OPRE 6398.001 Prescriptive Analytics

Reading 14*

A major problem in managing airlines is to generate as much revenue as possible for the flights that are flown. With the price of fuel rising, and in a highly competitive environment, airlines have had to apply operations research models in innovative ways to gain competitive advantage.

The management of its reservation system, referred to as "yield management," is a significant factor in American Airlines' profitability. At American Airlines, yield management consists of three functions: overbooking, discount allocation, and traffic management. Overbooking is the practice of selling more reservations for a flight than there are available seats in order to compensate for no-shows and cancellations. Discount allocation is the process of determining the number of discount fares to make available on a flight. Too few discount fares will leave a flight with empty seats, while too many will limit the number of flights to schedule to different markets in order to maximize revenues. Finally, traffic management controls reservations by passenger origin and destination to provide the optimal mix of flights. This problem is complicated because there are a number of flight patterns that can get a passenger from an origin to a destination.

The process of determining the allocation of discount fares for a flight is essentially a decision analysis model with a decision tree. The initial decision is to accept or reject a discount fare request. If the request is rejected, there is a probability, p, that the seat will eventually be sold at full fare and a probability of 1 - p that the seat will not be sold at all. The estimate of p is updated several times before flight departure, depending on the forecast for seat demand and the number of available seats remaining. If the expected value of the decision to reject is smaller than the discount fare, then the request is accepted.

American Airlines began the research on managing revenue from seat reservation in the early 1960s. According to some recent reports, the quantifiable benefit from the decision analysis-based yield management is estimated at $1.4 billion over the last three years. The company also expects an annual revenue contribution of over $500 million to continue into the future.

* Adapted from Smith, B., Leimkuhler, J., & Darrow, R. Yield management at American Airlines. *Interfaces*, 1992, January-February, 8-31.