Development of Outbound Tourism Forecasting Models in Korea

Ji-Hwan Yoon* · Jung Seung Lee** · Kyung Seon Yoon***

Abstract

This research analyzes the effects of factors on the demands for outbound to the countries such as Japan, China, the United States of America, Thailand, Philippines, Hong Kong, Singapore and Australia, the countries preferred by many Koreans. The factors for this research are (1) economic variables such as Korea Composite Stock Price Index (KOSPI), which could have influences on outbound tourism and exchange rate and (2) unpredictable events such as diseases, financial crisis and terrors.

Regression analysis was used to identify relationship based on the monthly data from January 2001 to December 2010. The results of the analysis show that both exchange rate and KOSPI have impacts on the demands for outbound travel.

In the case of travels to the United States of America and Philippines, Korean tourists usually have particular purposes such as studying, visiting relatives, playing golf or honeymoon, thus they are less influenced by the exchange rate. Moreover, Korean tourists tend not to visit particular locations for some time when shock reaction happens.

As the demands for outbound travels are different from country to country accompanied by economic variables and shock variables, differentiated measure to should be considered to come close to the target numbers of tourists by switching as well as creating the demands. For further study we plan to build outbound tourism forecasting models using Artificial Neural Networks.

Keywords : Demand Forecasting, Tourism Demand, Stepwise Regression Analysis

Received : 2013. 08. 15. Final Acceptance : 2014. 03. 28.

※ This research was supported by the Academic Research fund of Hoseo University in 2012.

* School of Tourism Management, Kyunghee University, e-mai : yoon1207@khu.ac.kr

** Corresponding Author, Department of Business Administration, Hoseo University, e-mail : jslee@hoseo.edu

*** Department of Hotel and Tourism, Daelim University College, e-mail : louis6901@hotmail.com

1. Introduction

As the tourist industry has been growing so rapidly since the overseas travels were liberalized in 1989, this research analyzes the effects of some factors on the demands for outbound to the countries. Major eight destinations preferred by Koreans include Japan, China, United States of America, Thailand, Philippines, Hong Kong, Singapore and Australia. To forecast tourism demand for each destination, possible factors should be collected and selected properly.

Objectives of this research are as follows. First we identify related factors which could influence on outbound tourism in Korea. Second, we build outbound tourism forecasting models for each major destination.

2. Literature Review

Along with the growth in tourism demand in the world, interest in tourism research is growing. Among the important areas in tourism research, tourism forecasting modeling has attached much more attention of both academics and practitioners.

A number of articles on tourism demand forecasting reviewed and categorized by tourism directions, forecasting target levels, and forecasting models as followed <Table 1>. In the case

〈Table 1〉 Tourism Forecasting Models

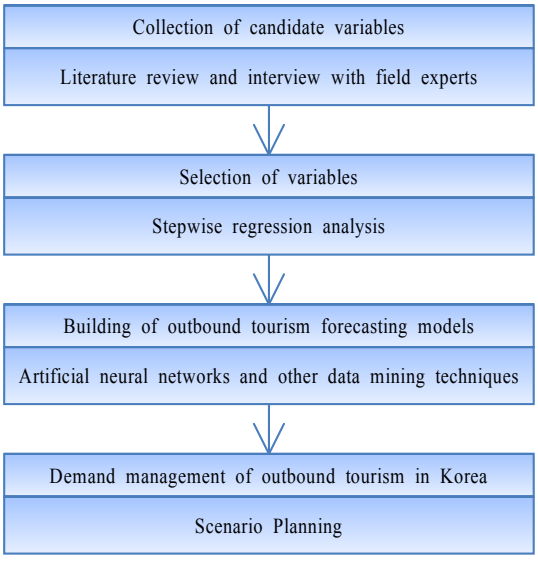
Directions	Forecasting target levels	Forecasting Models		
		Time-series analysis	Regression Analysis	Artificial Intelligence
Inbound tourism	Country level	[Yang, 1993] [Song, 2002; 2007] [Lim and McAleer, 2002] [Lim and Pan, 2005] [Lim, 1990]	[Lee, 2006] [Sheldon, 1993] [Dritsakis, 2004]	
	Tourism industry level	[Kim et al., 1999] [Choi, 2000]		[Cho, 2003] [Kwak, 2007]
	Individual company level	[Huh, 2001] [Cheong, 2002] [Kim et al., 2006] [Kim et al., 2006] [Chu, 1998]	[Shin, 2001] [Kim and Uysal, 1998]	[Pattie and Snyder, 1996] [Rob and Norman, 1999] [Law and Ray, 2004]
Outbound tourism	Country level	[Moh, 2008a] [Ahn et al., 2005] [Park, 2004] [Yoon et al., 2005]	[Lim, 2006] [Moh, 2005; 2008b] [Webber, 2001]	
	Tourism industry level	[Kim et al., 2001] [Lai & Lu, 2005] [Lim, 2003]	[Guthrie, 1961] [Lim, 2003] [Moh, 2004] [Kim et al., 2002]	
Inbound/outbound tourism	Tourism industry level	[Choi, 1999] [Kim, 2006] [Chi et al., 2009]	[Moh, 2010] [Yoo et al., 2011]	
	Individual company level	[Koo, 2006]		

of outbound tourism demand forecasting [Moh, 2008a], [Ahn et al., 2005], [Park, 2004] and [Yoon et al., 2005] applied Time-series analysis at country level, while [Lim, 2006], [Moh, 2005; 2008b] and [Webber, 2001] applied Regression analysis. There were also several studies at tourism industry level such as [Kim et al., 2001], [Lai and Lu, 2005], [Lim, 2003], [Guthrie, 1961], [Lim, 2003], [Moh, 2004], and [Kim et al., 2002].

Recently Artificial intelligence techniques such as Artificial neural networks, Case-based reasoning, and Business rules are being used as well as traditional Time-series analysis and Regression analysis. Although [Cho, 2003], [Kwak, 2007], [Pattie and Snyder, 1996], [Rob and Norman, 1999] and [Law and Ray, 2004] examined Artificial intelligence techniques for inbound demand forecast at industry and individual company levels, there were few former studies for outbound demand forecast at any levels.

3. Research Models and Methods

Overall research process is shown by following process chart, <Figure 1>. First, we collected candidate dependent and explanatory variables for outbound tourism forecasting models through literature review of related research and interview with tourism field experts. Second, among the candidate variables we selected statistically significant variables using Stepwise regression analysis. Third, we can build outbound tourism forecasting models using Artificial neural networks and other data mining techniques. And then demand management of outbound tourism can work and scenario planning will be possible in Korea. As a part of overall research scope this research only focused on the first two steps of them, 'collection of candidate variables and selection of variables' and remain the rest two steps for the continuing research in the future.



<Figure 1> Overall research process

We collected explanatory variables which could have influenced outbound tourism demand in Korea during last ten years through focused interview with tourism field experts and former related studies. These are economic variables such as KOSPI, exchange rate and unpredictable variables such as financial crisis, natural disaster, infectious disease including SARS and H1N1 virus, and terrors including 9・11 attack and Bali bombings.

Notations about dependent and explanatory variables are as follows. The total number of outbound tourists from Korea and the number of outbound tourists to eight major destinations

are defined respectively. Moreover eight explanatory variables from KOSPI to Bali bombings are also defined.

$\widehat{O_t}$: The number of outbound tourists from Korea in month t

$\widehat{JPN_t}$: The number of outbound tourists to Japan in month t

$\widehat{CHA_t}$: The number of outbound tourists to China in month t

$\widehat{USA_t}$: The number of outbound tourists to United States in month t

$\widehat{THA_t}$: The number of outbound tourists to Thailand in month t

$\widehat{PHN_t}$: The number of outbound tourists to Philippine in month t

$\widehat{HKG_t}$: The number of outbound tourists to Hong Kong in month t

$\widehat{SGP_t}$: The number of outbound tourists to Singapore in month t

$\widehat{AUS_t}$: The number of outbound tourists to Australia in month t

KI_t : Average KOSPI in month t

ER_t : Average won-dollar exchange rate in month t

FC_t : Occurrence of financial crisis in month t

ND_t : Occurrence of natural disaster, tsunami in month t

ID_{1t} : Occurrence of infectious disease, SARS in month t

ID_{2t} : Occurrence of infectious disease, H1N1 virus in month t

T_{1t} : Occurrence of terrorism, 9・11 attack in month t

T_{2t} : Occurrence of terrorism, bombings in the resort of Bali in month t

To identify the relationship based on monthly data from January, 2001 to December 2010. Stepwise regression analysis was used. Through following nine equations we tried to find statistically significant variables for each destination.

$$\widehat{O_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{JPN_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{CHA_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{USA_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{THA_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{PHN_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{HKG_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{SGP_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

$$\widehat{AUS_t} = \beta_0 + \beta_1 KI_t + \beta_2 ER_t + \beta_3 FC_t + \beta_4 ND_t + \beta_5 ID_{1t} + \beta_6 ID_{2t} + \beta_t T_{1t} + \beta_8 T_{2t} + \epsilon_t$$

4. Experimental Results

After Stepwise regression analysis for each destination, we could build following nine equations based on the experimental results. Table 2 summarized the experimental results.

The result of the analysis shows that both exchange rate and KOSPI have effects on the demands for outbound travels and the former is the more influential a little bit of the two. But in the case of travels to United States of America and Philippines, the tourists usually have particular purposes such as studying, visiting

relatives, playing golf or honeymoon, thus they are less influenced by exchange rate. On the other hand in the case of travels to Southeast Asia including Japan and Australia, the tourists mainly enjoy their leisure time or holidays, thus they are influenced by both of KOSPI and exchange rate.

Moreover Koreans tend not to visit particular locations for some time when shock reaction happens. Financial crisis reduced travels to Japan, Hong Kong, Singapore as well as United States of America, while it didn't impact the numbers of tourists of relatively less expensive countries such as China, Thailand, and Philippines. SARS made tourism industry of Great China Region shrink simultaneously.

$$\widehat{O_t} = 16780000 + 1183KI_t - 8968ER_t + \epsilon_t \quad (R^2 = 0.5651)$$

$$\widehat{JPN_t} = 269800 + 37.24KI_t - 143.3ER_t + 17320FC_t - 31810ID_{2t} + \epsilon_t \quad (R^2 = 0.6287)$$

$$\widehat{CHA_t} = 40500 + 76.20KI_t - 222.7ER_t - 54990ID_{1t} + \epsilon_t \quad (R^2 = 0.5958)$$

$$\widehat{USA_t} = 21780 + 14.49KI_t - 10390FC_t - 22860T_{2t} + \epsilon_t \quad (R^2 = 0.1845)$$

$$\widehat{THA_t} = 140700 - 72.27ER_t - 23730ND_t + \epsilon_t \quad (R^2 = 0.3694)$$

$$\widehat{PHN_t} = 36370 + 16.54KI_t + \epsilon_t \quad (R^2 = 0.5304)$$

$$\widehat{HKG_t} = 49020 + 25.39KI_t - 31.77ER_t + 13070FC_t - 14570ND_t - 12180ID_{1t} + \epsilon_t \quad (R^2 = 0.6392)$$

$$\widehat{SGP_t} = 43520 + 6.157KI_t - 24.59ER_t + 4900FC_t - 8770ND_t + 5815ID_{1t} + \epsilon_t \quad (R^2 = 0.5554)$$

$$\widehat{AUS_t} = 25970 + 1.880KI_t - 10.63ER_t + \epsilon_t \quad (R^2 = 0.2959)$$

5. Conclusion

Using the monthly data during the last ten years we identified related factors which could influence on outbound tourism in Korea. And then we built outbound tourism forecasting models for eight major destinations such as Japan, China, United States of America, Thailand, Philippines, Hong Kong, Singapore, and Australia, the countries preferred by Koreans.

As the demands for outbound travels are different from country to country according to economic variables and shock variables, differentiated measures to overcome the crisis should be taken in order to come close to the target

〈Table 2〉 Summary of Experimental Results

	Total	JPN	CHA	USA	THA	PHN	HKG	SGP	AUS
KOSPI	√	√	√	√		√	√	√	√
Exchange rate	√	√	√		√		√	√	√
Financial crisis		√		√			√	√	
Tsunami					√		√	√	
SARS			√				√	√	
H1N1 virus		√							
9 · 11 attack				√					
Bali bombings									
R^2	0.57	0.63	0.60	0.18	0.37	0.53	0.64	0.56	.030
F	5.11E-17	1.06E-20	1.02E-18	0.003	1.35E-08	3.01E-15	2.29E-21	1.63E-16	3.25E-06

numbers of tourists by switching and creating the demands.

For further study, we plan to build outbound tourism forecasting models using Artificial Neural Networks. Statistically significant explanatory variables which are found in this research for each regression models will become input nodes and dependent variables will become output nodes in Artificial Neural Networks.

References

[1] Ajayi, R. A., Friedman, J., and Mehdian, S. M., "On the dynamic relation between stock prices and exchange rates : Tests of Granger causality", *Global Financial Journal*, Vol. 9, No. 2, 1996, pp. 241-251.

[2] Chu, F. L., "Forecasting Tourism Arrivals : A Combined Approach", *Tourism Management*, Vol. 19, 1998, pp. 515-520.

[3] Cho, V. A., "Comparison of Three Different Approaches to Tourist Arrival Forecasting", *Tourism Management*, Vol. 24, No. 3, 2003, pp. 323-330.

[4] Crouch, G. I., "The study of International demand : A Review of Findings", *Journal of Travel Research*, 1994, pp. 12-23.

[5] Dritsakis, N., "Cointegration Analysis of German and British Tourism D for Greece", *Tourism Management*, Vol. 25, 2004, pp. 111-119.

[6] Dimitrova, D., "The Relationship between Exchange Rates and Stock prices : Studied in a Multivariate Model", *Issues in Political Economy*, Vol. 14, 2005, pp. 1-25.

[7] Frechtling, D. C., *Forecasting Tourism Demand : Method and Strategies*, B. H : Oxford, 2001.

[8] Ferrario, F. F., "The Evaluation of Tourist Resources : An Apply Methodology", *Journal of Research*, 1997, pp. 18-22.

[9] Guthrie, H. W., "Demand Tourists Goods and Services in a World Market", *Papers and Proceedings of the Regional Science Association*, Vol. 17, 1961.

[10] Holloway, J. C., *The Businness of Tourism*, 3rd ed., London : Pitman Publication, 1990, p. 103.

[11] Jorion, P., "The exchange-rate exposure of U.S. multinationals", *Journal of Business*, Vol. 63, 1990, pp. 331-345.

[12] Kim, Y. T. and Uysal, M., "Time-dependent Analysis for International Hotel demand in Seoul", *Tourism Economics*, Vol. 4, No. 3, 1998, pp. 253-263.

[13] Lai, S. L. and Lu, W. L., "Impact Analysis of September 11 On Air Travel demand in the USA", *Journal of Air Transport Management*, Vol. 11, No. 6, 2005, pp. 455-458.

[14] Law, R. and Pine, R., *Tourism demand forecasting for the tourism industry*, The Hong Kong Polytechnic University, Hong Kong, 2004.

[15] Lim, C., "Review of international tourism demand models", *Annals of Tourism Research*, Vol. 24, No. 4, 1997, pp. 835-849.

[16] Lim, C. and McAleer, M., "Time Series Forecasts of International Travel demand for Australia", *Tourism Management*, Vol. 23, No. 4, 2002, pp. 389-396.

[17] Lim, C. and Pan, G. W., "Inbound Tourism Developments and Patterns in Chine", *Ma-*

thematics and Computer in Simulation, Vol. 68, No.(5-6), 2005, pp. 498-506.

[18] Martin, C. A. and Witt, S. F., "Accuracy of Econometric Forecasts of Tourism", *Annals of Tourism Research*, Vol. 53, 1989, pp. 29-52.

[19] Mishkin, F. S., *The transmission mechanism and the role of asset prices in monetray police*, NBER Working Paper, 8617, 2001.

[20] Pattie and Snyder, "Using a Neural Network to Forecast Visitor Behavior", *Annals of Tourism Research*, Vol. 23, No. 1, 1996, pp. 151-164.

[21] Song, W. G., "Comparing Forecast Accuracy by Time Period in Tourism demand An Application of Different Univariate Time Series Methods", *International Journal of Tourism Sciences*, Vol. 2, No. 2, 2002, pp. 55-64.

[22] Song, H. and Witt, S. F., "Forecasting international tourist flows to Macau", *Tourism Management*, Vol. 27, No. 2, 2006, pp. 214-224.

[23] Sheldon, P. J., "Forecasting Tourism : Expenditures Versus Arrivals", *Journal of Travel Research*, Vol. 32, No. 1, 1993, pp. 13-20.

[24] Vygodina, A. V., "Effects of size and international exposure of the US firm on the relationship between stock prices and exchange rates", *Global Finance*, Vol. 17, 2006, pp. 214-223.

[25] Webber, A. G., "Exchange Rate Volatility and Cointegration in Tourism Demand", *Journal of Travel Research*, Vol. 39, 2001, pp. 398-405.

[26] Yoon, K. S., *The Effects of KOSPI and Exchange Rate on Outbound*, Master's Thesis, Department of Tourism Leisure, Graduate School of Tourism, Kyunghee University, 2012.

Author Profile

Ji-Hwan Yoon

Ji-Hwan Yoon is a currently professor in school of tourism management at Kyunghee University in South Korea. He received a B.A. from Korea University and M.S. and Ph.D. in school of hospitality management from Pennsylvania State University. His primary research area is strategic management of tourism industry.

Jung Seung Lee

Jung Seung Lee is a currently assistant professor in department of business administration at Hoseo University in South Korea. He has been served as a vice-president of Korea Intelligent Information System Society and a director of Korea Database Society. He received a B.A. and M.S. in Management Science and Ph.D. in Management Engineering from KAIST. He established two venture companies such as Good Friends (oldboy.co.kr, an internet community site) and Best Money (bestmoney.co.kr, a financial consulting site for individuals). His primary research areas are supply chain management, demand forecasting and management, and business data analytics.

Kyung seon Yoon

Kyung seon Yoon is a currently adjunct professor in department of hotel and tourism at Daelim University College in South Korea and established a travel company, Hana Free Travel Inc.(gocebu.co.kr). He received M.S. in Department of Tourism Leisure in Graduate School of Tourism from Kyunghee University. His primary research areas is outbound tourism demand forecasting.