Risk Averseness Regarding Short Connections in Airline Itinerary Choice

AV020

Annual Meeting 2006

Submission Date: 01 April 2006, Word Count: 6902

By:

Georg Theis
Massachusetts Institute of Technology
Department of Civil and Environmental Engineering
Room 35-217
77 Massachusetts Avenue
Cambridge, MA 02139
Tel.: (617) 253-3507
Fax: (270) 968-5529
Email: gtheis@mit.edu

Thomas Adler
Resource Systems Group
55 Railroad Row
White River Junction, VT 05001
Tel.: (802) 295-4999
Fax: (802) 295-1006
Email: tadler@rsginc.com

John-Paul Clarke
School of Aerospace Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332-0150
Tel: (404) 385-7206
Fax: (404) 894-2760
Email: john-paul.clarke@aerospace.gatech.edu

Moshe Ben-Akiva
Massachusetts Institute of Technology
Department of Civil and Environmental Engineering
Room 1-181
77 Massachusetts Avenue
Cambridge, MA 02139
Tel.: (617) 253-5324
Fax: (617) 253-0082
Email: mba@mit.edu

ABSTRACT

Network airlines traditionally attempt to minimize passenger connecting times at hub airports based on the assumption that passengers prefer minimum scheduled elapsed times for their trips. Minimizing connecting times, however, creates peaks in hub airports' schedules. These peaks are extremely cost intensive in terms of additional personnel, resources, runway capacity and schedule recovery. Consequently, passenger connecting times should only be minimized if the anticipated revenue gain of minimizing passenger connecting times is larger than the increase in operating cost, i.e. if this policy increases overall operating profit. This research analyzes to what extent a change in elapsed time impacts passenger itinerary choice and thus an airline's market share.

We extend an existing airline itinerary choice survey to test the assumption that passenger demand is affected by the length of connecting times. Previous studies have not explicitly focused on the connecting time at hubs in their models. We hypothesize that passengers might incur lower utilities from shorter connecting time versus longer connecting times based on the potential discomfort of a hasty connection and the misconnection risk associated with short connecting times. We perform an SP experiment and collect socioeconomic data in order to estimate a choice model. The MNL model supports our hypothesis and refutes the traditional network airline assumption.

DEFINITIONS

The following terminology is used in this paper.

- "Itinerary": An itinerary is a series of flights from a passenger's origin to her destination. An itinerary may contain only one flight (i.e. a non-connecting itinerary) or more than one flight (i.e. a connecting itinerary).
- "Elapsed time" of an itinerary is the time between the scheduled departure of the first flight and the scheduled arrival of the last flight.
- "Connecting time" is defined as the scheduled time between the arrival of a flight and the departure of a subsequent flight within an itinerary.
- "Minimum connecting time" is the minimum feasible connecting time at an airport as published by the corresponding airport authority.
- "Buffer time" is the difference between connecting time and minimum connecting time.

Figure 1 shows a graphic representation of these definitions. The elapsed time of this itinerary is 4 hours, with a connecting time at Atlanta airport of 70 minutes. The minimum connecting time for Atlanta as published by the airport authority is 45 minutes, leaving a buffer of 25 minutes.

1 INTRODUCTION

The business environment for U.S. network airlines has changed considerably over the past ten years. Whereas network airlines were able to yield record profits in the late nineties, they incurred record losses after Sep 11, 2001.

As part of an effort to reduce overall costs, several network airlines reconsidered their hub timetable design. Traditionally, network airlines assumed that passengers have a strong preference to minimize the elapsed time of their trip. Thus, airlines created banks or peaks in schedules in order to minimize the connecting times for their connecting passengers.

However, these peaks resulted in high operational costs for the airline, the airport and air traffic control. Resources have to be supplied for the peak level and are underutilized in off peak times. In addition, aircraft utilization suffers from banks in schedules: In order for an airplane to arrive within a bank, aircraft often have to be on the ground longer at the spoke station than the required minimum ground time. Empirical evidence also suggests that block times into and out of banks are longer than off-bank flights because of congestion effects (*1*).

Consequently, some network airlines have started to "depeak" their schedule. American Airlines reported that this led to a savings of five aircraft and an increase in average connecting times of 7 minutes (*2*). Some network airlines are reluctant to depeak further, however, since they fear that an increase in connecting time would have a detrimental effect on their market shares.

Contrary to this belief, we hypothesize that shorter connecting times might actually reduce market share because of the discomfort of rush and the risk of misconnection associated with short connecting times.

The objective of this paper is to study the impact of transfer time length on passenger itinerary choice. In order to achieve this objective, a stated preference experiment is designed and executed that explicitly accounts for connecting time.

The organization of the paper is as follows. In section 2, we discuss traditional hypotheses regarding the importance of connecting time in itinerary choice and our alternate behavioral hypothesis. In section 3, we give a brief overview of previous work in passenger itinerary choice. In section 4, we discuss the survey design and present summary statistics of the survey data. In section 5, the specification of the models is presented. In section 6, the modeling results are presented and in section 7 we summarize the findings.

2 HYPOTHESES REGARDING THE RELEVANCE OF CONNECTING TIMES IN ITINERARY CHOICE

Traditional Hypotheses

The importance of elapsed time is historically attributed to three factors: The screen position of an itinerary in global distribution systems (GDS), the decision window model, and passenger preferences regarding lengths of trips and connections. Since the airline industry has changed dramatically in the last few years, however, some of these changes may lead to the conclusion that elapsed time has lost relative importance in passenger airline choice.

The most prominent hypothesis about the importance of elapsed time is based on the GDS screen position. Global distribution systems have until recently been required by government regulation to supply a “neutral” display that shows itineraries in a certain order. While the U.S. regulation only called for elapsed time to be a “significant factor” (*3*), European Union regulation specifically requires connecting itineraries to be ranked by elapsed journey time (*4*). Based on this ranking and the fact that around 80% of all bookings are made from the first screen (and “no fewer than 50%” from the first line) (*5*), many airlines feel that elapsed time is important in passenger choice. However, this might be a confusion of correlation and causality. Bookings for itineraries on the first page might be made for other reasons than screen position: Since GDS’ often display nonstop flights first, path quality might for example be more important than the mere fact that an itinerary is on the first screen. The DOT ruled that display order regulations be terminated by July 31, 2004 (*6*). This might eventually lead to the disappearing of neutral displays and could reduce elapsed time’s impact on screen position.

Even if there is a causality between screen position and passenger itinerary choice, GDS screen position could only be relevant when a neutral display is used and no one involved in the decision process has any biases. However, airlines work hard to introduce incentives to all members of the decision chain in passenger bookings: Passengers are incentivized by fares and frequent flyer programs, corporate travel offices are incentivized by special discounts and travel agents by override commissions. Override commissions are special commissions given to a travel agency when it reaches a certain revenue level with one airline. Thus, a travel agent would try to maximize revenue with one specific airline if the other members of the decision chain had not voiced any preferences regarding their preferred itinerary choice.

The change in market shares of distribution channels is another factor that diminishes the importance of GDS and thus the potential of a “screen position hypothesis”. Currently, approximately 50% of airline ticket sales in the U.S. market are conducted online (*7*). If passengers book directly with airlines (either online or via telephone), GDS screen position is irrelevant. In addition, internet sites increasingly are used even by travel agents for airline bookings. These sites have never been regulated, i.e. may sort and bias by whatever criteria they choose.

The second important hypothesis about the relevance of elapsed time is based on the Decision Window Model (*8*). The Boeing Decision Window Model postulates that a passenger has a predetermined decision window in which he wants to go from A to B. All itineraries within this window will be considered. Passengers then choose from this itinerary set either by airline preference and subsequently by path quality (nonstop/connecting) or vice versa.

A longer elapsed time could cause an itinerary to go beyond a passenger's decision window and thus be excluded from the choice set. However, it is questionable if passenger choice occurs in this way. Passengers might also be willing to accept tradeoffs and choose a lower fare or a preferred airline even though the itinerary is not in their original window. The definition of the window could also be supply oriented, i.e. one would first check possible itineraries and then finalize plans at the destination.

The third rationale for the importance of elapsed time is the hypothesis that passengers *prefer* short elapsed times. It is a common statement that "passengers prefer shorter connections" and "discount longer connections" (*1*). The major objection to the statement is that passengers may prefer shorter *actual* connections, not shorter *scheduled* connections. With increasing congestion and delays in the 1990's, missed connections for passengers and luggage increased as well. As a consequence of increased delays, minimizing elapsed times may increase the risk of misconnections and increase the "transfer anxiety" level of passengers.

All of these aspects allow us to question whether minimizing elapsed time is as important for market shares as it might have been earlier and whether minimizing elapsed time is what passengers truly prefer.

An Alternate Hypothesis

We hypothesize that there are three components associated with the utility of connecting times (see Figure 2). First, passengers' value of time lets us assume that a longer scheduled connecting time leads to a lower utility level. Second, we assume that the transfer success rate (defined as the number of successful passenger transfers for a specific itinerary divided by the total number of passengers that embarked on that itinerary) is dependent upon the length of the scheduled connecting time. That is, we assume that passengers with a longer scheduled connecting time have a better chance of actually making their connection. Third, we assume that short connecting times (close to the minimum feasible as published by the airport) may create a feeling of rush for the passenger and thus might have a lower utility than longer connecting times.

In total, these assumptions lead to an "n-shaped" curve of utility. Based on our assumptions, we hypothesize that there is a window of indifference regarding the length of connecting time. The purpose of our research is to test whether this hypothesis will be confirmed.

3 PREVIOUS WORK

Numerous authors have discussed passenger airline choice. Alamdari and Black (*9*) gives an overview of the MNL model application to airline passenger choice to that date. Proussaloglou and Koppelman (*10*) uses a survey to estimate a passenger airline choice model. In Proussaloglou and Koppelman (*11*), the authors include schedule delay, defined as the deviation from preferred departure time, but include no information on transfer time or overall trip time. Coldren and Koppelman (*12*) estimates a nested logit model which uses departure time as one attribute. The authors also differentiate between service types (nonstop/one-stop connecting, two-stop connecting). Algers and Beser (*13*) uses a similar approach to that of Proussaloglou and Koppelman (*11*) of evaluating scheduling delay. Ndoh (*14*) uses overall travel time as part of a study on airport choice. Adler et al. (*15*) uses a previous version of the airline survey used in this paper that doesn't incorporate the specifics on connecting itineraries.

4 THE DATA

Data Options

Data for a model incorporating connecting times can be retrieved from observed choices (revealed preference) or from choice experiments (stated preference).

Our choice of data is largely based on feasibility. Historic booking data is available from GDS' in form of MIDT (Market Information Data Transfer) files. This is data derived from the major GDS's and has been used widely in passenger choice models. However, the data has major drawbacks. First, it only reveals the final choice of a passenger. It remains unknown whether this was his first choice or if he had to divert from another choice which was fully booked at the time of his booking. Second, we have no socio-demographic information (e.g. frequent flyer membership) on the passenger. Third, MIDT data only gives us bookings via CRS's, and only some of the bookings made directly through airline websites pass through CRS's. Thus, MIDT data would potentially overestimate the importance of schedule since it doesn't capture all passengers who choose by airline (and book directly through the airline). Fourth, MIDT data doesn't give us any information on attitudes or perceptions of travelers.

From the previous discussion we conclude that a more advantageous option to study the field of interest is to perform a survey.

Survey Design

For the subsequent analysis, a part of the annual "Resource Systems Group (RSG) Airline Survey" was extended to include connection choice parameters. RSG annually collects data via the Internet from passengers who made at least one domestic air trip in the 12 months preceeding the survey. In the first part of the survey, the respondent is asked to provide information about a recent trip. This information is then used in the SP experiment to serve as the "current itinerary" versus a modeled "alternate itinerary".The attributes shown for each itinerary are the airline, the aircraft type, departure and arrival airports, departure and arrival times, connecting time (=layover time), total travel time, number of connections, and fare as reported. In addition to the reported connecting time, the respondent is informed about the minimum connecting time as published by his connecting airport. The alternative is designed randomly based on the attributes and levels shown in Table 1.

In Figure 3, a sample screen shot of the stated preference experiment is shown. Respondents have two itineraries to choose from based on the displayed attributes of the itineraries.

In addition to the stated preference experiment, the respondents were asked to rate 14 statements regarding their willingness to rush vs. a shorter scheduled elapsed time, their willingness to risk a misconnection vs. a shorter elapsed time, and their trust into airlines willingness to schedule reliable connections. Figures 4 and 5 show the statements that were ranked by the respondents on a five point scale from "strongly disagree" to "strongly agree".

Summary Statistics

A total of 4968 SP observations were collected from 621 respondents. After sorting out responses with insufficient data, 4664 SP observations remained in the dataset.

Of all respondents, 73% booked their ticket online. This figure is higher than that for the total U.S. traveling population. Nielsen/NetRatings reports that "nearly 50%" of airline ticket sales have been conducted online in the first half of 2005 (*7*). Nielsen also reports that out of these 50%, half are conducted via airline websites and the other half via online travel agencies. Of the respondents reporting online ticket bookings in our survey, 66% bought their ticket on an airline's website, and the remainder on third party web sites.

Of the reported trips, 18% were for business purposes, while 45% were VFR (visiting friends and relatives) trips and 30% vacation trips. Of all respondents, 44% traveled alone, and another 32% as a party of two. 48% of respondents spent four nights or a fewer number of nights away from home for this trip. 77% of respondents checked baggage for their flight.

Of special interest in this study is the number of connections of the recent trip. 63 % of respondents had a nonstop flight. This corresponds well with a 65.7 % share of nonstop trips in the U.S. domestic market in 2004 (based on DB1B market data). Previous experience with misconnections may impact respondents' future decisions. Of all respondents, 13% missed a connecting flight in the previous two years.

A summary of the rating exercise results can be found in Figures 6. 59% of all respondents somewhat or strongly agree to the statement "I like to take my time when connecting between flights". 56% of respondents somewhat or strongly agree that they try to avoid short connections because of the misconnection risk. On the other hand, 48% somewhat or strongly agree that they don't mind being rushed at a connecting airport. 92% of respondents somewhat or strongly agree that catching their connecting flight is of great importance to them.

5 ANALYTICAL APPROACH

Decision Rule

Various decision rules could be applied to the choice problem, among them dominance, satisfaction, lexicographic rules and utility (*16*). Dominance seldomly leads to a unique solution and is thus disregarded. Both satisfaction and lexicographic rules do not allow for tradeoffs: Satisfaction rules eliminate alternatives if at least one of its attributes is below a predefined satisfaction level. Lexicographic rules (e.g. the decision window model) would rank first by only one attribute. If an alternative A does not have the same attribute level in the attribute defined most important as the alternative with the highest attribute level, all other attributes of that alternative A would be irrelevant. Passenger airline choice, however, shows that tradeoffs are made: Passengers for instance choose a different itinerary if the price is reduced or other attributes are changed. Thus the decision rule should allow for tradeoffs. In the utility decision rule, the decision maker maximizes the utility, whereby attributes can be traded off against each other. Since not all attributes of the alternatives and all characteristics of the decision maker(s) can be observed, the random utility approach is widely used. For the modeling of airline itinerary choice in this paper, we will use binary logit choice.

Specification

In the initial specification search, the following explanatory variables were used:

- Airline rank
- Airport rank
- Airport access time
- Aircraft type
- Fare
- Number of connections
- On-time performance
- Buffer time
- Night departure dummy (departures between midnight and 5 am)
- Frequent flyer status for airline in itinerary

We expected decreasing coefficient values for airline and airport from 1st to least ranked airline/airport. For aircraft type, we expect increasing coefficient values with aircraft size. The fare coefficient was expected to be negative, indicating a preference of lower fares. The "number of connections" coefficient resembles the inconvenience of a connection as such, regardless of connecting time. Thus, we expected this coefficient to be negative as well. For on-time performance, we expected higher utilities to be associated with higher probabilities of on-time departures, i.e. a positive coefficient. For buffer time, we expect the non-linear effect described earlier. For night departures, we expect a negative coefficient.

6 RESULTS

Estimation was performed with the BIOGEME software package. Numerous specifications were tested. The final model results are summarized in Table 2.

The alternative specific constant for the current trip reveals an inertia effect and possibly also ambiguity aversion of respondents. Since they have experienced the current trip, and presumably most of respondents were satisfied with the overall trip, there could be the tendency of choosing the "known" alternative since it carries less risk than the unknown, constructed alternative.

The buffertime coefficient for buffertimes shorter than 15 minutes is positive, meaning that an additional minute of buffertime increases the utility of an alternative. This is in line with our hypothesis that very short connecting times carry the burden of higher misconnection risk and discomfort through potential rush. The parameter for buffertimes up to 60 minutes and that of more than 60 minutes shows the expected negative sign.

The elite and normal frequent flyer program (FFP) coefficients resemble whether or not the respondent was an elite or normal member for that specific airline. Elite and normal membership prove to be significant in airline itinerary choice. They have a $40 and $16 eqivalent fare value, respectively, versus non-membership.

Fare was treated as a log transform, increasing the fit of the model and depicting the decreasing marginal returns of fare.

Night departures, defined as departures between midnight and 5 AM decrease the utility of an alternative. The equivalent fare value is $30, which could have interesting implications for airlines when deciding whether to schedule departures at night.

Ontime performance has an equivalent fare value of $10 for every 10 percentage points. Several models with dummy variables were tested. However, none of them resulted in superior models. Thus, we use a linear approach. Some airlines show historic, flight number based, ontime performance on their booking engines. Given that historic performance may or may not be a base for prognosis for the future, airlines could rethink their strategy here.

Airport access time was valued at $22 per hour, whereas duration (=elapsed time) was valued at $16, showing the higher importance of a short access time to respondents.

The airline coefficient captures all product attributes that are not included explicitly as attributes, i.e. seat pitch, frienliness of flight attendants, etc. A differentiation into the four original ranks did not improve the model, leading to the final model that includes a dummy for "1st or 2nd preferred airline" only. The equivalent fare value, however, is only $13, showing indirectly the importance of the explicitly included attributes of an itinerary.

Choice of departure airport has high equivalent fare values (1st vs. worst: $67, 2nd vs. worst: $25), revealing possibly convenience and familiarity with specific airports. Specification tests for the third ranked and fourth ranked airport didn't lead to any statistically significant results.

The coefficient for number of connections captures the inconvenience of a connection as such, with an equivalent fare value of $58 per connection.

Aircraft dummies were tested for the four aircraft categories. However, none of these led to significant improvements of the model. This might be an indication that smaller, regional aircraft have become more commonplace in scheduled air travel.

7 IMPLICATIONS AND CONCLUSIONS

This is the first attempt to specifically study the question of connection choice. While reliability issues have been studied in public transit and individual traffic, airline choice models have until now not benefited from this viewpoint.

The findings suggest that, contrary to the traditional network airline assumption, passengers do not prefer to minimize transfer times. Risk aversion and Rush aversion appear to be a factor in the evaluation of transfer times.

There are several implications associated with these findings. Even with a fixed timetable, airlines could increase fleet commonality by moving lower booking class passengers or specific socio-demographic cohorts to longer connecting times. By spreading passengers out over the day, airlines could reduce the need to have larger aircraft capacity in preferred times of day, thus allowing for the same aircraft to fly into a hub from a spoke city all day.

By changing their timetable, airlines could change their bank optimization and not schedule the most passengers on minimum connecting times with its associated peak problems. Airlines could also give riskaverse passengers better options: Instead of offering a 45 minute or a 240 minute connecting time, a relaxation of the bank structure could offer a 90 minute connecting time, thereby giving the riskaverse passenger a shorter connecting time than in the original schedule. Finally, the adapted timetable will allow depeaking and thus better resource utilization for the hub airport and the airlines.

In both cases, longer connecting times would lead to fewer irregularities (missed connections for passengers and baggage), fewer needed ad hoc services (ramp direct service, hub transfer center, etc.), and fewer outbound delays (since aircraft are often held for connecting passengers). Finally, longer connecting times could also lead to higher concession revenues for airports which in turn could lead to higher profits of airports or airlines or lower fares for passengers.

In future research, the rating exercise will be used as indicators for the described latent variables and integrated in a combined choice and latent variable model. This will allow analyzing what socio-demographic characteristics rush and risk averse passengers embody. It will also allow using these latent variables as inputs into the choice model, thus including these attitudes in the estimation and allowing for a model that will account for some of the heterogeneity and thus leading to higher explanatory power.

8 ACKNOWLEDGEMENTS

The authors would like to acknowledge financial support by the Sloan Foundation through MIT’s Global Airline Industry Program. In addition, the authors would like to acknowledge the support of various airlines, aircraft manufacturers and airline reservation services who have contributed to this research through purchases of syndicated reports, data and related services. We also would like to acknowledge the use of the freely available software BIOGEME by Michel Bierlaire. The results and opinions reported here are, however, solely the responsibility of the authors and do not reflect the opinions of those sponsors.

9 REFERENCES

[1] Mayer, C. and T. Sinai. Network Effects, Congestion Externalities, and Air Traffic Delays: Or why not all Delays are Evil. *American Economic Review*, Vol. 93 No. 4, 2003, pp. 1194-1215.

[2] American cuts operations yet again. In *Airline Business*, Sep. 2002, p. 15.

[3] U.S. Department of Transportation, Regulation 14CFR Part 255, 4a(2), http://www.access.gpo.gov/nara/cfr/waisidx_03/14cfr255_03.html. 2003. Accessed May 20, 2004.

[4] European Community Council Regulation No. 323/1999, Annex 1. http://europa.eu.int/eur-lex/lex/LexUriServ/LexUriServ.do?uri=CELEX:31999R0323 :EN:HTML. 1999. Accessed Aug. 30, 2005.

[5] House of Lords. European Communities Committee, 32nd report, 17 Nov 1998, Part 4, No. 51, http://www.parliament.the-stationery-office.co.uk/pa/ld199798/ldselect/ ldeucom/156/15606.htm. 1998. Accessed Jan. 24, 2004.

[6] Department of Transportation. Final Rule, DOT 14CFR Part 255, RIN 2105-AC65, 2004. http://dmses.dot.gov/docimages/pdf88/263280_web.pdf. Accessed Oct. 21, 2004.

[7] Nielsen/Netratings press release. http://www.netratings.com/pr/pr_050621.pdf. Accessed June 21, 2005.

[8] Boeing Commercial Airplane Group. Decision Window, Path Preference Methodology, Time Mode. 1993.

[9] Alamdari, F. E. and I. G. Black. Passengers Choice of Airline under Competition - the Use of the Logit Model. *Transport Reviews* , V. 12, No. 2, 1992, pp. 153-170.

[10] Proussaloglou, K. and F. Koppelman. Air Carrier Demand - an Analysis of Market Share Determinants. *Transportation* , Vol. 22, No. 4, 1995, pp. 371-388.

[11] Proussaloglou, K. and F. Koppelman. The Choice of Carrier, Flight and Fare Class. *Journal of Air Transport Management*, Vol. 5, No. 4, 1999, pp. 193-201.

[12] Coldren, G., and F. Koppelman. Modeling the competition among air travel itinerary shares: GEV model development. Paper presented at the 8th IATBR Conference, Switzerland, 10-15 August 2003.

[13] Algers, S., and M. Beser. Modeling choice of flight and booking class - a study using Stated Preference and Revealed Preference data. *Int. J. Services Technology and Management*, Vol. 2, No. ½, 2001, pp. 28-45.

[14] Ndoh, N. N., et al. Air transportation passenger route choice: a nested multinomial logit analysis. In *Fisher, M. et al. (eds.) Spatial Choices and Processes, North-Holland, Elsevier Science*, 1990, pp. 349- 65.

[15] Adler, T., C. Falzarano, and G. Spitz. Modeling Service Trade-offs in Air Itinerary Choices. In *Transportation Research Record: Journal of the Transportation Research Board, No. 1915*, TRB, National Research Council, Washington, D.C., 2005, pp. 20-26.

[16] Ben-Akiva, M. and S. Lerman. Discrete Choice Analysis: Theory and Application to Travel Demand. Cambridge, MA: The MIT Press, 1985.

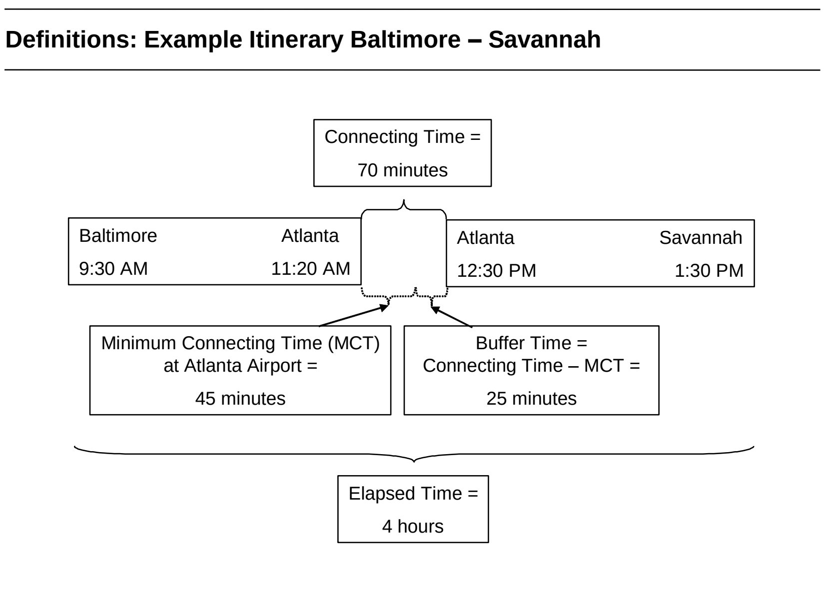


FIGURE 1: Definitions of flight schedule terms

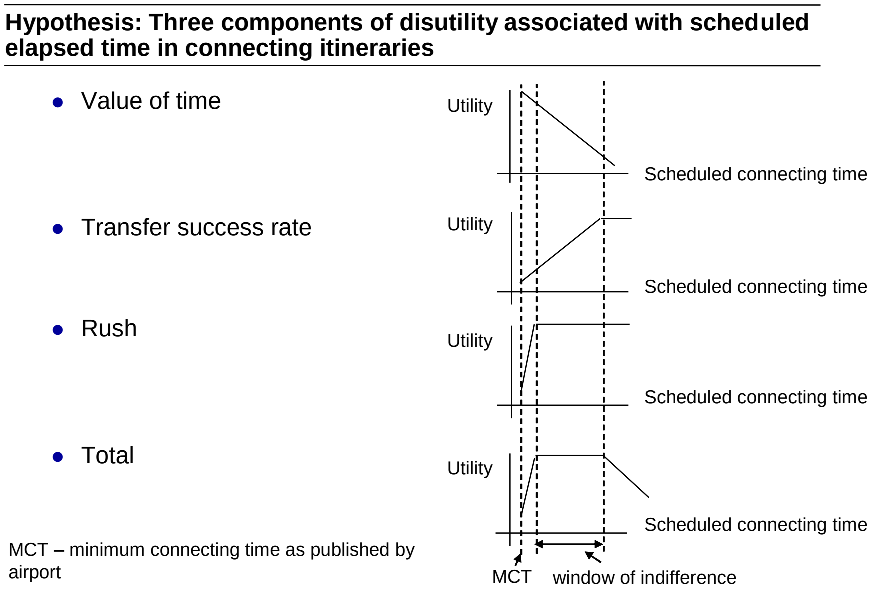
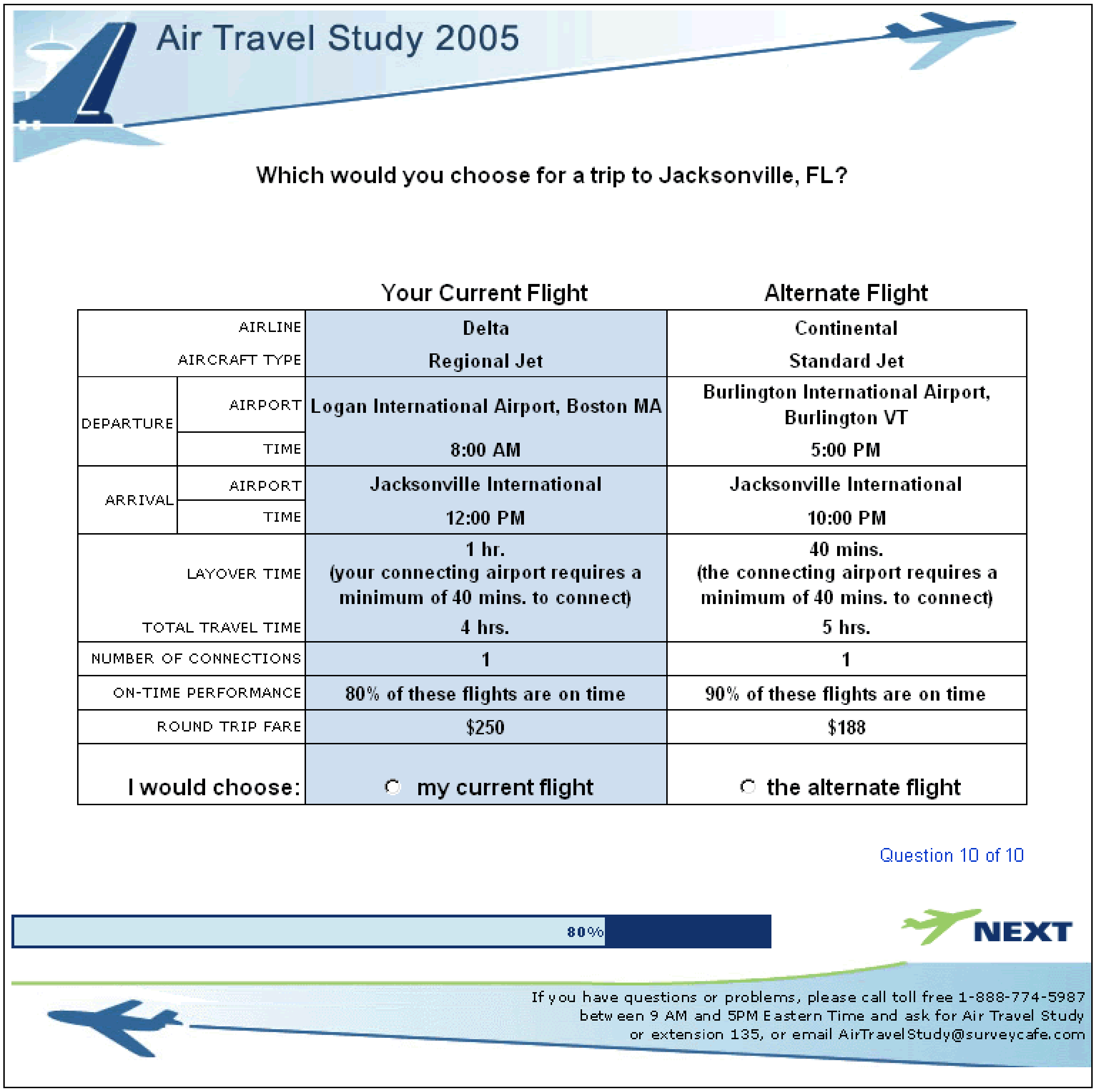


FIGURE 2:Utilities associated with connecting time

TABLE 1:Attributes and Levels of Stated Preference Experiment

Attribute	**Level/Definition**
Airline	Based on previously collected preferences (1st, 2nd, 3rd, least preferred airline).
Aircraft Type	Propeller, regional jet, standard jet, widebody jet
Arrival Airport	Always same as current trip.
Departure Airport	Based on previously collected preferences regarding departure airports near the respondent's home (1st, 2nd, 3rd, 4th ranked)
Arrival Time	Previously collected preferred time with the following levels (-2,-1,0,+1,+2 hours).
Departure Time	(Arrival time –elapsed time of itinerary). The elapsed time accounts for the distance between departure and arrival airport, the connecting time and observes time zone differences
Minimum Connecting Time (MCT)	30,40,50,60 minutes
Connecting Time	MCT level + (0, 15, 30, 45, 60, 90, 150, 210 minutes)
Number of Connections	Nonstop (0), 1 airport connection, and 2 airport connection
On-time performance	50%, 60%, 70%, 80%, 90%.
Round Trip Fare	Based on current fare, the fare for the alternate trip is calculated using the levels (-50%, -25%, same as current, +25%, +50%).



Air Travel Study 2005

Which would you choose for a trip to Jacksonville, FL?

		Your Current Flight	Alternate Flight
	AIRLINE	Delta	Continental
	AIRCRAFT TYPE	Regional Jet	Standard Jet
DEPARTURE	AIRPORT	Logan International Airport, Boston MA	Burlington International Airport, Burlington VT
	TIME	8:00 AM	5:00 PM
ARRIVAL	AIRPORT	Jacksonville International	Jacksonville International
	TIME	12:00 PM	10:00 PM
	LAYOVER TIME	1 hr. (your connecting airport requires a minimum of 40 mins. to connect)	40 mins. (the connecting airport requires a minimum of 40 mins. to connect)
	TOTAL TRAVEL TIME	4 hrs.	5 hrs.
	NUMBER OF CONNECTIONS	1	1
	ON-TIME PERFORMANCE	80% of these flights are on time	90% of these flights are on time
	ROUND TRIP FARE	$250	$188
	I would choose:	○ my current flight	○ the alternate flight

Question 10 of 10

80%

NEXT

If you have questions or problems, please call toll free 1-888-774-5987 between 9 AM and 5PM Eastern Time and ask for Air Travel Study or extension 135, or email AirTravelStudy@surveycafe.com

FIGURE 3: Example of stated preference experiment display

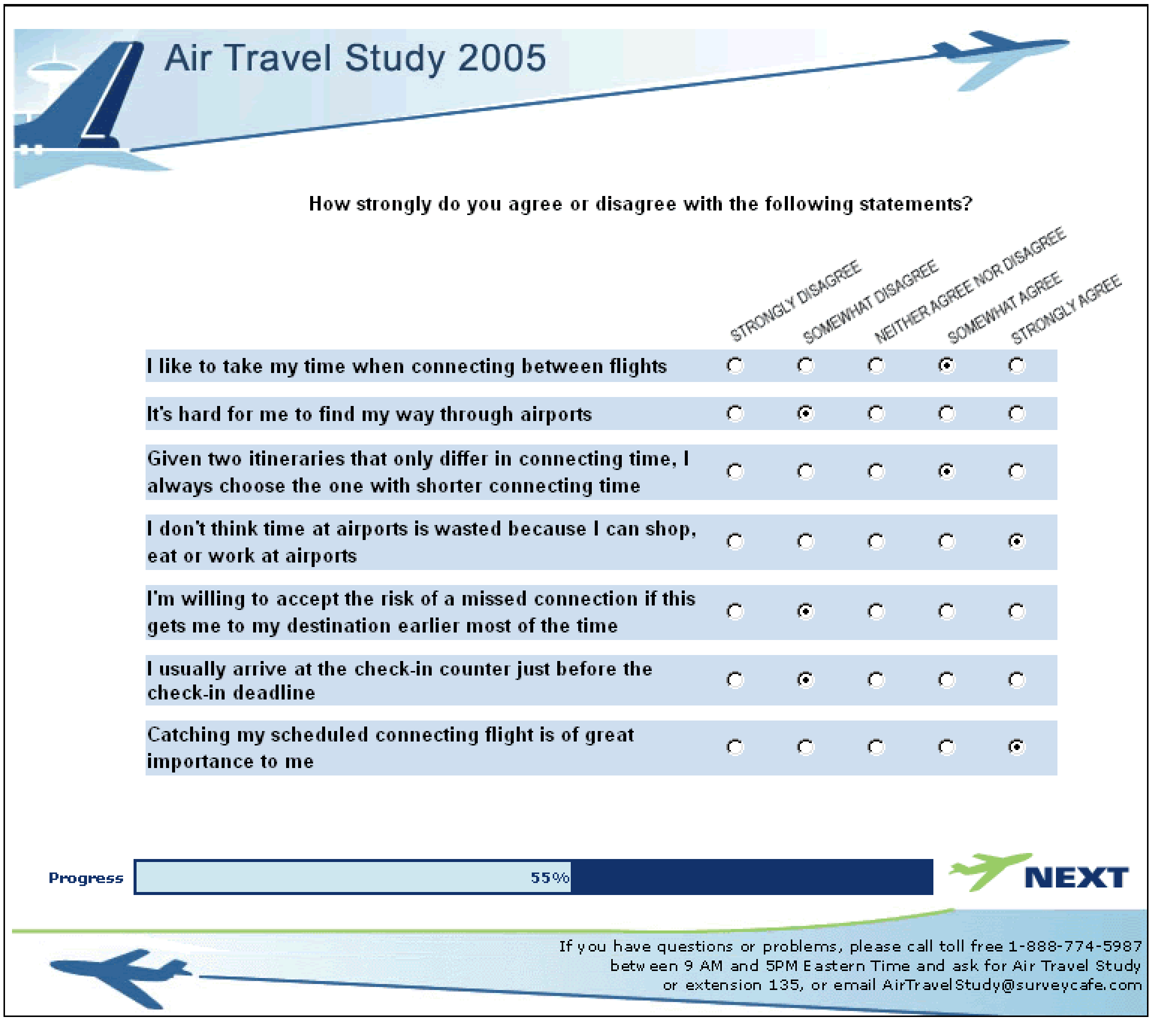


FIGURE 4: First part of rating exercise

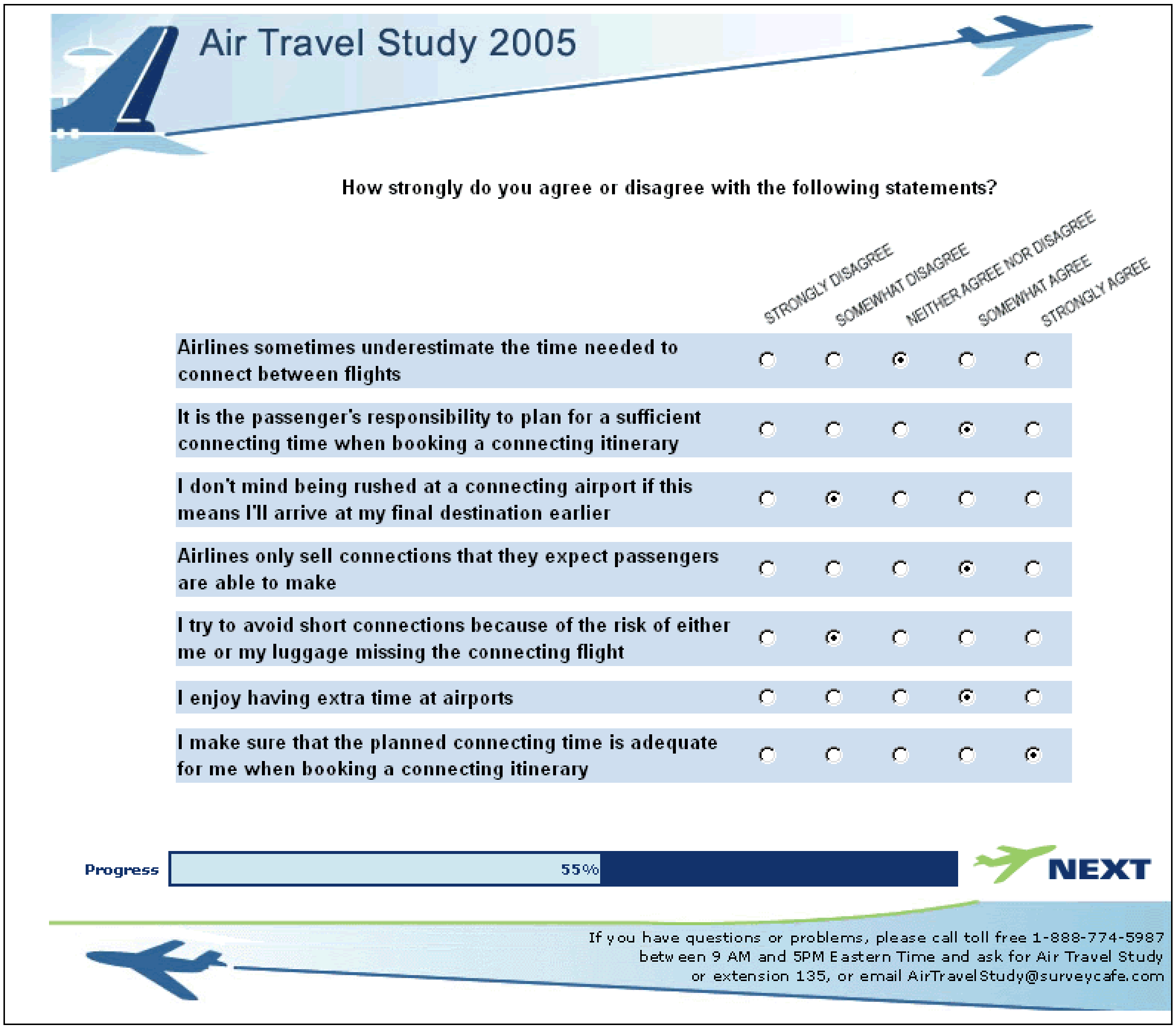


FIGURE 5: Second part of rating exercise

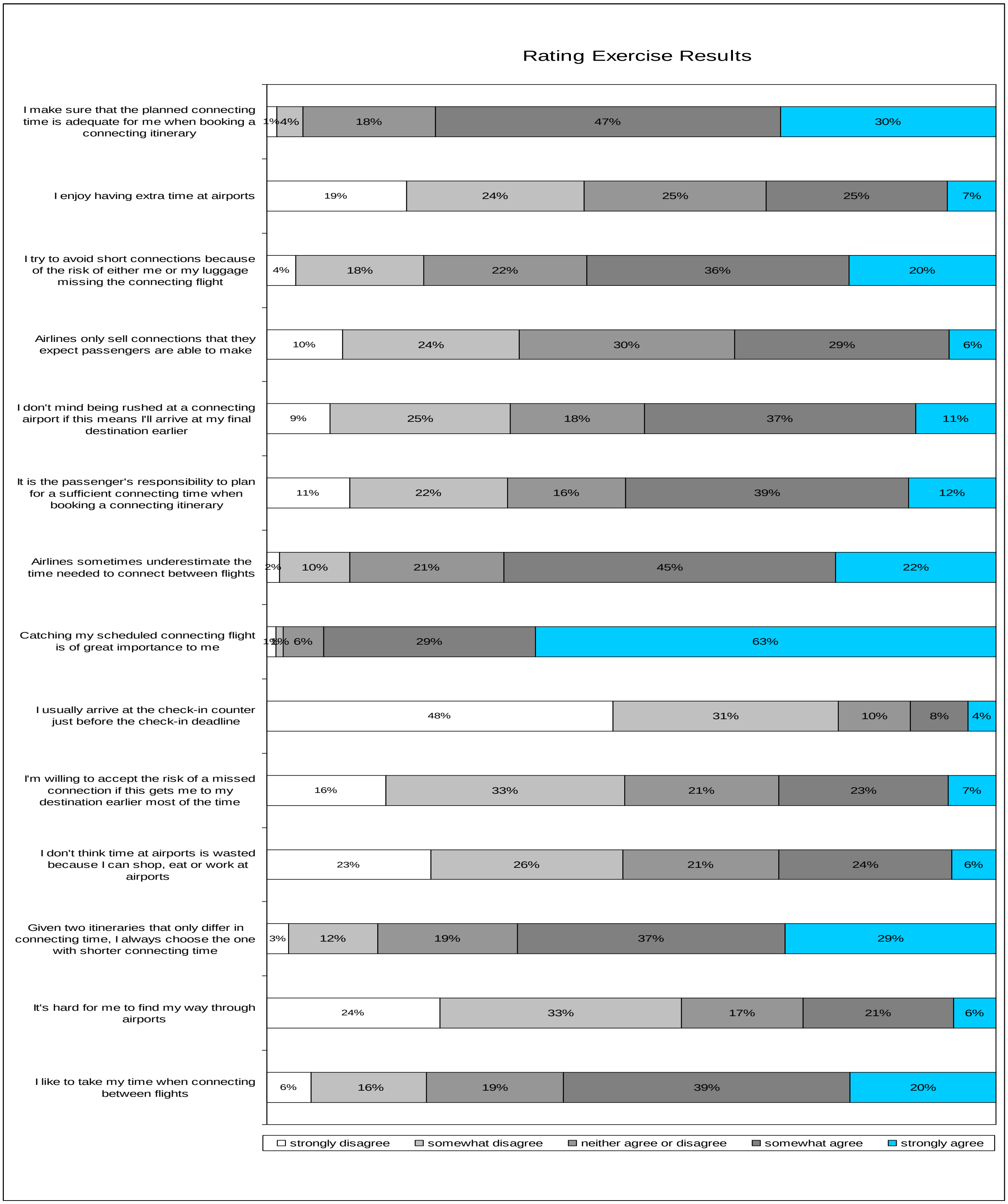


FIGURE 6: Summary of rating exercise responses

TABLE 2: MNL Results

Name	Value	Std err	t-test
ASC_alt	0.0000		
ASC_cur	1.0308	0.0609	16.9256
Buffertime < 15 min in min	0.0166	0.0063	2.6457
Buffertime 15-59 min in min	-0.0087	0.0033	-2.6431
Buffertime > 60 min in min	-0.0018	0.0014	-1.2786
Elite FFP Dummy	0.4697	0.1976	2.3772
Normal FFP Dummy	0.1948	0.0973	2.0025
LN (fare)	-3.9671	0.1327	-29.8955
Night Departure Dummy	-0.3636	0.1773	-2.0507
Ontime performance in percent	0.0117	0.0025	4.6242
Airport access time in min	-0.0043	0.0008	-5.5384
1st or 2nd preferred airline dummy	0.1499	0.0668	2.2448
1st preferred airport dummy	0.7949	0.0937	8.4864
2nd preferred airport dummy	0.3058	0.0972	3.1448
Number of connections	-0.6926	0.0853	-8.1221
Duration in minutes	-0.0032	0.0005	-6.8777

Parameters:	15
Number of observations:	4664
Final log-likelihood:	-1658.27
Adjusted rho-square:	0.4824