Forecasting the Supply of B&B Accommodation in Taiwan

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Abstract: Based on the literature reviewed in this study, a few important factors influence the number of accommodation units. We selected two variables to explore in this study, that is, GNP and holiday duration. We used 54 sets of data obtained from reports published by the Taiwan Tourism Bureau to predict the number of B&B accommodation units and business income. The results of this study show that (1) the number of B&B accommodation units and business income have adopted a steady growth trend in Taiwan; and (2) GNP and holiday duration are valid indicators for forecasting the number B&B accommodation units and business income. Furthermore, if the GNP for six months ago increased by one million, the number of accommodation units would increase by 0.079 and business income would increase by NT$54.78. If the holiday duration increased by one day in the current month, the number of accommodation units would increase by 5,792 and business income would increase by NT$5,424,336.

Keywords: The number of B&B accommodation units; Business income; GNP; Holiday duration

1. Introduction

Although B&Bs originated in 18th century France, the French Royal Family were the only people who could afford to rent a house for exclusive vacations in recreational farms. When ordinary people eventually began to participate in tours to experience country life, the social structure and economy changed (Chang, 2002). In Taiwan, B&Bs became common when scenic and recreational areas, such as Kending, Alishan, and Xitou, were developed in 1981. At that time, the supply of hotels usually fell short of demand when numerous tourists went sightseeing on the weekends or during holidays. Tourists were required to book hotels in advance to ensure accommodation (Cheng, 2004). Nowadays, because of the change in lifestyle, increase in consumption levels, and implementation of the two-day weekend, people have more time for leisure. The holiday policy enforced by government encouraged people to make plans for leisure, tours, and entertainment. Taiwanese people enjoy experiencing natural ecology and traveling in the countryside for vacation (Wu, Chang, Lin, and Hsieh, 2008).

Chu, Liu, and Lin (2007) indicated that people who resided in the scenic areas tended to provide spare rooms in their house to tourists because they earn additional income while addressing the problem of inadequate accommodation. Additionally, tourists could experience different accommodation styles in these areas. The above factors resulted in the emergence and flourishing of the B&B industry. Husen and Postlethwaite (1994) contended that people's needs vary, and people's basic needs are typically lower than their target needs. Despite the nature of these needs, which can be either basic needs or preferences, demands occur when the basic needs are not satisfied. Therefore, because a shortage of hotels may be troublesome for tourists, they learnt to consider this issue when planning trips. In addition, tourists tended to choose different B&Bs according to their personal preferences. Unfortunately, because of the unique design styles and services offered by B&Bs, the prices varied greatly(Lai, Huang, Lu, & Chang, 2013).

In December 2001, the Taiwanese government announced the "Regulations for B&B Management" for B&B owners to improve the quality of tourism services. In 2002, the Executive Yuan proposed the "National Development Plan for 2008." The Executive Yuan defined the tourism and recreation industry as part of the culture and creativity industry, and the B&B industry was included in the tourism and recreation industry. The purpose of the plan was to develop the B&B industry through government involvement, using local culture combined with features of recreation, sports, tourism, historical

ruins, aesthetics, education, entertainment, creativity, and intimacy to successfully transform this industry. Recently, B&B owners have made heavy investments in B&B equipment and facilities to transform traditional agriculture into recreational agriculture, allowing tourists to access nature, remedy their spiritual state, and readjust their pace. However, this led to questions of how to use space for a B&B effectively? How to increase the perceived quality of a B&B with comprehensive planning and investment? To answer the questions, this study forecasts future demands for B&B based on historical and concurrent records of supply.

The strategy of collecting accommodation supply records for forecasting future demand has been conducted in previous studies in other countries (Emerick and Emerick, 1994; Lanier and Berman, 1993; Morrison, Pearce, Moscardo, Nadkarni, and O'Leary, 1996). Most studies primarily discussed the appeal of B&Bs for guests and investigated customer motivation and satisfaction; they seldom explored the feasibility of forecasting future accommodation supply using national data. Therefore, the Tourism Bureau, the government, and B&B owners had limited information of the actual industry conditions or potential. Thus, this study collected data from a periodical survey of B&Bs conducted by the Tourism Bureau and created a list of authorized B&Bs. However, these data were not used to forecast the number of future accommodation units.

Witt, Sykes, and Dartus (1995) used econometrics to explain travel needs. For an international conference, they adopted the forecasting technique of estimating the maximum consumption. After conducting a comparative study based on previous data, they found that the econometrics forecasting technique could provide more accurate forecasts. Uysal Crompton (1985) contended that three factors could be used to forecast the potential demand resulting from travel, that is, the number of tourists, business opportunities in the destination, and the factors affecting tourists' willingness to visit. Witt and Witt (1995) stated that the number of tourists was variable most commonly used in previous studies to forecast the demands resulting from travel. The increasing importance of leisure time has enabled the travel industry to thrive (Tisdell, 2000). Therefore, the fulfillment of demands has become increasingly important.

Cost is one of the important factors people consider when determining their travel needs. Hanley and Spash (1993) stated that traveling costs varied according to the relevant factors selected, such as the travel frequency and duration, multipurpose travel, costs for tourists and local residents, estimated unit distance cost, estimated costs, and alternative

destinations. Chou, Yen, and Chao (2008) stated that the demands resulting from travel comprised five factors: transportation, food, service, recreational facilities, and space. They also found significant differences according to demographic variables, such as gender, categories, occupation, education, and monthly income. Cai, Hong, and Morrison (1995) indicated that because of their income levels, socioeconomic variables affect people's travel expenditure on food, accommodation, transportation, and entertainment. Therefore, a steady monthly income enables people to determine their travel needs; thus, this factor should be considered an important indicator in this study (Chen, 2003; Taylor, Fletcher, and Clabaugh, 1993; Lee, 2001; Jang, Bai, Hong, and O'Leary, 2004).

As shown in previous studies, gross national product (GNP) is useful for research related to business travel or leisure and tourism (Wang, 2007; Song and Witt, 2000). Examining the travel market in China, Cai and Kuntson (1998) found that two variables, GNP and leisure time, influenced people's travel behavior (relevant factors included GNP, reduced working hours, political factors, and major changes in government tourism policies). They also established a linear model for their study. Their results showed that an increase in both GNP and leisure time had a positive correlation with the number of tourists, suggesting that GNP and leisure time are related to the demands resulting from travel.

In response to the government's two-day weekend regulation, a number of foreign-funded and Taiwanese companies implemented this policy. This policy not only maintained company productivity and competitiveness, but also provided employee benefits, such as stress relief, increased family harmony, and enhanced self-actualization. Additionally, the policy increased employees' loyalty to the organization, which effectively enhanced company productivity and sales growth (Chu and Ho, 2004). In 2000, the World Travel & Tourism Council (WTTC) conducted a global survey and found that 192.21 million people were employed in the tourism industry, accounting for one-twelfth of the total employed population. Furthermore, an additional 59.41 million employment opportunities were expected to be created by the end of 2010, meaning that the number of people employed in the tourism industry worldwide would reach 251.62 million (WTTC, 2007). In summary, increased leisure time encouraged more vacations, enhanced the local economy, increased the employment rate, enabled individuals to form a deeper bond with families and friends, and played an important role in developing the national economy.

By reviewing existing literature, we identified two primary variables that affect the supply of accommodation, that is, GNP and holiday duration. Thus, data provided by the Tourism Bureau was used in the forecasting model employed in this study. The aim of this study was to develop an effective forecasting model, the results of which would provide the government and B&B owners with a reference for management decisions.

2. Data And Methodology
2.1 Data source and operational definitions of variables
1. Data of the "number of accommodation units" and "business income" were obtained from monthly reports issued by the Taiwan Tourism Bureau from January 2007 to June 2011.
2. GNP is the quarterly gross national product. We collected data from January 2007 to June 2011 of the DGBAS Quarterly National Economic Trends (2011).
3. For holiday duration, we obtained data from the holiday schedule posted on the Central Personnel Administration (2011) website from January 2007 to June 2011 to calculate the average number of holiday days.

2.2 Methodology
2.2.1 Hypothetical model
This study gathered data for the four variables the "number of accommodation units," "business income," "GNP," and "holiday duration" from January 2007 to June 2011. We collected a total of 54 sets of numerical data. Subsequently, we divided the data into two groups. The first group was from January 2007 to December 2010 and contained 48 sets of data; the second group was from January 2011 to June 2011 and contained 6 sets of data. These two data groups were used for forecasting. "GNP" and "holiday duration" were considered independent variables and converted into a seasonal autoregressive integrated moving average (SARIMA) to enable linear regression with SARIMA time-series errors for fitness and forecasting analysis.

2.2.2 Statistical mothod
For statistical analysis, we employed the KPSS (Kwiatkowski, Phillips, Schmidt, and Shin) test of unit root to verify the stability of the "number of accommodation units" and "business income" variables. Kwiatkowski et al. (1992) developed the KPSS unit root test to examine whether the time series was stationary; the null hypothesis indicated that the series was stationary. If the hypothesis is not supported (p-value $< .05$), the differencing procedure is required and the auto correlation frunction (ACF)

and partial auto correlation function (PACF) are conducted to determine the order of SARIMA (SARIMA(p,d,q)* (P,D,Q)s). Furthermore, the cross-correlation function (CCF) is used to explore the lag in the relationship among the independent variables, GNP, and the dependent variables "number of accommodation units" and "business income." The insignificant parameters are gradually eliminated in the forecasting model. Then, ACF, PACF, and Ljung-Box tests are conducted to determine whether the residual is autocorrelated. Finally, the mean absolute percentage error (MAPE)

$$[\text{MAPE}= \left(\frac{1}{n} \sum_{t-1}^{n} \left(\frac{|Z_t - \hat{Z}_t|}{Z_t} \right)^2 \right) $$

: observations in phase t, $\hat{Z}_t$: observations in period t, n: prediction phase] is employed to evaluate the model's overall forecasting performance.
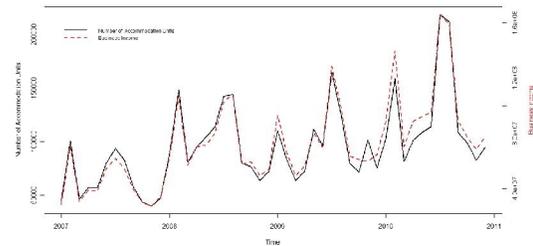

Figure 1. Time series of the number of accommodation units and the business income

As shown in Fig. 1, both the "number of accommodation units" and "business income" demonstrated a steady growth trend every year. Furthermore, the result of the unit root test show that the KPSS for the number of accommodation units was 0.7414 ($p < .01$) and the KPSS for business income was 1.0866 ($p < .01$), which suggests that the primary data was not stationary. According to ACF and PACF, the data represented a seasonal cycle of six months; thus, seasonal differencing was conducted for this cycle. Subsequently, the KPSS changed to 0.0785 ($p > .1$) and 0.0747 ($p > .1$), indicating that the data became stationary after seasonally differencing. With ACF and PACF, the SARIMA of the "number of accommodation units" and "business income" was $(1,0,0)*(1,1,0)_6$. To identify the independent variables, we referred to the result of CCF and found that an essential lag occurred in the relationship between "GNP" and the "number of accommodation units." Furthermore, the relationship between "GNP" and "business income" comprised six phases. Accordingly, the comprehensive model for the two sets of correlations

are written as follows: ARIMA(1,0,0)*(1,1,0)6 +GNP(lag 6)+total days of holiday each month.

Table 1. Fitness Model for the Number of B&B Accommodation Units and Business Income

Model	Business Income		
Variable	Estimate	Standard Error	Sig.
ar1	0.607	(0.145)	<.001
sar1	-0.767	(0.104)	<.001
GNP_lag6	54.782	(25.624)	.034
Days of Holiday	5424336	(1048367)	<.001

According to the residuals of the ACF, PACF, and LB tests, the two previous models were not auto correlated. Therefore, the model of this study was finalized according to the following: the increased number of accommodation units and business income (i.e., the value of the present month – the values of six months ago) in the current month is related to the increased amount for last month, the increased amount for six months ago, the GNP for six months ago and the days of holiday in the current month. In addition, assuming that the other conditions remained the same, when the GNP for six months ago increased by 1 million, the number of accommodation units would increase by 0.079, and the business income increased by NT$54.78. If the days of holiday increased by 1 day in the current month, the number of accommodation units would increase by 5,792, and the business income would increase by NT$5,424,336.

Table 2. Comparison of the Difference Between the Estimated and Actual Number of Accommodation Units and Business Income Amount

	Date	2011.1	2011.2	2011.3
Number of B&B Accommodation Units	Actual Value (T)	120732	189554	102644
	Estimate (I)	149952	189867.3	100372.9
	(T-I)/T	-0.242	-0.002	0.022
	MAPE	0.132		
Business Income	Actual Value (T)	110,150,893	180,858,386	100,906,361
	Estimate (I)	116,137,805	163,857,133	95,892,740
	(T-I)/T	-0.054	0.094	0.050
	MAPE	0.140		

Table 2. Comparison of the Difference Between the Estimated and Actual Number of Accommodation Units and Business Income Amount (continute)

	Date	2011.4	2011.5	2011.6
Number of B&B Accommodation Units	Actual Value (T)	144703	143697	170615
	Estimate (I)	120016.9	120395.3	138115.5
	(T-I)/T	0.171	0.162	0.190
	MAPE			

Table 2. Comparison of the Difference Between the Estimated and Actual Number of Accommodation Units and Business Income Amount (continute)

	Date	2011.4	2011.5	2011.6
Business Income	Actual Value (T)	133,573,463	129,887,920	95,491,281
	Estimate (I)	111,757,244	110,216,643	126,715,823
	(T-I)/T	0.163	0.151	-0.327
	MAPE			

In Table 2, the absolute errors for forecasting the number of accommodation units and business income in 6 months was 1% to 24% and 5% to 33%, respectively, and the average absolute errors were 13% and 14%. According to the forecasting power evaluation system proposed by Lewis (1982), both models used in this study were suitable for forecasting.

Table 3 shows the forecasted number of B&B accommodation units from July 2011 to December 2012, which was 89,5445.12. Business income was estimated to reach NT$664,583,986 from July 2011 to December 2011. Table 3 also shows that for January 2012 to December 2012, the forecasted number of accommodation units is 1,885,105 and business income is NT$785,828,022.

Table 3. Forecasts of the Number of Accommodation Units and Business Income

Date	2011.7	2011.8	2011.9
Number of Accommodation Units	235865	215772.3	116323.6
Business Income	160,291,722	155,791,241	91,233,565
Date	2012.1	2012.2	2012.3
Number of Accommodation Units	170478.1	184087.5	112772
Business Income	143,836,609	166,215,697	105,227,653
Date	2012.7	2012.8	2012.9
Number of Accommodation Units	222073.7	216733.6	130992.7
Business Income	154,080,560	162,296,188	106,114,815

Table 3. Forecasts of the Number of Accommodation Units and Business Income (continute)

Date	2011.10	2011.11	2011.12
Number of Accommodation Units	116571.7	95054.82	115857.7
Business Income	92,337,520	79,220,151	85,709,787
Date	2012.4	2012.5	2012.6
Number of Accommodation Units	148751.9	151390	176025.6
Business Income	131,629,283	132,865,557	105,111,623
Date	2012.10	2012.11	2012.12
Number of Accommodation Units	116706.1	109910.1	145183.3
Business Income	93,634,885	92,337,327	104,893,589

3. Conclusion and Suggestions

3.1 Conclusion

Based on the literature reviewed in this study, a few important factors influence the number of accommodation units. We selected two variables to explore in this study, that is, GNP and holiday duration. We used 54 sets of data obtained from reports published by the Taiwan Tourism Bureau to predict the number of B&B accommodation units and business income. The results of this study show that (1) the number of B&B accommodation units and business income have adopted a steady growth trend in Taiwan; and (2) GNP and holiday duration are valid indicators for forecasting the number B&B accommodation units and business income. Furthermore, if the GNP for six months ago increased by one million, the number of accommodation units would increase by 0.079 and business income would increase by NT$54.78. If the holiday duration increased by one day in the current month, the number of accommodation units would increase by 5,792 and business income would increase by NT$5,424,336.

3.2 Suggestions

Generally, B&Bs are cheaper than hotels; thus, people tend to consider them when making accommodation decisions. This study found that the B&B industry has experienced a steady growth trend. However, we recommend that the government assist and develop this industry (for example, establish a grading system for B&Bs, conduct regular fire safety inspections, and provide a complaints line for consumers) to improve the quality and safety and upgrade the business model. Increasing numbers of tourists choosing to stay at B&Bs benefit the development of local tourism and create additional employment opportunities.

We also recommend that B&B owners refer to data of GNP and holiday duration, such as the increase in GNP and the number of holiday days per month, to understand the changes in the number of accommodation units to prepare appropriate facilities and manpower. Although this study established an effective forecasting model for the number of accommodation units and business income, B&B owners must still provide a good-quality service and employ effective marketing strategies to attract tourists. Furthermore, good marketing strategies will be even more effective if they are designed according to the actual demands for accommodation.

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