ LRPUS_t \\ LCPUS_t \\ LEXUS_t \\ LOCUS_t \end{bmatrix}$, then,

the vector autoregressive (VAR) can be written as:

$$Z_t = B_1 Z_{t-1} + B_2 Z_{t-2} + \ldots + B_p Z_{t-p} + U_t \tag{3.12}$$

where p =number of lags, B_i = an $(m \times n)$ matrix of parameters, and U_t =error term.

To obtain the error-correction mechanism (ECM), equation (3.12) is transformed as follows:

$$\Delta Z_t = \sum_{i=1}^{p=1} \Phi_i \Delta Z_{t-i} + \Phi Z_{t-p} + U_t \qquad (3.13)$$

where: $\Phi_i = -(I - B_1 - B_2 - ... - B_i)$, and $\Phi = -(I - B_1 - B_2 - ... - B_p)$. Φ_i and Φ are short-run and long-run adjustments to the changes in Z_t, respectively. Equation (3.13) is named as vector error correction model (VECM). The equilibrium relationship can be expressed as:

$$\Phi = \alpha\beta',$$

where α is the speed of adjustment to disequilibrium , and β' is a set of co-integrating vectors. The existence of cointegration relationships can be determined by the rank of Φ, $r \leq (m-1)$. To choose *r*, maximum Eigenvalue and trace tests will be employed.

In the long-run, the co-integrated parameters are expressed as equations (3.6) to (3.9). The signs of the long-run cointegration parameters are expected as follows: $(\alpha_1, \beta_1, \gamma_1, \phi_1) > 0$, $(\alpha_2, \beta_2, \gamma_2, \phi_2) < 0$, $(\alpha_3, \beta_3, \gamma_3, \phi_3 < 0 \ or > 0)$, $(\alpha_4, \beta_4, \gamma_4, \phi_4 < 0)$ and $(\alpha_5, \beta_5, \gamma_5, \phi_5 > 0)$.

3.2.3 Literature Review

In 2002, Mello et al. conducted a study regarding the international model of tourism demand. They used a system of equation model to examine tourism demand during the periods of transition and integration into the wider international community. The Almost Ideal Demand System model (AIDS model) was applied to the UK demand for tourism in the neighboring destinations of France, Spain and

Portugal. The results showed the extent to which the cross-country behavior of demand becomes more or less similar over time with respect to changes in expenditure and effective prices. The expenditure elasticities were greater for Spain than France during the initial period, indicating that tourism could assist countries to 'catch-up' with their richer neighbors. However, this outcome was not always the case and might not persist as Portugal had low initial expenditure elasticity and Spain's relatively high expenditure elasticity decreased over time. Destinations' sensitivity to changes in their own and competitors' prices could also change over time, as indicated by the increases in the own-price and cross-price elasticities for Spain, compared with the decreases for France and Portugal. The cross-price elasticity estimated indicates substitutability between the immediate neighbors, Portugal and Spain, and France and Spain.

Alleyne (2003) suggested that when analyzing tourism demand, account should be taken of the time series property of the data, in particular, seasonal unit roots. He employed the HEGY methodology in modeling the demand for Jamaica's tourism product and compared the results with those obtained from the traditional Box Jenkins methodology in which seasonal unit roots are implicitly assumed. Alleyne (2003) found that pre-testing the data for seasonal unit root and incorporating their effects helps improve forecasting accuracy in the single equation model.

In the case of Thailand, Song and Witt (2003) examined the demand for Thai tourism by seven major origin countries: Australia, Japan, Korea, Singapore, Malaysia, the UK and the USA. The general autoregressive distributed lag model (ADLM) was followed in the construction, estimation, testing and selection of the tourism demand models. The empirical results showed that habit persistence was the most important factor that influences the demand for Thai tourism by residents from all origin countries. The income, own price, cross price and trade volume variables were also found to be significant in the demand models, but the explanatory power of these variables, judged by the number of times they appear in the models, varies from origin to origin. The Asian financial crisis that occurred in late 1997 and early 1998 also appeared to have had a significant impact on tourist arrivals from Singapore, Malaysia, Korea and the UK, but the magnitude and direction of influence are not the same for all models. The models that performed relatively well for each of the origin countries, according to both economic and statistical criteria were selected to generate *ex ante* forecasts for the period up to 2010. The results suggested that Korea, Malaysia and Japan are expected to be the largest tourism generating countries by the end of the forecasting period, while the growth rate of tourist arrivals from Korea to Thailand was likely to be the highest among the seven origin countries.

For Asian countries such as Malaysia, Norlida Hanim Mohd Salleh, Law Siong-Hook, Sridar Ramachandran, Ahmad Shuib and Zaleha Mohd Noor (2008) attempted to estimate the demand for tourism to Malaysia in the long-run and short-run relationship among tourist arrivals and some of the macroeconomic variables. Tourism price, travelling cost, substitute tourism price, income and exchange rate had been selected as the determinants in the long-run as well as the short-run. Besides two dummy variables, namely the 1997 Asian economic crisis and the outbreak of SARS were also included as short-run variables. Here the Asian7 had been chosen since it was the highest market share of tourist arrivals to Malaysia. The ARDL (The autoregressive distributed lag) technique was applied to test the evidence of long-run and short-run relationship between demand for tourism and its determinants. The empirical results showed that there was a cointegration among the variables in all the individual countries of the Asian7. Most of the variables were significant in the tourism demand for Malaysia in the long-run as well as for the short-run granger causality. Furthermore, there were some similarities in terms of the culture and religions among the citizens. These factors might also motivate the citizens to travel irrespective of high tourism price and travelling cost. However, overall, the empirical results were consistent with the economic theory and models passed all the diagnostic tests. Thus, the results from this study can be used as a guide in order to formulate relevant tourism policy for Malaysia.

From details of literature review we can conclude that Mello et al. (2002) studied the AIDS model that was given by

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{x}{p}\right)$$

where w_i = the logarithm of the expenditure share of tourism

$\ln p_j$ = the logarithm of the effective prices of tourism

$\ln\left(\frac{x}{p}\right)$ = the logarithm of the real per capita expenditure of tourism

γ_{ij} = the own-price and cross-price elasticities of demand

β_i = the expenditure elasticity of demand

They studied the elasticity of demand and forecasts using the method of estimation that was the Ordinary Least Square (OLS). OLS is a static analysis, thus it relies heavily on the basic assumptions in the Classical Linear Regression Model (CLRM), especially the assumptions related to the error term. Any violation of the assumptions would result in invalid regression estimation.

In order to overcome this problem the data used in regression analysis should be stationary. If the data is stationary, then the error term should meet all the basic requirements under the CLRM assumptions. However, most tourism demand data shows seasonal activity and such data might exhibit non-stationary trends and seasonality and the issue of stationary data has been ignored by this paper. Estimation based on non-stationary data is flawed. This can lead to a serious problem of spurious regression. The consequence for ignoring data stationarity is that the estimated parameters are unreliable and t-tests and F-tests produce misleading results. Hence, in order to overcome this problem Alleyne (2003) suggested that when analyzing tourism demand account should be taken of the time series property of the data, in particular, seasonal unit roots. He employed the HEGY methodology in tourism demand modeling. He found that pre-testing the data for seasonal unit root and incorporating their effects helps improve a problem of spurious regression and forecasting accuracy.

To overcome this problem the modern econometric methodologies are employed in recent studies on the demand for tourism. After the mid-1990s, most researchers apply the dynamic analysis since the problem of spurious regression. Two of the most popular dynamic methodologies in the field of tourism at the present are the ADLM (The general autoregressive distributed lag model) and the ARDL (The autoregressive distributed lag). Song and Witt (2003) examined the demand for Thai tourism by seven major origin countries using the ADLM and Norlida Hanim Mohd Salleh et al. (2008) which estimated the demand for tourism to Malaysia among tourist arrivals using the ARDL. The ADLM is the error correction method (ECM) while the ARDL is the cointegration method. The ECM method is a dynamical system with the characteristics that the deviation of the current state from its long-run relationship will be fed into its short-run dynamics. The cointegration method shows the long-run equilibrium relationship while accommodating the dynamic short-rum relationship. If the equations under consideration are cointergrated, the regression equations are free from spurious results.

In studies from literature reviews, to overcome the spurious regression and forecasting accuracy problems from the traditional regression, the data used in regression analysis should be stationary otherwise it must be cointegrated. If the data is stationary, then the error term should meet all the basic requirements under the CLRM assumptions. The unit root tests and seasonal unit root tests must be used to test the stationarity of the data. In the study for Malaysian and Japanese tourist demand elasticity analysis and forecasts, we will use the cointegration approach associated with unit root tests and seasonal unit root tests.

3.3 Objectives of this study

The objectives of this study are:

1. To determine the factors that significantly explained the number in flock Malaysian and Japanese tourists visiting Thailand.

2. To estimate an equation of the demand for Malaysian and Japanese tourism. Hence, this is to analyze the different variables that influenced the number of tourist arrivals. It includes other key behavioral decisions, income per capita, the relative price, the relative price with respect to the price level observed in competing countries, nominal exchange rate and occupancy rate in Thailand.

3. To estimate elasticity of the Malaysian and Japanese tourists demand for the formulation of efficient tourism policies.

3.4 Data collection

Based on the above methodology we can divide data collection as follows: we used the secondary data using data for years 1985 to 2007, we obtain 92 observations quarterly for analyzing elasticity of demand. The data used to measure the independent and dependent variables are from the Tourism Authority of Thailand (TAT), the Bank of Thailand (BOT), Immigration Bureau (Police Department) etc.

Note the three important dips in the tourist activity for the periods 1991, 1997 and 2005, respectively. The first period is due to the negative impact of the Gulf war during the period 1991. The second is due to the "Tomyumkung" economics crisis during 1997 where the Asian tourists market seemed to be the most affected. The third period is due to the Tsunami disaster of 2005.

3.5 Unit Root Tests

Based on the above methodology we used the secondary data from 1985 to 2007. Standard unit root test based on the methods of Augmented Dickey-Fuller (1979) and Phillips and Perron (1988) are reported in Table 3.2.

The ADF tests for a unit root are used for logarithmic variable series over the full sample period. Note that the ADF tests of the unit root null hypothesis correspond to the following one-sided test:

$$H_0 : \delta = 0$$

$$H_1 : \delta < 0$$

The ADF test results are confirmed by the Phillip-Perron test and the coefficient is significant at the 5% level. The results of the ADF unit root tests are that when the ADF test statistics are compared with the critical values from the nonstandard Dickey-Fuller distribution, the former for the most of variable series are greater than the critical value at 5% significance level. Thus, the null hypothesis of a unit root is not rejected at the 5% level, implying that the series are non-stationary. By taking first differences of the logarithm of variables, the ADF tests show that the null hypothesis of a unit root is clearly rejected. The ADF statistics for the series are less than the critical value at the 5% significance level. Thus, the first differences of the logarithmic variables are stationary. These empirical results allow the use of this data to estimate elasticity of demand.

Table 3.2 the result of unit root tests

Variable	ADF Without trend		PP Without trend	
	Level	1st difference	Level	1st difference
LNM	-0.7398	-10.2938***	-2.9563	-22.0079***
LGDPM	0.4725	-3.6299***	0.3856	-9.9287***
LRPM	-3.0045**	-8.3155***	-2.8282	-12.8983***
LCPM	-0.9953	-6.8248***	-1.0575	-6.7223***
LEXM	-2.3260	-7.2688***	-2.4453	-7.2182***
LOCM	-3.0526**	-7.7780***	-2.9293**	-10.1874***
LNJ	-2.6299	-5.2665***	-2.7455	-33.2950***
LGDPJ	-2.7398	-5.3504***	-4.1608***	-7.9611***
LRPJ	-2.0486	-10.6838***	-2.3570	-10.8918***
LCPJ	-1.5401	-7.6855***	-1.4941	-7.7672***
LEXJ	-2.7758	-7.4179***	-2.7221	-7.2616***
LOCJ	-4.1995***	-11.5111***	-4.1995***	-13.3012***
LNUK	-1.7106	-5.3459***	-1.4034	-14.8141***
LGDPUK	-5.0878***	-7.6546***	-4.2279***	-8.1004***
LRPUK	-1.5416	-10.6521***	-1.4503	-10.7752***
LCPUK	-1.1264	-6.9986***	-1.02734	-6.9909***
LEXUK	-1.5074	-7.1279***	-1.6432	-6.9268***
LOCUK	-4.1787***	-10.9957***	-4.1797***	-15.4945***
LNUS	-1.3186	-5.2263***	-2.3909	-19.6126***
LGDPUS	-0.9223	-4.3776***	-1.2933	-7.3036***
LRPUS	-1.1383	-9.8437***	-1.1201	-9.8372***
LCPUS	-1.1035	-6.7721***	-1.0025	-6.7626***
LEXUS	-1.4014	-6.4159***	-1.1412	-6.3151***
LOCUS	-3.2041**	-7.6492**	-2.9797**	-16.4149***

Notes:

1. LNM denotes the logarithm of Malaysian tourist arrivals, LGDPM denotes the logarithm of GDP per capita of Malaysian tourists, LRPM denotes the logarithm of relative price of tourist goods and service in Thailand compared with the price level measured of Malaysia, LCPM denotes the logarithm of relative price of tourist goods

and service in Thailand with respect to the price level observed in competing countries compared with the price level measured of Malaysia, LEXM denotes the logarithm of nominal exchange rate expressed in term of the price of Thailand currency in the Malaysia currency, LOCM denotes the logarithm of occupancy rate of Malaysian tourists, LNJ denotes the logarithm of Japanese tourist arrivals, LGDPJ denotes the logarithm of GDP per capita of Japanese tourists, LRPJ denotes the logarithm of relative price of tourist goods and service in Thailand compared with the price level measured of Japan, LCPJ denotes the logarithm of relative price of tourist goods and service in Thailand with respect to the price level observed in competing countries compared with the price level measured of Japan, LEXJ denotes the logarithm of nominal exchange rate expressed in term of the price of Thailand currency in the Japan currency, LOCJ denotes the logarithm of occupancy rate of Japanese tourists, LNUK denotes the logarithm of United Kingdom tourist arrivals, LGDPUK denotes the logarithm of GDP per capita of United Kingdom tourists, LRPUK denotes the logarithm of relative price of tourist goods and service in Thailand compared with the price level measured of United Kingdom, LCPUK denotes the logarithm of relative price of tourist goods and service in Thailand with respect to the price level observed in competing countries compared with the price level measured of United Kingdom, LEXUK denotes the logarithm of nominal exchange rate expressed in terms of the price of Thailand currency in the British currency, LOCUK denotes the logarithm of occupancy rate of United Kingdom tourists, LNUS denotes the logarithm of American tourist arrivals, LGDPUS denotes the logarithm of GDP per capita of American tourists, LRPUS denotes the logarithm of relative price of tourist goods and services in Thailand compared with the price level measured of USA, LCPUS denotes the logarithm of relative price of tourist goods and services in Thailand with respect to the price level observed in competing countries compared with the price level measured of USA, LEXUS denotes the logarithm of nominal exchange rate expressed in term of the price of Thailand currency in the USA currency and LOCUS denotes the logarithm of occupancy rate of American tourists.

2. *** denotes the null hypothesis of a unit root is rejected at the 1% level.

** denotes the null hypothesis of a unit root is rejected at the 5% level.

3.6 Seasonal Unit Roots Test

3.6.1 HEGY tests

The test equation for the presence of seasonal unit roots given by

$$(1-L^4)y_t = \pi_1 y_{1t-1} - \pi_2 y_{2t-1} - \pi_3 y_{3t-2} + \pi_4 y_{3t-1} + \mu_t + \varepsilon_t ,$$

where

$$y_{1t-1} = (1+L+L^2+L^3)y_{t-1} = y_{t-1} + y_{t-2} + y_{t-3} + y_{t-4}$$

$$y_{2t-1} = (1-L+L^2-L^3)y_{t-1} = y_{t-1} - y_{t-2} + y_{t-3} - y_{t-4}$$

$$y_{3t-1} = (1-L^2)y_{t-1} = y_{t-1} - y_{t-3} \text{ So that } y_{3t-2} = y_{t-2} - y_{t-4}$$

The deterministic component μ_t includes seasonal dummies, a trend and a constant term, and ε_t is a normally and independently distributed error term with zero mean and constant variance.

Consider the following regression in each market:

(See Table 3.3) Malaysian tourists market:

$$(1-L^4)y_t = \underset{(0.903)}{9.454} - \underset{(-0.922)}{0.193y_{t-1}} - \underset{(-3.016)}{0.663y_{2t-1}} + \underset{(4.453)}{0.479y_{3t-1}} - \underset{(-2.109)}{0.859y_{3t-2}} + \varepsilon_t$$

where y_t is the logarithm of Malaysian tourist arrivals.

The coefficient on y_{t-1} has t-statistic of -0.922. Given the five % critical value, we cannot reject the null hypothesis of a nonseasonal unit root. The next coefficient on y_{2t-1} has t-statistic of -3.016. Given the five percent critical value, we can reject the null hypothesis of a seasonal unit root test. The sample F-statistic for the null hypothesis that the coefficient on y_{3t-1} and y_{3t-2} jointly equal zero is 12.96. Hence, there are not unit root at the semi-annual and the annual frequency, hence, they are stationary. In the same way the rest determinant factors, they are also nonseasonal unit root. In conclusion, all of the determinant factors are stationary.

Table 3.3 the coefficient of y_t with intercept for Malaysian tourist market

Determinants	Intercept	y_{t-1}	y_{2t-1}	y_{3t-1}	y_{3t-2}
LNO	9.454 (0.903)	-0.193 (-0.922)	-0.663 (-3.016)	0.479 (4.453)	-0.859 (-2.109) (12.968)*
LGDP	6.298 (1.757)	-0.198 (-1.791)	-0.662 (-4.657)	0.466 (4.375)	-0.85 (-3.738) (22.358)*
LRP	0.651 (0.534)	0.065 (0.505)	-0.405 (-2.494)	0.477 (4.355)	-0.384 (-1.360) (10.565)*
LCP	-1.25 (-0.943)	-0.054 (-0.627)	0.540 (-4.627)	0.481 (4.458)	-0.596 (-4.087) (25.54)*
LEX	0.095 (0.079)	-0.013 (-0.108)	-0.494 (-3.043)	0.495 (4.541)	-0.529 (-1.919) (13.44)*
LOC	-0.682 (-1.154)	0.06 (1.076)	-0.418 (-3.349)	0.518 (4.887)	-0.322 (-2.100) (17.32)*

Note: * is F-statistics

(see Table 3.4) Japanese tourists market:

$$(1-L^4)y_t = \underset{(0.923)}{3.13} - \underset{(-0.960)}{0.067 y_{t-1}} - \underset{(-4.936)}{0.540 y_{2t-1}} + \underset{(5.265)}{0.485 y_{3t-1}} - \underset{(-3.936)}{0.630 y_{3t-2}} + \varepsilon_t$$

where y_t is the logarithm of Japanese tourist arrivals.

The coefficient on y_{t-1} has t-statistic of -0.960. Given the five % critical value, we cannot reject the null hypothesis of a nonseasonal unit root. The next coefficient on y_{2t-1} has t-statistic of -4.936. Given the five percent critical value, we can reject the null hypothesis of a seasonal unit root test. The sample F-statistic for the null hypothesis that the coefficient on y_{3t-1} and y_{3t-2} jointly equal zero is 27.568. Hence, there are not unit root at the semi-annual and the annual frequency, hence, they are stationary. In the same way the rest of determinant factors, they are also nonseasonal unit root. In conclusion, all of the determinant factors are stationary.

Table 3.4 the coefficient of y_t with intercept for Japanese tourist market

Determinants	Intercept	y_{t-1}	y_{2t-1}	y_{3t-1}	y_{3t-2}
LNO	3.13 (0.923)	-0.067 (-0.960)	-0.540 (-4.936)	0.485 (5.265)	-0.630 (-3.936) (27.568)*
LGDP	16.75 (0.817)	-0.279 (-0.825)	-0.771 (-2.222)	0.491 (5.319)	-1.051 (-1.545) (16.24)*
LRP	0.298 (2.179)	-0.065 (-2.330)	-0.521 (-5.669)	0.483 (5.324)	-0.562 (-5.701) (47.94)*
LCP	-0.175 (-1.448)	-0.020 (-1.594)	-0.532 (-5.77)	0.468 (5.114)	-0.535 (-5.791) (45.18)*
LEX	-0.008 (-0.132)	-0.005 (-0.526)	-0.515 (-5.329)	0.530 (5.81)	-0.438 (-4.723) (41.05)*
LOC	0.215 (0.714)	-0.025 (-0.792)	-0.529 (-5.627)	0.402 (4.512)	-0.543 (-5.214) (31.12)*

Note: * is F-statistics

(see Table 3.5) UK tourists market:

$$(1-L^4)y_t = \underset{(1.489)}{3.651} - \underset{(-1.538)}{0.084}y_{t-1} - \underset{(-5.667)}{0.573}y_{2t-1} + \underset{(5.031)}{0.457}y_{3t-1} - \underset{(-4.990)}{0.659}y_{3t-2} + \varepsilon_t$$

where y_t is the logarithm of UK tourist arrivals.

The coefficient on y_{t-1} has t-statistic of -1.538. Given the five % critical value, we cannot reject the null hypothesis of a nonseasonal unit root. The next coefficient on y_{2t-1} has t-statistic of -5.667. Given the five percent critical value, we can reject the null hypothesis of a seasonal unit root test. The sample F-statistic for the null hypothesis that the coefficient on y_{3t-1} and y_{3t-2} jointly equal zero is 33.61. Hence, there are not seasonal unit root at the semi-annual and the annual frequency, hence, they are stationary. In the same way the rest of determinant factors, they are also non-seasonal unit root. In conclusion, all of the determinant factors are stationary.

Table 3.5 the coefficient of y_t with intercept for UK tourist market

Determinants	Intercept	y_{t-1}	y_{2t-1}	y_{3t-1}	y_{3t-2}
LNO	3.651 (1.489	-0.084 (-1.538)	-0.573 (-5.667)	0.457 (5.031)	-0.659 (-4.990) (33.61)*
LGDP	3.396 (1.571)	-0.107 (-1.611)	-0.588 (-5.452)	0.481 (5.251)	-0.695 (-4.511) (32.87)*
LRP	-1.24 (1.419)	-0.080 (-1.468)	-0.564 (-5.511)	0.483 (5.263)	-0.645 (-4.747) (34.96)*
LCP	-1.274 (-1.381)	-0.0446 (-1.462)	-0.527 (-5.607)	0.487 (5.294)	-0.573 (-5.439) (43.06)*
LEX	1.603 (1.348)	-0.066 (-1.405)	-0.553 (-5.541)	0.485 (5.286)	-0.617 (-4.903) (39.983)*
LOC	0.190 (1.749)	-0.054 (-1.949)	-0.487 (-5.609)	0.369 (4.296)	-0.509 (-5.723) (34.59)*

Note: * is F-statistics

(see Table 3.6) American tourists market:

$$(1-L^4)y_t = \underset{(9.47)}{5.546} - \underset{(-1.509)}{0.125}y_{t-1} - \underset{(-5.230)}{0.600}y_{2t-1} + \underset{(5.118)}{0.466}y_{3t-1} - \underset{(-4.197)}{0.742}y_{3t-2} + \varepsilon_t$$

where y_t is the logarithm of American tourist arrivals.

The coefficient on y_{t-1} has t-statistic of -1.509. Given the five % critical value, we cannot reject the null hypothesis of a nonseasonal unit root. The next coefficient on y_{2t-1} has t-statistic of -5.230. Given the five percent critical value, we can reject the null hypothesis of a seasonal unit root test. The sample F-statistic for the null hypothesis that the coefficient on y_{3t-1} and y_{3t-2} jointly equal zero is 26.74. Hence, there are not unit root at the semi-annual and the annual frequency, hence, they are stationary. In the same way the rest of determinant factors, they are also nonseasonal unit root. In conclusion, all of the determinant factors are stationary.

Table 3.6 the coefficient of y_t with intercept for American tourist market

Determinants	Intercept	y_{t-1}	y_{2t-1}	y_{3t-1}	y_{3t-2}
LNO	5.546 (5.546)	-0.125 (-1.509)	-0.600 (-5.23)	0.466 (5.118)	-0.742 (-4.197) (26.74)*
LGDP	7.847 (1.715)	-0.194 (-1.739)	-0.672 (-4.926)	0.478 (5.229)	-0.864 (-3.736) (26.44)*
LRP	-0.361 (-0.437)	-0.028 (-0.484)	-0.519 (-4.829)	0.493 (5.324)	-0.557 (-3.76) (27.101)*
LCP	-0.979 (-1.155)	-0.037 (-1.238)	-0.529 (-5.570)	0.488 (5.302)	-0.561 (-5.294) (41.47)*
LEX	0.045 (0.674)	-0.032 (-0.736)	-0.526 (-5.219)	0.497 (5.368)	-0.559 (-4.458) (33.55)*
LOC	0.029 (0.327)	-0.012 (-0.639)	-0.474 (-5.39)	0.353 (4.102)	-0.465 (-5.29) (29.11)*

Note: * is F-statistics

3.7 Modeling the Malaysian and Japanese Tourist Demand

The literature on tourism demand analysis can be divided into two main groups. The first group focuses on the non-causal (mainly time series) modeling approach while the second group is based on causal (econometrics) methods. The forecasting based on non-causal modeling approaches "extrapolates the historic trends into the future without considering the underlying causes of the trend" (e.g. Box-Jenkins ARIMA model and the exponential smoothing method) (Song et. 2003, 437). Causal forecasting models include the factors that influence tourism demand, so that they can be used by decisions made for policy evaluation purposes. Furthermore, the tourist demand model must take into account the time path of the tourist's decision-making process (Song & Witt, 2000, 28).

Regarding the Malaysian tourists demand, the results show the LNOM (logarithm of number of Malaysian tourist arrivals) can be explained by the LGDPM (logarithm of Malaysia's GDP per capita), LGRPM (logarithm of relative price), LCPM (logarithm of relative price with respect to the price level observed in competing countries), LEXM (logarithm of nominal exchange rate) and LOCM (logarithm of Malaysian tourists' occupancy rate):

$$LNOM = \underset{(6.2564)}{5.3013} + \underset{(8.9403)}{0.8949}LGDPM^{*} - \underset{(-1.5124)}{0.5553}LRPM + \underset{(1.6585)}{0.11371}LCPM^{***} - \underset{(-1.3319)}{0.6372}LEXM + \underset{(2.9368)}{0.3208}LOCM^{*}$$

$$R^2 = 0.72 \quad DW = 1.76 \quad AIC = -1.015 \quad BIC = -0.819$$

Note: * = significance at 1% level, ** = significance at 5% level, *** = significance at 10% level, respectively

Malaysian tourists are 'short-haul' tourists. From the Malaysian tourism demand model, there are three positive and significant determinant factors. Firstly, it is found that LGDPM is positive and significant. Its value is 0.89. Secondly, LCPM is positive and significant. Thirdly, LOCM is also positive and significant.

Regarding the Japanese tourists demand is estimated as follows:

$$LNOJ = \underset{(-2.7516)}{-10.0895} + \underset{(5.9312)}{1.3919 LGDPJ^{*}} + \underset{(4.5612)}{0.8552 LRPJ^{*}} \underset{(-1.5587)}{-0.1775 LCPJ} + \underset{(3.2042)}{0.9449 LEXJ^{*}} + \underset{(5.2986)}{0.5078 LOCJ^{*}}$$

$$R^2 = 0.90 \quad DW = 2.22 \quad AIC = -1.015 \quad BIC = -0.473$$

Japanese tourists are ‘medium-haul’ tourists. From Japanese tourism demand model, there are four positive and significant determinant factors. Firstly, it is found that LGDPJ is positive and significant, its value is 1.39. Secondly, LRPJ is positive and significant. Thirdly, LEXJ is positive and significant. Fourthly, LOCJ is also positive and significant.

British tourists demand is estimated as follows:

$$LNOU = \underset{(-3.7589)}{-2.8414} + \underset{(13.6770)}{1.6647 LGDPU^{*}} - \underset{(-0.4892)}{0.1493 LRPU} \underset{(-1.4764)}{-0.1408 LCPU} - \underset{(-1.0244)}{0.3844 LEXU} + \underset{(5.7408)}{0.4685 LOCU^{*}}$$

$$R^2 = 0.95 \quad DW = 1.69 \quad AIC = -0.978 \quad BIC = -0.8133$$

British tourists are ‘long-haul’ tourists. From the UK tourist demand model, there are two positive and significant determinant factors. Firstly, it is found that LGDPU is positive and significant. Its value is 1.67. Secondly, LOCU is also positive and significant.

The last demand model is the American tourist demand, which is estimated as follows:

$$LNOUS = \underset{(-2.5483)}{-3.4828} + \underset{(9.4093)}{1.378 LGDPUS^{*}} - \underset{(-0.1758)}{0.0585 LRPUS} \underset{(-2.3730)}{-0.2302 LCPUS^{**}} - \underset{(-1.3300)}{0.5021 LEXUS} + \underset{(5.2236)}{0.3994 LOCU^{*}}$$

$$R^2 = 0.90 \quad DW = 1.75 \quad AIC = -1.067 \quad BIC = -0.903$$

American tourists are also ‘long-haul’ tourists. From the American tourist demand model, there are three significant determinant factors. Firstly, it is found that

LGDPUS is positive and significant. Its value is 1.38. Secondly, LCPUS is negative and significant. It is found that American tourism is complementary. Thirdly, LOCUS is also positive and significant.

From these above models, we will see that non-stationary variables are used I (0). When we use the OLS method in tourism demand model estimation, they will hold spurious results. Hence, the error correction representations offer an alternative approach to modeling integrated data. They associate two kinds of variables: the co-integrated non-stationary variables and the other stationary variables and (or) the exogenous variables. These methods will be presented in 3.8.

3.8 Empirical results of Cointegration and Error Correction Model

Prior to conducting the cointegration analysis, it is important to determine the order of integration of all economics variables. ADF test statistics and PP test statistics in Table 3.2 show all variables become I (0) after taking the first difference, In other words, the results of ADF and PP test imply that the first difference of all variables have the same order of integration.

Johansen's cointegration analysis can be carried out using EVIEWS 5.1. The initial step is to specify a lag length for VAR model. Base on test statistics for selecting the order of VAR model, this study chooses two or VAR (2) model.

To determine *r* or the number of cointegrating vectors, trace tests and maximal eigenvalue are carried out (Table 3.7 to Table 3.14). For cointegrating vectors of Malaysian tourists, the Johansen test statistics show rejection for the null hypothesis of no cointegrating vectors under both the trace and maximal eigenvalue forms of the test. In the case of the trace test, the null of no cointegrating vectors is rejected since the test statistic of 140.05 is greater than the 5% critical value of 95.75. Moving on the test the null of at most one cointegrating vector, the trace statistic is 84.33, while the 5% critical value is 69.82, so the null hypothesis is just rejected at 5%. Finally, examining the null hypothesis that there are at most two cointegrating vectors, the trace statistic is now well below the 5% critical value, suggesting that the null hypothesis should not be rejected, so there are two cointegrating vectors. In the case of the maximal eigenvalue test, we can explain in the same way of the trace test. Finally, we can conclude that there are two cointegrating vectors. From the results of both tests, this paper chooses $r = 2$.

Table 3.7 Trace tests for cointegrating vectors of Malaysian tourists

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.576	140.052	95.754	0.000
At most 1 *	0.496	84.332	69.819	0.002
At most 2	0.276	39.796	47.856	0.230
At most 3	0.156	18.768	29.797	0.510
At most 4	0.107	7.742	15.495	0.493
At most 5	0.006	0.407	3.841	0.523

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

Table 3.8 Maximum Eigenvalue tests for Malaysian tourists

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.576	55.720	40.078	0.000
At most 1 *	0.496	44.537	33.877	0.002
At most 2	0.276	21.031	27.584	0.274
At most 3	0.156	11.023	21.132	0.645
At most 4	0.107	7.335	14.265	0.450
At most 5	0.006	0.407	3.841	0.523

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

For cointegrating vectors of Japanese tourists, the Johansen test statistics show rejection for the null hypothesis of no cointegrating vectors under both the trace and maximal eigenvalue forms of the test. In the case of the trace test, the null of no cointegrating vectors is rejected since the test statistic of 132.72 is greater than the 5% critical value of 95.75. Moving on the test the null of at most one cointegrating vectors, the trace statistic is 83.72, while the 5% critical value is 69.82, so the null hypothesis is just rejected at 5%. Finally, examining the null hypothesis that there are at most two cointegrating vectors, the trace statistic is now greater than the 5% critical value, suggesting that the null hypothesis should be rejected, so there are three cointegrating vectors. In the case of the maximal eigenvalue test, we can explain in the same way of the trace test. Finally, we can conclude that there are two cointegrating vectors.

From the results of both tests, this paper chooses $r = 2$ because, according to Seddighi and Shearing (1997), the maximal eigenvalue test have greater power than the trace test.

Table 3.9 Trace tests for cointegrating vectors of Japanese tourists

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.423	132.720	95.754	0.000
At most 1 *	0.330	83.719	69.819	0.003
At most 2 *	0.254	48.072	47.856	0.048
At most 3	0.127	21.957	29.797	0.301
At most 4	0.074	9.858	15.494	0.292
At most 5	0.034	3.048	3.841	0.081

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

Table 3.10 Maximum Eigenvalue tests for Japanese tourists

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.423	49.001	40.07757	0.004
At most 1 *	0.330	35.647	33.87687	0.030
At most 2	0.254	26.116	27.58434	0.076
At most 3	0.127	12.099	21.13162	0.538
At most 4	0.074	6.810	14.26460	0.512
At most 5	0.034	3.048	3.841466	0.081

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

For cointegrating vectors of UK tourists, the Johansen test statistics show rejection for the null hypothesis of no cointegrating vectors under both the trace and maximal eigenvalue forms of the test. In the case of the trace test, the null of no cointegrating vectors is rejected since the test statistic of 131.26 is greater than the 5% critical value of 95.75. Moving on the test the null of at most 1 cointegrating vectors, the trace statistic is 88.24, while the 5% critical value is 69.82, so the null hypothesis is just rejected at 5%. Finally, examining the null hypothesis that there are at most 2 cointegrating vectors, the trace statistic is now greater than the 5% critical value, suggesting that the null hypothesis should be rejected, so there are three cointegrating vectors. In the case of the maximal eigenvalue test, we can explain in the same way of the trace test. Finally, we can conclude that there are two cointegrating vectors.

From the results of both tests**,** this paper chooses r = 2 because, according to Seddighi and Shearing (1997), the maximal eigenvalue test have greater power than the trace test.

Table 3.11 Trace tests for cointegrating vectors of UK tourists

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.383	131.264	95.754	0.000
At most 1 *	0.339	88.236	69.819	0.001
At most 2 *	0.216	51.411	47.856	0.022
At most 3	0.165	29.762	29.797	0.051
At most 4	0.095	13.762	15.495	0.090
At most 5 *	0.053	4.865	3.841	0.027

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

Table 3.12 Maximum Eigenvalue tests for UK tourists

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.383	43.028	40.078	0.023
At most 1 *	0.339	36.824	33.877	0.022
At most 2	0.216	21.649	27.584	0.239
At most 3	0.165	16.000	21.132	0.225
At most 4	0.095	8.897	14.265	0.295
At most 5 *	0.053	4.865	3.841	0.027

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

For cointegrating vectors of American tourists, the Johansen test statistics show rejection for the null hypothesis of no cointegrating vectors under both the trace and maximal eigenvalue forms of the test. In the case of the trace test, the null of no cointegrating vectors is rejected since the test statistic of 141.43 is greater than the 5% critical value of 95.75. Moving on the test the null of at most one cointegrating vectors, the trace statistic is 61.34, while the 5% critical value is 69.82, so the null hypothesis should not be rejected at 5%, so there are one cointegrating vectors. In the case of the maximal eigenvalue test, we can explain in the same way of the trace test. Finally, we can conclude that there are one cointegrating vectors. Hence, from the results of both tests, this paper chooses $r = 1$.

Table 3.13 Trace tests for cointegrating vectors of American tourists

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.593	141.426	95.754	0.000
At most 1	0.301	61.335	69.819	0.197
At most 2	0.165	29.515	47.856	0.743
At most 3	0.092	13.453	29.797	0.870
At most 4	0.050	4.863	15.495	0.823
At most 5	0.003	0.294	3.841	0.588

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Table 3.14 Maximum Eigenvalue tests for American tourists

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.593	80.091	40.078	0.000
At most 1	0.301	31.821	33.877	0.086
At most 2	0.165	16.062	27.584	0.661
At most 3	0.092	8.591	21.132	0.864
At most 4	0.050	4.569	14.265	0.795
At most 5	0.003	0.294	3.841	0.588

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

For the error correction terms, the diagnostic tests reveal that the error-correction model is correctly specified. Base on the test results in Table 3.15, the residual of the model does not have problems of non-normality, serial correlation and heteroscedasticity.

The results of the error correction model for Malaysia, Japan, UK and USA are presented in Table 3.15. The results indicate that growth in GDP per capita in origin countries has a positive impact on number of tourist arrivals in the short run; however, this result is significant in the case of tourists from the Malaysia and Japan ($\Delta LGDP(-2)$). Furthermore, the relative price variable has a negative impact on number of tourist arrivals in the short run, except the result in the case of American tourists which it has positive impact ($\Delta LRP(-2)$**).** However, this result is significant in the case of visitors from Japan, UK and USA.

Table 3.15 Error correction model

Variable	Coefficient			
	Malaysia	Japan	UK	USA
Coint.(ECM(-1))	-0.275*** (-3.020)	-0.735*** (-4.399)	-0.079* (-1.297)	-1.802*** (-8.777)
$\Delta LNO(-1)$	-0.361*** (-2.612)	-0.287** (-1.713)	-0.084 (-1.233)	0.741*** (4.785)
$\Delta LNO(-2)$	-0.305** (-2.270)	0.247** (2.055)	-0.868*** (-12.482)	0.168* (1.482)
$\Delta LGDP(-1)$	0.635 (1.006)	8.415*** (4.022)	1.369 (0.082)	-3.948* (-1.520)
$\Delta LGDP(-2)$	1.530*** (2.718)	3.787** (1.738)	0.631 (0.398)	1.908 (0.753)
$\Delta LRP(-1)$	-0.266 (-0.533)	-0.739** (-1.669)	0.334 (1.255)	0.928*** (3.120)
$\Delta LRP(-2)$	-0.259 (-0.533)	-0.697** (-1.683)	-1.100*** (-4.353)	0.540** (1.971)
$\Delta LCP(-1)$	-0.306** (-1.675)	0.206 (1.250)	0.050 (0.513)	-0.335*** (-2.515)
$\Delta LCP(-2)$	-0.305* (-1.523)	0.188 (1.233)	0.105 (1.226)	-0.262*** (-2.515)
$\Delta LEX(-1)$	-0.739 (-0.903)	0.494 (0.909)	-0.274 (-0.752)	0.571* (1.468)
$\Delta LEX(-2)$	-0.757 (0.889)	0.007 (0.013)	0.980*** (2.801)	-0.128 (-0.291)
$\Delta LOC(-1)$	0.219 (1.027)	0.054 (0.368)	0.103 (1.238)	-0.140 (-1.175)
$\Delta LOC(-2)$	0.184 (1.003)	-0.397*** (-2.841)	0.141*** (1.723)	-0.188*** (-1.779)
Intercept	-0.001 (-0.032)	-0.030 (-1.23)	0.017 (0.538)	0.033 (0.902)
Goodness of fit				
R^2	0.64	0.67	0.83	0.74
Diagnostic tests				
Serial correlation ($\chi^2_{(2)}$)	31.414 *p*=0.686	48.029 *p*=0.087	38.822 *p*=0.3437	41.267 *p*=0.251
Normality ($\chi^2_{(2)}$)	3.985 *p*=0.136	3.323 *p*=0.190	1.309 *p*=0.520	0.656 *p*=0.721
Heteroscedasticity ($\chi^2_{(26)}$)	34.254 *p*=0.129	19.460 *p*=0.8164	29.351 *p*=0.207	21.703 *p*=0.705

Note:

*** denotes the null hypothesis of a unit root is rejected at the 1% level.

** denotes the null hypothesis of a unit root is rejected at the 5% level.

* denotes the null hypothesis of a unit root is rejected at the 10% level.

Table 3.16 Long-run coefficients for tourism demand (Cointegrating vector 1)

Variable	Coefficients			
	Malaysia	Japan	UK	USA
LGDP	0.474** (2.056)	1.679*** (7.197)	1.789*** (7.644)	1.124*** (13.357)
LRP	-4.235*** (-3.481)	1.043*** (3.404)	2.295*** (3.041)	-0.905*** (-5.047)
LCP	-0.042 (-0.291)	-0.108 (-1.191)	-0.117 (-0.453)	0.317*** (5.986)
LEX	0.609 (0.453)	-0.073 (-0.259)	-2.486*** (-3.576)	0.440** (1.818)
LOC	0.735*** (2.856)	0.232** (2.132)	1.116*** (6.580)	0.193*** (4.752)
Intercept	-9.540	-12.004	-2.571	-1.122

Note:

*** denotes the null hypothesis of a unit root is rejected at the 1% level.

** denotes the null hypothesis of a unit root is rejected at the 5% level.

* denotes the null hypothesis of a unit root is rejected at the 10% level.

Table 3.17 Long-run coefficients for tourism demand (Cointegrating vector 2)

Variable	Coefficients			
	Malaysia	**Japan**	**UK**	**USA**
LGDP	0.168 (0.875)	1.653*** (7.108)	1.628*** (9.912)	-
LRP	-3.037*** (-3.040)	1.041*** (3.406)	1.071** (2.026)	-
LCP	-0.021 (-0.175)	-0.124* (-1.357)	0.137 (0.754)	-
LEX	0.082 (0.074)	-0.017 (-0.057)	-1.667*** (-3.427)	-
LOC	0.562*** (2.657)	0.227** (2.089)	0.841*** (7.048)	-
Intercept	-8.292	-11.488	-1.375	-

Note:

*** denotes the null hypothesis of a unit root is rejected at the 1% level.

** denotes the null hypothesis of a unit root is rejected at the 5% level.

* denotes the null hypothesis of a unit root is rejected at the 10% level.

The empirical results of the long-run tourism demand model for Thailand's four main tourist source countries, obtained by normalizing on tourist arrivals, are presented in Table 3.16-3.17. The signs of long-run coefficients for variables LGDP, LRP and LOC of Malaysian tourists are consistent and significant with the economic theory. In the long-run, a 1% increases in Malaysian tourists' GDP per capita will lead to an increase in number of tourist arrivals up to 0.47%. It is inelastic demand. On the other hand, a 1% rises in the relative price or price of tourism goods and services, the number of tourist arrivals will decrease by 4.24%. Finally, a 1% increases in the accommodation capacity will lead to an increase in number of tourist arrivals up to 0.73%.

The signs of long-run coefficients for variables LGDP, LOC of Japanese tourists are consistent and significant with the economic theory. In the long-run, a 1% increases in Japanese tourists' GDP per capita will lead to an increase in number of tourist arrivals up to 1.68%. It is elastic demand. Moreover, a 1% increases in the accommodation capacity will lead to an increase in number of tourist arrivals up to 0.23%. However, the relationship between number of tourist arrivals and relative price (LRP) does not support economic theory. The figures in Table 3.16-3.17 show that the coefficients of LRP range between 1.041 and 1.043, indicating that a rise in relative price increase the number of tourist arrivals. One of the possible explanations is that, even if the price of tourism goods and services in Thailand increases in the long-run, Japanese tourists will likely choose to travel to Thailand because the relative price is cheaper than for them.

The signs of long-run coefficients for variables LGDP, LEX and LOC of UK tourists are consistent and significant with the economic theory. In the long-run, a 1% increases in UK tourists' GDP per capita will lead to an increase in number of tourist arrivals up to 1.79%. It is elastic demand. On the other hand, a 1% rises in the nominal exchange rate, the number of tourist arrivals will decrease by 2.49%. Finally, a 1% increases in the accommodation capacity will lead to an increase in number of tourist arrivals up to 1.12%. However, the relationship between number of tourist arrivals and the relative price (LRP) does not support economic theory. The figures in Table 3.16-3.17 show that the coefficients of LRP range between 1.07 and 2.30, indicating that a rise in the relative price increase the number of tourist arrivals. We can explain in the same way of Japanese tourists.

The signs of long-run coefficients for all variables of American tourists are consistent and significant with the economic theory. In the long-run, a 1% increases in American tourists' GDP per capita will lead to an increase in number of tourist arrivals up to 1.12%. It is elastic demand. On the other hand, a 1% rises in the relative price, the number of tourist arrivals will decrease by 0.91%. In addition, a 1% increases in LCP will lead to an increase in number of tourist arrivals up to 0.32%. It means that American tourism is substitute. In the case of LEX, a 1% increases in the nominal exchange rate will lead to an increase in number of tourist arrivals up to 0.44%. Finally, a 1% increases in the accommodation capacity will lead to an increase in number of tourist arrivals up to 0.19%.

The results imply that in the long-run, when we consider from income elasticity of demand, it was found that short haul tourism is inelastic demand but medium haul and long haul tourism are elastic demand. Furthermore, when we consider from the elasticity of the price, it was found that short haul tourism is more sensitive in prices than medium and long haul tourism.

3.9 Conclusion

Quarterly numbers of international tourist arrivals to Thailand are analyzed for the period 1985-2007. The main purpose is to analyze and compare the elasticity of demand among major tourists of Thailand such as Malaysian tourists and Japanese tourists including UK tourists and American tourists.

That is we can divided the tourists into 3 groups (1) short haul such as Malaysian tourists (2) medium haul such as Japanese tourists (3) long haul such as UK tourists and American tourists.

This paper has carried out error correction model and Johansen's cointegration analysis to examine the short and long run relationships between number of tourist arrivals in Thailand and its economic determinants.

The study discovered several distinctive results.

First, the results demonstrated that growth in GDP per capita in origin countries has a positive impact on number of tourist arrivals in the short run; however, this result is significant in the case of visitors from the Malaysia and Japan. Furthermore, the relative price variable has a negative impact on number of tourist arrivals in the short run, except the result in the case of American tourists which it has positive impact**.** However, this result is significant in the case of visitors from Japan, UK and USA.

Second, a 1% increase in GDP per capita in the long-run in Malaysia, Japan UK and the USA leads to an increase in number of tourist arrivals from these countries in Thailand of 0.47%, 1.68%, 1.79% and 1.12%, respectively. This result is consistent and significant with economic theory and it demonstrated that Malaysian tourism is inelastic demand but Japanese, UK and American tourism are elastic demand.

Third, the relative prices are an important determinant of tourism demand. The changes in the relative prices can significantly affect the demand for number of tourist arrivals in the long run. This study also found that an increase in the relative prices can lead to a decrease in the demand for Malaysia and America but an increase in the relative prices can lead to increase in the demand for Japan and the UK. One of the possible explanations is that, even if the price of tourism goods and services in Thailand increases in the long-run, Japanese and UK tourists will likely choose to travel to Thailand because the relative prices are cheaper than for them.

Fourth, changes in the substitute prices (LCP) can significantly affect the demand for only USA, a 1% increase in the substitute prices in the long-run leads to an increase in the number of tourist arrivals in Thailand of 0.32%. Therefore, the American tourism is substitute. On the other hand, changes in the nominal exchange rate can significantly affect the demand for UK and USA, a 1% increase in the nominal exchange rate leads to the number of UK tourist arrivals will decrease by 2.49%. In the case of USA, a 1% rises in the nominal exchange rate, and the number of American tourist arrivals will increase by 0.44%. Finally, a 1% increase in the occupancy rate in the long run in Malaysia, Japan, UK and USA leads to an increase in the number of tourist arrivals from these countries in Thailand of 0.74%, 0.23%, 1.12% and 0.19%, respectively.

Fifth, the results imply that in the long-run, when we consider from income elasticity of demand, it was found that short haul tourism is inelastic demand but medium haul and long haul tourism are elastic demand. Furthermore, when we consider from the elasticity of the price, it was found that short haul tourism is more sensitive in prices than medium and long haul tourism.

Overall, the diagnostic tests certified that there are no serial correlation, non-normality and heteroscedasticity issues in the residual of the error correction model. In other words, the tourism demand model, which is proposed in this paper, is correctly specified. Given the fact, the model can be employed by tourism stakeholders to plan pricing policies and marketing strategies for promoting tourism.