Modelling the Demand for Malaysia's Inbound Tourism

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Abstract

This study estimates the tourism demand model for Malaysia using the Pedroni cointegration approach. Unlike the earlier studies, we incorporate new control variables – pollution, crime rates and educational quality into the tourism demand model for Malaysia. We find that tourist arrivals are sensitive to income, price of tourism, pollution, crime rate and educational quality in Malaysia. Income and educational quality have a positive effect on tourism demand, while increase in the price of tourism, pollution and crime rates will reduce international tourist arrivals to Malaysia. In order to attract international tourists to Malaysia, appropriate tourism marketing policies should be formulated based upon the findings of the present study.

Keyword: Malaysia; Pedroni cointegration; Tourism demand, JEL Classification: C33; L83; Q54
Introduction

Tourism is one of the potential growth industries in the world and many empirical studies have also confirmed that tourism is an important source of economic growth (e.g. Lean and Tang, 2010; Tang and Abosedra, 2012). Given the fact that tourism is a catalyst of growth, it is imperative to investigate the factors that influence the demand for tourism. Investigating the key factors that influence the demand for tourism is essential for policymakers to implement effective tourism marketing policies because business and management policies failures are quite often due to the failure to understand the market demand (Song, Witt and Li, 2009). Without knowing the key determinants of tourism demand, wrong policies may be formulated which in turn could waste resources and impede the process of economic growth and development of a country. Owing to the need for modelling the demand for tourism, many empirical studies have been dedicated to the topic (Crouch, 1994a, 1994b; Johnson and Ashworth, 1990; Lim, 1997). However, earlier empirical studies on tourism demand have mainly focused on the developed and developing countries in the western region. Not much emphasis has been given to developing countries in Asia such as Malaysia.

Among the Asian countries, Malaysia is one of the famous tourist visiting destinations. In 2005, Malaysia has been ranked as the second most visited destination in Asia (Zain, 2005). Tourism is also the second largest foreign exchange earner for Malaysia since 2000. Therefore, Malaysia could be a good case study of international inbound tourism demand. Nevertheless, only seven studies have empirically investigated the inbound tourism demand in Malaysia. Among them are Hanafiah and Harun (2010), Salleh et al. (2010), Kadir and Karim (2009), Habibi et al. (2009), Salleh et al. (2008), Kadir, Abdullah and Nayan (2008), and Salleh, Othman and Ramachandran (2007). None of these studies have considered the impact of crime, environmental pollution and the quality of research and education on the demand for tourism in Malaysia. According to Tang (2009), crime rates in Malaysia increased drastically from approximately 30 thousand criminal cases in 1970 to approximately 200 thousand criminal cases in 2006. Tang (2010a) maintained that crime is a source of insecurity and discomfort in every society, thus the high crime rate in Malaysia implies the poor level of public safety and security. Garofalo (1979) explained that fear is not merely generated from the experience of crime, but also the media presentations of crime. Therefore, increase in the crime rate will reduce the demand for tourism because generally tourists fear of crimes. Sönmez and Graefe (1998) and Brunt, Mawby and Hambly (2000)
also revealed that tourists are more likely to choose a less risky destination for travel because the safety and security of tourists is a pre-requisite condition for the choice of visiting destinations. Furthermore, Pizam (1999) stressed that when it concerns the issue of safety tourists are willing to cancel or to postpone travels to a particular destination or choose alternative travel destinations that involve less risk (see also Ryan, 1993).

Apart from that, Gartner (1996), Aga (2011) and Massidda and Etzo (2012) revealed that the choice of travel destination is also very sensitive to the quality of environment and education in the visiting destination. Bigano, Hamilton and Tol (2006), Hamilton and Lau (2005) and Maddison (2001) stated that environment is one of the main factors that affects tourists’ decision on where to go and when to go. Smith (1993) mentioned that weather such as rain, strong winds, severe thunderstorms, floods and air temperature will influence tourists’ comfort, health and safety (see also Greenough et al., 2001). Mazzarol and Soutar (2002) discovered that reputation and the quality of education is the first criterion to travel abroad for study. In the context of Malaysia, Lam, Ariffin and Ahmad (2011) also found that academic and research quality of an institution is the most promising factor to attract international students. Therefore, the quality of research and education could be a very important determinant of tourism demand at least to attract international students and researchers to either study, attend conferences or to engage in research collaborations. From our literature survey, the past tourism demand studies related to Malaysia have not taken into consideration these important factors. Hence, the estimation results of the earlier studies in Malaysia are incomplete and less informative owing to the omission of important variables that affect the demand for tourism.

Motivated by this consideration, this paper involves re-estimating the inbound tourism demand model for the Malaysian economy for the period from 1989 to 2010. The novelties of this study are: first, unlike the earlier studies on Malaysia, we incorporate environmental pollution, crime rate and the quality of research and education as new explanatory variables into the model to explain the behaviour of inbound tourism demand in Malaysia. In doing so, our estimation model not only allows us to examine the effects of economic variables but also the effects of environmental pollution, crime and the quality of research and education on the demand for tourism in Malaysia. This is also in line with the effort to promote Malaysia as a hub of educational excellence in the Asia-Pacific region, particularly for the tertiary education and research collaboration (Arokiasamy, 2011). Based upon the findings of this study, more effective and comprehensive macroeconomic policies could be suggested to
attract more genuine tourists to Malaysia which may eventually enhance the speed of Malaysia’s economic growth and development.

Second, the past Malaysian studies on tourism demand are often based upon time series data. Unfortunately, the standard time series unit root and cointegration tests are likely to be low power and distorted, especially when the data span is short. To overcome this problem, we investigate the behaviour of inbound tourism demand in Malaysia through the non-stationary panel approaches. Specifically, this study employs the panel unit root tests proposed by Im, Pesaran and Shin (2003) and Maddala and Wu (1999) as well as the panel cointegration tests developed by Pedroni (1999, 2004). One of the advantages of using panel data approach is that it can improve the power of unit root and cointegration tests because of accommodating the cross-sectional into the time series dimension to form the panel dataset. Therefore, estimation results of this study would be more reliable and efficient owing to the tremendous increase in the degree of freedom. According to Tang (2011) and Tang and Tan (2013), not all tourist arrivals contribute to economic growth. They found that among 12 major tourism markets to Malaysia, only 8 of them (i.e. tourist arrivals from Australia, Germany, Japan, Singapore, Taiwan, Thailand, the United Kingdom, and the United States) show strong and stable evidence to support the tourism-led growth (TLG) hypothesis, whereas 4 of them (i.e. tourist arrivals from Brunei, China, Indonesia, and Korea) show either weak or no evidence to support the TLG hypothesis in Malaysia. Following their thought, we further divide our analysis into two major groups. The first sub-group of analysis will focus on balance panel data of 8 tourism markets that strongly support the TLG hypothesis (hereafter TLG markets), while the second sub-group of analysis will focus on balance panel data of 4 tourism markets that are less likely to support the TLG hypothesis (hereafter non-TLG markets). By doing so, comparisons between markets could be done and more effective policy recommendations to attract genuine tourists could also be suggested based upon the findings of the present study.

The remainder of this paper is structured as follows. The next section will provide a discussion of the empirical model and the source of data. The econometric techniques used in this study will be discussed in Section 3. Section 4 will provide the discussion of the empirical results of this study. Finally, the concluding remarks and policy recommendations will appear in Section 5.
EMPIRICAL MODEL AND DATA SOURCE

1. Empirical model

Modelling the demand for tourism is definitely not an easy task, but it has significant contribution to policymakers in formulating appropriate tourism policies. According to the literature, empirical models for tourism demand vary among researchers. Following the theory of consumer behaviour and the existing tourism demand literature, we propose the following inbound tourism demand model for the Malaysian economy.

\[
V_{MAL_{jt}} = f\left( GDP_{jt}, RP_{MAL_{jt}}, POL_{MAL_{jt}}, CR_{MAL_{jt}}, EDU_{MAL_{jt}}, DUM_{jt} \right)
\]  

where \( V_{MAL_{jt}} \) is the per capita tourist arrivals from origin country \( j \) to Malaysia. \( GDP_{jt} \) is the per capita real gross domestic product (GDP) for origin country \( j \). \( RP_{MAL_{jt}} \) is the relative price of tourism in Malaysia adjusted by the exchange rate. The price of tourism plays a very important role in determining whether to visit Malaysia or to stay at the home country. According to Lim (1997), we can calculate \( RP_{MAL_{jt}} \) by using the CPI in Malaysia divided by the CPI in origin country \( j \) and then multiply the ratio with nominal exchange rates. Therefore, the relative price of tourism in Malaysia is a combination of relative prices and exchange rates. It is needless to further elaborate on the importance of including income and prices variables into the tourism demand model because they have been well acknowledged in the theory of consumer behaviour.

\( POL_{MAL_{jt}} \) is the level of air pollution in Malaysia and is defined as per capita carbon dioxide \((CO_2)\) emissions. Pollution could affect a tourist’s satisfaction. \( CR_{MAL_{jt}} \) is the crime rate used to measure the level of safety and security in Malaysia. Sönmez and Graefe (1998), Pizam (1999), and Brunt, Mawby and Hambly (2000) revealed that tourists are more likely to choose less risky destinations for travel because safety and security of tourists is a precondition for the choice of visiting destination. Garofalo (1979) added that fear is not merely generated from the experience of crime, but also the media presentations of crime. Therefore, an increase in the crime rate will reduce the demand for tourism because most tourists fear crime.

\( EDU_{MAL_{jt}} \) is the quality of research and higher education in Malaysia and it can be defined as the total number of articles published in scientific journals indexed by the Science
Citation Index Expended (SCIE) and Social Sciences Citation Index (SSCI). Finally, $DUM_{i,t}$ is a set of one-off dummies to capture the qualitative effects on tourism demand in Malaysia of for example (a) the Asian financial crisis from 1997 to 1998 and the Malaysian Ringgit peg in 1998 to 2005; (b) the epidemic diseases namely SARS and avian flu in 2003, and (c) the terrorist attacks at the World Trade Centre in New York and the Pentagon in the United States on September 2001.

As a result, the econometric model for tourism demand in Malaysia can be written as follows:

$$
\ln V_{MAL,i,t} = \beta_0 + \beta_1 \ln GDP_{i,t} + \beta_2 \ln RP_{MAL,i,t} + \beta_3 \ln POL_{MAL,i,t} + \beta_4 \ln CR_{MAL,i,t} + \beta_5 \ln EDU_{MAL,i,t} + \beta_6 DPEG_{i,t} + \beta_7 D911_{i,t} + \beta_8 SARS_{i,t} + \varepsilon_{i,t}
$$

(2)

where $\ln$ denotes the natural logarithm and $\varepsilon_{i,t}$ are the residuals of the panel regression. $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$ and $\beta_5$ are the elasticities for income, own-price, environmental pollution, crime rate and educational quality, respectively. $DPEG_{i,t}$ is a dummy variable to cater for the effect of the Asian financial crisis and the Malaysian Ringgit peg regime that takes the value of 1 for the period 1998 to 2005 and 0 otherwise. $D911_{i,t}$ is a dummy variable that takes the value of 1 in year 2001 and 0 otherwise. Finally, $SARS_{i,t}$ is a dummy variable that takes the value of 1 in year 2003 and 0 otherwise.

2. Sources of data

This study attempts to examine the inbound tourism demand in Malaysia using balance panel data for 12 major tourism markets from 1989 to 2010. The major tourism markets are Australia, Brunei, China, Germany, Indonesia, Japan, Korea, Singapore, Taiwan, Thailand, the United Kingdom (UK) and the United States (USA). The data used in this study are extracted from World Development Indicators (WDI), International Financial Statistics (IFS), Web of Science (WoS) and CEIC databases. All variables will be transformed into the natural logarithm form, except for the dummies.
ECONOMETRIC METHODS

1. Panel unit root tests

The unit root tests have been extensively explored in the time series literature due to the spurious regression problem raised by Granger and Newbold (1974). Analysis with panel data has no exception too and testing for unit root is also necessary to avoid misleading regression results. Moreover, testing for unit root is also a pre-requisite condition for testing the presence of cointegration relationships between the variables of interest. In this study, we employ the heterogeneous panel unit root test developed by Im, Pesaran and Shin (IPS, 2003). Im, Pesaran and Shin (2003) adapted the Augmented Dickey-Fuller (ADF) framework to construct a unit root test for panel data that allows for heterogeneity. Therefore, this is a null non-stationarity test. To implement the IPS unit root test, we estimate the following equation:

\[ \Delta w_{it} = a_i + a_t + b_i w_{i,t-1} + \sum_{j=1}^{n} c_{ij} \Delta w_{i,t-j} + e_{it} \]  

(3)

where \( i = 1, \ldots, N \) and \( t = 1, \ldots, T \). \( \Delta \) is the first difference operator, \( (w_{i,t} - w_{i,t-1}) \), and the residuals \( e_{i,t} \) are assumed to be independent across countries. The IPS unit root test is a two-stage approach. At the first stage, we need to calculate the mean value of individual ADF-statistic for each of the countries under investigation. While the second stage, we use the following equation to construct the standardised IPS t-statistic for unit root test.

\[ t_{ips} = \sqrt{N} \left[ \bar{T} - E(\bar{T}) \right] \]  

(4)

Here \( \bar{T} \) is the mean value of the calculated individual ADF-statistic, while \( E(\bar{T}) \) and \( \text{var}(\bar{T}) \) represent the theoretical mean value and variance of \( \bar{T} \).

To check for robustness, we also apply the panel unit root test proposed by Maddala and Wu (MW, 1999). Maddala and Wu (1999) propose the Fisher-type panel unit root test by combining the p-values of individual ADF-statistic for each of the countries under investigation using the following equation:
\[ MW = -2 \sum_{i=1}^{N} \ln p_i \]  

(5)

Here \( \ln \) denotes the natural logarithm and \( p_i \) are the probability values of the computed individual ADF-statistics. This is a non-parametric test and has a chi-square distribution with \( 2N \) degrees of freedom, where \( N \) is the number of cross-sectional units.

2. Pedroni cointegration tests

Testing for cointegration is pivotal for time series as well as for panel data analyses because it has a direct implication to the problem of spurious regression, particularly when the variables are non-stationary. If the variables are non-stationary and/or non-cointegrated, regression results with such variables are likely to be biased. Therefore, we utilise the panel cointegration approach proposed by Pedroni (1999, 2004) to verify the existence of cointegration between tourism and its determinants in Malaysia. To perform the heterogeneous panel cointegration test, we follow Pedroni (1999, 2004) by estimating the following panel regression model:

\[ y_{i,t} = \alpha_i + \delta t + \sum_{m=1}^{M} \beta_m x_{m,i,t} + \epsilon_{i,t} \]  

(6)

Here \( y_{i,t} \) is the dependent variable (i.e. tourist arrivals) with the dimension of \( NT \times 1 \), while \( x_{i,t} \) are the explanatory variables with the dimension of \( NT \times m \) where \( N \) is the cross-sections, \( T \) is the time period and \( m \) refers to the number of explanatory variables. Both \( y_{i,t} \) and \( x_{i,t} \) are assumed to follow the \( I(1) \) process. Unlike other panel cointegration tests (e.g. Kao, 1999) that imposed homogeneity assumption in the slope coefficients, Pedroni (1999, 2004) noted that the intercept \( (\alpha_i) \) and the slope coefficients \( (\beta_w) \) are permitted to vary across the individual members in the panel. For this reason, it is also known as the Pedroni’s heterogeneous panel cointegration test. \( \epsilon_{i,t} = y_{i,t} - \hat{\alpha}_i - \hat{\delta}_t - \sum_{m=1}^{M} \hat{\beta}_m x_{i,t} \) are the residuals from the panel regression model.

To test for cointegration, Pedroni (1999, 2004) suggested seven residuals-based tests to examine the null hypothesis of no cointegration in a panel data model that allows for
considerable heterogeneity. Specifically, the suggested tests can be classified into two categories. The first category consists of four tests (i.e. panel $\nu$-statistic, panel $\rho$-statistic, panel PP-statistic and panel ADF-statistic) based upon the ‘within-dimension’ procedure, whereby they can be calculated by pooling of the autoregressive coefficients across different members of panel for the unit root test on the residuals. On the other hand, the second category consists of three tests (i.e. group $\rho$-statistic, group PP-statistic and group ADF-statistic) based upon the ‘between-dimension’ procedure, whereby they are the simple averaging of the test statistics for cointegration in the time series across cross-sections. The seven tests statistics of Pedroni’s heterogeneous panel cointegration test are listed below:

\[ Z_\nu = T^2 N^{1/2} \left( \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\delta}_{i,t-1}^2 \right)^{-1} \]

(7)

\[ Z_\rho = T \sqrt{N} \left( \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\delta}_{i,t-1}^2 \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\delta}_{i,t-1}^2 \left( \hat{\epsilon}_{i,t-1} \Delta \hat{\epsilon}_{i,t} - \hat{\lambda}_i \right) \]

(8)

\[ Z_j = \left( \bar{s}_{N,T}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\delta}_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\delta}_{i,t-1}^2 \left( \hat{\epsilon}_{i,t-1} \Delta \hat{\epsilon}_{i,t} - \hat{\lambda}_i \right) \]

(9)

\[ Z_l = \left( \bar{\tilde{s}}_{N,T}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\delta}_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{\delta}_{i,t-1}^2 \left( \hat{\epsilon}_{i,t-1} \Delta \hat{\epsilon}_{i,t} - \hat{\lambda}_i \right) \]

(10)

\[ \tilde{Z}_\rho = T N^{-1/2} \sum_{i=1}^{N} \left( \sum_{j=1}^{T} \hat{\epsilon}_{i,j}^2 \right)^{-1} \sum_{i=1}^{T} \left( \hat{\epsilon}_{i,t-1} \Delta \hat{\epsilon}_{i,t} - \hat{\lambda}_i \right) \]

(11)

\[ \tilde{Z}_l = N^{-1/2} \sum_{i=1}^{N} \left( \sigma_i^2 \sum_{j=1}^{T} \hat{\epsilon}_{i,j}^2 \right)^{-1/2} \sum_{i=1}^{T} \left( \hat{\epsilon}_{i,t-1} \Delta \hat{\epsilon}_{i,t} - \hat{\lambda}_i \right) \]

(12)

\[ \tilde{Z}_l^* = N^{-1/2} \sum_{i=1}^{N} \left( \sum_{j=1}^{T} \hat{\epsilon}_{i,j}^2 \right)^{-1/2} \sum_{i=1}^{T} \left( \hat{\epsilon}_{i,t-1} \Delta \hat{\epsilon}_{i,t} \right) \]

(13)
where \( \hat{\lambda} = \frac{1}{T} \sum_{t=1}^{T} \left( 1 - \frac{s}{k_t + 1} \right) \sum_{i=1}^{N} \hat{\mu}_{it} \hat{\mu}_{i,t-1} \), \( s_i^2 = \frac{1}{T} \sum_{t=1}^{T} \hat{\mu}_{i,t}^2 \), \( \hat{\sigma}_i^2 = s_i^2 + 2 \hat{\lambda} \), \( \hat{\sigma}_{N,T}^2 = \frac{1}{N} \sum_{j=1}^{N} \hat{\lambda}_{ij} \hat{\lambda}_{ij} \), \( s_{i,t}^2 = \frac{1}{T} \sum_{t=1}^{T} \hat{\sigma}_i^2 \), and \( \hat{\lambda}_{2i} = \frac{1}{T} \sum_{t=1}^{T} \hat{\eta}_{i,t} \), \( \hat{\eta}_{i,t} = \hat{\gamma}_{i,t-1} + \sum_{k=1}^{K} \hat{\gamma}_{i,k} \Delta \hat{\epsilon}_{i,t-k} + \hat{\mu}_{i,t} \) and \( \Delta \hat{y}_{i,t} = \sum_{m=1}^{M} \hat{b}_{m,i} \Delta x_{m,t} + \hat{\eta}_{i,t} \), respectively. \( \hat{\lambda}_{2i} \) is the long run conditional asymptotic covariance matrix for the residuals \( \Delta \hat{\epsilon}_{i,t} \), while \( \hat{\sigma}_i^2 \) and \( \hat{s}_i^2 \) are the individual long run and contemporaneous variances, respectively of the residuals \( \hat{\epsilon}_{it} \).

Additionally, Pedroni (1999) revealed that under appropriate mean and variance corrections, the standardised panel and group mean statistics for cointegration become asymptotically normally distributed.

3. Group mean Fully Modified OLS estimator

After examining the existence of cointegration, we will employ the group mean Fully Modified Ordinary Least Squares (FMOLS) estimator suggested by Pedroni (2000) to estimate the relationship between tourism and its determinants in Malaysia. On the basis of Monte Carlo experiment, Chen, McCoskey and Kao (1999) discovered that estimated results based upon the FMOLS estimator are more robust in cointegrated panel regressions. In addition, Pedroni (2000) revealed that the FMOLS estimator constructed by incorporating the Phillips and Hansen’s (1990) semi-parametric correction to the OLS estimator will not only adjust the heterogeneity that appears in the fixed effect and in the short run dynamic, but can also remove the endogeneity and serial correlation problems. The group mean FMOLS estimator can be expressed as below:

\[
\hat{\beta}_{FMOLS}^{*} = \frac{1}{N} \sum_{i=1}^{N} \left[ \frac{\sum_{i=1}^{T} (y_{i,t} - \bar{y}_i) y_{i,t} - T \hat{\gamma}_i}{\sum_{i=1}^{T} (y_{i,t} - \bar{y}_i)^2} \right] \tag{14}
\]

where \( y_{i,t} = (y_{i,t} - \bar{y}_i) - \frac{\hat{\Omega}_{1i}}{\hat{\Omega}_{22i}} \Delta y_{i,t} \) and \( \hat{\gamma}_i = \hat{\Gamma}_{2i} + \hat{\Omega}_{22i} \left( \hat{\Gamma}_{22i} + \hat{\Omega}_{11i} \right) \). Pedroni (2000; 2001) noticed that the asymptotic covariance matrix, \( \hat{\Omega}_i \) differs across individual members.
and it can also be decomposed as $\Omega_i = \Omega_i^0 + \Gamma_i + \Gamma_i'$ where $\Omega_i^0$ is the contemporaneous covariance matrix and $\Gamma_i$ is the weighted sum of autocovariances. The asymptotic long run covariance matrix can be estimated by using the Newey-West estimator. Apart from that, the group mean t-statistics associated with the group mean FMOLS can be calculated by the following equation:

$$
\bar{t}_{FMOLS} = \frac{1}{N} \sum_{i=1}^{N} (\hat{\beta}_{FMOLS} - \beta) \left( \hat{\Omega}^{-1}_{i} \sum_{t=1}^{T} (x_{it} - \bar{x}_i)^2 \right)^{1/2}
$$

(15)

**EMPIRICAL RESULTS**

1. Panel unit root and cointegration results

In this section, we discuss the empirical results of this study. Prior to testing the presence of cointegration using the residual-based panel cointegration tests developed by Pedroni (1999, 2004), it is necessary to verify the order of integration of each series. For this purpose, we employ the t-bar test of IPS and the Fisher-ADF test of MW for unit root in the panel data. The results of IPS panel unit root tests are reported in Table 1.

At levels, we find that the t-bar statistics of IPS panel unit root test cannot reject the null hypothesis of a unit root for all variables at the 5 per cent significance level. With regard to this, all variables are non-stationary at levels. Nevertheless, at first differences, we find that the t-bar statistics of IPS panel unit root tests consistently reject the null hypothesis of a unit root for all variables at the 1 per cent significance level. Therefore, the IPS test concludes that the variables are integrated of order one, $I(1)$ process. Apart from that, we also perform the Fisher-ADF panel unit root tests proposed by Maddala and Wu (1999) to confirm the order of integration of each series. The results of MW panel unit root test are presented in Table 2.
Table 1: The results of IPS panel unit root tests

<table>
<thead>
<tr>
<th>Variables</th>
<th>IPS t-bar statistics</th>
<th>Tourist arrivals from 12 major tourism markets</th>
<th>Tourist arrivals from TLG markets</th>
<th>Tourist arrivals from non-TLG markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln VA_{MAL,t}</td>
<td>-1.753</td>
<td>-2.334</td>
<td>-2.385</td>
<td></td>
</tr>
<tr>
<td>Δ ln VA_{MAL,t}</td>
<td>-2.894***</td>
<td>-3.673***</td>
<td>-4.732***</td>
<td></td>
</tr>
<tr>
<td>ln GDP_{t}</td>
<td>-2.045</td>
<td>-2.326</td>
<td>-1.940</td>
<td></td>
</tr>
<tr>
<td>Δ ln GDP_{t}</td>
<td>-3.512***</td>
<td>-3.332***</td>
<td>-3.677***</td>
<td></td>
</tr>
<tr>
<td>ln RP_{MAL,t}</td>
<td>-2.192</td>
<td>-2.003</td>
<td>-2.569</td>
<td></td>
</tr>
<tr>
<td>Δ ln RP_{MAL,t}</td>
<td>-3.928***</td>
<td>-3.962***</td>
<td>-3.861***</td>
<td></td>
</tr>
<tr>
<td>ln POL_{MAL,t}</td>
<td>-1.992</td>
<td>-1.992</td>
<td>-1.992</td>
<td></td>
</tr>
<tr>
<td>Δ ln POL_{MAL,t}</td>
<td>-3.003***</td>
<td>-3.003***</td>
<td>-3.003***</td>
<td></td>
</tr>
<tr>
<td>ln CR_{MAL,t}</td>
<td>-1.427</td>
<td>-1.427</td>
<td>-1.427</td>
<td></td>
</tr>
<tr>
<td>Δ ln CR_{MAL,t}</td>
<td>-2.884***</td>
<td>-2.884***</td>
<td>-2.884***</td>
<td></td>
</tr>
<tr>
<td>ln EDU_{MAL,t}</td>
<td>1.004</td>
<td>1.004</td>
<td>1.004</td>
<td></td>
</tr>
<tr>
<td>Δ ln EDU_{MAL,t}</td>
<td>-3.557***</td>
<td>-3.557***</td>
<td>-3.557***</td>
<td></td>
</tr>
</tbody>
</table>

Note: The asterisks *** and ** denote significance at the 1 and 5 per cent levels, respectively. The unit root tests are conducted with intercept and trend and the selection of deterministic components is based upon the plot of each series.

Similar to the results of IPS panel unit root test in Table 1, we find that the Fisher-ADF statistics fail to reject the null hypothesis of a unit root for all variables at the 5 per cent significance level. However, at first differences, we find that the Fisher-ADF statistics reject the null hypothesis of a unit root for all variables at the 5 per cent significance level or better. Therefore, we conclude that ln VA_{MAL,t}, ln GDP_{t}, ln RP_{MAL,t}, ln POL_{MAL,t}, ln CR_{MAL,t} and ln EDU_{MAL,t} belong to I(1) process. In general, these results are consistent with the assertion by Nelson and Plosser (1982) that macroeconomic variables are likely to be non-stationary at levels, while they become stationary after first differencing.
Having established that all the selected variables follow the \( I(1) \) process, the next step of this study is to examine the existence of a long run equilibrium relationship between tourist arrivals and its determinants in Malaysia using the Pedroni’s panel cointegration tests. The panel cointegration results are presented in Table 3. Overall, there are seven types of residual-based tests for cointegration and the results tend to be inconsistent. From the panel cointegration results illustrated in Table 3, we discover that majority of the test statistics (i.e. 4 out of 7 tests) reject the null hypothesis of no cointegration between tourist arrivals and its determinants in Malaysia at the 1 per cent significance level. However, only 3 tests statistics cannot reject the null hypothesis of no cointegration at the conventional significance level. Specifically, panel v-statistic, panel \( \rho \)-statistic and group \( \rho \)-statistic cannot reject the null hypothesis even at the 5 per cent significance level.

<table>
<thead>
<tr>
<th>Variables</th>
<th>MW Fisher-ADF statistics</th>
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<tr>
<td></td>
<td>Tourist arrivals from 12 major tourism markets</td>
</tr>
<tr>
<td>( \ln VA_{M A L, j t} )</td>
<td>15.541</td>
</tr>
<tr>
<td>( \Delta \ln VA_{M A L, j t} )</td>
<td>42.997***</td>
</tr>
<tr>
<td>( \ln GDP_{j t} )</td>
<td>24.668</td>
</tr>
<tr>
<td>( \Delta \ln GDP_{j t} )</td>
<td>67.193***</td>
</tr>
<tr>
<td>( \ln RP_{M A L, j t} )</td>
<td>28.189</td>
</tr>
<tr>
<td>( \Delta \ln RP_{M A L, j t} )</td>
<td>84.197***</td>
</tr>
<tr>
<td>( \ln POL_{M A L, j} )</td>
<td>13.488</td>
</tr>
<tr>
<td>( \Delta \ln POL_{M A L, j} )</td>
<td>44.510***</td>
</tr>
<tr>
<td>( \ln CR_{M A L, j} )</td>
<td>4.880</td>
</tr>
<tr>
<td>( \Delta \ln CR_{M A L, j} )</td>
<td>39.747**</td>
</tr>
<tr>
<td>( \ln EDU_{M A L, j} )</td>
<td>0.008</td>
</tr>
<tr>
<td>( \Delta \ln EDU_{M A L, j} )</td>
<td>67.447***</td>
</tr>
</tbody>
</table>
Note: The asterisks *** and ** denote significance at the 1 and 5 per cent levels, respectively. The unit root tests are conducted with intercept and trend and the selection of deterministic components is based upon the plot of each series.

On the other hand, the panel PP-statistic, panel ADF-statistic, group PP-statistic and group ADF-statistic successfully reject the null hypothesis of no cointegration at the 1 per cent significance level. Obviously, the results of the cointegration tests are conflicting and vary among the panel cointegration tests of Pedroni (1999). According to Pedroni (2004), group ADF-statistics and panel ADF-statistics are superior to other tests for cointegration, particularly in small sample. Likewise, the Monte Carlo experiment conducted by Örsal (2008) also exhibited that the panel ADF-statistic for cointegration has the best size and power properties (see also Harris and Sollis, 2003). For these reasons, the cointegration results provided by group ADF-statistics and panel ADF-statistics are preferred. Since these two tests statistics reject the null of no cointegration, we could surmise that the variables under investigation are cointegrated. Hence, there is a meaningful long run relationship between tourist arrivals and its determinants in Malaysia. The finding of cointegration between tourism and its determinants is hence consistent with most of the previous studies (e.g. Narayan, 2004; Seetanah, Durberry and Ragodoo, 2010).

2. Group mean FMOLS results

As we observed that the variables are cointegrated, we can proceed to estimate the long run relationship between tourist arrivals and its determinants in Malaysia using the group mean FMOLS estimator. Table 4 shows the estimation results of long run coefficients and the t-statistics for each of the explanatory variables. We consider first all the 12 major tourism markets to Malaysia, followed then by the two sub-groups such as the 8 major TLG tourism markets and the 4 non-TLG tourism markets.
Table 3: The results of Pedroni cointegration tests

<table>
<thead>
<tr>
<th>Tests</th>
<th>Tourist arrivals from 12 major tourism markets</th>
<th>Tourist arrivals from TLG markets</th>
<th>Tourist arrivals from non-TLG markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel v-stat</td>
<td>-1.348</td>
<td>-1.907</td>
<td>-1.452</td>
</tr>
<tr>
<td>Panel $\rho$-stat</td>
<td>1.938</td>
<td>1.366</td>
<td>1.723</td>
</tr>
<tr>
<td>Panel PP-stat</td>
<td>-5.542***</td>
<td>-6.918***</td>
<td>-5.554***</td>
</tr>
<tr>
<td>Panel ADF-stat</td>
<td>-5.886***</td>
<td>-6.595***</td>
<td>-6.186***</td>
</tr>
<tr>
<td>Group $\rho$-stat</td>
<td>3.447</td>
<td>2.803</td>
<td>3.357</td>
</tr>
<tr>
<td>Group PP-stat</td>
<td>-5.319***</td>
<td>-6.732***</td>
<td>-4.667***</td>
</tr>
<tr>
<td>Group ADF-stat</td>
<td>-6.663***</td>
<td>-7.478***</td>
<td>-7.156***</td>
</tr>
</tbody>
</table>

Conclusion: Cointegrated  Cointegrated  Cointegrated

Note: The asterisks *** denote significance at the 1 per cent level. RATS programming code is used to compute the Pedroni cointegration tests. The null hypothesis of no cointegration can be rejected if: (a) the panel $v$-statistic is greater than 2.326 (1 per cent) or 1.645 (5 per cent); (b) the other six tests statistics are less than $-2.326$ (1 per cent) or $-1.645$ (5 per cent).

In general, Table 4 reveals that all variables are statistically significant at the 1 and 5 per cent levels, except for the educational quality ($\ln EDU_{MAL,t}$) in the non-TLG markets. Moreover, the sign of the coefficient is also consistent with the economic theory and our expectation. In the case of tourist arrivals from 12 major tourism markets in Malaysia, we find that the per capita GDP has an elastic positive effect on tourism demand in Malaysia. The coefficient of $\ln GDP_{jt}$ indicates that a 1 per cent increase in income, on average would increase tourist arrivals from these 12 major tourism markets will increase by 5.4 per cent. Likewise, the income elasticities for tourist arrivals from the TLG markets (2.626) and the non-TLG markets (11.124) are also positive and greater than unity. These results show that the demand for tourism in Malaysia is very sensitive to the level of income. This is consistent with the theory and also with the findings of past studies (e.g. Choyakh, 2008; Kim and Song, 1998; Lee, 1996; Narayan, 2004; Ouerfelli, 2008; Salleh, et al., 2010; Tan, McCahon and
Miller, 2002). In addition, our findings also indicate that tourism is a luxury item because the income elasticities are greater than unity.

Apart from that, our study also finds that price of tourism in Malaysia has a significant inelastic negative effect on tourism demand in the markets under review. This is consistent with the theory of consumer behaviour and most of the earlier studies (e.g. Kadir, Abdullah and Nayan, 2008; Narayan, 2004; Salleh, et al., 2008; Seetanah, Durbary and Ragodoo, 2010; Tan, McCahon and Miller, 2002; Witt and Martin, 1987). Specifically, for the case of tourist arrivals from 12 major tourism markets, a 10 per cent increase in the price of tourism in Malaysia reduces tourist arrivals by 5.3 per cent of tourist arrivals from these 12 major tourism markets. However, the tourist arrivals from the TLG markets and the non-TLG markets will drop by about 6.7 per cent and 0.4 per cent, respectively. Comparing the price effects on tourism demand across the different tourism markets, we find that change in the price of tourism in Malaysia has a greater impact on the TLG markets than the non-TLG markets. Therefore, an increase in the price level in Malaysia will reduce tourist arrivals from the TLG markets more than tourist arrivals from the non-TLG markets.

Table 4: The results of group mean FMOLS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tourist arrivals from 12 major tourism markets</th>
<th>Tourist arrivals from TLG markets</th>
<th>Tourist arrivals from non-TLG markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\ln GDP_{jt}$</td>
<td>5.409 (9.288)***</td>
<td>2.626 (6.308)***</td>
<td>11.124 (5.694)***</td>
</tr>
<tr>
<td>$\ln RP_{MAL,jt}$</td>
<td>$-0.533$ (-3.642)***</td>
<td>$-0.674$ (-8.562)***</td>
<td>$-0.044$ (-4.043)***</td>
</tr>
<tr>
<td>$\ln POL_{MAL,jt}$</td>
<td>$-1.742$ (-8.448)***</td>
<td>$-1.461$ (-4.892)***</td>
<td>$-2.391$ (-6.337)***</td>
</tr>
<tr>
<td>$\ln CR_{MAL,jt}$</td>
<td>$-0.370$ (-8.559)***</td>
<td>$-0.382$ (-6.444)***</td>
<td>$-0.426$ (-4.411)***</td>
</tr>
<tr>
<td>$\ln EDU_{MAL,jt}$</td>
<td>0.129 (4.333)***</td>
<td>0.186 (4.195)***</td>
<td>0.085 (1.893)</td>
</tr>
<tr>
<td>$DPEG$</td>
<td>0.122</td>
<td>0.094</td>
<td>0.147</td>
</tr>
</tbody>
</table>
### Note:
The asterisks *** and ** denote significance at the 1 and 5 per cent levels, respectively. RATS programming code is used to compute the FMOLS results. Figure in parenthesis ( ) is the t-statistic.

In terms of environmental pollution \(\ln POL_{MAL,t}\), our estimation results for the case of 12 major tourism markets as well as for the two sub-groups of tourism markets show that the coefficients of \(\ln POL_{MAL,t}\) are negative and greater than unity. Therefore, the choice of Malaysia as their visiting destination is very sensitive to the quality of environment in Malaysia. A 10 per cent increase in the environmental pollution would cause tourist arrivals from the 12 major tourism markets to fall by about 17.4 per cent. At the disaggregate level, our findings suggest that tourist arrivals from the TLG markets and the non-TLG markets would reduce by about 14.6 per cent and 23.9 per cent, respectively. Likewise, our findings also suggest that the crime rate \(\ln CR_{MAL,t}\) is statistically significant at the 1 per cent level although it has an inelastic negative effect on tourism demand in all groups of tourism markets under review. Therefore, international tourists would react negatively to an increase in the crime rate in Malaysia. For example, a 10 per cent increase in the crime rate would lead to a 3.7 per cent decrease in tourist arrivals from the 12 major tourism markets to Malaysia. Furthermore, a 10 per cent increase in the crime rate, on average, would reduce tourist arrivals from the TLG markets and the non-TLG markets by about 3.82 per cent and 4.26 per cent, respectively. Hence, these results indicate that international tourists to Malaysia are sensitive to the quality of environment and the level of safety and security in Malaysia.

On the other hand, our empirical results indicate that educational quality \(\ln EDU_{MAL,t}\) is positively associated with tourist arrivals to Malaysia, but the tourist arrivals from the non-TLG markets are not sensitive to the educational quality in Malaysia. These results imply that the significant effect of educational quality on tourism demand in Malaysia is driven by the tourist arrivals from the TLG markets. At the aggregate level (i.e.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-Statistic</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>D911</td>
<td>-0.167</td>
<td>-0.118</td>
<td>-0.156</td>
</tr>
<tr>
<td></td>
<td>-5.193 (***)</td>
<td>-3.985 (***)</td>
<td>-2.067 (**)</td>
</tr>
<tr>
<td>SARS</td>
<td>-0.347</td>
<td>-0.300</td>
<td>-0.448</td>
</tr>
<tr>
<td></td>
<td>-15.325 (**)</td>
<td>-12.650 (***)</td>
<td>--7.286 (***)</td>
</tr>
</tbody>
</table>
12 major tourism markets), we find that the impact of educational quality on tourism demand is 0.129, meaning that a 10 per cent increase in the educational quality measured by the number of publications in the scientific journals would lead to an increase in tourist arrivals from the 12 major tourism markets by 1.29 per cent. However, at the same amount of changes in the educational quality, tourist arrivals from the TLG markets would increase by approximately 1.86 per cent. Therefore, educational quality is an effective pulling factor of international tourist arrivals to Malaysia, particularly from the TLG markets.

Furthermore, this study also finds that the terrorist attack in the United States in 2001 (\(D_{911,i}\)) and the epidemic diseases SARS and avian flu in 2003 (\(S_{ARS,i}\)) have a negative effect on the demand for tourism in Malaysia. Although the magnitudes varied among the two qualitative factors, the coefficients of \(D_{911,i}\) and \(S_{ARS,i}\) are statistically significant at the 5 per cent level or better. Hence, these results indicate that international tourists are concerned about the level of safety and health when choosing the visiting destination. On the other hand, we find that international tourist arrivals to Malaysia react positively to the Malaysian Ringgit peg regime and the coefficient is statistically significant at the 1 per cent level. This is because it makes the cost of living cheaper in Malaysia. Therefore, during the period of Ringgit peg regime, Malaysia had successfully attracted a lot of international tourist arrivals.

**CONCLUDING REMARKS**

Using the panel unit root and cointegration approaches, this study analyses the behaviour of inbound tourism demand in Malaysia. Unlike the earlier studies, this study contributes to the existing tourism demand literature by incorporating environmental pollution, crime rate and the quality of research and education into the tourism demand model for Malaysia. Our empirical results reveal that tourism and its determinants in Malaysia are moving together in the long run (i.e. they are cointegrated).

We also find that income and the quality of research and education have positive relationships with tourism demand. Nevertheless, international tourist arrivals to Malaysia react negatively to price of tourism, environmental pollution and crime rates in Malaysia. Therefore, price of tourism, environmental quality and safety would affect the tourists’ decision on where to visit. In summary, those destinations with high environmental pollution
and/or high crime rates will have a lower likelihood to be visited, while those with high quality of research and education would be able to attract tourists, particularly those from the TLG markets.

REFERENCES


