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# ALBERS SCHOOL OF BUSINESS AND ECONOMICS

**Airline Demand Forecasting:**

**Reduce Error by developing Demand forecast Models**

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**ABSTRACT:** Although there is considerable interest in advance bookings model as a forecasting method in airline industry, there has been little research done to analyze the use of advance booking curve in forecasting flight reservations. The mainstream of advance booking models reviewed in the literature uses only the bookings-in-hand data on a certain day and ignores the booking data beforehand. It is also common industry practice using only the current bookings-on-hand and ignoring the booking data beforehand in forecasting. This empirical study analyzes the entire booking dataset provided (here we have 3 months historical data, i.e.: Training data) and identifies the trends and patterns in the data (Validation data). The analysis demonstrates a more in-depth understanding of advance bookings modeling and the use of advance booking curve in forecasting reservations at property level.

**AIRLINE DEMAND FORECASTING**: As per IATA, passenger numbers are expected to rise from 4.1 billion passengers in 2017 to 4.3 billion passengers in 2018 (+6% growth). The overall revenue is expected to rise from $754 billion in 2017 to $824 billion in 2018 (+9.4% growth). Global airline industry net profits will reach $38.4 billion in 2018, increasing from $34.5 billion in 2017 (+11.3% growth).

Demand Forecast plays pivotal role to maximize the revenue. As illustrated by Weatherford(2003), many of the forecasting studies in revenue management have their origins in airline industry, which later served as the base for other industries, Hotel Reservation for example. **Our objective** here is to discuss & implement different forecasting models, compare their result with Naïve Forecast given in validation dataset and find out the MASE(Mean Absolute Percentage Error) for each model. The lesser the MASE, the better is the model for given set of inputs. Here we have included, Additive Model (3 Variations including smoothing the average), Multiplicative Model (2 Variations) and a combination of both additive and Multiplicative model. We will discuss about different MASE(s) in corresponding section.

**Model Discussion: T**his section is our view for different models and why we reckoned them in our research. In each model, our final forecast for any given date (combination of departure date and booking days prior) hinged on bookings-in-hand data and model forecasted value. We will also discuss corresponding MASE(s).

**(I) Additive: Version 1- Direct Mean :**What is the average number of seats sold *‘n’* days prior to departure date is the foundation. Our additive model predicts by averaging trend/historical data per departure date & booking date(days prior) and yield final forecast by adding this to bookings-in-hand. We got a MASE of 1.41 which is very poor.

**Version 2- Mean by Day of Week:** On Which day of week booking is made can improve the model significantly. This model is like the version 1, only change being prediction value is by averaging trend/historical data per departure date, per booking date(days prior) & booking Day of week is included. This one shows a massive improvement and MASE decreased to 0.83.

**Version 3 – Average Smoothing:** There use to be randomness in the dataset which if removed can significantly reduce the error from model. In this version, advance to version 2, Instead taking average of each day value, this model takes average of the average of 3 days (last, current and next) which is nothing but a smoothing technique, used to remove noises from dataset. MASE for this model we got – 0.707 which is the best we have.

**(II) Multiplicative: Direct Mean rate and Mean rate by day of week** What is the average booking rate trend *‘n’* days prior to departure date is seedbed for this model. It assumes future bookings are reliant to bookings-on-hand so, final forecast value is determined by multiplying the average booking rate to bookings made so far. This is what exactly Version 1 does, and we got the MASE 0.83 which is a good value. Version 2 is implemented in same manner as version 2 of additive model and here we got MASE 0.97, not so good choice.

**(III) Combination of Additive on weekday and Multiplicative on Weekend:**