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Modeling air travelers' choice of flight departure and return dates on long holiday weekends

Chieh-Hua Wen*, Yao Yeh

Department of Transportation Technology and Management, Feng Chia University, 100, Wenhwa Road, Seatwen, Taichung, 40724, Taiwan, ROC

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ABSTRACT

Air travel demand is typically high on long holidays. Understanding factors that influence the choice of air travelers with respect to their departure and return dates on long holidays can help airlines make effective decisions on pricing, ticket sales, and scheduling. We conduct a stated preference survey to examine the preferences of low-cost airline travelers on a particular holiday weekend. A temporally correlated logit model is developed to account for the temporal correlation of day-of-the-week alternatives. The results indicate that airfare is the key variable affecting air travel date choices. The utility of day alternatives decreases when more leave days are required before the holiday begins. Departure dates before the beginning of the holiday weekend and return dates after the end of the holiday are highly substitutable. The low-fare strategy comprising early departures and late returns can effectively increase the load factor of off-peak flights on long holiday weekends.

1. Introduction

Airlines have been employing dynamic pricing since several decades. Fare classes (or buckets) and the number of seats assigned to each category of classes are determined for each flight. Airlines typically reduce the number of tickets available in the relatively low-fare classes if ticket sales are better than expected and increase the number of low-fare tickets available if sales are not as good as expected. Several studies have examined the factors that explain the variations in airfares (Pels and Rietveld, 2004; Malighetti et al., 2009; Mantin and Koo, 2009; Gillen and Mantin, 2009; Obermeyer et al., 2013). In general, fares increase as flight departure dates come closer. Mantin and Koo (2010) examined day-of-the-week pricing mechanisms and found a strong weekend effect for airfare dispersion but not for price level. Price discrimination based on the day-of-the-week was studied by Puller and Taylor (2012); it was found that fares were 5% lower when air tickets were purchased on the weekend rather than on weekdays because weekend purchasers tend to be leisure customers, who are price sensitive.

However, the literature does not investigate the day-of-the-week effect on the purchase of air tickets on holidays. Airfares vary with regular and holiday weekends; further, airfares on holiday weekends are particularly higher than regular weekday and weekend airfares owing to high demand. As a result, price discrimination on holiday weekends may impact air travelers' choices. Among travel choices, the selection of flight time is critical to air travelers (Grammig et al., 2005). Travelers must decide their preferred departure and return dates and flight-time schedules. Several studies have emphasized how air travelers choose flights at different times of the day. For example, Coldren et al. (2003) used the multinomial logit (MNL) model to examine air itinerary choices, considering explanatory variables such as level-of-service, carrier attributes, time-of-day, connection quality, and aircraft size and type. Coldren and Koppelman (2005) further used generalized extreme value models to identify flexible substitution patterns between itinerary choice alternatives. Brey and Walker (2011) estimated the time-of-day distributions for air travel and examined flight arrival and departure time preferences. However, the air traveler's decision-making regarding departure and return dates has been less examined. Understanding traveler preferences for departure and return dates helps airlines make better decisions with respect to pricing, ticket sales, fleet grouping, route allocation, and scheduling (Koppelman et al., 2008).

This study identifies the important factors that influence air travelers in their choice of departure and return dates on long holiday weekends. Traveler demand for going abroad on long weekends is much higher than on regular weekends. This study uses questionnaires to obtain the stated preference data as well as

* Corresponding author.
E-mail address: chwen@fcu.edu.tw (C.-H. Wen).

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individual and trip characteristics. Departure and return date choice models for low-cost airlines have been developed using discrete choice modeling approaches. The proposed methodology enables the development of a pricing strategy that can effectively shift high demand for air travel on long holiday weekends to off-peak periods, and eventually increase airline revenue.

2. Methodology

2.1. Stated preference design

This study develops a stated preference experiment to examine the flight departure/return date preferences of low-cost airline travelers. Low-cost airline fares are dynamic; thus, air travelers may not know whether the fare will increase, decrease, or remain constant when the airline tickets go on sale. Furthermore, air travelers may not pay attention to fares on the days before and after holiday weekend periods. The choice experiment involves a simulation of various possible situations. Taking a three-day long holiday weekend (Friday being a holiday) as an example, a choice scenario of the departure date shows fares from Monday to Saturday, whereas that of the return date shows fares from Friday to the following Wednesday. This setting comprises the holiday weekend itself and a before-and-after period. Here, the designated attribute is airfare. The period of leave and duration of stay are calculated and presented to respondents in the choice experiment.

According to the Taiwan Tourism Bureau, Japan was among the top three tourist destinations, following China and Hong Kong, from 2008 to 2013. Two low-cost airlines, Scoot Airlines and Vanilla Air, offered direct flights from Taiwan Taoyuan International Airport to Tokyo Narita International Airport. Because Vanilla Air offered a higher frequency of daily flights compared to Scoot Airlines, the actual fares of Vanilla Air were used to determine the fare levels for departure and return dates. Fares collected from the website of Vanilla Air from February 4, 2014, to February 8, 2014, include six ticket prices without departure tax: $3,000NT, $3,600NT, $4,500NT, $5,700NT, $7,500NT, and $9,000NT. Departure tax from Taoyuan airport is $300NT and that from Narita airport is $800NT.

Fig. 1 shows the departure fares for Vanilla Air before 228 Peace Memorial Day, Friday to Sunday being the holiday period. The search results for February 9 indicate that the departure fares for Wednesday and Thursday were sold out, and therefore, this study presents fares of selected days from February 4 to 8, 2014. Sunday was excluded from the departure category because most travelers do not go abroad on the last day of the holiday weekend.

The departure fares were designed with three levels for each day, except Thursday, which had four levels (Table 1). The lowest fare of $3,900NT was set for departures on Monday, Tuesday, and Saturday, and the fare rose to $6,000NT. Departure fares were set to be more expensive on Wednesday and Thursday; the lowest fare was $4,800NT, and the highest fare, $9,300NT, applied to Thursday, which was a peak travel day. Friday, the first day of the holiday weekend, had the most expensive departure fare. Departure fares on Friday began at $6,000NT, the highest fare being $9,300NT.

Fig. 2 presents the return fares for Vanilla Air from February 4 to 8, 2014 because the Sunday return tickets were sold out on February 9. Generally, travelers do not visit Japan for more than ten days, including a three-day weekend. Thus, the return date intervals involved Friday to the following Wednesday. The return fares were designed with four levels for each alternative, except for Sunday fares, which had three levels (Table 2). The lowest fare was $3,800NT for returns on Friday and the following Tuesday and Wednesday, and the fare increased to $6,500NT. Airfares were higher on Saturday and the following Monday, ranging from $4,400NT to $8,300NT. Sunday had the highest fare, going up to $9,800NT.

Among six days for departure, five alternatives had three levels and one had four levels. Thus, a total of 972 ($= 4 \times 3^5$) combinations of choice scenarios were used for departure. The fractional factorial design was used to reduce the total number of combinations to 25 scenarios, using an orthogonal table of L_{25} (4×3^5). However, seven scenarios had the possibility of conflicting with the actual situation. For example, the departure fares on Wednesday cannot be higher than those on Thursday. The rules were determined based on our observation of the fare settings by Vanilla Air. Therefore, a total of 18 scenarios were used for departure. Five return alternatives had four levels and one had three levels. Thus, a total of 3072 ($= 3 \times 4^5$) combinations of choice scenarios were used for return. Using an orthogonal table of L_{25} (3×4^5), the fractional factorial design produced 25 scenarios. After the exclusion of unrealistic scenarios, 18 scenarios were obtained and used in the case of return flights. The departure and return scenarios were randomly paired. Each pair comprised one departure and one return. Each respondent was asked to evaluate two hypothetical paired scenarios in the choice experiments. Each respondent selects one alternative among six days for departure and one alternative for return.

2.2. Choice modeling

This study uses the discrete choice models for flight departure and return dates. Travelers were faced with travel choices for different days of the week (e.g., Monday to Saturday). The utility function of traveler i for any alternative j is defined as follows:

$$U_{ij} = V_{ij} + \varepsilon_{ij} = \beta' X_{ij} + \varepsilon_{ij} \tag{1}$$

where V_{ij} is the observable component of the utility function, and X_{ij} is a vector of explanatory variables that include fare, individual socioeconomic traits and individual trip characteristics. ε_{ij} is a random error term, and β is a vector of unknown parameters that

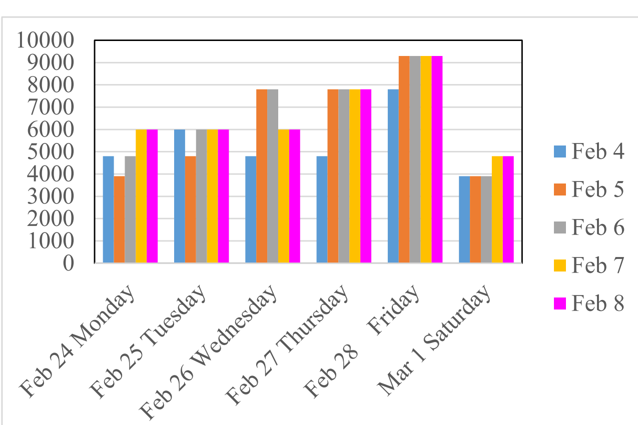

Fig. 1. The departure fares purchased from February 4 to 8, 2014 for Vanilla Air.

Table 1
Fare levels (NT$) of departure dates.

Day of the week	Level			
Monday	1 = 3900	2 = 4800	3 = 6000	
Tuesday	1 = 3900	2 = 4800	3 = 6000	
Wednesday	1 = 4800	2 = 6000	3 = 7800	
Thursday	1 = 4800	2 = 6000	3 = 7800	4 = 9300
Friday	1 = 6000	2 = 7800	3 = 9300	
Saturday	1 = 3900	2 = 4800	3 = 6000	