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Modeling Tourism Demand in Japan Using Cointegration and Error correction Model

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This paper uses annual macroeconomic data from 1962-2009 to investigate the long-run and short-run relationship in tourists' arrival to Japan from five major Western countries. The augmented Dickey-Fuller (ADF) test is used to determine the order of integration of the series, and we employ the Engle-Granger cointegration procedure to test for the presence of long-run relationship. The results of the cointegration indicate that there is a long-run relationship between tourists' arrival series and the causal variables. Both the short-run and long-run models indicate that GDP per capita in tourists' origin country is the most significant factor influencing the inflow of visitors into Japan. The price elasticity and price of tourism in alternative destinations are found to be significant in some cases. The long-run and error correction models clearly indicate that the U.S.A and Canada have the highest fidelity to tourism in Japan among the five Western countries considered.

JEL Codes: C32, C51 and C52

1. Introduction

International tourism has grown rapidly over the last decade, however, the rate of growth varied from year to year and also among different countries. The growth witnessed in international tourism has catalyzed a continuous research interest in tourism demand. Tourism demand is the bedrock on which many tourists related businesses rests and the success of these business is largely determined by the state of tourism in that country. Since the launch of the "visit to Japan" campaign in 2003 through Prime Minister Junichiro Koizumi's policy speech, tourism to Japan has gained a tremendous boost. For example, during a 5 year period from 1998-2002 prior to the launched, the total arrival of foreign visitors to Japan was about 23.3 million; however, after the campaign was launched in 2003, the number of foreign visitors to Japan for a 5 year period of 2004-2008 was about 36.9 million representing an increment of 58.4% (Japan National Tourism Organization, hereafter, JNTO, 2009). However, tourism in Japan faces several challenges such as competition from all major markets in Asia, such as Hong Kong, Thailand, Singapore, China, South Korea, Malaysia as they are also launching aggressive promotion to attract tourists particularly from the long-haul markets (US and Europe), Kadir and Karim (2009). In addition, the Asian financial crises that occurred around 1997-1998 and the global financial crises that occurred around 2008-2009 also caused a downward trend in arrival of visitors to Japan, see JNTO

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(2009). Furthermore, the proneness of Japan to natural disaster such as tsunamis and earthquakes are also a major challenge to the Japan's tourism industry. Hence, the crucial task faced by the Japan's tourism management is how to confront and boost her tourism industry in order to remain a major player in the Asia region.

Tourism contributes to mutual international understanding through a one-on-one exchange, and the arrival of international visitors can result in regional revitalization and business expansion. Within the Western market, there are six countries which are considered as priority markets to Japan, these include U.S.A, Canada, U.K, Germany, Australia and France. They are the countries that send a large number of visitors to Japan among all the western countries. Since they are designated as priority market to Japan, it seems important to study the dynamic flow of tourists from these countries to Japan using econometric models.

The previous studies on tourism demand focus mainly on Western countries as destination and also on some Asia countries such as Thailand, Hong Kong, Singapore and Malaysia. Studies that focused on Japan as a destination country using econometric models are yet to appear in the literature. Hence, this study is proposed to fill up this lacuna in the literature. This study and the findings are different from previous studies on tourism demand because it is the first attempt in the literature to apply econometric modeling strategies to tourism in Japan. This study construct an econometric model of tourism demand and estimates the demand elasticities for five major Western markets of Japan's tourism using cointegration and error correction models. The short-run error correction model will provide useful information concerning how rapid is the adjustment taking place among the various variables to restore equilibrium in response to short-term disturbances in the demand for tourism in Japan. Finally, we will examine and compare the adjustment to shocks' rate among the different countries in our study.

The rest of the paper is structured as follows. Section 2 is a brief review of the literature on tourism demand, section 3 explains the data and econometric methodology, section 4 presents the empirical results and discussion. And section 5 concludes.

2. Literature Review

The term 'tourism demand' may be defined for a particular destination as the quantity of tourism product (tourism goods and services) that consumers are willing and able to purchase under a specified period under a given set of conditions (Song *et al.,* 2009). The conditions that relate to the quantity of tourism demanded includes; tourism prices in the destination (tourists' cost of living in the destination and the transportation fare to the destination), tourism prices in competing or substitute destinations, income of the consumer, expenditure on advertising, tastes of the consumers in origin (generating) countries, and other social, geographic and political factors. However, in empirical applications it can be difficult to use all the exact determinants due to lack of data availability. In a recent review of the literature, Song and Li (2008) noted that tourists' income, tourism prices in destination relative to the origin country, tourism prices in alternative destinations and exchange rates are the most important determinant of tourism demand. However, in our study since the tourist arrival data includes business visitors we also added the bilateral trade between the destination country and origin country.

The published articles on tourism demand modeling can be classified into two major groups: (i) those that study the factors that affects tourism demand and examine the elasticities of tourism demand with respect to these factors, see for example, Song and Wong (2003), Song, Romilly, and Liu (2000), Hiemstra and Wong (2002), Crouch (1992) and host of others. These studies provide vital information as regard to the factors affecting tourism as this will help decision making by public and private sector involved in tourism development and marketing and (ii) those that focus on tourism demand modeling and forecasting, see for example, Choyakh (2009), Kadir and Karim (2009), Shen, Li and Song (2009),Witt and Witt (1992) and Song, Witt and Jensen (2003). It is a truism that accurate forecast of expected future demand is very vital in all planning activities. Modeling and forecasting tourism is of considerable importance and interest to academics, researchers, policy makers as well practitioners in the fields of tourism, travel, hospitality and consultancy who make decisions on the basis of forecasts.

The previous studies on tourism demand focus mainly on Western countries as destination and also on some Asia countries such as Thailand, Hong Kong, Singapore and Malaysia. An exception is Vu (2006); however, Vu (2006) apply the univariate time series modeling technique to tourists' arrival to Japan. Studies that focused on Japan as a destination country using econometric models are yet to appear in the literature. This study construct econometric model of tourism demand and estimates the demand elasticities for five major markets of Japan's tourism using cointegration and error correction models.

For a comprehensive study on the literature of tourism demand from 2000- 2008 see Song and Li (2008). According to previous studies on tourism demand, the following are the determinants of tourism demand.

2.1 Dependent Variable

Most of the studies on International tourism generally measured the demand of tourism in terms of the total number of tourists from a given origin to a particular destination, or in terms of tourists' expenditure by visitors from the origin country in the destination country. The number of tourist nights spend by the residents of the origin country in the destination country is also used in the literature. In our study, we used the total number of visitors' arrival.

2.2 Explanatory Variable

The following are the explanatory variables considered in this study.

2.2.1 Income

In tourism demand modeling, the income of the visitor's country is considered as the most important determinant of tourism demand. Past studies have used different measures for income of origin country, these includes, GDP, GNP, consumption expenditure and personal disposal income. Song *et al.* (2009) noted that if holiday or visit to friends and family are under study, the appropriate variable to use is the personal disposal income or private consumption expenditure; however, if business visitors are under study or they form part of the total visitors' arrival, the national income or GDP should be used. Since, the visitors series in our study includes both holiday and business visitors, we used the GDP per capita as a proxy for income.

2.2.2 Own Price

Song *et al.* (2009) noted that the appropriate measure of tourism price is difficult to obtain. Tourism prices consist of two components: the transportation cost from the origin country to the destination country and the cost of living in the destination country. While the later has appeared in most of the studies on tourism demand, the former seldom appear on ground of possible multicollinearity problem and lack of data availability. In addition, Crouch (1992) noted that a potential international visitor has the option of spending his vacation in his own country; hence, the cost of living in the destination country relative to the origin country may affect the motivation to travel. Usually, the consumer price index (CPI) in the destination country is considered as a proxy for cost of living in that country, hence to estimate the cost of tourism or price of tourism in a particular destination, this CPI is usually divided by the CPI of the origin and adjusted by the nominal exchange rate.

2.2.3 Substitute Prices

With the continuous increase in global competition in the tourism industry, consumers have a lot of many alternative destinations. Hence, before travelling to a particular destination, consumers may compare the prices and quality of tourism services between a set of alternatives. The substitute prices is normally specify as the cost of living in a particular destination relative to a weighted average value in alternative destination.

2.2.4. Qualitative Factors

Tourism are buffeted by natural shocks, wars, policy changes, tastes, advertising, expectations, political instability, terrorism and other special events. However, due to lack of data availability and measurement problem, they usually enter the model as a dummy variable or through the model's disturbance or error term.

3. Data and Methodology

In the analysis of international tourism demand to Japan from the five western countries (U.S.A, Canada, U.K, Germany and Australia), the number of visitors arrival from the origin are used as proxy for the international tourism demand. The data used in this study are annual time series for the period 1962-2009. The data are obtained from different sources; the tourists arrival data are obtained from statistics on tourism for Japan (JNTO, 2009) and Ministry of Justice of Japan (MOJ), the trade data are obtained from UN comtrade database, GDP data is obtained from World Bank database, and the CPI and nominal exchange rate data are collected from the CD-ROM of IMF International financial statistics. We used data up to 2009in the analysis because of the difficulty in obtaining recent data of all the variables considered in the study.

The demand function for tourism in destination i by visitors from origin j is given by:

$$TA_{ijt} = f(Y_{jt}\ Tv_{ijt}\ P_{it}\ Ps_{kt}\ dummy\ \text{var}iables\ \ \varepsilon_{ijt}) \quad (1)$$

where TA_{ij} is the total tourists' arrival from origin j to destination i, Y_j is the income level in origin j, Tv_{ij} is the total volume of trade between origin j and destination i measured by the sum of their import and export volumes which is then adjusted by the import and export prices indices ; $\mathbf{P}_i$ is the price of tourism in destination i, Ps_k is the price of tourism in substitute destinations and the dummy variables comprise two oil crises D_{1t} and D_{2t} , where $D_{1t} = 1$ in 1973-1974, and 0 otherwise, $D_{2t} = 1$ in 1979-1980, and 0 otherwise, D_{3t} and D_{4t} are used to capture the effect of the Gulf War and the Asian financial crisis (D_{3t} = 1 in 1990-1991, 0 otherwise, D_{4t} = 1 in 1997-1998 and 0 otherwise) , D_{5t} is used to capture the effect of U.S.A September 11thterrorist attack ($D_{5t} = 1$ in 2001-2002 and 0 otherwise)and ε_{ij} is the disturbance term. The tourism demand model is estimated in a log-linear model where both the dependent and independent variable are expressed in logarithms. It is usual to apply this transformation to economic variables as it reduces heteroskedasticity and makes the variables to be consistent with a Gaussian distribution, which can take values on the real line. The use of logarithm also enables the estimated coefficients to be interpreted as elasticities. The model for estimation of the tourism demand can be expressed in log-linear form as:

$$\ln TA_{jt} = \beta_0 + \beta_1 \ln y_{jt} + \beta_2 \ln Tv_{jt} + \beta_3 \ln p_{it} + \beta_4 \ln ps_{kt} + dummies + \varepsilon_{jt} \quad (2)$$

where the $\ln$ in front of the variables denotes logarithm. The GDP per capita is used in this analysis because our visitors arrival data include both leisure and business visitors as suggested by Song *et al.* (2009).

The relative cost of living in Japan to that of the origin country P_{it} which is also the relative price of tourism in Japan is given by:

$$p_{it} = \frac{(CPI_J / EX_J)}{(CPI_j / EX_j)} \quad (3)$$

where CPI_J and CPI_j denotes the consumer price index for Japan and the visitors origin country j, where j are the five countries in our analysis; U.S.A, Canada, U.K , Germany and Australia. Also, EX_J and EX_j are the annual average nominal exchange rate of the Japanese yen against the U.S dollar and the origin j local currency against the U.S dollar. Using the same approach, the price of tourism in other destinations is constructed as a relative weighted average of the CPI of alternative destinations to the CPI of origin country. The alternative destinations used in this study are South Korea, Singapore, Thailand and Malaysia. China and Taiwan are excluded because of lack of availability of their data. An increase in the price of tourism in Japan will increase the demand of tourism in the alternative destinations, if these destinations are substitute for Japan, on the other hand, an increase in the price of tourism in Japan will decrease the demand in these destinations if they are complementary to Japan. The price of tourism in alternative destination k (South Korea, Singapore, Thailand and Malaysia) is calculated using the formula:

$$ps_{kt} = \frac{\sum_{k=1}^{4}\left(CPI_k / EX_k \right) \times w_{kt}}{\left(CPI_j / EX_j \right)} \qquad (4)$$

where k = 1, 2,3, and 4 representing , South Korea, Singapore, Thailand and Malaysia, and w_{kt} is the weight, constructed using the relation:

$$w_{kt} = \frac{TVA_{kt}}{\sum_{k=1}^{4} TVA_t} \qquad (5)$$

see Song *et al.* (2003) for justification for using the above weighting system. TVA_t denotes the total number of international tourists from country k . The disturbance term captures all other factors that affects tourism but are excluded from the above model and is assumed to be normally distributed with mean zero and constant variance.

To investigate the long-run relationship between tourism in Japan and the factors that influence tourism demand, the ordinary least squares (OLS) is used to estimate equation (2) and an error correction model is constructed to obtain the speed of adjustment to restore equilibrium in the dynamic model. We used these modeling techniques because the previous research on Japan tourism followed the univariate modeling technique, see Vu (2006).Prior to the estimation of the long run model, it is important to determine the order of integration of all the variables. This is important in order to have a *balanced regression* and also to avoid the spurious regression problem as pointed out by Granger and Newbold (1974). Hence, in the next section we briefly discussed the unit root test.

3.1 Unit Root Tests

The first step in carrying out a cointegration analysis is to determine the order of integration of the variables. Loosely speaking, a series $\{y_t\}$ is said to be *integrated* of order 1 (unit root) denoted as $I(1)$ if the series is not stationary while the first difference $\{\Delta y_t\}$ appear to be stationary.A series in integrated of order d , $I(d)$ if it can be difference d times to achieve stationarity. The augmented Dickey-Fuller test (ADF) is the most commonly used criteria in time series econometrics to test for unit roots. The ADF test is based on the auxiliary regression of the form:

$$\Delta y_t = \beta + \delta t + \alpha y_{t-1} + \sum_{i=1}^{k} \varphi_i \Delta y_{t-i} + \varepsilon_t \qquad (6)$$

We used the ADF to test the unit root hypothesis in the logarithm of all the variables considered in the study. In equation (6) above, β represents the constant term, t denotes the deterministic time trend, Δy_{t-i} are added to correct for serial correction in the error term (ε_t). The null hypothesis for a unit root in y_t against the alternative is stated as:

$$H_0: \alpha = 0 \text{ vs } H_1: \alpha < 0$$

The number of lags in the ADF test is determined using the Schwarz information criteria and an initial maximum lag length 4 is used in the test. The criteria evaluates the significance of the fourth lag using the t -statistic associated with the lag and sequentially reduce the lag until a significant lag is obtained.

3.2 Cointegration Tests

Cointegration came to the limelight of time series econometrics through the work of Engle and Granger (1987) and Johansen (1988) seminal papers. Cointegration test is conducted to ascertain if there is any long-run relationship between two or more non-stationary time series. The existence of a long-run or equilibrium relationship among a set of non-stationary time series implies that their stochastic trends must be linked. Individually, the series may drifts or wander apart, but in the long run they will move together to restore equilibrium, since, equilibrium relationship means that the variable cannot move independently of each other. This linkage among the stochastic trends necessitates that the variables are cointegrated, Enders (2004).

Cointegration techniques have been successfully applied to model tourist data of a number of countries. Lim and McAleer (2002) apply cointegration method to model tourist arrivals from Malaysia to Australia. Their results support a long-run equilibrium relationship among the international tourism demand, transportation costs and exchange rates. Kadir and Karim (2009) also used the cointegration method to model demand for tourism in Malaysia by UK and US tourists and finds evidence supporting cointegration. In addition, Choyakh (2009) also finds evidence supporting cointegration of tourism demand in Tunisia. Other studies that have also apply cointegration to model tourism demand includes; Algieri (2006) using Russiaas a destination, Daniel and Ramos (2002) focused on Portugal, Dritsakis (2004) examined the case of Greece, Kulendran and Wilson (2000) focused on Australia, Lim and McAleer(2001a) also study the case of Australia, Narayan (2004) examined the case of Fiji, Salman (2003) and Witt*et al.* (2003) focused on Sweden and Denmark as destination countries respectively. In this study, we shall apply the cointegration test to model the tourists' inflow into Japan from five Western countries using the Engle and Granger (1987) techniques. This is two-step procedures which involve estimating the cointegrating regression equation (2) using Ordinary Least Squares (OLS) and then conducting unit root tests for the residuals $\hat{\varepsilon}_t$. According to Engle and Granger (1987), the stationarity of the residuals of the regression implies that the series are cointegrated.

3.3 Error Correction Model

The error correction model help to capture the rate of adjustment taking place among the various variables to restore long-run equilibrium in response to short-term disturbances in the demand for tourism in Japan. According to the Granger representation theorem (Granger, 1983; Engle and Granger, 1987), if a set of variables are cointegrated, then there exists a valid *error-correction mechanism.* Hence, a necessary and sufficient condition for cointegration is the existence of an error correction mechanism (ECM). If we denote our dependent variable TA_{jt} as y_t and the entire explanatory variables in equation (2) as x_t, there exists an error-correction representation of the form:

Given that; $$z_t = \begin{bmatrix} y_t \\ x_t \end{bmatrix} \sim CI(1,1),\ \beta' z_{t-1} = \varepsilon_t$$

$$\begin{aligned} \Delta y_t &= \alpha_1 + \phi_1(\beta' z_{t-1}) + \sum_{j=1}^{k} \varphi'_j \Delta z_{t-j} + \nu_t \\ \Delta x_t &= \alpha_2 + \phi_2(\beta' z_{t-1}) + \sum_{j=1}^{k} \lambda'_j \Delta z_{t-j} + \upsilon_t \end{aligned} \tag{7}$$

where ν_t and υ_t are well-behaved error terms and $|\phi_1| + |\phi_2| \neq 0$. Since all terms in the ECM are $I(0)$ 'stationary', there is no inferential problem and it can easily be estimated by the OLS method. The error correction models above describe how y_t and x_t behave in the short-run consistent with a long-run cointegrating relationship. A significant error correcting parameter indicates that cointegration indeed exist among the variables. Hence, ECM also serves as a confirmatory test for cointegration.

4. Results and Discussion

Prior to the cointegration analysis, we test for the order of integration of the series.. The results of the ADF test for the tourists' arrivals from the five countries under study is depicted in Table4.1

Table 4.1: Unit root test for tourists' arrival series

Country	$t-statistic$ (level)	K	Conclusion	$t-statistic$ (1st diff)	k	Conclusion
U.S.A	-2.384717	0	$I(1)$	-4.9942**	0	$I(0)$
Canada	-3.404206	0	$I(1)$	-9.9224**	0	$I(0)$
U.K	-1.364078	0	$I(1)$	-5.9647**	0	$I(0)$
Germany	-1.920445	3	$I(1)$	-5.2078**	0	$I(0)$
Australia	-3.239238	1	$I(1)$	-5.2240**	0	$I(0)$

Table 4.2: Unit root test for log GDP per capita (Income) series

Country	$t-statistic$ (level)	K	Conclusion	$t-statistic$ (1st diff)	K	Conclusion
U.S.A	-3.106500	1	$I(1)$	-2.886327**	0	$I(0)$
Canada	-1.231028	0	$I(1)$	-2.800935**	0	$I(0)$
U.K	-3.226993	1	$I(1)$	-3.461507**	0	$I(0)$
Germany	-0.731857	0	$I(1)$	-2.389952*	0	$I(0)$
Australia	-2.076224	0	$I(1)$	-3.051439**	0	$I(0)$

Note: The level data were estimated using the ADF that allows for both a constant term and a deterministic time trend. On the other hand, the differenced data are estimated without any exogenous term, however, we added the constant term when the plots of the data indicate fluctuations around a constant term. ** and * denote rejection of the unit root hypothesis at 1% and 5% respectively. Critical values are based on MacKinnon (1996).

The ADF tests results for the other variables also indicates that they are all $I(1)$, (the ADF results for the other series are available from the author upon request; the complete results are not reported here for brevity). After confirming that the variables are integrated of the same order of $I(1)$, we then proceed to estimate a long-run relationship for the variables.

Table 4.3: OLS estimates of the long-run models (dependent variable $\ln TA_{jt}$)

	Country				
Variable	U.S.A	Canada	U.K	Germany	Australia
Constant	-7.491*** (-11.716)	-27.320*** (-14.113)	-21.953*** (-5.607)	-16.410*** (-12.374)	-30.517*** (-13.005)
y_{jt}	0.775*** (3.011)	2.815*** (9.544)	1.158 (1.396)	2.198*** (8.228)	3.317*** (5.675)
Tv_{jt}	0.488*** (4.555)	0.482*** (2.834)	1.022*** (2.717)	0.195* (1.795)	0.413 (1.653)
p_{jt}	-0.260*** (-5.671)	-0.191 (-1.374)	-0.685 (-1.486)	-0.440*** (-3.973)	-0.173 (-1.212)
ps_{kt}	-0.043 (-0.572)	0.252** (2.382)	1.244*** (4.302)	0.235*** (3.266)	0.369** (2.097)
Dum_{oil1}	-0.064** (-2.285)	-0.353*** (-4.124)	-0.358*** (-3.213)	-0.072** (-2.297)	-0.184* (-1.722)
Dum_{oil2}	-0.189*** (-4.951)		0.255** (2.224)		-0.191*** (-4.852)
Dum_{Gulf}	0.047* (1.779)		0.226 (1.255)	-0.083** (-2.139)	
Dum_{AFC}	-0.048** (-2.526)	0.087* (1.973)	-0.261** (-1.755)	0.035 (1.452)	-0.141** (-2.708)
Dum_{Sept11}	-0.072*** (-3.308)		-0.116** (-1.772)	-0.104*** (-5.825)	0.088 (1.050)
R^2	0.983	0.971	0.943	0.987	0.982
DW	1.993	1.904	0.814	1.750	1.052
JB	0.216	42.702***	1.256	1.300	1.393
LM	1.321	0.918	16.645***	1.961	6.715**
H	0.865	1.745	1.321	4.149***	2.075

Notes: (a) Values in parentheses indicate t-statistics, ***, ** and * indicate that estimates are significant at 1%, 5% and 10% levels respectively. (b) JB denotes the Jarque-Bera test for normality; LM is the Breusch-Godfrey test for serial correlation and H is theBreusch-Pagan-Godfrey test for heteroskedasticity. (c) In estimating the long-run models, we started from the general-to-specific method where all the explanatory variables are included for all the countries considered; however, we gradually dropped the variables that are grossly insignificant.

Table 4.3 reports the results of the long-run elasticity. The estimated elasticities have expected signs. With the exception of U.K, the results indicate that incomes in the visitors' country play a positive significant role in influencing their decision to visit Japan. The estimated income elasticities range from 0.775 for US to 3.317 for Australia. The results indicate that a 1% increase in real GDP per capita of the visitors' country results to increases in tourist arrivals to Japan by 3.32%, 2.82% and 0.78% from Australia, Canada and U.S.A respectively. The low income elasticity of the U.S.A also implies that the decision to visit Japan by Americans is relatively insensitive to the economic situation in the U.S.A. It may also be interpreted that the demand for tourism in Japan is regarded as a normal "necessity" by tourists from the U.S.A while tourists from the other countries consider visiting Japan as "luxury" or "superior" goods. However, a rise in income in Canada, Germany and Australia will be accompanied by a more than proportionate rise in tourism demand in Japan. The results also indicate that tourism in Japan is price inelastic in all the Western countries considered in the analysis. The results also imply that visitors from these countries choose Japan as a destination without much consideration of the cost of living in Japan. Since tourism in Japan is price inelastic an increase in cost of living in Japan will result in a less than proportionate decrease in the number of tourist arrivals, and as a result total tourism revenue will rise, see Song *et al.* (2009). The long-run estimates also reveal that the price in the competing destinations is elastic for U.K and inelastic for the other countries. Also, tourists from Canada, UK, Germany and Australia consider the four alternative destinations as substitute for Japan (positive cross elasticities), while American tourists considered the alternative destinations as complementary destinations for Japan. The results also indicate that a 1% increase in the relative prices of competing destinations will increase tourists' arrival from U.K, Australia and Canada to Japan by 1.24%, 0.37% and 0.25% respectively. The small and insignificant value of cross price elasticity of U.S.A (-0.04) further confirm the fidelity of U.S.A tourists to Japan. The U.S.A visitors to Japan are not concern by the prices in the competing destinations. As expected, bilateral trade also have a positive impact on visitors arrival to Japan from the various countries.

Having estimated the long-run model, we then proceed to test for cointegration using the residuals based method of Engle and Granger (1987). According to Engle and Granger (1987), if the residuals obtained from the above static regression are stationary, it implies that the variables are cointegrated. Hence, there is a tendency for the variables to move together in the long-run even though the variable may wander or drift individually apart. Engle and Granger (1987) cointegration techniques test for the presence of a unit root in the residuals. This implies that the null of a unit root corresponds to no cointegration. The results obtained using the Engle and Granger (1987) cointegration test is presented in table 4.4.

However, Verbeek (2008) noted that there are additional complications in testing for cointegration using OLS residuals rather than in observed time series. He noted that using the ADF tests, we may reject the null hypothesis of no cointegration too often. From the results display in table 4.4, we may say that, there is a strong evidence of cointegration in the case of U.S.A, Canada and Germany.

Table 4.4: Engle and Granger Cointegration Test

Country/ Residual ($\hat{\varepsilon}_t$)	$t-statistic$	k
U.S.A	-7.070***	0
Canada	-6.480***	0
U.K	-3.430***	0
Germany	-5.885***	0
Australia	-3.824***	0

Note: *** indicates significance at 1%.

However, the cointegration detected for the case of UK and Australia will be taken with caution until it is confirmed by further analysis. To circumvent the problem associated with the Engle and Grangers' methodology, we proceed to constructing an error-correction model for the different countries. This is because the presence of a cointegrating relationship implies that there exists an error-correction mechanism (ECM) that describes the short-run dynamics consistent with the long-run relationship. The results of the ECM are presented in table 4.5. The error correction term ECT_{t-1} are all significant and have the expected negative signs. The estimated coefficient of the error correction terms measure the speed of adjustment to restore equilibrium in the dynamic model. The ECM results indicate that the speed of adjustment is fastest in the case of U.S.A followed by Canada while U.K has the slowest adjustment rate. The error correction models further justify our previous results from table 4.3 that U.S.A has the highest fidelity to tourism in Japan. The estimated speed of adjustment in the case of U.S and Canada are 98.1 % and 91% respectively and are statistically significant. However, any shocks to Japan's tourism will have a longer effects on tourism demand from U.K and Australia tourists' since their speed of adjustments are 20.9% and 35.7% respectively. As with the long-run model, Australia again has the highest income elasticity while U.S income elasticity is still the lowest. In the case of Australia, an increase in GDP per capita will result to 3.13 increases in the number of visitors from Australia at time t. The significant of the $\Delta TA_{j,t-1}$ may be interpreted as a feature of psychocentrictourists. These are tourists who are afraid to take risks and travel to places they are not familiar to, it may also be seen as an habit, as some tourists tend to return the same destination since the uncertainty is less.

5. Conclusions

Cointegration allows the estimation of long-run equilibrium relationship among economic variables while ECM permits the modeling of the short-run and the long-run adjustments processes simultaneously. In this paper, we use the cointegration and error correction models to estimate econometric model for Japan's tourism demand from five major Western countries-U.S.A, Canada, U.K, Germany and Australia. The results of the cointegration indicate that there is a long-run relationship between tourists' arrivals and the causal variables. Both the short-run and long-run models indicate that GDP per capita in tourists' origin country is the most significant factor influencing the inflow of visitors into Japan. The estimated price elasticity in the long-run model of the U.S and Germany are -0.260 and -0.440 respectively and are statistically significant. The statistical significance of these values implies that higher prices are likely to discourage tourists from these countries from traveling to Japan. The estimates of the income elasticity exceed unity in the case of Canada (2.815), Germany (2.198) and Australia (3.317). These values far exceed unity and are statistically significant. Hence, a rise in income level in these countries will be accompanied by a more than proportionate rise in visitors from these countries to Japan. Therefore, Japan's government and tourism organization should pay attention to monitoring and forecasting the expected level of economic activities in these countries. Again, from the long-run model, the prices of tourism in competing destinations are positive and significant; U.K (1.24), Australia (0.37), Canada (0.25) and Germany (0.24). These indicates that an increase in the price of tourism in the substitute or competing destinations (Singapore, South Korea, Thailand and Malaysia) will increase tourists arrival from Australia, Canada and Germany to Japan by 0.37%, 0.25% and 0.24% respectively.

Table 4.5: Error correction model for tourism demand in Japan

(dependent variable ΔTA_{jt})

	Country				
Variable	U.S.A	Canada	U.K	Germany	Australia
Intercept	0.023* (1.702)	0.050* (1.721)	0.129** (2.274)	0.013 (1.129)	0.031 (0.955)
Δy_{jt}	0.439 (0.698)		2.450** (1.990)	0.622 (1.148)	3.133** (2.441)
$\Delta y_{j,t-1}$	-1.279*** (-2.853)				
$\Delta y_{j,t-2}$					
ΔTv_{jt}	0.368** (2.202)	0.486* (1.760)		0.338*** (3.202)	
$\Delta Tv_{j,t-1}$					
$\Delta Tv_{j,t-2}$			0.480* (1.811)		
Δp_{jt}			-0.415** (-2.230)	0.183** (2.430)	
$\Delta p_{j,t-1}$		-0.268 (-1.333)			-0.414** (-2.364)
$\Delta p_{j,t-2}$			-0.262 (-1.040)		-0.361** (-2.071)
Δps_{kjt}	-0.146 (-1.449)			0.153** (2.532)	
$\Delta ps_{kj,t-1}$		0.628** (2.405)			0.320 (1.511)
$\Delta ps_{kj,t-2}$					
$\Delta TA_{j,t-1}$	0.293** (2.279)			0.192* (1.765)	
$\Delta TA_{j,t-2}$	-0.142 (-1.40)	0.109 (0.967)			
ECT_{t-1}	-0.981*** (-5.409)	-0.910*** (-6.048)	-0.209** (-1.998)	-0.674*** (4.877)	-0.357** (-2.207)
R^2	0.710	0.520	0.303	0.628	0.406
DW	2.090	2.037	1.725	2.010	1.702
JB	1.195	35.620***	89.657***	0.033	0.048
LM	0.254	1.139	0.747	1.285	0.623
H	0.865	1.775	1.513	0.356	1.035

Notes: (a) Values in parentheses indicate t-statistics, ***, ** and * indicate that estimates are significant at 1%, 5% and 10% levels respectively. (b) JB denotes the Jarque-Bera test for normality; LM is the Breusch-Godfrey test for serial correlation and H is theBreusch-Pagan-Godfrey test for heteroskedasticity. (c) In estimating the ECM, we used the general-to-specific method.

Since these values are statistically significant, tourism policy makers and planners in Japan should also keep a close watch on the prices of tourism in competing destinations. The long-run and error correction models clearly indicate that the U.S.A and Canada have the highest fidelity to tourism in Japan. Authorities in Japan should therefore strive hard to maintain this high fidelity from tourists from the U.S.A and Canada.

A limitation of this study is the inability to account for structural change in the various models. The tourism industry is highly volatile and there is need to account for possibility of structural change in the model building in future study of Japan's tourism.

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