**Introduction**

Dynamic pricing tools have been widely used for increasing a company’s revenue and customer satisfaction while maintaining competitiveness in many industries. In the private aviation industry, the objective of the dynamic pricing tool algorithm is to calculate flight prices for a customer based on a multitude of factors including the type of private jet, the arrival and departure dates and locations, and the time proximity to a special event or holiday. For our project, a dynamic pricing tool is being created in collaboration with OneSky particularly OneSky Network, in order to maximize the possible revenue for every day of the year. OneSky is a combined resource company that manages several private jet charters including PrivateFly, SentientJet, Flexjet, and so on. The main goal of the dynamic pricing tool is to maximize the profit made by these private charters.

**Static vs. Dynamic Pricing**

The two graphs shown above represent the difference between static and dynamic pricing. Static pricing will not yield as much extra revenue as dynamic pricing. This is due to the fact that in dynamic pricing, the price of goods can be varied. Therefore, using dynamic pricing allows for a greater area underneath the demand curve to be accessed, which allows for extra revenue to be gained.

**Description of Data**

The original data provided was 333MB in size and contained about 4.8 million unique flight data points, so there were reoccurring complications in trying to open all of the data at once. In order to address the problem, the data was divided into 4 quarters for each year for the three consecutive years: 2017, 2018, and 2019. Thus, a separate file was created for each quarter in order for it to be manageable by the processing systems. Afterwards, any outliers from the data were removed since they do not provide any insight into trends (See Table 1).

**Data Statistics**

<table>
<thead>
<tr>
<th>Data</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Size</td>
<td>333MB</td>
<td>4,8 million</td>
<td>1,684,207</td>
<td>1,894,462</td>
</tr>
<tr>
<td>Number of Flights</td>
<td>1,684,207</td>
<td>1,894,462</td>
<td>1,683,914</td>
<td>5,033,583</td>
</tr>
<tr>
<td>Number of Unique Flight Data Points</td>
<td>333MB</td>
<td>4,8 million</td>
<td>1,684,207</td>
<td>1,894,462</td>
</tr>
<tr>
<td>Number of Unique Airports</td>
<td>6176</td>
<td>5,033,583</td>
<td>1,683,914</td>
<td>3,333,583</td>
</tr>
</tbody>
</table>

**Main Strategy**

In order to create a useful dynamic pricing tool, we will need to calculate and assign coefficients or multipliers to every possible aspect affecting flight demand, including day of the week, month, year, and events. These coefficients will then be kept in a database, called the event calendar. The steps of our strategy to achieve this are as follows:

- Normalize the flight data in order to obtain a flat curve, from which we can then calculate the values of multipliers (for more detail of this process, see section Algorithm Description).
- Cross examine the leftover peaks in flight data after normalization with events to account for any additional trends.
- List the found coefficients in the event calendar, beginning with global and regional events and narrowing it down to local events.

Currently, days and weeks have been normalized, so next the coefficients of the months will be calculated (See Fig. 3). Also, the first rendition of a heat map has been generated, so now it must be applied to the entire data set (See Fig. 4).

**Algorithm Description**

The purpose of our algorithm is to normalize the data given into a flat curve. By doing this, it will be possible to pick out variations in flight demand caused by the corresponding day, week, month, or event and assign multipliers. The steps in order to accomplish this are as follows:

- For each “average” week, identify an average coefficient of demand for each day, then divide each by their respective coefficients to normalize each week (for example, see Fig. 2).
- Since the number of flights per month will vary coefficients of demand will then be found for each month, which can then be divided out to normalize the months.
- Yearly coefficients will then be found based off of the three years of data provided; then the coefficients can be divided out to normalize the entire data set.
- After normalization, the only demand peaks left will be those corresponding to specific events, so the events can be identified and their respective coefficients can be found.
- Dividing the event coefficients out will produce a completely flat data curve, from which the multipliers can be reapplied in order to produce the original data (see Fig. 2).

**Findings**

From normalizing the weeks, the multipliers for each day of the week can be calculated. So far, only the multiplier for Fridays has been found, which is approximately 0.4270.02. The coefficients for the rest of the days are still being determined. Also from the heat map (Fig. 4), it is possible to see flight trends towards particular locations in association with certain events. In the figure shown, it is clear that the states with the highest populations also have the highest amount of flight traffic during a major holiday (New Years Day), which is a trend that will likely recur with country-wide events throughout the year. Following the same processes as we have thus far, we will soon have the rest of the coefficients for days of the week, months, years, and events and will be able to complete the dynamic pricing tool.

**Resources**


**Table 1**

The information above describes the flight data provided by OneSky quantitatively. The data statistics considered do not include any outliers, which are airports that contained 2 or less flights throughout the 3 year time period (i.e., a flight was made in one of the years, but it was not made in the other years). These are usually airports that are located in the Northeastern states or small airports that are located in cities that have a small population. The data shown, outliers (airports that contained 2 or less flights throughout the 3 year time period) have been removed, so the dynamic pricing tool will be based upon this newly shown data. The red dotted line shows the best fit curve, which is used to obtain a baseline price. The many peaks and valleys seen above occur because the data has been normalized and is used to normalize similar data sets.