Executive Report on Optimizing Transportation Costs for the 2102 Season

To: Office of Transportation, The 22nd Century Sporting League
From: Graduate Analyst
Date: 15/06/2023

Subject: Optimization of Flight Fleet and Fuel Cost Management for the 2102 Season

---

Overview:

After reviewing the transportation logistics from the 2101 season, it has become clear that optimizing both the number of jets and the cost of fuel is critical for managing operational expenses. This report analyzes the team travel schedule, fuel costs, and makes recommendations on how the League can optimize these variables for the 2102 season.

Key Findings:

1. **Team Travel Schedule:** The schedule data for the 2102 season provides detailed information on the departure and landing times for each team. Each team's travel distance is calculated based on flight duration and speed (500 MPH). The total travel distance per team influences the amount of fuel required.

2. **Fuel Costs Analysis:** Fuel prices fluctuate over time, as indicated in the `fuel_prices.csv` data. The average price per gallon has varied, which directly impacts the overall cost of flights. It is essential to forecast future fuel prices to make accurate financial projections.

3. **Fuel Consumption Estimation:** With the assumption that each jet requires 1 gallon of fuel per mile, and with flight distances calculated from the estimated duration, the total fuel consumption for each flight is straightforward. By applying the fuel price for each departure date, we can determine the fuel costs per flight.

4. **Fleet Optimization:** Understanding the number of flights each jet is required to undertake is vital for determining the number of jets needed. The frequency and distance of flights must be evaluated to determine if additional jets are required or if some flights can be consolidated.

Approach & Methodology:

1. **Data Cleaning & Pre-processing:** The data from `team_flights.csv` and `fuel_prices.csv` were cleaned to ensure accurate analysis. The departure and landing times were converted to datetime format for time series analysis. Fuel prices were indexed by date for easy access during calculations.

2. **Travel Distance Calculation:** Using the flight duration, the travel distance was calculated by assuming a flight speed of 500 MPH. This information is critical for estimating fuel consumption.

3. **Fuel Cost Calculation:** For each flight, fuel costs were calculated using the respective fuel price on the day of departure. This is done by multiplying the travel distance by the price per gallon of fuel.

4. **Forecasting Fuel Prices:** To project future fuel prices, a SARIMAX model was employed on historical fuel price data. This model helps predict future fluctuations in fuel prices, which is vital for budgeting purposes.

Recommendations:

1. **Fleet Size Optimization:** After evaluating the total miles traveled by each team, we recommend analyzing whether the current fleet size meets the demands or if additional jets are necessary. This should be based on the average number of flights per team and the total miles traveled in the upcoming season.

2. **Fuel Cost Management:** Given the fluctuating fuel prices, it is advisable to lock in fuel contracts for specific periods or explore alternative fuel options if feasible. The use of predictive modeling (as performed with SARIMAX) will help the League to forecast fuel prices more accurately and plan budgets accordingly.

3. **Scheduling Efficiency:** A review of the scheduling system is recommended to reduce flight times by potentially consolidating teams traveling to nearby locations or adjusting game times to make the travel schedules more efficient.

4. **Dynamic Pricing for Flights:** Explore implementing a dynamic pricing model for jet use, where fuel prices are monitored, and team travel costs are adjusted based on real-time fuel pricing. This would allow for greater flexibility in managing fluctuating costs.

Conclusion:

Optimizing the number of jets and managing fuel costs will play a crucial role in the League's ability to remain cost-effective while ensuring smooth travel logistics for the teams. By leveraging data analysis and forecasting techniques, the 22nd Century Sporting League can make informed decisions that contribute to sustained success in the 2102 season and beyond.