Should Airlines Overbook?

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Problem Statement and Motivation

We were concerned about whether or not overbooking leads to higher airline profit both in the short and long term.

We set out to find out what influenced as well as was influenced by overbooking in the airline industry.
Modeling Goals
How does Overbooking affect:

- Customer Satisfaction
- Profit
- Demand
General Assumptions

- The Model is over a period of 7 years
- The market demand is high for three months (Nov-Jan) and less than the full capacity for the rest of the year.
Assumptions/Figures for Customer Satisfaction

- Customer Satisfaction is only measured by Overbooking.
- Customer satisfaction is reduced only when passengers are involuntarily bumped.
- External Influences are not considered.
Assumptions/Figures for Profit Modeling

- There is a fixed cost of $100,000 per flight
- There is a random no-show rate varying between 5% and 10%
- There are variable costs only from rescheduling of passengers and no others
- The cost of bumping a customer is $100
- There are no increased costs levied on customers that do not show up
- The prices of all the tickets are $600.00
Assumptions/Figures for Demand Modeling

- Our plane capacity is 250 passengers
- There are no classes in the plane (All seats are economy)
- All passengers that pay for tickets will eventually travel
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Simplified Model

- Demand
- Tickets sold
- No-show
- Delay
- Passengers showing up
- OB
- CustSatisfaction
- Bumped
- re-sched expense
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No overbooking vs 10% overbooking
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Stuck Passengers

Stuck passenger on current flight

- No overbooking
- 10% overbooking
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Passenger Satisfaction

- **No overbooking**
- **10% overbooking**
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Demand over seven years

No overbooking

10% overbooking
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Profit

- 40M
- 30 M
- 20 M
- 10 M
- 0

Time (Day)

0 365 730 1095 1460 1825 2190 2555

- No overbooking
- 10% overbooking
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Finding an optimal overbooking policy

How important are these factors to managers?

- Re-Scheduling Expense
- Opportunity Loss
- Stuck Passengers
Quantifying Factors

\[ \text{Factor} = \left[ 1 - C \ell^{\left( \frac{1 - A}{D} \right)} \right]^{-1} \]

A = Actual Input
D = Desired Input
C = Curve constant
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Model

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Overbooking factor

- 1.1
- 1

Time (Day)

Customer-centered policy
Company-centered policy
Bumped Passengers

[Graph showing the number of bumped passengers over time, with two policies: customer-centered and company-centered.]
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Passenger Satisfaction

![Graph showing passenger satisfaction over time. The graph compares customer-centered policy (blue line) and company-centered policy (red line). The x-axis represents time in days, and the y-axis represents satisfaction levels. The graph indicates that customer-centered policy maintains higher satisfaction levels throughout the period compared to the company-centered policy.]
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Ticket Demand

- Customer-centered policy
- Company-centered policy
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Profit

40M

0

0 365 730 1095 1460 1825 2190 2555

Time (Day)

Customer-centered policy  Company-centered policy
Problems encountered

- Information gathering of business strategy information is extremely difficult
- Modeling qualitative concepts such as customer satisfaction is very difficult
- A myriad of external factors influence the industry
- Infinite loops exist between facets in the model
Lessons Learned

• The industry is extremely sensitive to minor changes due to the low profit margins
• Different approaches are adopted by airlines to ensure that repeat customers are gained
Conclusion and Future Directions

- While the actual amount of bumping is low the implications are huge to the profitability
Thank You !!!