

An Overbooking Model for Car Rental Service with Different Types of Cars

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Abstract : Overbooking is a very useful revenue management technique that could help reduce costs caused by either undersales or oversales. In this paper, we propose an overbooking model for two types of cars that can minimize the total cost for car rental service. With two types of cars, there is an upgrade possibility for lower type to upper type. This makes the model more complex than one type of cars scenario. We have found that convexity can be proved in this case. Sensitivity analysis of the parameters is conducted to observe the effects of relevant parameters on the optimal solution. Model simplification is proposed using multiple linear regression analysis, which can help estimate the optimal overbooking level using appropriate independent variables. The results show that the overbooking level from multiple linear regression model is relatively close to the optimal solution (with the adjusted R-squared value of at least 72.8%). To evaluate the performance of the proposed model, the total cost was compared with the case where the decision maker uses a naïve method for the overbooking level. It was found that the total cost from optimal solution is only 0.5 to 1 percent (on average) lower than the cost from regression model, while it is approximately 67% lower than the cost obtained by the naïve method. It indicates that our proposed simplification method using regression analysis can effectively perform in estimating the overbooking level.

Keywords : overbooking, car rental industry, revenue management, stochastic model

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