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Application of Vector Autoregressive Model in Tourism

Although tourism development in North East Asia is growing increasingly competitive, there has been limited research focusing on applying time series analyses to analyze the competition between tourist country destinations. This study will use Vector Auto Regressive (VAR) model, Vector Error Correction (VEC) model, and Granger analysis to explore the causal short and long-term tourism impacts of China and Japan on North East Asia destinations. Findings indicate that neither China nor Japan have short-run influence on tourism development. Interestingly, the long-run inbound tourism of China will depend on the inbound tourism of Japan but not vice versa. The study also finds that Japan has a dominant strategy in the zero-sum game with China, thus strengthening tourism will boost the Japanese economy.

Keywords: Inbound and Outbound tourism, Vector Auto Regressive, Vector Auto Correction, Granger Analysis, Nash equilibrium, Dominant strategy.

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Introduction

Although North East Asia tourism, including China, Hong Kong, Japan, Korea, Macao, Mongolia, and Taiwan, contributed 11.9% to the world's market share in 2012, it rapidly increased 6% in 2012, compared to the world growth of 4%. Within North East Asia, the tourist receipts of China and Japan have been constantly changing in the Asia market. The market share of China is three times bigger than Japan in North East Asia, 36% and 13% respectively. However, considering a 15-year period (1998-2012), the Chinese market share has been lately decreasing 17%, 16%, and 15% in 2010, 2011, and 2012 respectively, whereas the market share of Japan has remained almost the same 5%, 4%, and 5% (UNWTO, 2013). In 2012, the number of Chinese tourists is the second biggest in Japan after Korea (Japan National Tourism Organization, 2012) and the number of Japanese tourists is the second biggest in China after Korea (China Tourism Academy, 2012). China is the biggest spender on international tourism in 2012 as much as $102 billion whereas Japan is the top 8th spender, $28.1 billion. An average expense of each Chinese tourist was one-fourth compared with the one of a Japanese tourist; $54 vs. $213, respectively (UNWTO, 2012).

Japan and China both offer history, culture, heritage, and art for tourists to explore. In the long-term period, the visions of different countries may affect tourism development in reality (Tran et al., 2008). Chinese Tourism ranks tourism development in their economic development as follows: "Tourism and leisure as our starting point and ultimate goal in line with the overall requirements for completing the building of an initially prosperous society in China." (China, 2013). However, according to the Tourism Nation Promotion Basic Law enacted in January 2007, Japan will "(1) increase domestic travel by the Japanese as well as visits to Japan by international travelers, while expanding overseas travel by the Japanese, (2) promote sustainable development of tourism, (3) achieve vibrant regional communities that residents can take pride in and feel attached to, and (4) contribute to enhancement of Japan" (Japan, 2013). In both countries, the government and the tourism industry jointly form tourism development strategy. The industry focuses on providing competitive products, marketing those products and conducting pricing strategies, while the government provides necessary infrastructure, regulates tourist arrivals and foreign capital inflows, and helps the industry in promotion.

The question is whether or not there are potential trends of relationships between the two countries in the short and long run. How can these countries improve their own relationship among one another in order to contribute to tourism in North East Asia and the world?

Literature Review

In order to measure and compare tourism development across countries, researchers used to use demand models (Sinclair, 1998) as follows:

$$D_{ij} = f(Y_i, P_{ij}, E_{ij}, T_{ij}, DV)$$

where *Dij* refers to tourism receipts of the tourist origin country i to the destination j. *Yi* refers to income per capita of country i; *Pij*, relative prices of country i compared to country j. *Eij* refers to exchange rates of country i compared to country j; *Tij* refers to transport costs of country i compared to country j, and DV, dummy variables. When both dependent *Dij* and independent variables (*Yi, Pij, Eij, Tij*) are in the natural log, each coefficient on an independent variable represents an elasticity index, which is interpreted as the percentage change in *Dij* attributable to a one-percent change in independent variables.

When using the demand model, Broomfield (1991) found income elasticities for tourism demand to Fiji to range from .18 to 8.1, depending on country of origin. Shamsudding (1995) reported that exchange rate elasticities only varied between -.78 and 1.27 in Malaysia. Uysal and Crompton (1984) found that the expenditure elasticities in Turkey varied from .18 to 4.22. The previous studies have limits in the duration of their time-series data. According to Narayan (2003), tourism modeling literature before 1995 has ignored unit root tests and co-integration and hence have met spurious regression problems.

Recent studies have applied time series methods to examine the relationships in a new light. Song et al. (2010) uses bias-corrected bootstrap to build and test the demand elasticity for Hong Kong tourism. Lim, Min and McAleer (2008) use the ARIMAX model to find that Japanese income is elastic to tourism in New Zealand. Ouerfelli (2008) uses co-integration analysis and error correction models (ECMs) to estimate and forecast the long run European tourism demand elasticities. Munoz (2007) estimates a dynamic model for German tourists to Spain. The model provides short and long-run elasticities of price for German demand in Spain, which are -1.06 and -2.16, respectively. Li, Wong, Song, and Witt (2006) combine short and long-run approaches to develop a time varying parameter (TVP) and error correction model (ECM). Croes and Vanegas (2005) explore the elasticities of tourists from the U.S., Netherlands, and Venezuela in Aruba. Kulendran and Witt (2001) use the diagnostic checking method to study the adoption of cointegration and error correction models leading to more accurate tourism demand forecasts than those generated by least squares regression models. Since the elasticity relates to human behavior changing over time, researchers have focused on a dynamic model of forecasting rather than a static one. Unfortunately, the dynamic models are limited to one country not related to other competitors.

Competitive tourist destinations are also discussed in the literature. Gomezelj and Mihalic (2008) report that Slovenia's tourism industry possessing inherited resources cannot guarantee an advantageous position for the destination in the regional tourism competition. Buhalis (2000), Uysal et al. (2000), Milhalic (2000), Kozak (2001) and Ritchie and Crouch (2000) report that governments commit considerable effort and funds to enhance their destinations' image and attractiveness. Ritchie and Ritchie (2002) find that government effort is largely directed at promoting public–private sector partnerships to increase destination competitiveness. Reid et al. (2008) present the Atlantic Canada Tourism Partnership (ACTP) as a successful model of a multi-partner alliance for developing the export tourism market. The federal government plays a central role by offering funding necessary to bring competitive destinations and tourism enterprises into cooperation. Qu et al. (2005), Stokes (2008) and Singh and Hu (2008) investigate governments' role in strengthening destination competitiveness. The researchers on destination competition, however, have not applied game theories in their analyses. This study is thus combining Sinclair's (1998) model, time series analyses and game theories to analyze the competition in tourism between China and Japan in North East Asia.

Method

To simulate the logic of using a tourism model for game theory in time series analyses, the present study developed a simple game theory model for a destination under competition to derive the rational tourism development strategy. Sinclair's (1998) model is modified for the game theory as follows:

$$D_{ij} = f(Y_i)$$

where Dij refers to the inbound tourism measured by tourism receipts of the tourist origin country i to the destination j. Yi refers to income per capita of country i measured by the gross domestic product. Inbound tourism is the tourism of non-resident visitors in a country.

The above model is symmetric; that is, it contains two comparable destinations Japan and China within the North East Asia region. In this study, the game theory is the study of interactive decision-making in the sense that China and Japan are assumed to be affected by their own choices and by the decisions of the other. The tourism game between China and Japan is non-cooperative and the player act individually rationally; choosing outcomes that are their own best interest. The countries' "Pay-off" in this study is the value of increasing their gross domestic product units from inbound tourism. The game is either a zero-sum (winner/loser) or a non-zero-sum (win-win). A win-win game, non-zero sum, is the game designed in a way that all participants can profit from it in one way or the other. China and Japan in a win-win game will position their market share in developing inbound and outbound tourism in the North East Asia with an integrative result. In contrast, a zero-sum game is a game in which a participant's gains (or losses) of utility is balanced by the losses (or gains) of the utility of the other participants. Japan and China in a zero-sum game will distribute the pie of tourism in North East Asia with a distributive result.

The rational strategy for Japan and China is the one that can enhance inbound tourism for this game. This study divides the strategies into two: (i) create inbound tourism in the North East Asian tourism market or (ii) withhold inbound tourism from the North East Asian tourism market. The two most fundamental strategy concepts in game theory is a dominant strategy and Nash equilibrium. A strategy is dominant if, regardless of what any other players do, the strategy earns a player a larger payoff than any other. A Nash equilibrium in this study is assumed to be a collection of strategies of Japan or China, which are mutual best responses in the sense that each country's strategy is optimal given the strategy of the other. In a Nash equilibrium, no player has an incentive to deviate from his strategy given that the other players don't deviate. Under the non-cooperative Nash game model, a country is assumed to have concern only for the impact of tourism on its own economy.

In order to measure the pay-off of the country's strategy, the study employs Vector Auto Regression (VAR) as a part of simultaneous equation model. The VAR model is a general framework used to describe the dynamic interrelationship among stationary variables for the analysis of multivariate time series. If the estimation of the relationship among series is co-integrating, the VAR will become the vector error correction (VEC) model that can be used to identify predictors for short-term and long-term impacts. The study employs the following panel data model to generate the payoff schedule:

$$GDP_{it} = \beta_i Tourism_{it} + \varepsilon_t \quad (1)$$

Where GDP_{it} is Gross Domestic Product for country i (China or Japan) at time t. ε_t is residual from GDP and Tourism for country i at time t.

$Tourism_{it}$ is the key variable in this paper that explains the contribution of China and Japan inbound tourism to their GDP. The data of GDP and tourism receipts are taken from the UNWTO (2013). The coefficient (incremental) values of the Tourism of China and Japan to the China GDP (CNGDP) and Japan GDP (JPGDP), respectively, will serve as corresponding values for the payoff matrix.

From the panel model (1), this study constructed simultaneous equation models on Tourism in China (CNTourism) and Japan tourism (JPTourism) through VAR approach as follows:

$$CNGDP_t = \alpha_1 + \Sigma\beta_1 CNGDP_{t\text{-}j} + \Sigma\beta_2 JPGDP_{t\text{-}j} + \Sigma\beta_3 CNTourism_{t\text{-}j} + \Sigma\beta_4 JPTourism_{t\text{-}j} + \varepsilon_1 \quad (2)$$

$$JPGDP_t = \alpha_2 + \Sigma\beta_3 JPGDP_{t\text{-}j} + \Sigma\beta_4 CNGDP_{t\text{-}j} + \Sigma\beta_5 CNTourism_{t\text{-}j} + \Sigma\beta_6 JPTourism_{t\text{-}j} + \varepsilon_2 \quad (3)$$

$$CNTourism_t = \alpha_3 + \Sigma\beta_7 CNTourism_{t\text{-}j} + \Sigma\beta_8 JPTourism_{t\text{-}j} + \Sigma\beta_9 CNGDP_{t\text{-}j} + \Sigma\beta_{10} JPGDP_{t\text{-}j} + \varepsilon_3 \quad (4)$$

$$JPTourism_t = \alpha_4 + \Sigma\beta_{11} JPTourism_{t\text{-}j} + \Sigma\beta_{12} CNTourism_{t\text{-}j} + \Sigma\beta_{13} CNGDP_{t\text{-}j} + \Sigma\beta_{14} JPGDP_{t\text{-}j} + \varepsilon_4 \quad (5)$$

All the variables in a VAR are treated symmetrically; each variable has an equation explaining its evolution based on its own lags and the lags of all the other variables in the model. The VAR approach assumes all variables in the system are potentially endogenous, so each variable is explained by its own lags and lagged values of the other variables. The variables are influencing each other, as for example the growth of China Tourism in year "t" is influenced by the China tourism from the previous period. Likewise, the growth of Japan tourism at year t is influenced by Japan tourism from the previous year.

This study also employs Vector Error Correction (VEC) to describe the pay-off through the coefficients of the model. According to the Engel-Granger (1987) theorem, if two variables y and x are cointegrated, then the relationship between the two can be expressed as an error correction mechanism in which the error term from the optimal least square regression, lagged once, acts as the error correction term. In this case the cointegration provides evidence of a long-run relationship between the variables, whilst the error correction mechanism provides evidence of the short-run relationship. This study formulates a model for the long and short run Granger relationship of tourism between China and Japan in North East Asia as follows:

$$\Delta CNA_t = \alpha_1 + \Sigma\beta_1 CNA_{t\text{-}j} + \Sigma\lambda_{1j} JPA_{t\text{-}j} + \Sigma\Phi\Delta CA_{t\text{-}1} + \varepsilon_1 \ (6)$$

$$\Delta JPA_t = \alpha_2 + \Sigma\beta_2 JPA_{t\text{-}j} + \Sigma\lambda_{2j} CNA_{t\text{-}j} + \Sigma\Phi\Delta JA_{t\text{-}1} + \varepsilon_2 \ (7)$$

Where

$\Delta CA_t, \Delta JA_t$: Difference operator (i.e., $\Delta X_t = X_t - X_{t-1}$) of Inbound or Outbound tourism receipts of China and Japan, respectively.

β, λ, Υ: Coefficients for long run impacts

Φ: Coefficients for short run impacts.

The equations above show that all variables are endogenous variables within the simultaneous equation. This equation describes the short-run dynamic interactions between tourism demand and its determinants measured by Φ coefficient and their long-run relationship measured by β *and* λ coefficients.

Data Analysis and Results

The study data of GDP and Tourism receipts of China and Japan are taken from the United Nations Database (2013). In this paper, the time series are given from 1995 to the end of 2011. The two series of Tourism Receipts of China and Japan, obtained in real values of the growth ratios and converted into natural logarithm to avoid heteroscedasticity, serve as the basis and we can use coefficients as elasticity.

Empirical Analysis and Results

Both tourism receipts of China and Japan are not stationary in levels if based on Figure 1 as follows:

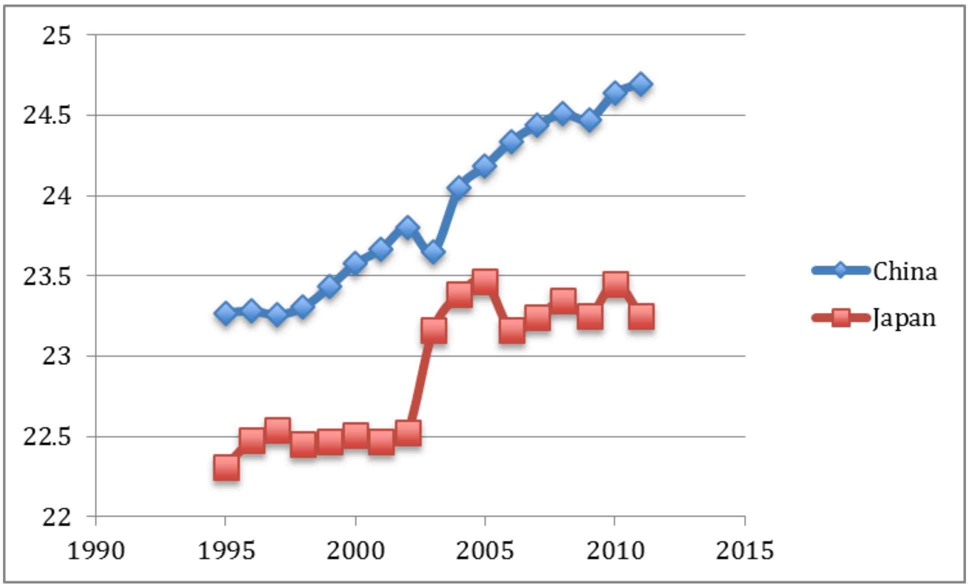

Figure 1: Tourism Receipts (in Ln) between China and Japan 1995-2011

The differences of China tourism receipts as well as Japan tourism receipts seem, however, stationary in Figure 2.

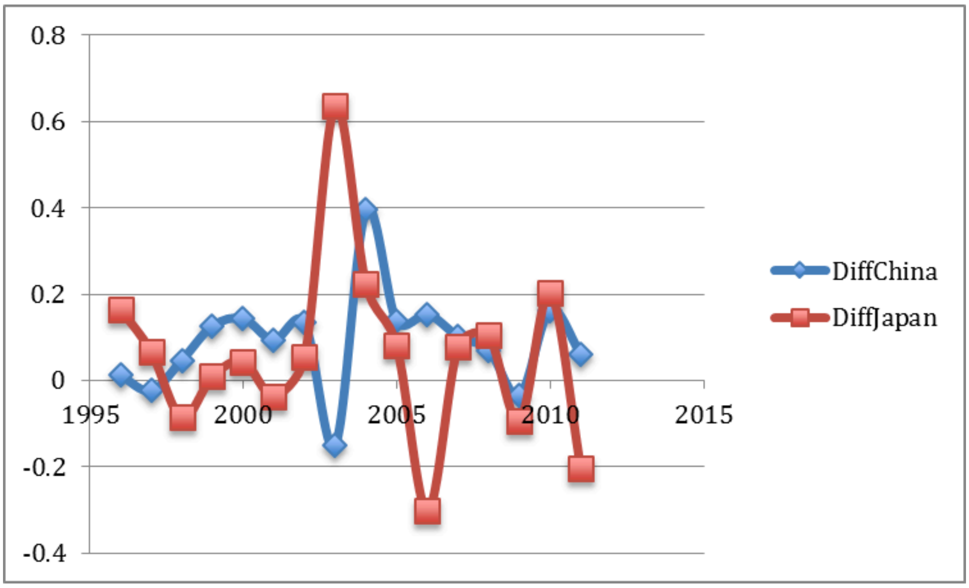

Figure 2: Differences of China Tourism Receipts and Japan Tourism Receipts in Log.

We used the ADF tests to evaluate the stationary characteristics of China and Japan tourism receipts in tables 1 and 2 as follows:

Table 1: Regression analysis between China Tourism Receipts Difference and the lags of China and Japan tourism receipts.

ChinaDiff	Coefficients	Std Error	t Stat	P-value
Intercept	0.104072	0.054249	1.918404	0.087279
ChinaDiff1	-0.38468	0.30376	-1.26641	0.237159
JapanDiff1	0.185372	0.160744	1.153207	0.278532
ChinaDiff2	0.114057	0.273252	0.417406	0.686163
JapanDiff2	0.197974	0.174451	1.134841	0.285761

There are no significant relationships, so the null hypothesis for the ADF test for China that the variable is not stationary is accepted. The variable is stationary and qualified for Granger test.

Table 2: Regression analysis between Japan Tourism Receipts Difference and the lags of China and Japan.

JapanDiff	Coefficients	Std. Error	t Stat	P-value
Intercept	0.121717	0.121813	0.999211	0.343798
ChinaDiff1	-0.21922	0.682072	-0.3214	0.755244
JapanDiff1	0.012004	0.360941	0.033258	0.974195
ChinaDiff2	-0.45402	0.613568	-0.73997	0.478174
JapanDiff2	-0.17385	0.391718	-0.44383	0.667647

There are no significant relationships so the null hypothesis for the ADF test for Japan that the variable is not stationary is accepted. The variable is stationary and qualified for Granger test. The insignificant coefficients of Japan and China in Tables 1 and 2 also indicate that in the short term Japan and China have no significant relationships to tourism development.

Next, Granger's regression analysis was conducted for tourism receipts of China and Japan. The residual between GDP and tourism was analyzed in the Engle-Granger test of cointegration. The residuals saved from the regression between the two tourism receipts were regressed with its lag in Table 3 as follows:

Table 3: Regression analysis between the residual of Tourism Receipts of two countries and its lag (1).

CoinChiJap	Coefficients	Standard Error	t Stat	P-value
Intercept	0	#N/A	#N/A	#N/A
Lag Residual	-0.50222	0.25202	-1.99277	0.06480

The t-ratio is −1.79. The 10% critical value for the model with no intercept is −1.99. The t-ratio falls within the rejection region and the null hypothesis of no cointegration is rejected and we conclude that the two real tourism receipts are cointegrated. The null hypothesis 1 was rejected; there was an integrated vector between TRJapan and TRChina. That is, TRChina and TRJapan have long run associations.

To get the VEC model results for Tourism Receipts of Japan, we estimated the following regression of the difference of Japan tourism receipts on the saved residuals in Table 4 as follows:

Table 4: Regression analysis between Japan tourism receipts difference and the residual of the two countries' tourism receipts.

Japan-China	Coefficients	Standard Error	t Stat	P-value
Intercept	0.06467102	0.052461376	1.232735868	0.237974635
Residual	0.220335348	0.219879892	1.002071385	0.333315274

The non-significant coefficient on lag e indicates that the Japan Tourism Receipts does not respond to disequilibrium between the China and Japan.

To get the VEC model results for Tourism Receipts of China, we estimated the following regression of the difference of China tourism receipts on the saved residuals in Table 5 as follows:

Table 5: Regression analysis between China tourism receipts difference and the residual of the two countries' tourism receipts.

China-Japan	Coefficients	Standard Error	t Stat	P-value
Intercept	0.082187367	0.025395245	3.236328983	0.005972958
Residual	-0.26532211	0.106438376	-2.492729793	0.025826775

China does appear to respond to the disequilibrium between the two tourism receipts of China and Japan. These findings support the idea that the tourism conditions in China depend on those in the Japan but not vice versa.

All the above VAR and VEC tests were "manually" analyzed using Excel. When applying the results to the game theory, this study had to use results from Eviews for VAR and VEC results as shown in Table 6 and Table 7.

Game Theory

The decision to enter North East Asia tourism will be a dominant strategy for Japan. From the VAR result simulation in Table 6, this study indicates that China Tourism is influenced by her own tourism in t-1 ($t=1.70$, $p<.05$) and Japanese tourism in t-1 ($t=1.93$, $p<.05$) while Japanese tourism, on the other hand, is clearly influenced by her tourism in t-1 ($t=2.25$, p<.05). From this simulation, this study indicates that China's strategy is relatively dependent on Japan's strategy.

Table 7 indicates that there was a long run impact of Japan tourism on China tourism (C(1)=-0.368, P<.001) but there was no long run impact of China tourism on Japan (C(7)=0.05, p=0.6). In order to find short run impacts between the two countries, a Wald test was conducted with two null hypotheses (C(2)=C(3)=C(4)=C(5)=0; and (C(8)=C(9)=C(10)=C(11)=0). As a result, the Chi-squares for both of the above equations were not significant so the null hypotheses were accepted; there is no short-term impact of China on Japan and vice versa.

Table 6: VAR result from EVIEWS

	CNGDP	JPGDP	CNRECEIPTSMIL	JPRECEIPTSMIL
CNGDP(-1)	0.407468	2.621553	-17.77659	-10.9691
Std.errors	-0.53493	-8.15463	-9.81809	-10.0704
t-statistic	[0.76172]	[0.32148]	[-1.81060]	[-1.08924]
CNGDP(-2)	0.595559	4.064681	18.17989	9.761069
Std.errors	-0.46991	-7.16337	-8.62463	-8.84628
t-statistic	[1.26740]	[0.56743]	[2.10790]	[1.10341]
JPGDP(-1)	-0.008431	0.160042	0.121188	-0.205651
Std.errors	-0.02331	-0.35527	-0.42774	-0.43874
t-statistic	[-0.36175]	[0.45048]	[0.28332]	[-0.46873]
JPGDP(-2)	0.013263	-0.271768	-0.134437	-0.149302
Std.errors	-0.01496	-0.228	-0.27451	-0.28157
t-statistic	[0.88677]	[-1.19196]	[-0.48973]	[-0.53025]
CNRECEIPTSMIL(-1)	0.035337	-0.156732	0.579647	0.171979
Std.errors	-0.01864	-0.28408	-0.34203	-0.35083
t-statistic	[1.89623]	[-0.55171]	[1.69470]	[0.49021]
CNRECEIPTSMIL(-2)	-0.000467	-0.156854	0.549636	0.264402
Std.errors	-0.01754	-0.26738	-0.32192	-0.33019
t-statistic	[-0.02662]	[-0.58664]	[1.70738]	[0.80076]
JPRECEIPTSMIL(-1)	0.015428	0.157412	0.742465	0.886455
Std.errors	-0.02088	-0.31834	-0.38328	-0.39313
t-statistic	[0.73879]	[0.49447]	[1.93712]	[2.25485]
JPRECEIPTSMIL(-2)	-0.03103	-0.170132	0.16295	-0.443537
Std.errors	-0.02746	-0.41857	-0.50396	-0.51691
t-statistic	[-1.13010]	[-0.40646]	[0.32334]	[-0.85806]
C	-531.0819	37435.36	-3948.068	11839.68
Std.errors	-744.856	-11354.7	-13671	-14022.3
t-statistic	[-0.71300]	[3.29689]	[-0.28879]	[0.84434]
Mean dependent	2110.441	36378.06	29714.53	10322.4

Table 7: Long run and Short run Impacts in VEC from EVIEWS

System: UNTITLED

Estimation Method: Least Squares

Date: 05/06/14 Time: 03:14

Sample: 1998 2011

Included observations: 14

Total system (balanced) observations 28

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.368053	0.119557	-3.07847	0.0072
C(2)	-0.650616	0.253017	-2.571435	0.0205
C(3)	-0.462479	0.326484	-1.416544	0.1758
C(4)	-0.974137	0.54442	-1.789311	0.0925
C(5)	-0.731678	0.498323	-1.468281	0.1614
C(6)	6689.082	1743.121	3.837417	0.0015
C(7)	0.054419	0.131548	0.413679	0.6846
C(8)	-0.219707	0.278393	-0.789198	0.4415
C(9)	-0.135973	0.359229	-0.378515	0.71
C(10)	0.061936	0.599022	0.103395	0.9189
C(11)	0.088518	0.548302	0.161439	0.8738
C(12)	1237.884	1917.946	0.645421	0.5278

Equation: D(CNRECEIPTSMIL) = C(1)*(CNRECEIPTSMIL(-1) - 5.20320093912*JPRECEIPTSMIL(-1) + 24858.6357171) + C(2)*D(CNRECEIPTSMIL(-1)) + C(3)*D(CNRECEIPTSMIL(-2)) + C(4)*D(JPRECEIPTSMIL(-1)) + C(5)*D(JPRECEIPTSMIL(-2)) + C(6)

Observations: 14		Mean dependent var	
R-squared	0.64119	S.D. dependent var	2906.214
Adjusted R-squared	0.416933	Sum squared resid	3168.373
S.E. of regression	2419.332		46825328
Durbin-Watson stat	1.749638		

Equation: D(JPRECEIPTSMIL) = C(7)*(CNRECEIPTSMIL(-1) -5.20320093912*JPRECEIPTSMIL(-1) + 24858.6357171) + C(8)*D(CNRECEIPTSMIL(-1)) + C(9)*D(CNRECEIPTSMIL(-2)) + C(10)*D(JPRECEIPTSMIL(-1)) + C(11)*D(JPRECEIPTSMIL(-2)) + C(12)

Observations: 14		Mean dependent var	
R-squared	0.225639	S.D. dependent var	454.2143
Adjusted R-squared	-0.258336	Sum squared resid	2373.045
S.E. of regression	2661.977		56688980
Durbin-Watson stat	1.736849		

From the results in Table 6, this game scheme yields the payoff matrices in Table 8. Payoffs in the two-player game are given to the row player (Japan) and the column player (China).

Below is the detailed explanation.

Table 8: Payoff Matrices

China

Japan

Japan / China	Enter	Withhold
Enter	157,412 / 35,337	144,119 / 0
Withhold	0 / 2,423	0 / 0

Japan

If Japan decides to enter the North East Asia tourism market, it will yield several payoffs given China's actions. Japan will yield a GDP increase of $157,412 for each dollar of tourism if China decides to enter the inbound tourism. Japan will have $144,119 as a reward if China withholds her action. On the other hand if Japan's action is to isolate it from the North East Asia tourism market, it will give zero (0) contribution given China's actions. Thus, Japan's best response function is to enter the North East Asia market. This is true since it produces the most favorable outcome for Japan, taking other countries' strategies as given. This is also a dominant strategy in view of the fact that creating gross domestic product earns Japan larger payoffs than withholding it.

China

China's strategy to create gross domestic product through tourism will give her several payoffs given other countries' actions. China will take $35,337 from her GDP from an increase of $1 in tourism if Japan decides to do the same thing. China will get $2,423 as her payoff if Japan withholds from the North East Asia tourism market.

Discussion

The results of this study have indicated there are no short-term mutual influences between the two countries, but in the long term, China will continue to rely on the disequilibrium of tourism between China and Japan. The limit of this study is its assumption that there would be no change in the surrounding reality of international tourism flow patterns; there would be no wars, political conflicts, terrorism, flight accidents, etc... In fact, tourism is a political-economic activity, which dictates political trends and variations in these trends and it is out of the scope of the research for this study. For example, the current political dissention between the two countries regarding sovereignty of the Senkaku/Diaoyus Islands is certainly a short–term influence, which may have long-term consequences, which will distort data, and tourism flows.

The finding that China inbound tourism is affected in the long run by Japan inbound tourism but not vice versa can be explained by the fact that the number of tourists visiting Japan would include China in their travels. The simulation game in this study also indicates that China and Japan's strategy are interdependent to each other. With the absence of China tourism, Japan's GDP was decreased from 157,412 to 144,119. With the absence of Japan tourism, China's GDP was decreased from 35,337 to 2,423.

The Nash equilibrium in the game among Japan, China and other North East member countries would happen when China and Japan are playing the same strategy that is to create tourism with the North East member countries. The game is analyzed and it has created a benchmark towards the future tourism policy. The growing significance of China and Japan market for North East Asia will then serve as the basis for a single North East Asian tourism. China and Japan in a win-win game will position their market share in developing inbound and outbound tourism in the North East Asia in an integrative result. Eventually, China and Japan will find their way to contribute to the tourism in North East Asia to cope with the future challenges of globalization and remain internationally competitive.

Despite the limitations, this study contributes to applying the Vector Auto Regressive, Error Correction Vector, and the Granger Analyses to forecast exclusive the short and long term impacts of tourism receipts between Japan and China.

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