

# Dependence Structure between Tourist Arrivals of Inbound Tourism Markets in South Korea

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## ABSTRACT

Tourism demand is severely affected by unpredicted events. The purpose of this study was to investigate if non-linear dependence structures exist between tourist flows into South Korea from five major source countries, as South Korea has undergone fluctuations in tourist arrivals due to diverse circumstances and has complex relations with tourism source countries. Additionally, the study examines the structures of extreme tail dependence, which is indicated in the case of unexpected events, and identifies how co-movements vary over time through dynamic copula-GARCH (Generalized Autoregressive Conditional Heteroskedasticity) tests. The copula estimations indicate significant dependencies among all market pairs as well as the strongest dependence between China and Taiwan. Moreover, extreme tail dependence structures show co-movements for four pairs of tourism markets in only negative shocks, for five pairs in both positive and negative conditions, but no co-movement in the China-Taiwan pair. Finally, the dynamic dependence structures reveal that the China-Taiwan dependence is higher than the other time-varying dependence structures, implying that the two markets complement each other.

**Keywords:** Tail dependence; Time-varying dependence; Copula method; Inbound tourism

## INTRODUCTION

Although tourism has contributed to economic growth around the world, international tourism demand has been severely affected by numerous unpredictable events [1], indicating the vulnerability of tourism demand to negative shocks, such as financial crises, political instability, threats of global terrorism, and natural disasters [2]. For example, the global economic crisis of 2008-2009 caused a negative growth of 4% in international tourist arrivals in 2009 [3]. In Asia, due to the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, the number of international tourist arrivals to China decreased 70.0% in May 2003 compared with the same period in 2002 [4]; arrivals to Japan decreased 25.7% during the period of April-June 2003 [5], and arrivals to South Korea (hereafter Korea) decreased 11.1% during the period of 2003 [6]. Additionally, the earthquake in Japan in 2011 decreased tourist flows to Japan by about 28% [7]. Conversely, some studies have found that mega-events and festivals have positive shocks [8-11]. In order for destinations to generate stable revenue from tourism and maintain the sustainability of their tourism industry, it is crucial to examine

such negative and positive events and predict tourist arrivals from major markets [2]. Scholars have analyzed the associated volatility to predict tourism demand by employing both econometric and statistical models, to address the challenges that tourism policymakers and destination managers face due to negative shocks and the associated uncertainty influencing tourist arrivals. Numerous studies have applied multivariate Generalized Autoregressive Conditional Heteroskedasticity (GARCH), e.g., [12-15], to remedy the shortcoming of univariate GARCH, which is that it cannot be used to investigate inter-relationships between variables. However, these studies also have some limitations. Although several data sets have variables with non-linear correlations and the dependence the structure among variables is not normally distributed, numerous studies have applied Pearson correlations to such data assuming linear correlations and normally distributed variables [16]. Therefore, the copula function, which is a useful method for modeling fat tails, volatility clusters, and asymmetry [17], was employed in the study. The copula function can show co-movement during extreme events, and both constant and time-varying dependence

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can be considered. Since it is crucial for tourism developers and destination managers to understand the implied threat to the tourism industry of volatility in tourism demand, recent research has investigated the time-varying dependence between tourism demand and its associated variables, e.g., [11,18], and the interdependence between tourist source countries or between tourist destinations [1,19-21] by applying dynamic copula models.

## LITERATURE REVIEW

There are two approaches used in the extensive quantitative research on tourism demand modeling and forecasting, which focuses on measuring tourism demand as the number of international tourist arrivals. One approach forecasts tourism demand through time series models, which indicate the future trend in tourism based on historical patterns. The other approach predicts future tourism demand using econometric models, which concentrate on establishing a causality structure between the explanatory variables and tourism demand or identifying how a variety of independent variables influence future tourism demand [20]. Many studies have attempted to identify the critical determinants and external interventions for tourism demand by investigating the correlations between the volatility of tourism demand and numerous variables, such as exchange rates and income levels, tourism prices and transportation costs, geopolitical risk, seasonality, and climate change [22]. Numerous studies have been conducted to determine the volatility of tourism flows by employing univariate and multivariate GARCH, which is a common method for investigating the volatility of tourism demand, e.g., [12-15]. In tourism literature, the analysis of non-linear, symmetric and asymmetric interdependence dynamics among tourist flows from source markets to destinations have been used to improve the accuracy of tourism demand forecasts. Puarattanaarunkorn [1] examined the co-movements between tourist arrivals from China and Korea to Thailand, which are countries that have volatility in the growth rates of tourism demand, by applying the copula-based GARCH model to the period from 1997 to 2012. Tang et al. [21] also used the copula-based GARCH model to investigate the volatility and co-movement of Chinese outbound tourist flows to four destinations: Thailand, Singapore, Korea, and Japan.

## Methods and data

This study used static and time-varying copula functions to investigate the dependence structure between tourist flows from five source countries. Generally, the relationship between tourism markets was approached using a simple correlation. The growth rate of tourism demand between countries always varies depending on the occurrence of specific events or market conditions.

However, when using the Pearson correlation to measure the dependence between variables, the marginal distribution is limited and cannot be fully explained. However, the copula is a useful method for modeling fat tails, volatility clusters, and asymmetry [17]. Specifically, the advantages of the copula function include its consideration of all information regarding

the dependence between random variables, the nature of the dependencies, as well as the extreme co-movements. We modeled the marginal distributions using AR(p)-GARCH (1,1) and estimated the various copula models to explain the dependence structure. To describe the dependence structure, this study uses a static copula and time-varying copula. The static copula models are used with Gaussian, Student's  $t$ , Clayton, Gumbel, Joe, Survival-Gumbel, Survival-Joe, BB1, and BB7 copulas. And time-varying copula model is used with Student's copula. The data in this study used international tourist arrivals from five source countries to Korea, namely, China, Japan, Taiwan, Thailand, and the US. The analysis period is from January 2005 to June 2019 and the monthly data were obtained from the Korea Tourism Knowledge and Information System [23].

## DISCUSSION AND CONCLUSION

This study investigated the dependence among source countries of the inbound tourism market to Korea as well as tail dependence using static and time-varying copula models, which consequently provides tourism policymakers with effective implications for the sustainability of the tourism industry. Three main conclusions can be drawn from the results. First, estimates from the best-fitting copula models indicate dependencies among all inbound tourism market pairs, and the strongest market pair is interdependence between China and Taiwan.

Second, the extreme tail dependencies in tourist flow movements to Korea exist across the source countries. Four tourism market pairs (China-Japan, China-Thailand, China-US, and Japan-Thailand) move together in only negative shocks while five pairs (Japan-Taiwan, Japan-US, Taiwan-Thailand, Taiwan-US, and Thailand-US) show co-movements in both positive and negative conditions. Interestingly, the asymmetric extreme tail dependence between China and Taiwan does not exist even though the pairing has the highest static dependency.

Finally, co-movements for specific events can be identified through the dynamic dependence structure and the result indicates that the China-Taiwan dependence is higher than the other time-varying structures, implying that Chinese and Taiwanese tourists to Korea complement each other. Based on the results, the destination managers and tourism policymaker could plan and design tourism events and attractions by investigating the characteristics, culture, and preferences (e.g., holidays, festivals) for inbound tourists from one country, and could develop marketing strategies for the inbound market for the other country. In this case, although China and Taiwan have a complementary relationship, tail dependence does not exist. This result highlights the importance of inbound tourism market substitutes to manage risks such as extreme events that are not a general worldwide or regional circumstance but occurs in relation to only one specific country. Therefore, other co-moving countries should be considered as respective substitutes for one another to form a highly complementary relationship. The results indicate it is important to substitute for the major inbound markets, since there are political and diplomatic relations with tourist source countries, in order for tourism

destinations to generate stable revenue and maintain the sustainability of their tourism industry.

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