

The analysis of the relationships of Korean outbound tourism demand: Jeju Island and three international destinations

Joo Hwan Seo,

*Department of Marketing, School of Business, George Washington University,
Funger Hall, Suite 301, Washington, D.C. 20052, USA*

Sung Yong Park,

*Wang Yanan Institute for Studies in Economics, Xiamen University, Xiamen,
Fujian 361005, China.*

Larry Yu

*Department of Tourism and Hospitality Management, School of Business
George Washington University
Funger Hall, Suite 301U, Washington, D.C. 20052, USA*

Paper submitted to The George Washington University Doctoral Program

September 30, 3008

***** Manuscript Submission in Process *****

PLEASE DO NOT CITE OR QUOTE WITHOUT PERMISSION

The analysis of the relationships of Korean outbound tourism demand: Jeju Island and three international destinations

Abstract

This paper investigates the determinants of the relationship among Korean outbound tourism demand for Jeju Island and three other Asian island countries using the multivariate generalized autoregressive conditional heteroskedasticity (MGARCH) and Vector Error Correction (VEC) models. It is found that pairwise conditional correlations among tourism demand for Jeju, Thailand, Singapore and the Philippines are not constant but time-varying. Estimated conditional correlations among Jeju and the three Asian countries are negative over some time periods. This implies that the three Asian countries are substitutes for Jeju in certain specific time horizons. The VEC model is used to investigate the short-run and long-run dynamic relationships and the results reveal that Industrial Production Index and real exchange rates had the positive or negative impact on conditional correlations of tourism demand for these destinations. Tourism policy implications are discussed for managing tourism demand for these destinations.

Keywords: Dynamic conditional correlation; Multivariate GARCH; Vector error correction model; Jeju Island; Korean outbound tourism

The analysis of the relationships of Korean outbound tourism demand: Jeju Island and three international destinations

1. Introduction

The purpose of this study is to investigate the significance of South Korean outbound tourism to Jeju Island and three other Asian destinations by examining the determinants of the relationship among tourism demand and factors influencing the demand. It attempts to use the Dynamic Conditional Correlations (DCC) model to analyze the dynamic structure of conditional correlations among Korean outbound tourism demand for one domestic destination and three similar international destinations over time. It focuses on the applications of the research findings to demand analysis in destination management and government policy development.

Over the past several decades, the tourism industry in South Korea has increasingly become a significant segment of the national economy. Tourism expenditures accounted for 3.2% of the total final demand and value-added revenue induced from tourism-related businesses made up 3.5% of the Gross Domestic Product (GDP) in South Korea in 1988 (Oh, 2005). Twenty years later, the contribution of travel and tourism to the Korean GDP is estimated to reach 6.6% in 2008 by the World Travel and Tourism Council (2008). Before 1988, the Korean government restricted outbound travel by Korean citizens to control the outflow of foreign currency while promoting rigorously inbound tourism through mega events such as the 1986 Asian Games and 1988 Olympic Games. As a result, inbound tourism grew rapidly and South Korea enjoyed a surplus in its balance of payment in travel account. However, the Korean government lifted the restriction on outbound travel by Korean citizens as well as the spending limit on credit card use during overseas travel by passing the Liberalization of Travel Code in late 1988 (Singh, 1997; Mak, 1992). After the removal of the outbound travel

restriction by the government, outbound travel by Korean tourists gradually increased and the trend continued markedly throughout the 1990s and the first part of 2000s. Consequently, South Korea experienced seven consecutive years of deficits in the national balance of payments in travel account from 2000 to 2006. For example, the number of inbound tourists to Korea was recorded at 6.16 million while the number of Korean outbound tourists reached 11.61 million in 2006, resulting in a staggering deficit of \$8.49 billion in the balance of payments in travel account (Korea Tourism Organization, 2007).

The Korean outbound tourism demand is primarily for leisure, business, conference, and government travel (Korea Tourism Organization, 2007). Particularly, Korean leisure tourism demand for Asian countries, such as Thailand, Japan, China, Singapore and the Philippines, has markedly increased since 1992, except during the Asia Financial Crisis in 1997 and the outbreak of SARS in 2003.¹ The outbound tourism gradually affected Korean domestic tourism. Jeju Island, located to the southeast of Korea and recently designated as a World Natural Heritage site by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in June 2007, has been a leisure and honeymoon destination for Koreans.² The number of Korean and international tourists to Jeju Island was approximately 4.7 and 0.38 million in 2005 respectively, according to Jeju Special Self-Governing Provincial Tourism Association.³ Despite Jeju's pristine island landscapes and beach resorts - in comparison to other popular destinations on the Korean peninsula - Korean tourists have been influenced to overseas vacations by many push and pull factors. The push factors include increased discretionary income, relaxed policy on outbound travel and spending,

¹ Overall, Korean outbound tourism demand of leisure purpose for Thailand, Japan, China, Singapore and the Philippines was 70%, 58%, 55%, 85% and 81%, respectively in 2006 (Korea Tourism Organization, 2007). The demand of Korean outbound tourism for China has been significantly increased since 2000 due to improved political relations, open sky agreement (2006), geographic proximity and vigorous promotions by both the Chinese and Korean tourism industry.

² Jeju Island was recently recognized as UNESCO World Natural Heritage site for its spectacular volcanoes and lava tubes. It is the first UNESCO World Natural Heritage site in Korea.

³ Jeju Special Self-Governing Provincial Tourism Association is an industry association charged to promote the destination to both domestic and international tourism. More information can be obtained from: <http://www.hijeju.or.kr/>

available leisure time, and strong motivations for overseas travel. The pull factors are demonstrated in aggressive marketing by overseas tourism destinations, favorable foreign exchange rates, and convenient and competitive tour packages. The Korean tourism authority is now faced with the challenges of promoting Korean destinations to domestic tourists.

It is therefore interesting to examine the determinants of the time-varying relationships among Korean tourism demand for Jeju Island and other popular Asian island destinations. These determinants can reveal how selected major Korean macroeconomic variables affect Korean tourists' demand for Jeju and the other popular Asian destinations. As a competitive analysis, three Asian countries, the Philippines, Singapore, and Thailand, were selected for this study because these three countries also feature beautiful islands and have been popular with Korean tourists since the 1990s. Thailand, the Philippines, and Singapore were ranked the 4th, 5th and 8th outbound tourist destinations for the Koreans in 2005, respectively. Eighty-six percent of Korean visitors to Thailand, 81.4% to the Philippines and 70.2% to Singapore were reported as leisure tourists by the Korea Tourism Organization in 2005. In addition, Table 1 illustrates that about 63.5% of Korean outbound tourists visited Jeju Island as FIT, but about 75.9%, 80.3%, and 83.4%, respectively, of Korean outbound tourists took package tours to the Philippines, Singapore, and Thailand.

[Table 1 Here]

Three research questions were formulated for this study: (i) Is the relationship among tourism demand for Jeju and the three Asian destinations constant over the time horizon under study? (ii) Are the three Asian destinations substitutes or complements for Jeju Island in regard to Korean outbound tourism? (iii) What are the determinants of conditional correlations among Jeju Island and the three Asian destinations? The findings of these questions can be used to help policy formulation, forecast visitor flow, and enable

Korean tourism authority and destination management to understand demand patterns and promote domestic tourism.

In this study, the multivariate generalized autoregressive heteroskedasticity (MGARCH) model with dynamic conditional correlation (DCC) specification and the vector error correction model (VECM) is applied to investigate the above research questions. The relationship of Korean outbound tourism demand for Jeju and the three Asian destinations can be measured by correlation coefficient. Usually, correlation coefficient is given by a constant which is not time-varying. However, in reality, correlation coefficient of tourism demand between two destinations may not be a constant since it can fluctuate over time. The MGARCH model with DCC specification, proposed by Engle (2002), provides an useful way to estimate conditional (time-varying) variance-covariance matrix. Thus, the dynamic structure of conditional correlations among Korean outbound tourism demand for Jeju Island and the three Asian destinations can be analyzed by estimating DCC-MGARCH model. Once the time-varying correlation series are determined, the effects of major macroeconomic variables can be analyzed by the usual regression setup. It is well known that many macroeconomic variables are non-stationary (Nelson & Plosser, 1982). It is therefore very useful to apply VECM to evaluating such non-stationary behavior of time-series variables (Engle & Granger, 1987). Thus, VECM is applied to determining the effects of major economic variables to the time-varying correlation among Korean outbound tourism demand for Jeju Island and the three Asian destinations.

2. Literature Review of Tourism Demand

Scholars have been studying tourism demand by applying various econometric and statistical models to understand tourism decisions and behaviors influenced by macroeconomic factors.

Webber (2001) investigated exchange rate volatility as macroeconomic variable and cointegration in the long-run demand of Australian outbound leisure tourism for nine major tourism destination from 1983 to 1997. This study found that exchange rate was significant in determining the long-run tourism demand by 50% in some estimates. Another study applied the consumer theory of choice to Australian international tourism demand from the US, UK, Japan and New Zealand and discovered cross-demand effects due to diverse tourist motivations (Divisekera, 2003).

Several studies have been conducted to investigate the volatility of tourism demand (Chan, Lim & McAleer, 2005; Kim & Wong, 2006; Shareef & McAleer, 2007). Song, Romilly, and Liu (2000), and Kim and Wong (2006) used the univariate autoregressive conditional heteroskedasticity (GARCH) model to analyze the volatility of tourism demand.⁴ However, the univariate GARCH model cannot determine an interdependent effect among variables. Chan, Lim and McAleer (2005), and Shareef and McAleer (2007) later extended the univariate GARCH model to the multivariate GARCH (MGARCH) model for studying international tourism demand.

Hoti, McAleer, and Shareef (2007) applied the ARCH and VARMA-GARCH models to compare tourism demand, country risk return and associated volatility for Cyprus and Malta, and identified the spillover patterns in tourism growth and country risk returns in the two small island tourism economies. They used the MGARCH model with a constant conditional correlation specification by Bollerslev (1990) to analyze the interdependencies of international tourism demand among destinations.

However, they assumed that the conditional correlation is constant over time, which could be an especially strong assumption in the real world. This study applies the multivariate

⁴ GARCH model is a generalized autoregressive conditional heteroskedasticity (ARCH) model. It uses the variance of the current error term as a function of the variances of the previous time period's error term. The model relates the error variance to the square of a previous period's error.

generalized autoregressive conditional heteroskedasticity (MGARCH) model, one of the most frequently used methods to estimate the time-varying covariance matrix, to determine the conditional correlation coefficient as a measure for analyzing the time-varying relationships of tourism demand for Jeju and the three Asian destinations. The variance-covariance matrix is estimated each time to calculate the time-varying correlation coefficient. In this study, the MGARCH model with the dynamic conditional correlation (DCC) specification proposed by Engle (2002) was adopted to estimate the conditional correlation among the Korean tourism demand for Jeju Island and the three competing Asian destinations. As in previous research, Chan, Lim and McAleer (2005) noted that the constant conditional correlation multivariate GARCH model is not significantly different from one another and suggested the DCC model of Engle (2002) as a new approach for examining the dynamic structure of interdependent and dependent effects of international tourism demand. Moreover, determinants of the conditional correlations are examined using the vector error correction model (VECM) with time-series data of the Industrial Production Index (IPI) and real exchange rate for each country.

The error correction model (ECM) is a frequently adopted methodology for analyzing tourism demand (e.g., Kulendran & King, 1997; Seddighi & Shearing, 1997; Vogot & Wittayakorn, 1988). Kulendran (1996) applied the cointegration and ECM methods to estimate the short-run and long-run relationships between tourism demand and its determinants using quarterly tourism demand data. Kim and Song (1998) took the cointegration and error correction approach to examine the long-run and short-run international tourism demand of four countries for visiting Korea. After estimating VECM, the authors performed the impulse response and forecasting variance decomposition analyses to determine how major macroeconomic variables affect relationships of tourism demand for

these various destinations.

This study thus contributes to tourism demand research by advancing the constant conditional correlation GARCH model to the time-varying conditional correlation, DCC-MGARCH model to investigate fully the dynamic structure of conditional correlations and understand the impact of macroeconomic factors for short-run and long-run Korean outbound demand for Jeju Island and the three Asian destinations. It intends to determine if Jeju had been substituted by the three Asian destinations, especially after the Liberalization of the Travel Code went into effect in 1988. This study is applicable for destination competitive strategies and policy development.

3. Econometric Models

3.1. Multivariate Generalized Autoregressive Conditional Heteroskedasticity Model

The correlation coefficient $\rho(Y_{1,t}Y_{2,t})$ between stationary time-series $Y_{1,t}$ and $Y_{2,t}$, represents a constant relationship between two time-series variables. However, it is hardly believed that the relationship between these variables is constant over time. The conditional correlation coefficient can be written by $\rho_t | \mathfrak{F}_{t-1}$ where \mathfrak{F}_{t-1} denotes σ -algebra generated by all available information up to time $t - 1$. Therefore, $\rho_t | \mathfrak{F}_{t-1}$ is clearly time-varying since the main purpose of this paper is to analyze the interrelationship of conditional time-varying correlations among tourism demand for various destinations. The time-varying correlation approach is the most preferable explanation.

A widely used methodology for estimating the conditional correlation coefficient is the MGARCH model.⁵ In general, the M- dimensional MGARCH model can be written as

⁵ Bauwens, L., Laurent, S., & Rombouts, J. (2006) provided the survey and Multivariate GARCH models.

$$Y_t = m_t(x_t; \zeta) + \varepsilon_t, \quad (1)$$

$$\varepsilon_t | \mathfrak{F}_{t-1} \sim F(0, H_t), \quad (2)$$

Where $Y_t = (Y_{1,t}, Y_{2,t}, \dots, Y_{M,t})'$ and $\varepsilon_t = (\varepsilon_{1,t}, \varepsilon_{2,t}, \dots, \varepsilon_{M,t})'$ are $M \times 1$ vectors, $m_t(\cdot) = (m_{1,t}(\cdot), m_{2,t}(\cdot), \dots, m_{M,t}(\cdot))'$ denotes a vector-valued conditional mean function, $\zeta = (\zeta_1, \zeta_2, \dots, \zeta_M)'$ means $p \times M$ conditional mean parameters, F denotes an M -dimensional multivariate distribution, and H_t is a time-varying $M \times M$ conditional covariance matrix. Many types of the MGARCH model can be specified by constructing different H_t and F . There are many specifications for MGARCH model in the literature. In this study, Engle's (2002) Dynamic Conditional Correlation (DCC) specification is applied since it has fewer parameters to be estimated, and at the same time, it is relatively easy to use the numerical optimization for obtaining the convergence compared to other specifications, such as the diagonal vector and positive definitive variance specifications. The DCC-MGARCH model is given by

$$H_t = D_t \Gamma_t D_t, \quad (3)$$

$$D_t = \text{diag}\{h_{11,t}^{1/2}, h_{22,t}^{1/2}, \dots, h_{MM,t}^{1/2}\}, \quad (4)$$

$$h_{ii,t} = w_i + \beta_i h_{ii,t-1} + \gamma_i \varepsilon_{i,t-1}^2, \quad i = 1, 2, \dots, M, \quad (5)$$

$$\Gamma_t = (\text{diag}\{Q_t\})^{-1/2} Q_t (\text{diag}\{Q_t\})^{-1/2}, \quad (6)$$

$$Q_t = (1 - \delta_1 - \delta_2) \bar{Q} + \delta_1 u_{t-1} u_{t-1}' + \delta_2 Q_{t-1}, \quad (7)$$

where ε_t and $u_t = (\varepsilon_{1,t} / \sqrt{h_{11,t}}, \varepsilon_{2,t} / \sqrt{h_{22,t}}, \dots, \varepsilon_{M,t} / \sqrt{h_{MM,t}})'$ denote vectors of unexpected returns

and standardized unexpected returns, respectively. For simplicity, $h_{ii,t}$ is given by standard GARCH(1,1) process (Bollerslev, 1986). Γ_t is the time-varying correlation matrix, and Q_t denotes an $M \times M$ symmetric positive definite matrix. $\bar{Q} = E[u_t u_t']$ is an $M \times M$ unconditional variance matrix of u_t . Since \bar{Q} cannot be evaluated explicitly, \bar{Q} is replaced with its sample counterpart $\frac{1}{T} \sum u_t u_t'$ during the estimation process. δ_1 and δ_2 are scalar parameters, and $\delta_1 \geq 0$, $\delta_2 \geq 0$ and $\delta_1 + \delta_2 < 1$ guarantee positive definiteness of a conditional correlation matrix. Given the above model, the time-varying correlation coefficient between i and j , say, $\rho_{t,ij}$, for $i \neq j$, can be expressed by the element in Γ_t as

$$\rho_{t,ij} = \frac{q_{t,ij}}{\sqrt{q_{t,ii}q_{t,jj}}}, \quad (8)$$

where $q_{t,ij}$ is an $i - j$ th element of Q_t .

In order to estimate parameters, $\theta = (s', w', \rho', r', \delta')$ in (3)-(8), the maximum likelihood estimation method, is used assuming that F follows multivariate normal distribution. Engle and Sheppard (2001) demonstrated that $\hat{\theta}_{ML}$ is consistent and asymptotically normally distributed.

3. 2. Vector Error Correction Model

According to Engle and Granger (1987), when there is a long-run equilibrium relationship between two non-stationary variables, the short-term disequilibrium relationship can be represented by ECM. This model is helpful for both the long-run and short-run disequilibrium performance. When there are more than two variables in the system, such as M variables, it is possible that more than one cointegrating relationship can exist;

correspondingly, the ECM becomes a vector, and that vector is an error correction model (VECM). Bonham, Edmonds, and Mak (2006) demonstrated the application of VECM in their study, which explains the movement of four key endogenous tourism variables for generating a dynamic visitor forecast.

The form of VECM (p) can be written as

$$\Delta Y_t = \Gamma A' y_{t-1} + \Gamma_1 \Delta Y_{t-1} + \dots + \Gamma_{p-1} \Delta Y_{t-p+1} + \varepsilon_t, \quad (9)$$

where Γ and A are $(r \times \ell)$ parameter matrix, $\Gamma_i, i = 1, 2, 3, \dots, p-1$, denotes $(r \times r)$ matrix. ε_t denotes the white noise process with a mean of 0 and a covariance matrix Σ . When there exist ℓ numbers of cointegrating relationships among r unit-root process in Y_t , and A is written by $(r \times \ell)$ matrix in which ℓ rows represent cointegrating vectors, VECM (9) can be appropriately interpreted. Since A consists of ℓ rows of cointegrating vectors, $A'Y_{t-1}$ represents a deviation from the long-run equilibrium. These deviations are corrected by an error correction coefficient Γ .

When estimation results are generated, the key output of interest from VECM are the impulse response and the variance decompositions. Given the endogenous input to VECM and interaction between variables, an appropriate method of examining the force of shock to variables in the VECM is to study the behavior of impulse response functions generated from the model. To complement the analysis of the impulse response functions, the forecast error variance decomposition is investigated. The decomposition helps comprehend the proportion of the fluctuation in a series explained by its own shocks opposed to shocks from other variables. Usually, the variables are understood to explain almost all their forecast error variances on short horizons and in smaller percentages on longer horizons.

The cointegration and VECM methodology discussed in the above section demonstrates

several advantages. If the variables are found to be cointegrated, the VECM can find short-run disequilibrium errors. In addition, the VECM model can avoid the spurious regression problem with non-stationary variables. Lastly, the VECM expression of disequilibrium relationship among variables will minimize the problem of multicollinearity, because practitioners claim that the regressors in the VECM are frequently almost orthogonal.

4. Empirical Results

4.1. Descriptive Data

To estimate time-varying correlation coefficients of tourism demand for piecewise destinations, this research designates the proxy variable as the number of Korean tourist departures to the following three Asian destinations: the Philippines, Singapore and Thailand, as well as Jeju Island. Monthly Korean outbound data from April 1980 to June 2006 were used for this study, yielding a total of 314 observations obtained from the Korea Tourism Organization (2006). Figure 1 portrays that monthly tourist departures from Korea to the four destinations were highly volatile. Tourism demand for the three Asian countries has markedly increased since 1988 when the Liberalization of the Travel Code was established to relax the control over Korean outbound tourism. Tourism demand for the four destinations showed upward trends, with cyclical and seasonal patterns. Although tourism demand fell sharply around the time of the Asia Financial Crisis (1997), similar seasonal patterns were retained. Currently, the demand of Korean outbound tourism for Jeju Island has been steady, but it has increased significantly for the other three Asian destinations.

[Fig. 1 Here]

Since the MGARCH model is used to estimate the conditional correlation among Korean outbound tourism demand, the data should be stationary. Thus, the first difference of log-

transformed tourism demand data are taken to make series stationary. $Y_{jeju,t}$, $Y_{phil,t}$, $Y_{sing,t}$ and $Y_{thai,t}$ are denoted as the tourism demand incremental rate of Korean outbound tourism to Jeju Island, the Philippines, Singapore, and Thailand, respectively. Figure 2 plots the first differenced data for the four destinations. Table 2 shows the descriptive statistics for the incremental rates of Korean tourists for Jeju Island, $Y_{jeju,t}$, the Philippines, $Y_{phil,t}$, Singapore, $Y_{sing,t}$, and Thailand, $Y_{thai,t}$.

[Table 2 Here]

Based on the results of the normality test by Jarque and Bera (1980), the null hypotheses of $Y_{jeju,t}$, $Y_{sing,t}$ and $Y_{thai,t}$ are rejected at the 0.01% significance level, i.e., it is, significantly, normally distributed. While only $Y_{jeju,t}$ has kurtosis of less than 3, kurtoses of $Y_{phil,t}$, $Y_{sing,t}$, $Y_{thai,t}$ are greater than 3, and therefore, leptokurtosis. Since the skewness and kurtosis of $Y_{sing,t}$, respectively, are lower and higher than $Y_{jeju,t}$, $Y_{sing,t}$ and $Y_{thai,t}$ in absolute values, the Jarque and Bera statistics for Singapore is much higher. Ljung-Box (LB) test statistics of lag 10 using the series (Q) and its square (Q^2) are also presented. High values of Q and Q^2 indicate that there are strong first- and second-order dependence, and these imply that the autocorrelation and conditional heteroskedasticity are present in the data.

Figure 2 shows that the large (small) incremental rate is followed by a large (small) incremental rate. This demonstrates that there is a conditional variance process in the data. Accordingly, the MGARCH model is appropriate for modeling tourism demand for the four destinations.

[Fig. 2 Here]

To analyze the determinants of a time-varying correlation, macroeconomic variables of

Industrial Production Index (IPI) and real exchange rate for each country are also considered. Economists usually use Gross Domestic Product (GDP) to measure the value of economic development. However, GDP is usually reported quarterly. Since the monthly tourism departure data are used in this study, Industrial Production Index (IPI) is analyzed in lieu of GDP. The monthly IPI data were obtained from the financial database of International Financial Statistics (IFS), and exchange rates were collected from the Korea Exchange Bank. Furthermore, the Liberalization of the Travel Code (1988), Asian Financial Crisis (1997), ten million Internet users in Korea (1999), September 11 terrorist attacks (2001), Severe Acute Respiratory Syndrome (SARS, 2003), and the reduction of working hours in Korea (2004) are examined and introduced as dummy variables for analysis.

4.2. Estimation results for MGARCH model

To estimate the variance-covariance matrix H_t in (3), the conditional mean function $m_t(\cdot)$ in (1) needs to be specified correctly. Existing studies showed preferential use of the autoregressive (AR) model or the autoregressive moving-average (ARMA) model as the conditional mean model (Shareef & McAleer, 2005). Since it is well known that there are AR and seasonal effects in the tourism demand time-series, AR terms and 11 seasonal dummy variables are included in the conditional mean equation (Wong, Song & Chon, 2006). Thus, conditional mean equation can be written by

$$Y_{i,t} = m_t(x_i, \zeta) = c_{i,0} + c_{i,1}Y_{i,t-1} + c_{i,2}Y_{i,t-2} + \sum_{n=1}^{11} s_{i,n}D_n + \varepsilon_{i,t}, \quad i = 1, 2, 3, 4, \quad (11)$$

where $c_{i,0}$, $c_{i,1}$, $c_{i,2}$, $s_{i,n}$ and D_n denote coefficients and seasonal dummy variables; and conditional variance-covariance equations are given in (3) to (7) with $M = 4$. As a result, various combinations of lag order for AR and ARMA models are constructed. Based on

Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC), AR of order 2 Lag order 2, or AR(2), is selected.

Table 3 shows the estimated results of the proposed MGARCH model using a maximum likelihood estimation method assuming multivariate normality of error distribution. All the autoregressive coefficients are highly significant. All negative values of $c_{i,1}$ imply that all tourism demand is negatively related with the previous one. The results of conditional variance equations are $\hat{\gamma}_i + \hat{\beta}_i = 0.998$ and 0.985 for the Philippines and Jeju Island, respectively. The volatilities of these two destinations are highly persistent. However, the other destinations, Thailand, and Singapore, do not have such persistence. The GARCH effect, $\hat{\beta}_i$, is not significant and almost 0 for Singapore. When the estimated $\hat{\delta}_1$ and $\hat{\delta}_2$ are close to 0, it is concluded that the conditional correlation is constant. The highly significant values of $\hat{\delta}_1$ and $\hat{\delta}_2$ imply that the conditional correlation is time-varying. However, the seasonal effects cannot be created. For countries with island destinations, summer or winter effects turn out to be quite significant. For example, the Philippines and Singapore have strong positive winter effects, e.g., the “January effect” for Korean tourists to escape the cold climate at home.

The conditional variances for Y_{jeju} , Y_{phil} , Y_{sing} , and Y_{thai} are plotted in Figure 3. For Jeju, although the volatility of tourist departures were higher than those of the other destinations before 1990, there have been less fluctuations since 1990. The volatility of domestic visitors to Jeju Island were rather stable despite positive mega events or unfavorable events that took place in Korea in recent years, including the Asian Financial Crisis (1997 – 1999), the Mt. Gungang tourism development in North Korea (since 1998), the FIFA World Cup (2002), September 11 terrorist attacks (2001), SARS (2003) and Bird Flu (2004). On the other hand,

since 1990 the conditional variance of Korean outbound tourism demand for the three Asian countries has shown significant fluctuations during the Asian Financial Crisis (1997), the SARS outbreak (2003), and the Bird Flu scare (2004).

[Table 3 Here]

Thus, it can be surmised that Korean outbound travel to these three Asian countries could have different determinants of volatility due to tourist behavior and various other events.

[Fig. 3 Here]

Figure 4 shows time-varying conditional correlations among the four destinations for Korean tourists. Three periods—before 1988, from 1988 to the Asian Financial Crisis (1997), and 1997 to 2006—are examined and analyzed. Regardless of these categories, all conditional correlations for tourism demand among the three Asian destinations have shown increasing patterns. This implies that a positive relationship tends to increase as time progresses. However, for the conditional correlations of tourism demand between Jeju and the three Asian destinations, there have been negative conditional correlations over certain time horizons—for example, in the early 1980s, around 1990, and around 2000. The negative correlation in the early 1980s could be attributed to strict overseas travel control by the Korean government. The negative correlation during this period could be recognized as the “substitute effect.” It shows that the change in demand was entailed by the change in the rate of exchange rate between two goods (Varian, 2003). Most tourists sensitive to the variability of the price could change their travel plans for more affordable destinations. From the Liberalization of the Travel Code (1988) to the Asian Financial Crisis (1997), there were distinctive “U”-shape conditional correlations between Jeju and the three Asian countries. Those “U”-shape conditional corrections can be attributed to certain macroeconomic variables or Korea’s country-specific events. From 1997 to 2006, conditional correlations

showed a decreasing pattern, a possible indication of sharp upward trends of Korean outbound tourists.

[Fig. 4 Here]

All conditional correlations had similar trends from 1980 to 1988. However, when the Liberalization of the Travel Code was instituted in 1988, it had a significant impact on conditional correlations. It was not long before conditional correlations COR12, COR13, and COR23 appeared in the same trends, usually toward the upper drifts.⁶ On the other hand, COR14, COR24, and COR34 displayed decreasing trends from 1988 to mid 1990s.⁷ These correlations, COR14, COR24, and COR34, always remained below the former three conditional correlations. The Liberalization of the Travel Code (1988) affected clearly tourists' outbound decisions since tourists had more choices of their overseas vacation destinations. Conditional correlations including Jeju Island were always below the patterns of other conditional correlations. It is thus inferred that the Jeju Island was substituted by the Korean outbound tourists for the three Asian destinations. Therefore, it is important to further analyze the trend of Korean outbound tourism demand after a significant tourism policy change, in this case, after the Liberalization of the Travel Code was introduced in 1988.

4.3. Results of unit-root and cointegration tests

Unit-root and cointegration tests are first performed to construct the VECM model. If all variables are stationary, testing the cointegrating relationship among variables is not possible. Once the null hypothesis of a unit-root test is not rejected—i.e., there are a unit-root and some variables—then a cointegration test can be performed. When there is no cointegration

⁶ COR12, COR13, and COR23 denote a conditional correlation between Thailand and Singapore, between Thailand and the Philippines, and between Singapore and the Philippines, respectively.

⁷ COR14, COR24, and COR34 denote a conditional correlation between Thailand and Jeju, between Singapore and Jeju, and the Philippines and Jeju, respectively.

among variables, then VECM cannot be constructed. For a unit-root test, augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used, while the Johansen (1988) procedure is used for a cointegration test.

Even though ADF (Dickey & Fuller, 1979) and PP tests (Phillips & Perron, 1988) can perform the test for unit root, the two tests have slightly different purposes. The PP test is conducted to examine the existence of GARCH errors. The ADF tests unambiguously take into account a serial conditional correlation by modeling the structure in the errors, but not heteroskedasticity. However, the PP tests analyze both serial conditional correlation and heteroskedasticity using a non-parametric method. Table 4 reports the results of unit-root tests. Lag orders of ADF and PP tests are determined based on AIC. The test results strongly support the null hypothesis of unit-root for level, but not the first order differenced series of variables.

[Table 4 Here]

This means that the variables are converted into stationarity after taking the first order difference. Since there is a unit-root for all prescribed variables, it is possible to perform a cointegration test based on the Johansen method (1988). The critical values for the trace and the maximal eigenvalue test for testing the number of cointegrating vectors using the Johansen maximum likelihood procedure are available from several sources, including Johansen and Juselius (1990). The critical values for these tests depend on how linear trends and seasonal dummies are included in the estimation. Johansen and Juselius (1990) decided to stop investigating at the first failure and reject the null hypothesis when the test begins at zero cointegration vectors and moves consecutively to a large number of cointegration vectors.

Table 5 illustrates the results of the cointegration rank test. There are six and one

cointegrating vectors based on the trace and the maximum eigenvalues at the five percent significant levels, respectively.

[Table 5 Here]

4.4. Estimation results for VECM

A VECM comprised of ten variables is estimated in this study. The process of lag length selection is important for the specification of a VECM(p) model. If the lag length of p is too small, the model cannot represent the data generating process. On the other hand, if the lag length of p is too large, the model may be over parameterized. Lag length of $p = 1$ and 6 are chosen based on the AIC and SBC, respectively. Only VECM(1) is considered because the estimated results of VECM(1) and VECM(6) are very similar.

The responses of COR14, COR24, and COR34 to a ‘positive shock’ given to each variable are plotted in Figures 5, 6 and 7. The ‘positive shock’ is measured by the Cholesky one standard deviation innovations.⁸ For design purposes, only the impulse response function for the conditional correlation between tourism demand for Jeju Island and the rival destinations is presented.

Figure 5 shows responses of the conditional correlation between Thailand and Jeju Island (COR14). The response of COR14 to a shock to itself has been fluctuating smoothly up to ten months and converged to a positive constant, 0.024. For a shock to IPI, the response of COR14 moved monotonously to 0.0043 for the first ten months and reached 0.0044 in the long-run. The response of the shock to the real exchange rate of Thailand was negative for the first four months, but turned to a positive value and converged to 0.01 in the long-run. This can be regarded as behavioral change of potential tourists regarding Jeju Island. Since there was a positive shock in the exchange rate, price-sensitive potential tourists for Jeju were

⁸ Cholesky ordering is used to analyze impulse response and forecast error variance decomposition analysis.

quick to change their travel plan for Thailand. Therefore, potential tourists for Thailand became actual arrivals so that the correlation between tourism demand of Thailand and Jeju decreased in the short-run. However, in the long-run, tourists who wanted to travel to Jeju and who did not go to Thailand before the exchange rate shock were likely to visit Jeju. This should make COR14 increase in the long-run. The shock to the conditional correlation between the Philippines and Jeju Island (COR34) made COR14 increase by 0.01 in the long-run. On the other hand, the response of COR14 to the conditional correlation between Singapore and Jeju Island (COR 24) varied from zero, to -0.011 to zero during the first ten months, and was -0.012 in the long-run. The real exchange rates of the Philippines and Singapore impinged negatively, -0.0032 and -0.008 in the long-run. Thus, the Philippines and Singapore could be regarded as the substitutes for Jeju Island and Thailand.

[Fig. 5 Here]

As it can be discerned from Figure 6, the positive shock to IPI affected COR24 slightly: -0.0008 to 0.0024 in the first ten months and 0.0024 in the long-run. The real exchange rate of Singapore impinged positively: 0.0040 to 0.0073 in the first ten months and 0.0072 in the long-run. For a positive shock to COR34, the response of COR24 decreased from zero to -0.001 in the first month, increased from -0.001 to 0.0035 up to ten months, and was 0.0034 in the long-run. The response of COR24 to a shock to the real exchange rate of the Philippines had been widely fluctuating, from zero to -0.012 up to ten months, and converged to a negative constant -0.012 in the long run. This can be attributed to the changes in the behavior of actual tourists for Jeju Island and Singapore. Some price-sensitive tourists, including potential tourists for Singapore and Jeju Island, tended to alter their plans to visit the Philippines when there was a positive shock to the real exchange rate of the Philippines. Thus, the conditional correlation between the tourism demand of Singapore and Jeju Island

was decreasing. However, it is not discernable whether the real exchange rate of the Philippines directly affected tourists bound for Jeju Island and Singapore.

[Fig. 6 Here]

Figure 7 describes responses of COR34 to positive shocks to tested variables, including COR34 itself. The response of COR34 to a shock to IPI was decreasing from -0.0035 to -0.0046 up to ten months and then converged to a negative constant, -0.0046. For a shock to the real exchange rate of the Philippines, the response of COR34 decreased sharply, from -0.0050 to -0.0082 during the first three months, then increased from -0.0082 to -0.0055 up to 18 months, and finally converged to -0.0055 in the long run. Thus, the positive shocks to the real exchange rate of the Philippines and IPI affected the potential tourism demand of Jeju Island. Since there was a positive shock to the real exchange rate, some price-sensitive tourists originally planned for visiting Jeju were willing to change their decision for the Philippines. In addition, when income increased, the number of tourists destined for the Philippines increased, so that the correlation between the tourism demand of the Philippines and Jeju also decreased in the short run and in the long-run. The responses of the shock to the real exchange rates of Singapore and Thailand were -0.004 and -0.002 in the long-run, respectively. Thus, Singapore and Thailand can be regarded in the long-run as the substitute destinations for the Philippines and Jeju Island for price-sensitive tourists.

[Fig. 7 Here]

The variance decomposition (VD) method explains the analysis of the dynamic properties of a VECM. This decomposition enables researchers to comprehend the proportion of the fluctuation in a series clarified by its own shocks versus shocks from other variables. Generally, it is expected that a variable can explain almost all its forecast error variance

during short periods and smaller proportions in the long-run.

As it can be seen from Table 6, COR14 was shown to be largely autonomous in variance decomposition, while other variables, COR24 and COR34, had an impact of about 8% on output in the COR14. The real exchange rates of the Philippines and Thailand had a more relative impact on COR14, compared with an average of 1.5% in IPI. The real exchange rate of Thailand had a nearly 8% impact on COR14, and the real exchange rate of the Philippines affected COR14 moderately, with an average of 5% variance, self-determined after five months, on COR14. COR24 was also shown to be mostly autonomous in variance decomposition, but COR14 explained less than 5% variance after ten months, and COR 34 affected very slightly, about 1%, on COR 24. Unexpectedly, the results of the real exchange rate illustrated that the variance of COR24 was better explained by an average of 11% after 18 months with the real exchange rate of the Philippines, compared with an average of 4.9% in the real exchange rate of Singapore. Although COR34 was also explained to be largely self-sufficient, with an average of 55%, the variance of COR14 had a strong effect, with an average of 30% variance of COR 34 in the long-run. Additionally, the real exchange rate and IPI only marginally influenced COR34.

Therefore, conditional correlations were shown to be mainly autonomous in VD, while other variables had an impact on output in the conditional correlation in their VD. In one case, such as COR24, the real exchange rate movements of rival countries were shown to be very sensitive to movements in the conditional correlations.

[Table 6 Here]

5. Discussions

This paper examined the dynamic conditional relationships of tourism demand for Jeju Island and three other competing Asian destinations using multivariate generalized

autoregressive conditional heteroskedasticity (MGARCH) and vector error correction model (VECM). It is found that piecewise conditional correlations among tourism demand for Jeju and the three Asian countries are not constant but time-varying. While the estimated dynamic conditional correlations among these Asian destinations have shown increasing trends after the Liberalization of the Travel Code in 1988 and to the Asian Financial Crisis in 1997, those among Jeju and the three Asian countries have been stable. From 1997 to early 2000, the conditional correlations among Jeju Island and the three Asian destinations decreased. This might indicate that the three Asian destinations gradually substituted Jeju Island by the Korean outbound tourists after the Liberalization of the Travel Code in 1988. After 2000, the dynamic conditional correlations have shown increasing trends even though decreasing trends were identified during some periods.

The estimated conditional correlation is used to analyze the determinants of each conditional correlation by considering a regression-based model. By constructing VECM with the Industrial Production Index (IPI) and the real exchange rate, the determinants of conditional correlations are therefore determined and presented. Five important aspects of Korean outbound tourism demand are identified in this study to address the research questions.

Firstly, for the conditional correlation of Thailand and Jeju Island (COR14), IPI and the real exchange rate affected negatively up to four months in the impulse response, but became positive in the long run. Secondly, regarding the conditional correlation of Singapore and Jeju Island (COR24), the positive shock to IPI affected COR24 from being slightly negative in the first ten months to positive in the long-run. Unexpectedly, the real exchange rate of Singapore, compared with that of the Philippines, did not explain well the variance of COR24 in the long-run. Thirdly, for the conditional correlation of the Philippines and Jeju Island, the shocks

to IPI and the exchange rate of the Philippines negatively affected the responses of COR34 in the short run and in the long run. The COR14 determined almost 30% of the variance in COR34, but the real exchange rates and IPI explained relatively little. Fourthly, the real exchange rate affected significantly the conditional correlations when it was compared with IPI. Finally, conditional correlations were always shown to be largely autonomous in VD. From time to time, the real exchange rates of the competitive countries better explained their own conditional correlations.

6. Implications for Policy Planning and Destination Management

The empirical findings of this study reveal that the determinants of conditional correlations of Korean outbound tourism demand are different for each destination. Evidently, the real exchange rate is a better indicator for Korean outbound tourism demand than other economic indicators. The results indicate that Korean outbound tourists were more concerned with the price of travel. Therefore, policy makers and destination managers in South Korea need to consider the real exchange effect. It is recommended that they consider flexible pricing strategies for Jeju Island to correspond with the change of real exchange rates to improve its competitiveness against the three Asian destinations. Implications for policy planning and destination management are recommended for each destination investigated in this study and then are summarized as general applications for studying tourism demand and volatility.

6.1 Jeju Island

Clearly, Thailand, Singapore and the Philippines offer a diversity of attractions at affordable prices to the Korean tourists. In addition, the balmy weather of Southeast Asia provides a winter escape for the Koreans. Though Jeju Island is the closest destination to the

Korean mainland outbound tourists, the cost of transportation normally makes up the largest portion of the total tour price comparing to other services such as accommodation, admission fees and food. Competitive pricing of airline fare can promote Jeju Island to Korean mainland outbound tourists. From policy perspective, local and federal governments should consider and support the development of regional low-cost carriers (LCC) to reduce airline transportation cost by drawing experience from the popular Silk Air and Air Asia operated by Singapore Airlines and Thai Airways. In addition, the government can work with the aviation industry to establish a reliable flight-demand forecasting system to plan tourism demand from the Korean mainland. Operationally, tour price for Jeju is obviously higher than those offered by the other competing Asian destinations. Tourism industry in Jeju needs to emphasize the value and experience for the visit. Furthermore, the private sector participants should develop better coordination among travel agencies, airline companies, hoteliers and local merchants to price tour products competitively.

More specifically, travel agencies and airline companies should offer various travel package plans which are already well-developed for the overseas visitors to the Korean mainland outbound tourists. Though there are already package plans such as various honeymoon packages, school excursion, and Gold package, for Jeju visitors, these plans are not sophisticated to meet the varied domestic tourism demand. With the development of more affordable group package plans, the price can be competitively determined and Jeju can stay competitive for attracting both international and domestic tourists.

6.2 Thailand

Korean tourists are attracted by the wide range of tour packages at very competitive price and Korean tourists have been one of the leading inbound markets for Thailand. The Thai tourism industry can continue to attract Korean tourists with appealing package price and

friendly service. However, when Thailand is compared with the Philippines and Singapore as destinations for the Korean outbound tourism, the study found that Thailand was substituted by the other two destinations by price sensitive Korean tourists. Clearly, the Thai tourism industry needs to monitor the fluctuations of the real exchange rates and adjust tour package prices to remain competitive for the Korean outbound tourists.

6.3 The Philippines

The Philippines' appeal to the South Korean outbound tourists is clearly influenced by the fluctuations of real exchange rates during the period. South Korean outbound tourists were attracted to the Philippines when the exchange rate was to their advantage. The South Korean tourists enjoyed the affordable package tours of diversified natural and cultural resources. Since South Korea has been one of the leading source markets for the Philippines, the Philippines' tourism industry needs to maintain its pricing competitive advantage while improving guest service standards and tourism infrastructure.

6.4 Singapore

However, compared to Thailand and the Philippines, Singapore has a slight competitive advantage than Thailand, but lost to the Philippines due to real exchange rate fluctuations. The Singapore tourism industry may consider to forging strategic alliances with Thailand and the Philippines to develop jointly tourism products and each destination can complement one another to attract South Korean outbound tourists.

6.5 General Applications of DCC- MGARCH Models

As discussed in the Literature Review and Econometric Models sections, the novel approach of this study is to extend earlier research in tourism demand and volatility by using the DCC specification to analyze Korean outbound tourism demand because the DCC allows for time-varying conditional volatility and correlations. Conventionally, tourism demand

between two destinations is calculated as a constant correlation coefficient, the constant OLS estimator in the classical linear regression model. However, it is believed that tourism arrival/ departure time-series demonstrate conditional heteroskedasticity with time-varying interdependence between tourism demand and their determinants. The DCC-MGARCH models are able to calculate dynamic conditional covariance matrix and provide useful information which helps determine tourism demand volatility influenced by economic factors and world events during specific periods of time.

In the case of Korean outbound tourism demand for Jeju Island and the three Asian destinations, the DCC-MGARCH models and VEC models allow to calculate time-varying correlations of Korean outbound tourism demand and volatility for the four destinations and analyze the determinants of such conditional correlations. Administratively, the MGARCH models help tourism authority identify outbound/inbound travel pattern changes affected by the changes in the global economic environment, so the policy makers can adjust or adopt tourism policy to respond to market changes in outbound or inbound tourism demand and volatility. Based on the empirical results of this study, the increasing outflow of Korean outbound tourism to the three Asian destinations was fueled by the favorable real exchange effect, the South Korean Tourism Authority needs to formulate new policy to stimulate domestic tourism, such as initiating a marketing campaign with competitive tour products and services. Operationally, destination managers can use the MGARCH models to determine the volatility of tourism flows by analyzing the determinants of time-varying correlations among target market demand for their destinations and then construct competitive marketing strategies to (1) attract target inbound tourists to visit their destinations and (2) develop strategic partnership to promote regional tourism development by leveraging and complementing each destination's assets and marketing resources.

7. Conclusions

Jeju Island as well as other domestic destinations in South Korea face great challenges to maintain competitive advantage by keeping the domestic tourists at home through innovative product development, perceived value for unique tourism experience, developing low-cost carriers for domestic destinations while targeting aggressively the inbound tourism. In terms of the three competing Asian destinations, the Philippines enjoys the advantage in real exchange rate over Thailand and Singapore, and Singapore over Thailand. A competitive advantage can be developed for these three destinations in attracting South Korean outbound tourists if they form a strategic partnership in developing tourism products and cooperative destination promotion.

As demonstrated in this paper, the study of Korean outbound tourism demand is based on the time series of Korean tourist departures to Jeju Island and three selected Asian destinations as influenced by macroeconomic factors and other major shocks that had caused the volatility of tourism demand. A major limitation of this study is that tourist psychographics and behaviors are not examined for tourism demand analysis.

Acknowledgements

We would like to express our sincere appreciation to the editor and anonymous referees for their constructive comments.

References

- Bauwens, L., Laurent, S., & Rombouts, J. V. R. (2006). Multivariate GARCH models: a survey. *Journal of Applied Econometrics*, 21(1), 79-109.
- Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*, 31(3), 307-327.
- Bollerslev, T. (1990). Modeling the coherence in short-run nominal exchange rates: a multivariate generalized ARCH approach. *The Review of Economics and Statistics*, 72(3), 498-505.
- Bonham, C., Edmonds, C., & Mak, J. (2006). The impact of 9/11 and other terrible global events on tourism in the United States and Hawaii. *Journal of Travel Research*, 45(1), 99-110.
- Chan, F., Lim, C., & McAleer, M. (2005). Modeling multivariate international tourism demand and volatility. *Tourism Management*, 26(3), 459-471.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of American Statistical Association*, 74(366), 427-431.
- Divisekera, S. (2003). A model of demand for international tourism. *Annals of Tourism Research*, 30(1), 31-49.
- Granger, C. W. J., & Newbold, P. (1986). *Forecasting economic time series*, 2nd ed.,(pp. 205-215). New York: Academic Press.
- Engle, R. F. (2002). Dynamic conditional correlation: a new simple class of multivariate generalized autoregressive conditional heteroskedasticity models. *Journal of Business and Economic Statistics*, 20(3), 339-350.
- Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, 55(2), 251-276.
- Engle, R. F. & Sheppard, K. (2001). Theoretical and empirical properties of dynamic conditional correlation multivariate GARCH. *Working Paper Number 8554*, National Bureau of Economic Research.
- Hoti, S., McAleer M., & Shareef, R. (2007). Modeling international tourism and country risk spillovers for Cyprus and Malta, *Tourism Management*, 28(6), 1472-1484.
- Jarque, C. M., & Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters*, 6(3), 255-259.
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, 12(2-3), 231-254.
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration - with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2), 169-210.
- Kim, S., & Song, H. (1998). Analysis of tourism demand in South Korea: a cointegration and error correction approach, *Tourism Analysis*, 3(1), 25-41.

- Kim, S. S., & Wong, K. F. (2006). Effect of news shock on inbound tourist demand volatility in Korea. *Journal of Travel Research*, 44(4), 457-466.
- Korean Tourism Organization. (2006). Compiled from various issues of *annual statistical report on Tourism*.
- Korean Tourism Organization. (2007). *Monthly statistical report on tourism*. Last retrieved on May 4, 2008: <http://www.knto.or.kr/index.jsp>.
- Korean Statistical Information System. (2007). *Research report*. Last retrieved on May 4, 2008: <http://www.stat.go.kr/statcms/pop/popular.jsp?kind=C>.
- Kulendran, N. (1996). Modeling quarterly tourism flows to Australia using cointegration analysis. *Tourism Economics*, 2(2), 203-222.
- Kulendran, N., & King, M. L. (1997). Forecasting international quarterly tourist flows using error correction and time-series models. *International Journal of Forecasting*, 13(3), 319-327.
- Ljung, G. M., & Box, G. E. P. (1978). On a measure of lack of fit in time series models. *Biometrika*, 65(2), 297-303.
- Mak, J. (1992). Comparative tourism development in Asia and the Pacific. *Journal of Travel Research*, 31(1), 14-23.
- Nelson, C. R., & Plosser, C. I. (1982). Trends and random walks in macroeconomic time series: Some evidence and implications. *Journal of Monetary Economics*, 10(2), 139-162.
- Oh, C. O. (2005). The contribution of tourism development to economic growth in the Korean economy. *Tourism Management*, 26(1), 39-44.
- Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346.
- Seddighi, H. R., & Shearing, D. F. (1997). The demand for tourism in North East England with special reference to Northumbria: an empirical analysis. *Tourism Management*, 18(8), 499-511.
- Shareef, R., & McAleer, M. (2005). Modeling international tourism demand and volatility in small island tourism economies. *International Journal of Tourism Research*, 7(6), 313-333.
- Shareef, R., & McAleer, M. (2007). Modeling the uncertainty in monthly international tourist arrivals to the Maldives. *Tourism Management*, 28(1), 23-45.
- Singh, A. (1997). Asia Pacific tourism industry: Current trends and future outlook. *Asia Pacific Journal of Tourism Research*, 2(1), 89-99.
- Song, H., Romilly, P., & Liu, X. (2000). An empirical study of outbound tourism demand in the U.K. *Applied Economics*, 32(5), 611-624.
- Varian, R. H. (2005). *Intermediate microeconomics*, 7th Edition.. New York: W. W. Norton & Company.
- Vogt, M. G., & Wittayakorn, C. (1998). Determinants of the demand for Thailand's exports of tourism. *Applied Economics*, 30(6), 711-715.

Webber, A. G. (2001). Exchange rate volatility and cointegration in tourism demand. *Journal of Travel Research*, 39(4), 398-405.

Wong, K. K. F., Song, H., & Chon, K. S. (2006). Bayesian models for tourism demand forecasting. *Tourism Management*, 27(5), 773-780.

World Travel and Tourism Council (2008). Tourism research: Key facts at glance. Last retrieved on May 4, 2008: http://www.wttc.travel/eng/Tourism_Research/Tourism_Satellite_Accounting/TSA_Country_Reports/Korea_Republic_of/.

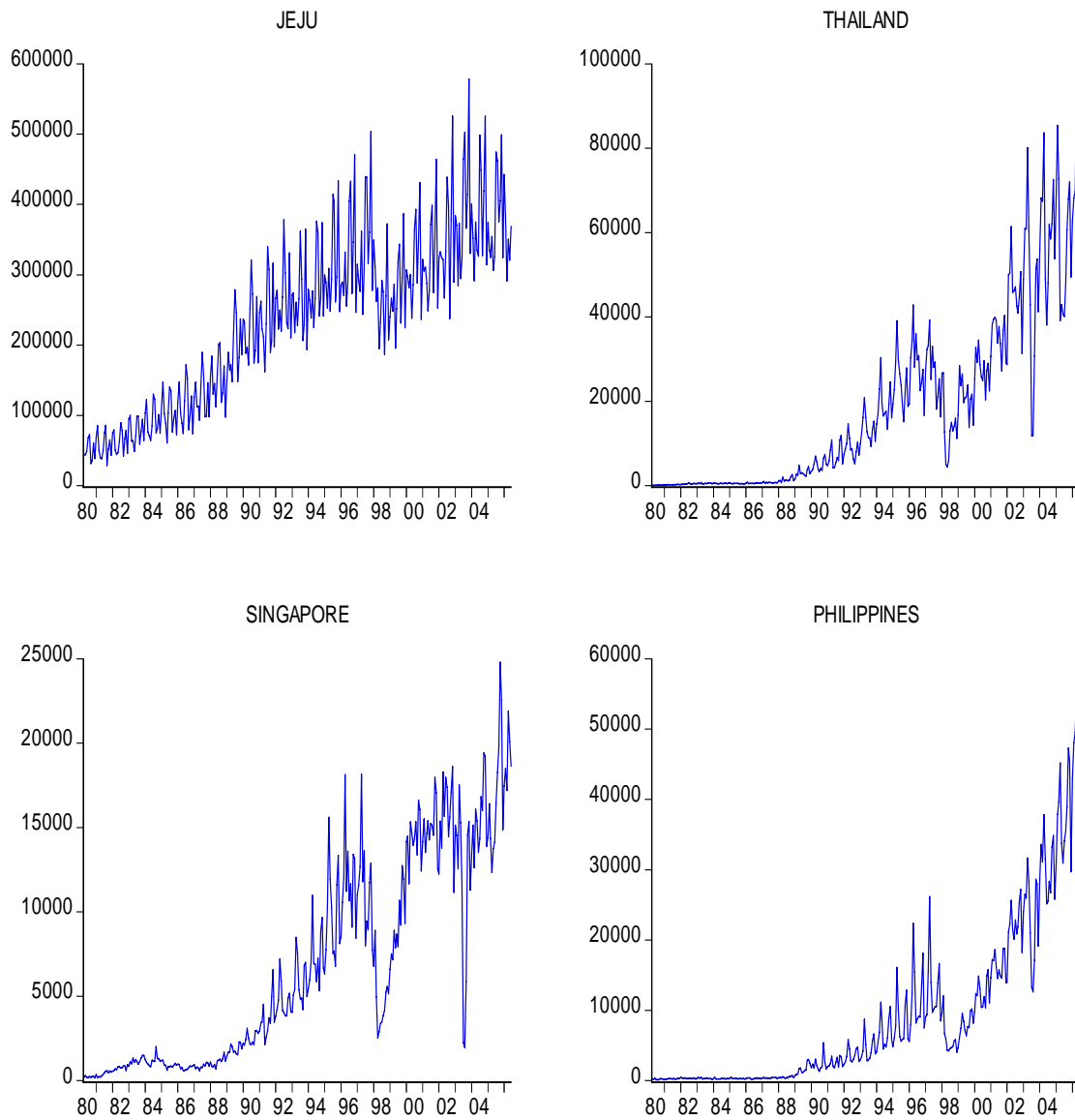


Figure 1. Korean tourist arrivals to each destination.

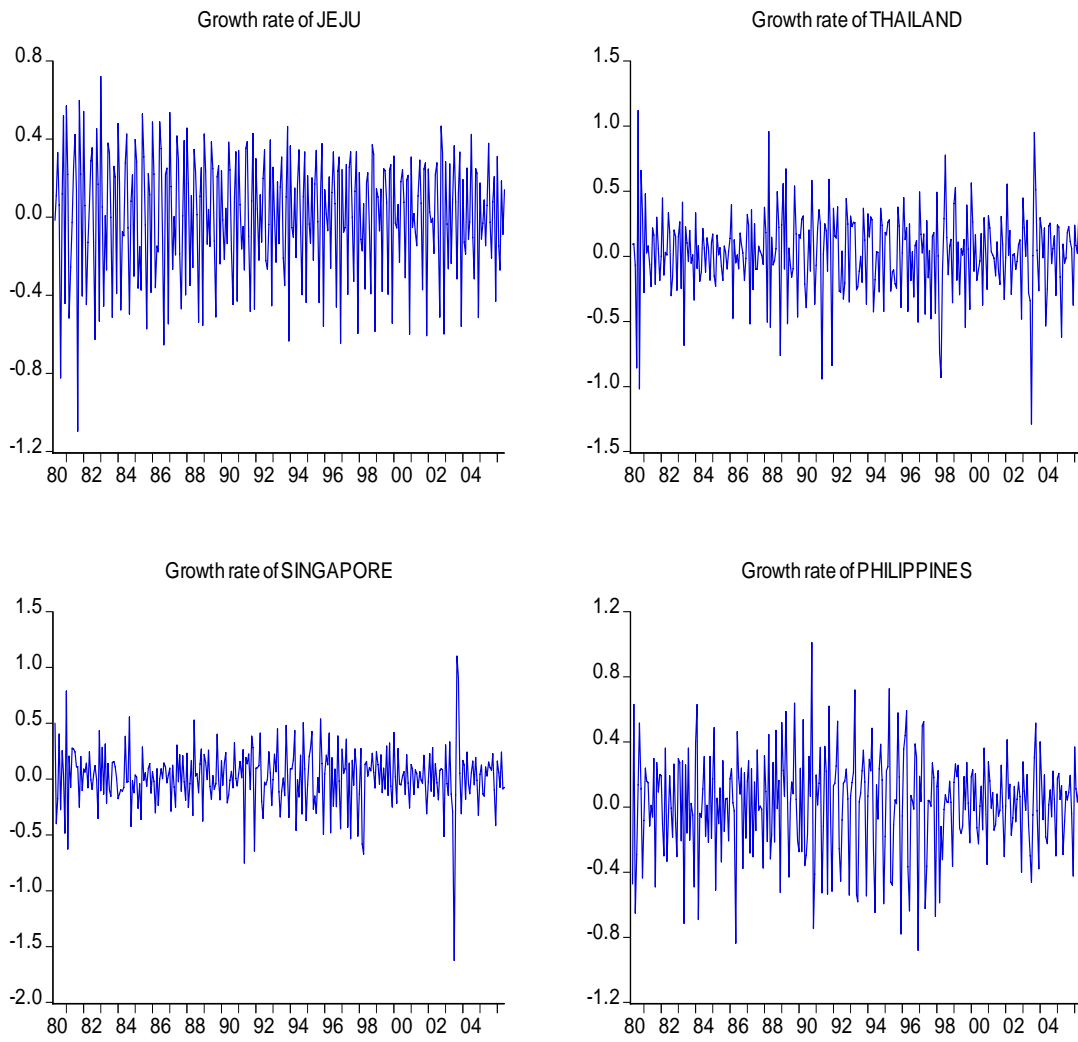


Figure 2. Growth rates of Korean outbound tourists to the four destinations.

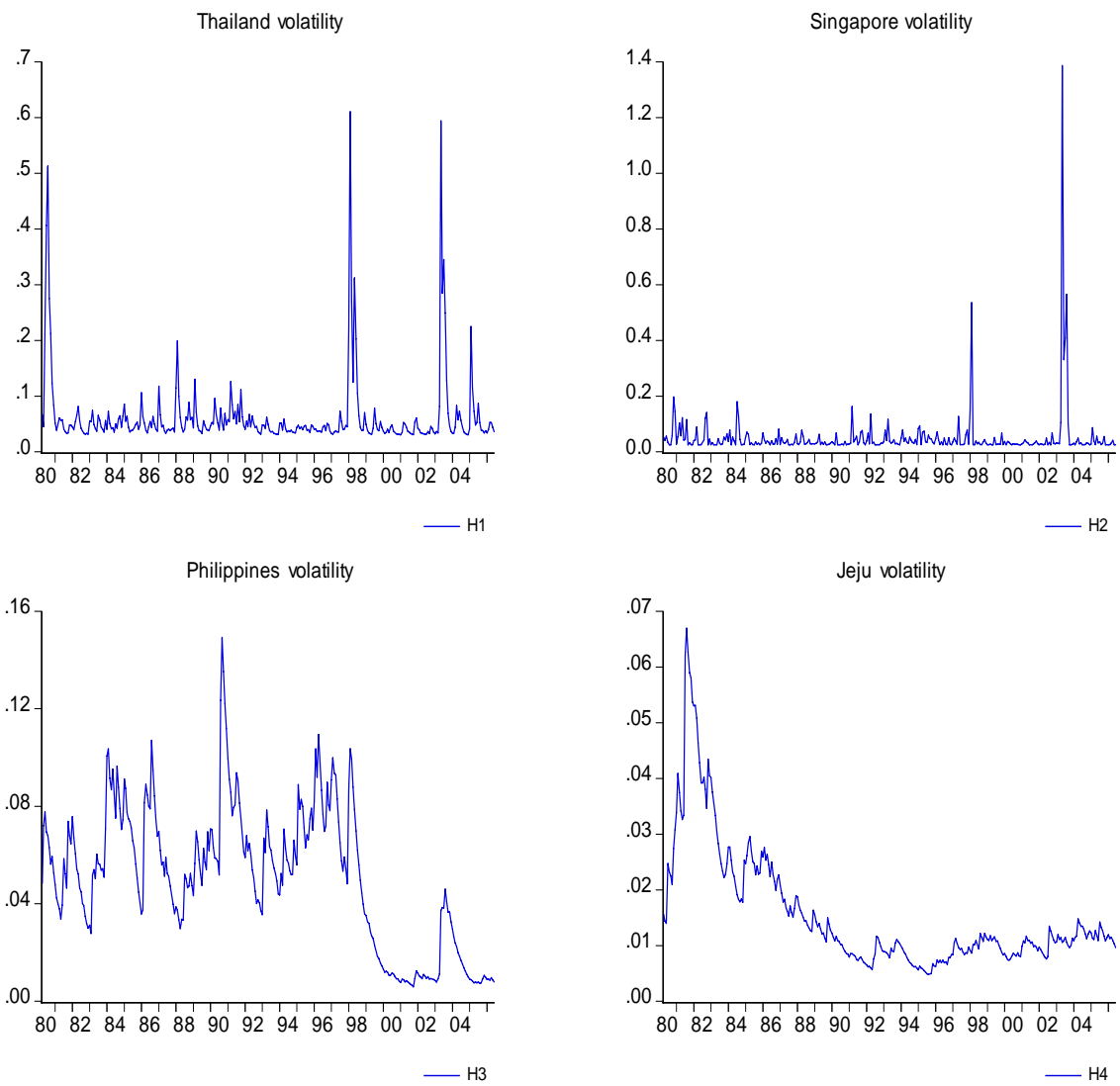


Figure 3. Volatilities of Korean outbound tourism demand for the four destinations.

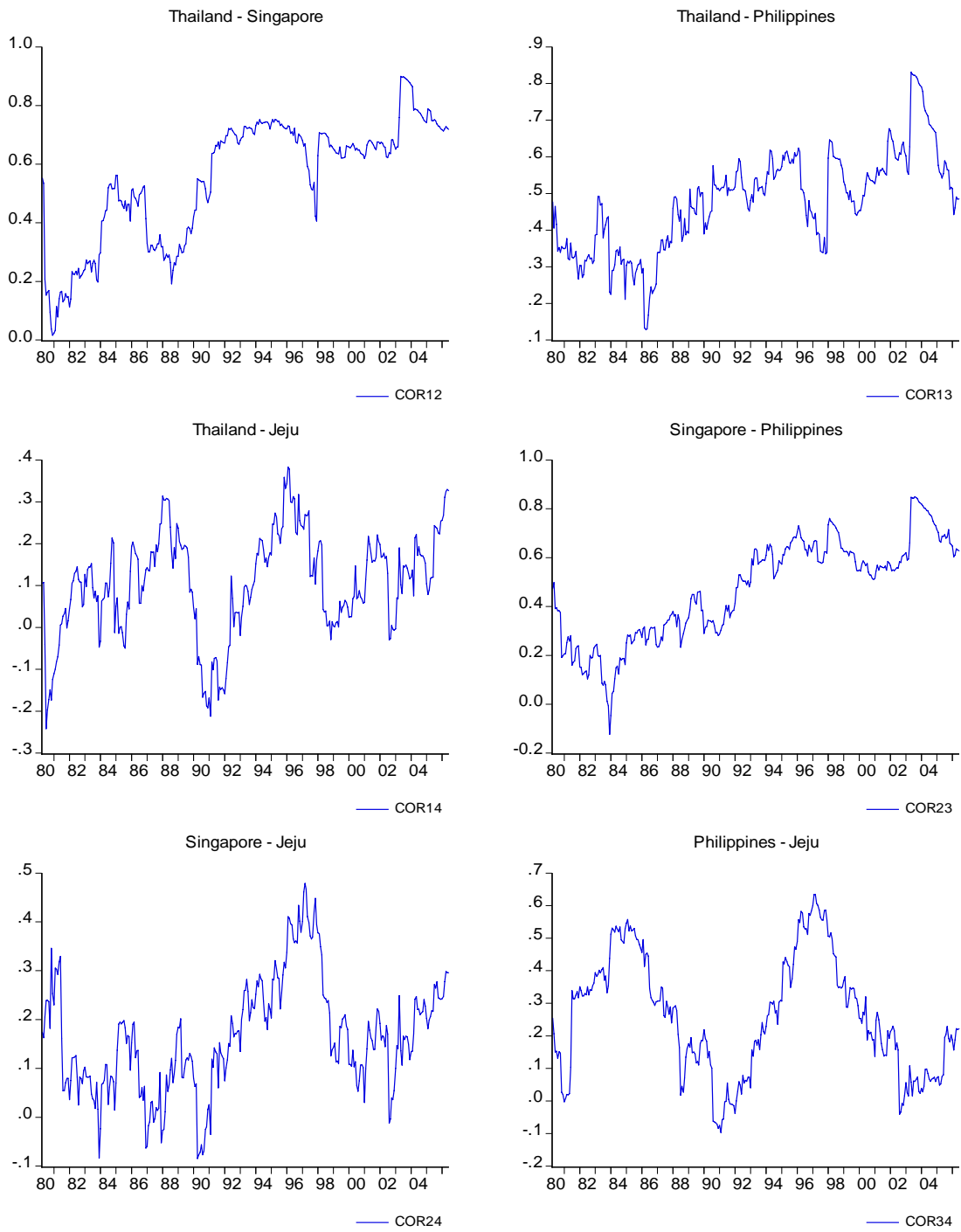


Figure 4. Conditional correlations of Korean outbound tourism demand for the four destinations

Fi

Response to Cholesky One S.D. Innovations

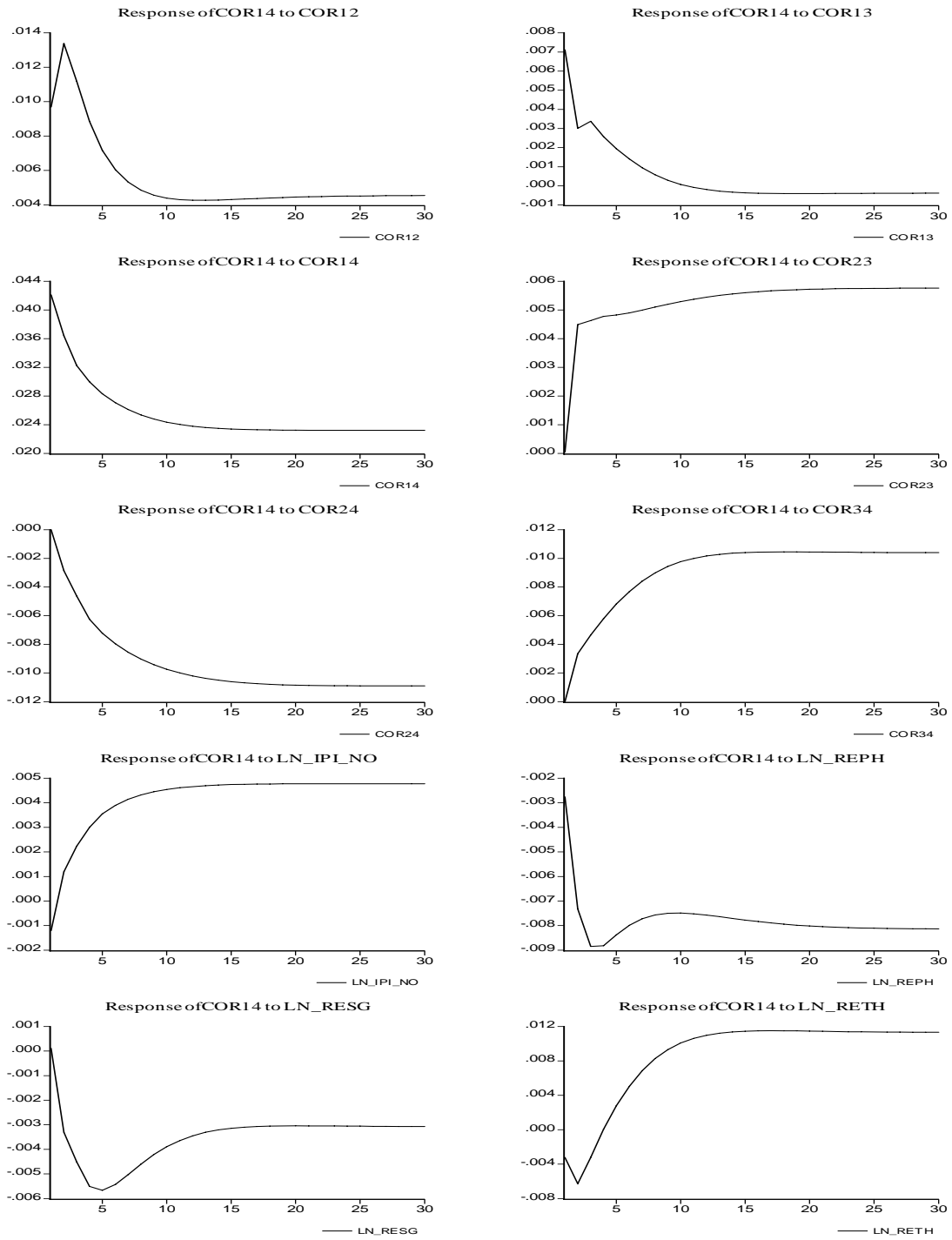


Figure 5. The Response of COR14 to Cholesky one S.D Innovation.

Response to Cholesky One S.D. Innovations

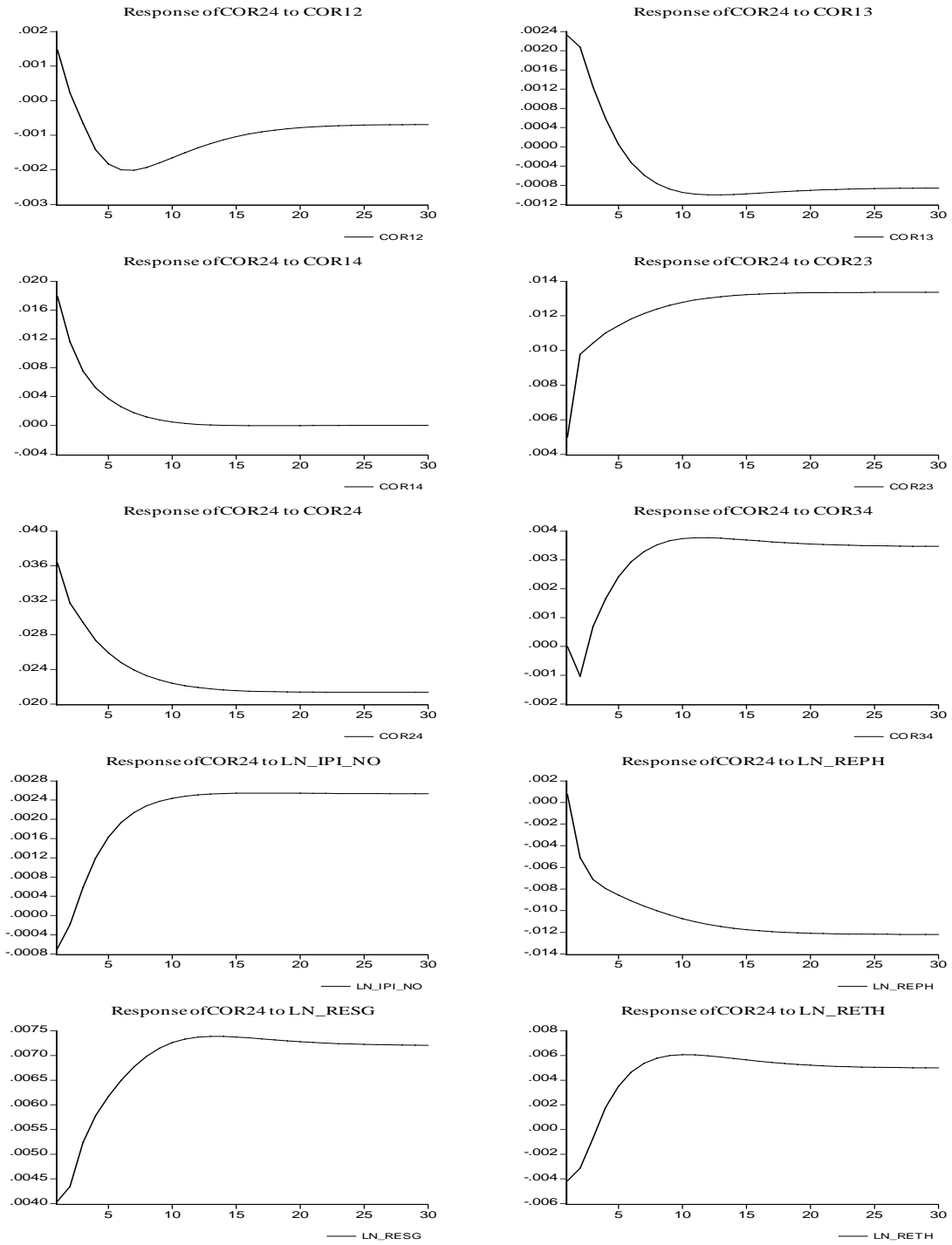


Figure 6. The Response of COR24 to Cholesky one S.D Innovation.

Response to Cholesky One S.D. Innovations

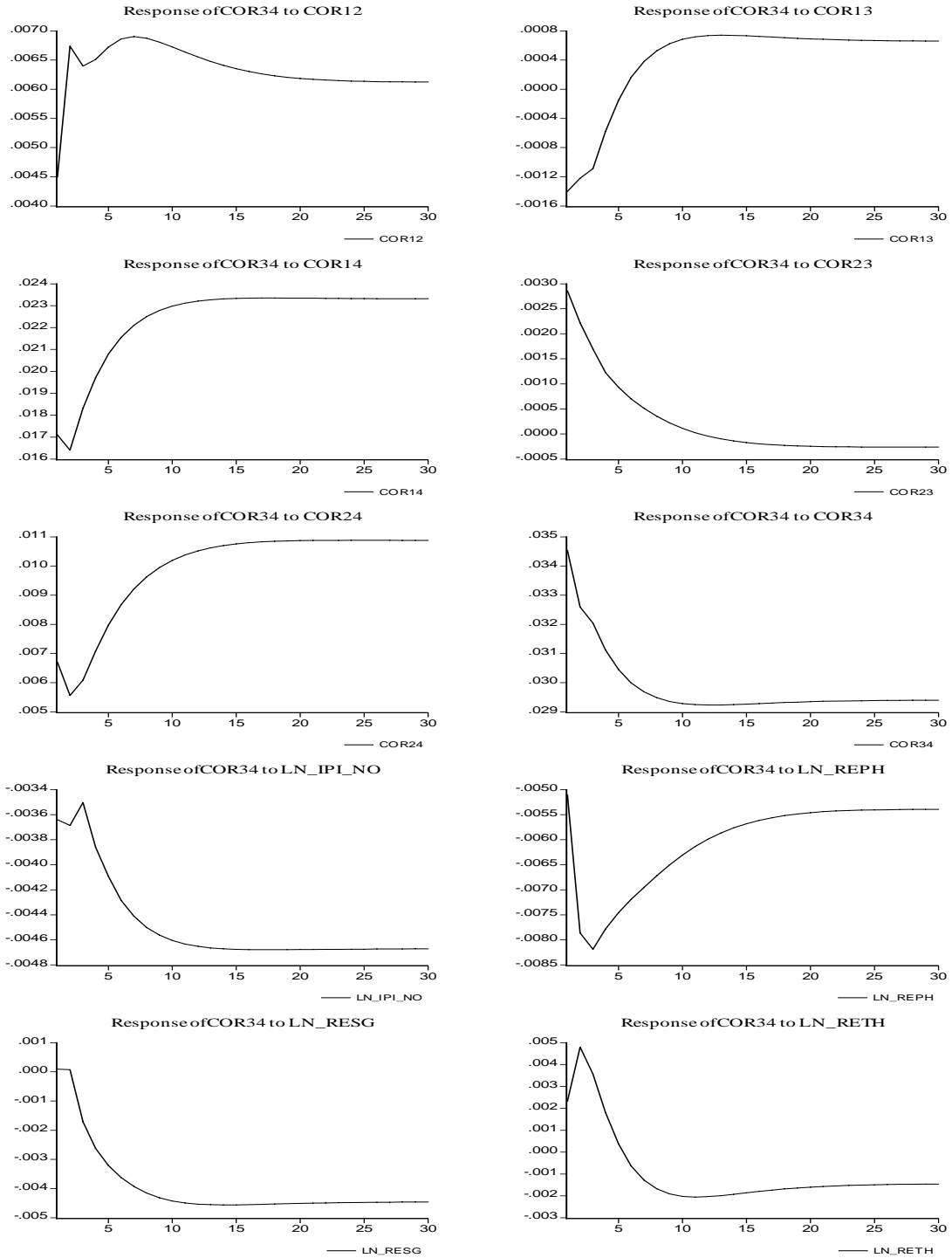


Figure 7. The Response of COR34 to Cholesky one S.D Innovation.

Table 1
Travel mode of Korean outbound tourists

Travel Mode	Jeju Island	Philippines	Singapore	Thailand
Individual (%)	63.54%	24.1%	19.7%	16.6%
Package (%)	36.45%	75.9%	80.3%	81.3%

Source: Jeju Special Self-Governing Provincial Tourism Association (2007) and Korea Tourism Organization (2007). Data for Jeju show the percentage of total tourists and data for the other three destinations show the percentage of sample populations.

Table 2
Basic statistics for the incremental rates of Korean outbound tourists

	$Y_{jeju,t}$	$Y_{phil,t}$	$Y_{sing,t}$	$Y_{thai,t}$
Mean	0.006732	0.015366	0.014672	0.019934
Median	0.060966	0.046469	0.028160	0.044406
Maximum	0.718800	1.008873	1.099975	1.118918
Minimum	-1.095538	-0.878751	-1.623610	-1.288067
Std. Dev.	0.310049	0.306799	0.262231	0.315838
Skewness	-0.476882	-0.314026	-0.637451	-0.426897
Kurtosis	2.643010	3.237466	8.490731	4.702623
Jarque-Bera	13.56885	5.898480	415.7034	47.46489
Probability	(0.0011)	(0.0524)	(0.0000)	(0.0000)
Q(10)	172.92	120.00	25.421	37.425
Probability	(0.0000)	(0.0000)	(0.0050)	(0.0000)
Q ² (10)	21.561	32.540	38.581	38.581
Probability	(0.0180)	(0.0000)	(0.0000)	(0.0000)
Sum	2.113742	4.824925	4.606996	6.259202
Sum Sq. Dev.	30.08875	29.46129	21.52355	31.22298
Observations	314	314	314	314

Note: $Q(10)$ denotes Ljung - Box statistics of lag order 10 for the four destinations.

Table 3
Results for MGARCH model

	Thailand		Singapore		Philippines		Jeju	
	par.	s.e.	par.	s.e.	par.	s.e.	par.	s.e.
Conditional mean								
$c_{i,0}$	0.136	(0.084)	-0.006	(0.045)	0.109**	(0.038)	-0.101**	(0.028)
$c_{i,1}$	-0.268**	(0.062)	-0.353**	(0.053)	-0.254**	(0.064)	-0.154**	(0.068)
$c_{i,2}$	-0.176**	(0.056)	-0.111**	(0.037)	-0.171**	(0.057)	-0.200**	(0.056)
Seasonal dummies								
$s_{i,1}$	0.040	(0.087)	0.177**	(0.054)	0.137**	(0.045)	0.162**	(0.032)
$s_{i,2}$	-0.406**	(0.098)	-0.122	(0.072)	-0.305**	(0.054)	-0.128**	(0.041)
$s_{i,3}$	-0.092	(0.117)	0.109	(0.081)	-0.246**	(0.060)	0.330**	(0.053)
$s_{i,4}$	-0.212	(0.119)	-0.069	(0.065)	-0.180**	(0.059)	0.420**	(0.044)
$s_{i,5}$	-0.194	(0.104)	0.048	(0.061)	-0.112**	(0.053)	0.137**	(0.033)
$s_{i,6}$	-0.263**	(0.101)	-0.010	(0.056)	-0.085	(0.046)	-0.263**	(0.032)
$s_{i,7}$	0.061	(0.077)	0.237**	(0.048)	0.153**	(0.044)	0.193**	(0.045)
$s_{i,8}$	0.009	(0.082)	0.106**	(0.049)	0.000	(0.041)	0.347**	(0.049)
$s_{i,9}$	-0.349**	(0.100)	-0.171**	(0.062)	-0.369**	(0.052)	-0.309**	(0.043)
$s_{i,10}$	0.060	(0.114)	0.037	(0.064)	0.003	(0.060)	0.387**	(0.061)
$s_{i,11}$	0.086	(0.119)	0.098	(0.062)	0.067	(0.065)	0.050	(0.062)
Conditional variance-covariance equations								
ω_i	0.018**	(0.006)	0.025**	(0.003)	0.000	(0.000)	0.000	(0.000)
γ_i	0.297**	(0.143)	0.490**	(0.142)	0.116	(0.070)	0.081*	(0.040)
β_i	0.390**	(0.137)	0.000	(0.000)	0.882**	(0.067)	0.904**	(0.036)
δ_1				0.049**	(0.014)			
δ_2				0.930**	(0.019)			
log-likelihood	536.5							
AIC	-2.943							
SBC	-2.113							

Note: * and ** denote rejection of the null hypothesis at the 5% and 1 % significance levels, respectively.

Table 4
Tests of hypotheses of unit-root for conditional correlations

Variables	ADF		PP	
	Level	First difference	Level	First difference
COR12	-1.471522	-15.37601**	-1.673895	-15.30368**
COR13	-2.602685	-17.91955**	-2.442862	-18.6569**
COR14	-3.064407*	-18.63141**	-3.030177*	-18.76334**
COR23	-1.39454	-17.3334**	-1.43534	-17.33073**
COR24	-3.222285*	-19.23916**	-2.916695*	-20.32108**
COR34	-1.950133	-17.87597**	-2.011853	-17.87454**
IPI	-1.994208	-22.78223**	-2.273936	-22.43583**
REPH	-2.103128	-14.50632**	-1.659976	-14.2548**
RESG	-2.252174	-11.77709**	-1.985038	-10.99029**
RETH	-0.964632	-10.48285**	-1.206414	-14.65523**

Notes: The ADF (Augmented Dickey-Fuller), the first differencing ADF, PP (Phillip-Perron), and the first differencing PP tests should be compared. The critical values for the rejection of the null hypothesis of a unit root are -3.451, and -2.870 for 1% and 5%, respectively. The differenced series are at the 1% significance level. To reject the null hypothesis which is less than the critical value indicates that a variable is stationary or does not include a unit root. The number for the conditional correlation indicates Thailand, Singapore, the Philippines, and Jeju Island for 1, 2, 3 and 4, respectively. * denotes rejection of the null hypothesis at the 5% significance level and ** denotes rejection of the null hypothesis at the 1% significance level. The REPH, RESG, and RETH indicate the exchange rates of the Philippines, Singapore, and Thailand, respectively.

Table 5
Tests of Unrestricted Conintegration Rank

Hypothesized No. of CE(s)	Unrestricted Cointegration Rank Test			
	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None	308.5246*	239.2354	83.84139*	64.50472
At most 1	224.6832*	197.3709	50.82562	58.43354
At most 2	173.8576*	159.5297	39.96581	52.36261
At most 3	133.8918*	125.6154	32.37484	46.23142
At most 4	101.5169*	95.75366	31.62302	40.07757
At most 5	69.8939*	69.81889	28.71236	33.87687
At most 6	41.18154	47.85613	18.08218	27.58434
At most 7	23.09936	29.79707	12.17066	21.13162
At most 8	10.9287	15.49471	8.198744	14.2646
At most 9	2.729956	3.841466	2.729956	3.841466

Notes: Trace test indicates 6 cointegration equations and Max-Eigen statistic indicate 1 cointegration equation at 5% significance level. * denotes rejection of the null hypothesis at the 5% significance level.

Table 6
Comparison of the Forecasting Models

Period	Variance Decomposition									
	COR12	COR13	COR14	COR23	COR24	COR34	IPI	REPH	RESG	RETH
COR14										
5	7.271678	1.121625	80.56667	1.20833	1.669324	1.555657	0.405838	3.971856	1.293612	0.935407
6	6.790859	1.003231	79.18609	1.344417	2.222515	2.069748	0.536947	4.237664	1.484863	1.123666
12	4.789711	0.585447	70.89227	1.910146	5.029854	4.920671	1.132201	4.808718	1.575276	4.355704
18	3.886215	0.412473	65.34672	2.245186	6.778005	6.566272	1.440283	5.12123	1.386599	6.817017
24	3.426875	0.320056	62.13293	2.452884	7.826635	7.457839	1.610917	5.371154	1.270583	8.13013
30	3.150242	0.262318	60.12955	2.587258	8.493674	8.001408	1.717119	5.548389	1.200371	8.909675
COR24										
5	0.131814	0.191143	9.116948	7.927295	75.94997	0.165988	0.081211	3.516573	2.209628	0.709429
6	0.171483	0.167437	8.008503	8.876819	74.70659	0.267387	0.123988	4.232692	2.52133	0.923774
12	0.241127	0.131834	4.57003	12.77189	67.29673	0.790828	0.3434	7.758886	3.901453	2.193829
18	0.204626	0.124175	3.19778	14.87044	62.8339	1.012191	0.45901	10.13357	4.565991	2.59832
24	0.172391	0.11648	2.461717	16.09435	60.30428	1.104947	0.521737	11.63888	4.891178	2.69404
30	0.150468	0.110551	2.001539	16.87173	58.72721	1.155545	0.560463	12.61647	5.081312	2.724707
COR34										
5	2.506083	0.064358	22.17649	0.237011	2.925332	66.84183	0.913605	3.500455	0.260196	0.574649
6	2.588941	0.05379	23.42584	0.202323	3.239734	65.22781	0.956616	3.465623	0.357288	0.482029
12	2.710095	0.03872	27.89419	0.101606	4.740784	59.26809	1.126864	3.011386	0.763218	0.345053
18	2.623819	0.036529	29.72257	0.067678	5.535869	56.92829	1.198251	2.654739	0.934388	0.29787
24	2.547144	0.034477	30.62063	0.051455	5.963742	55.83907	1.233214	2.439293	1.010767	0.260203
30	2.495821	0.032934	31.14531	0.041875	6.220045	55.21759	1.25361	2.305491	1.052892	0.234426

Notes: The number of month indicates the number of ex post sample periods. The VECM model is used to generate sample forecast. This model indicates the percentage of 30 months forecast error variance explained by innovations among each variable with different conditional correlations. The REPH, RESG, and RETH indicate the exchange rates of the Philippines, Singapore, and Thailand, respectively.