Airline Baggage Complaints

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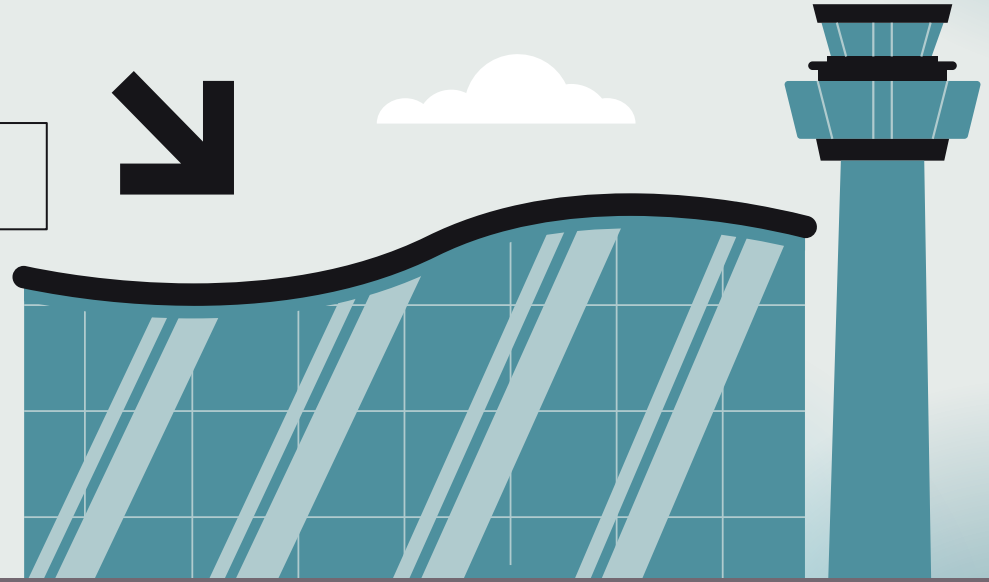
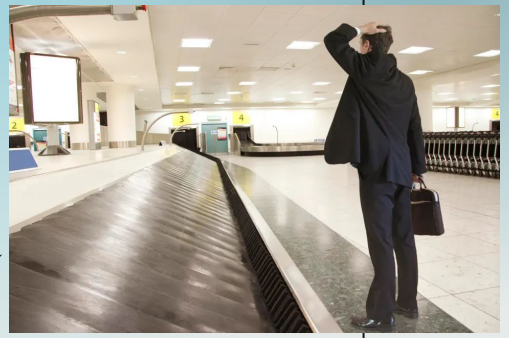
Jade Reutzel, Rani Misra



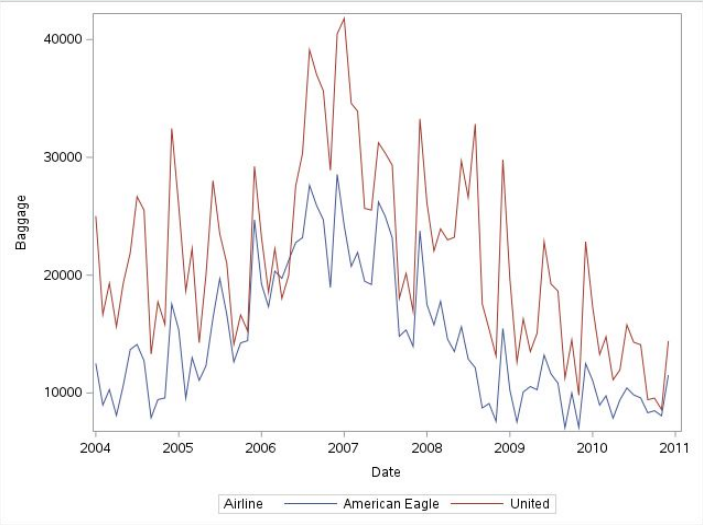
Introduction



Airplanes are a key method of transportation across the vast regions of the United States. Our data is housed in Kaggle and contains monthly observations from 2004 to 2010 for United Airlines, American Eagle, and Hawaiian Airlines. Each airlines contains 84 observations however, we decided not to include Hawaiian since they did not have enough traffic to include them along with American Eagle or United.

- Baggage - The total number of passenger complaints for theft of baggage contents, or for lost, damaged, or misrouted luggage for the airline that month.
- Scheduled - The total number of flights scheduled by that airline that month.
- Canceled - The total number of flights canceled by that airline that month.
- Enplaned - The total number of passengers who boarded a plane with the airline that month.

The Number of Baggage Complaints for Departed Flights



Results

The distribution reflects the trends and seasonality present before transformations.

Methods Attempted

dbaggage 1

The first difference of baggage
dbaggage = dif(baggage)

2 **cube_root_dbaggage**

The cubed root of baggage
*cube_root_dbaggage = sign(baggage) * abs(baggage) ** (1/3)*

Cross Correlation Function 3

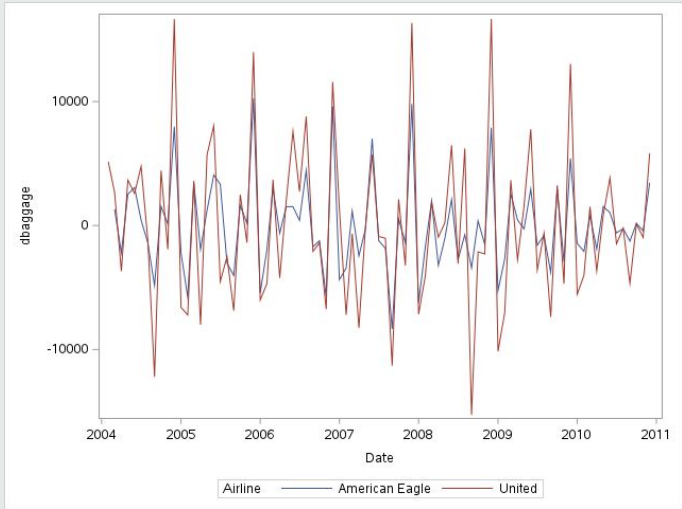
Baggage complaints per actual planes that left
baggage_per_plane = Enplaned/(Scheduled - Cancelled)

1

dbaggage

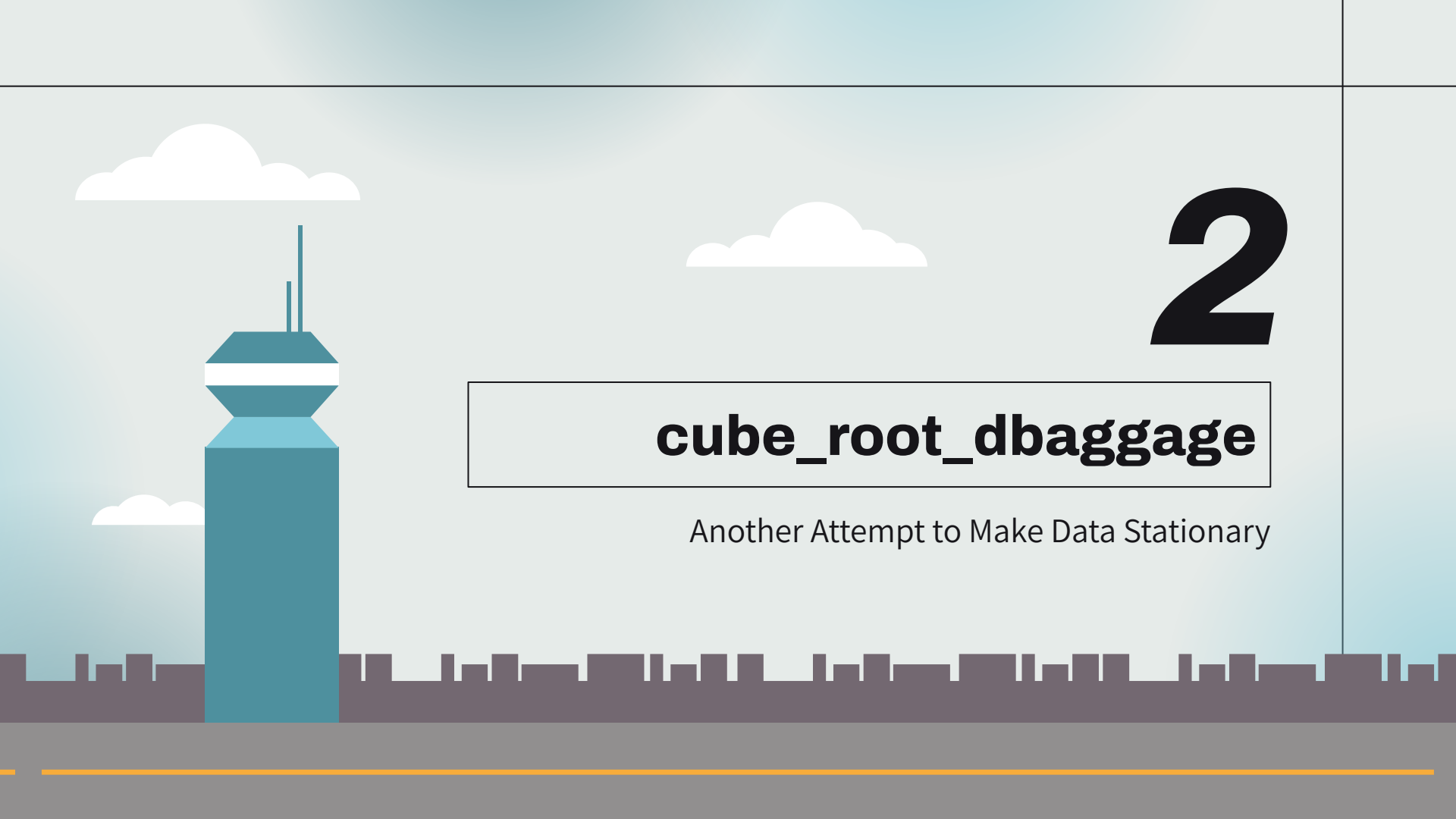
First Attempt to Make Data Stationary

The First Difference of Baggage



Results

The data shows to be much more stationary, but still has a large variance.



2

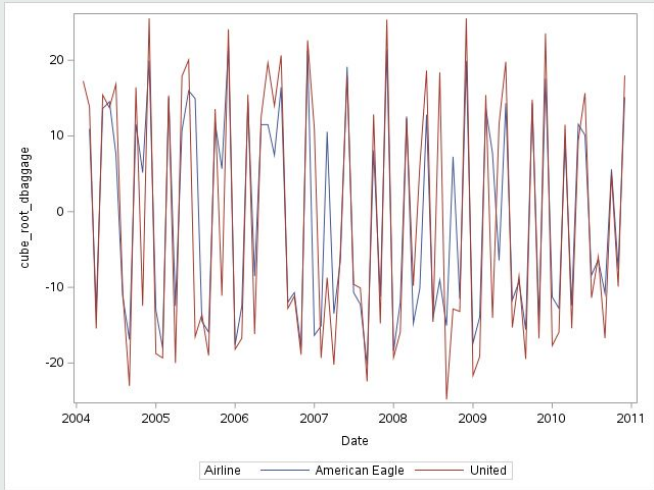
cube_root_dbaggage

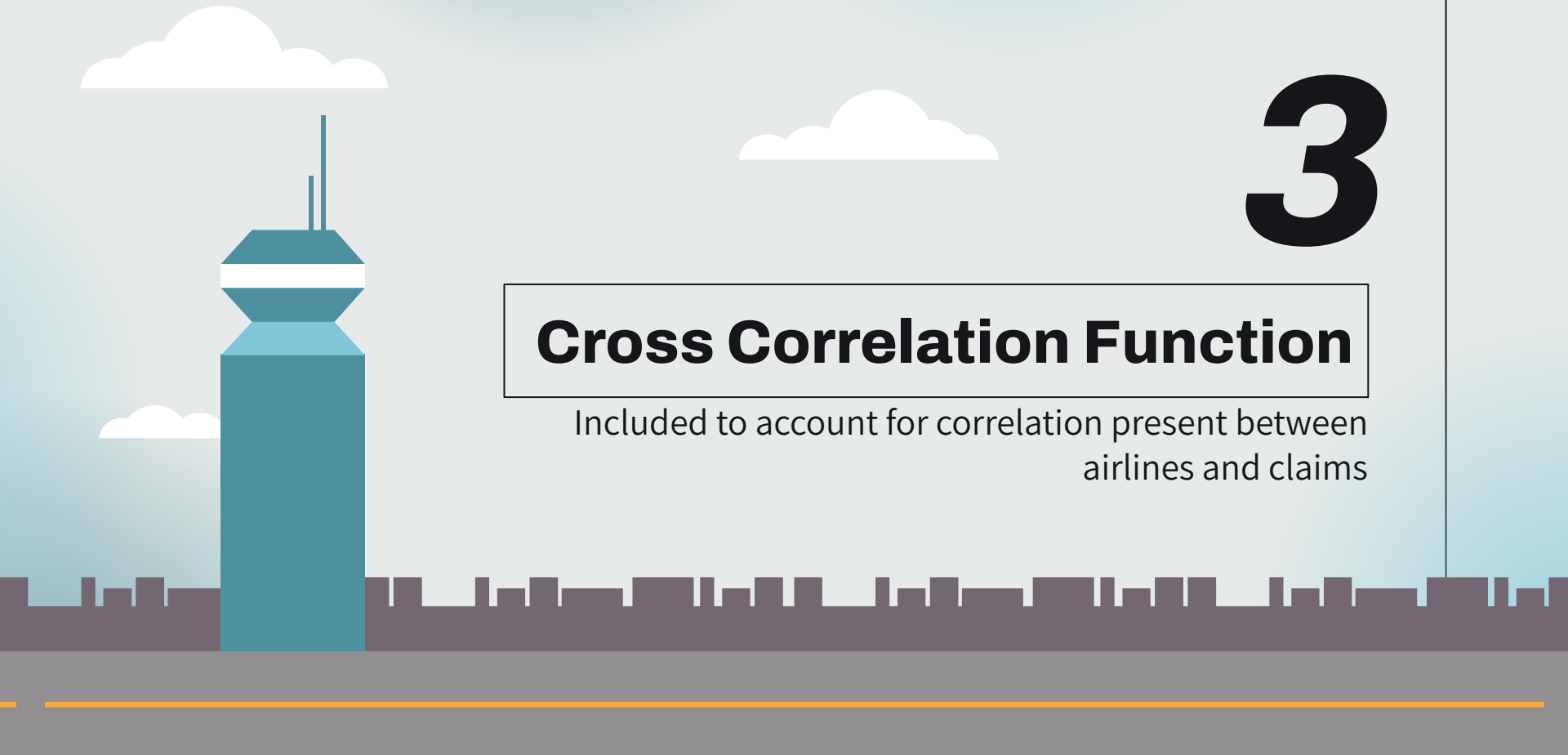
Another Attempt to Make Data Stationary

The Cube Root of the First Difference

Results ↘

The data shows to have a smaller range of variance, which is ideal for modeling.





3

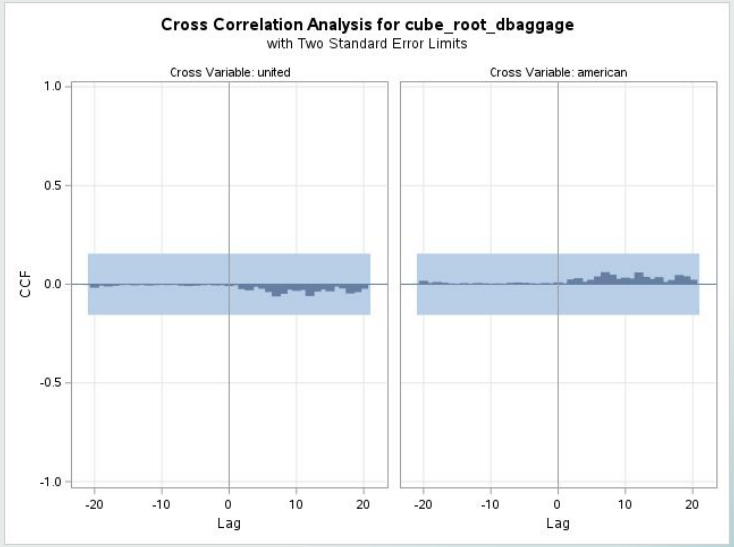
Cross Correlation Function

Included to account for correlation present between airlines and claims

Cross Correlation Function

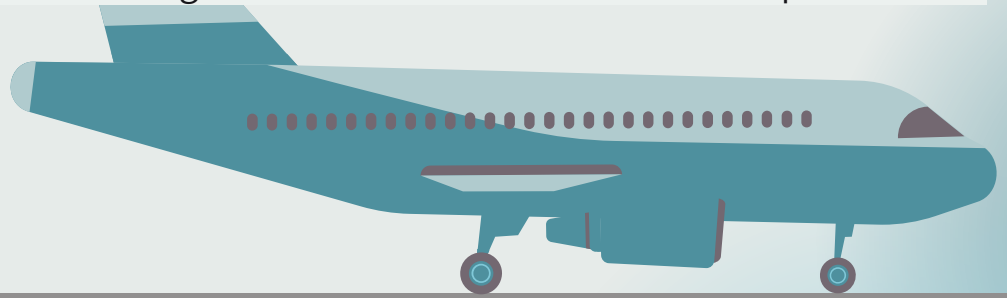
Results

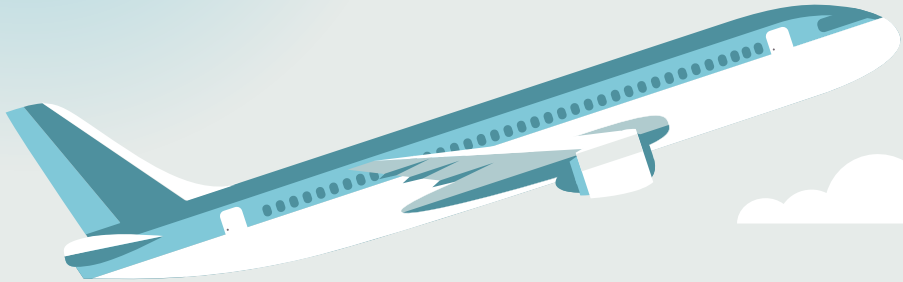
Models now account for the possible industry trend or standard set by either airline in regards to increased baggage complaints.



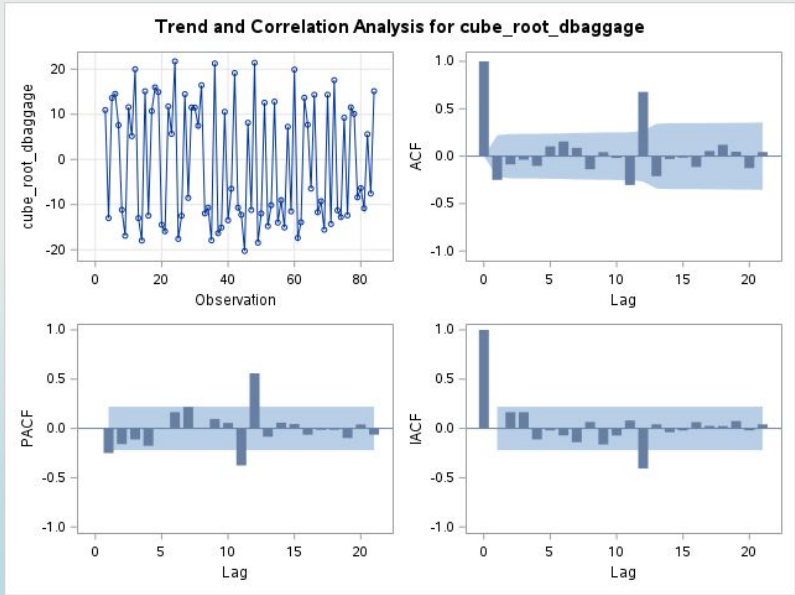
Modeling Approach

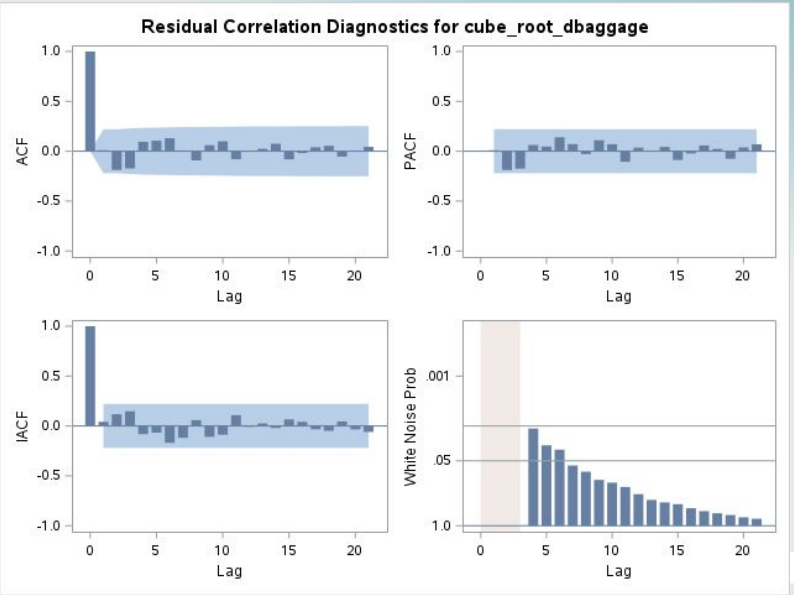
- **Analytical Techniques:** Autoregressive models are utilized to forecast trends in lost luggage complaints for United Airlines and American Eagle Airlines.
- **Seasonal Considerations:** Seasonal variations and lagged effects are incorporated into the models to capture recurring patterns and trends.
- **Forecasting:** The models aimed to provide insights into future trends and seasonal peaks in lost luggage complaints.



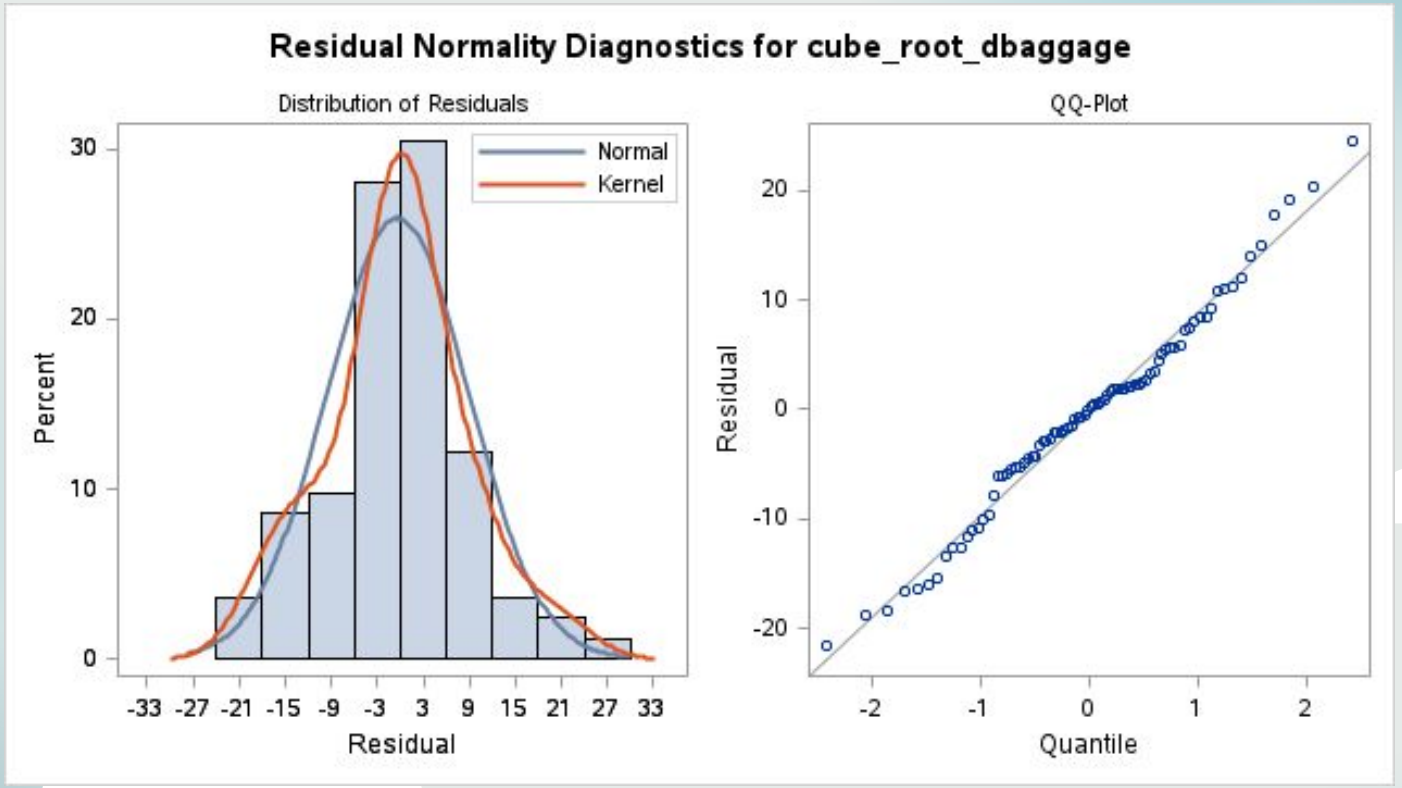


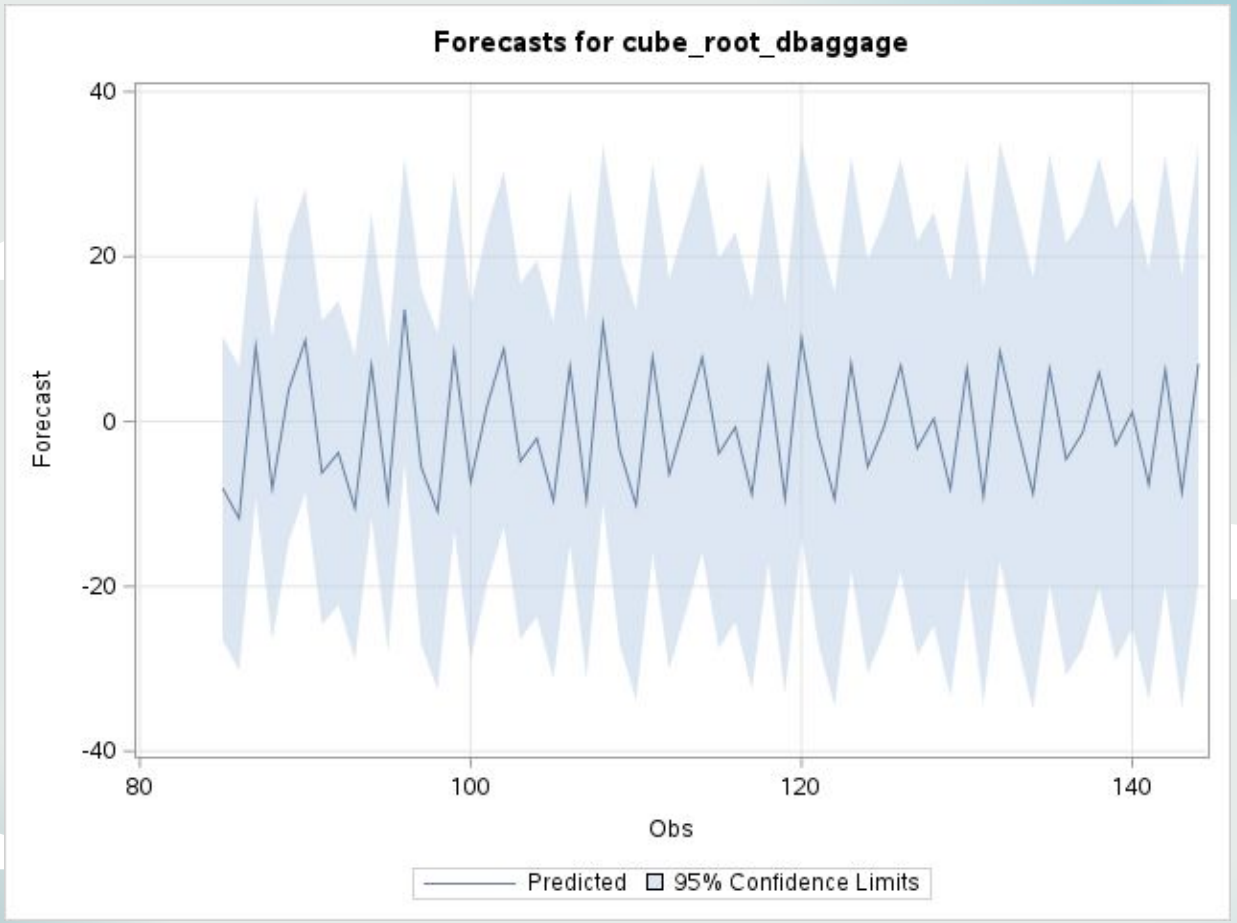
American Eagle Airlines

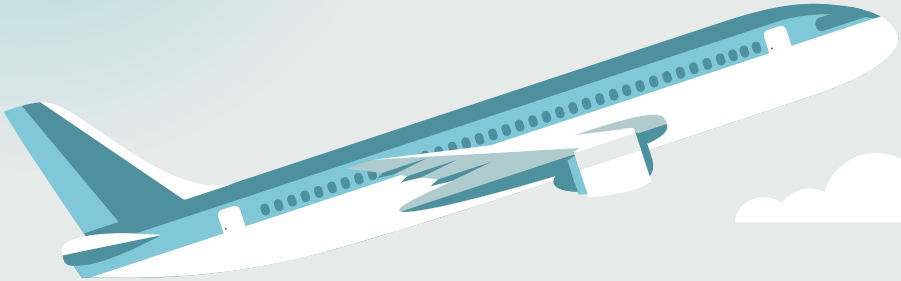




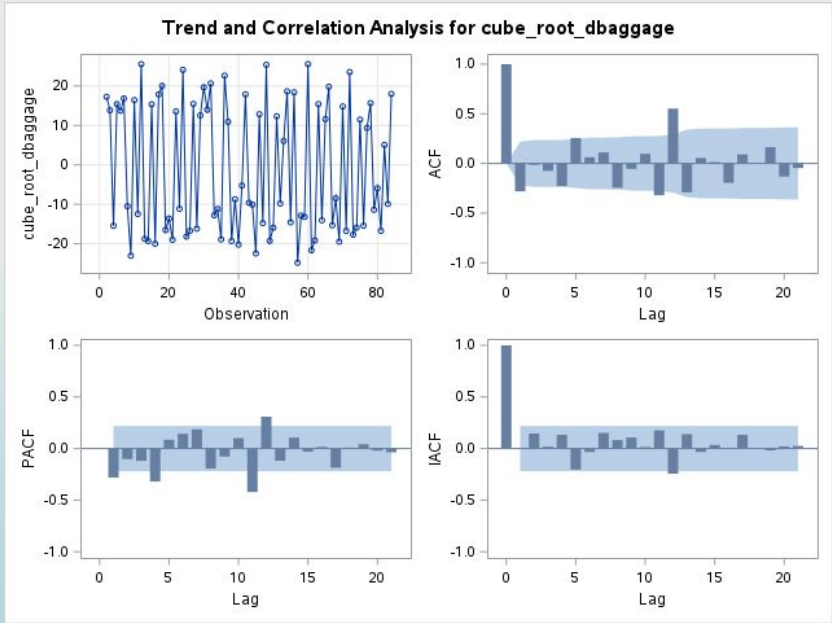
$$\sqrt[3]{z_t} + 0.11527\sqrt[3]{z_{t-11}} - 0.83069\sqrt[3]{z_{t-12}} = a_t - 0.23255\,a_{t-12}$$

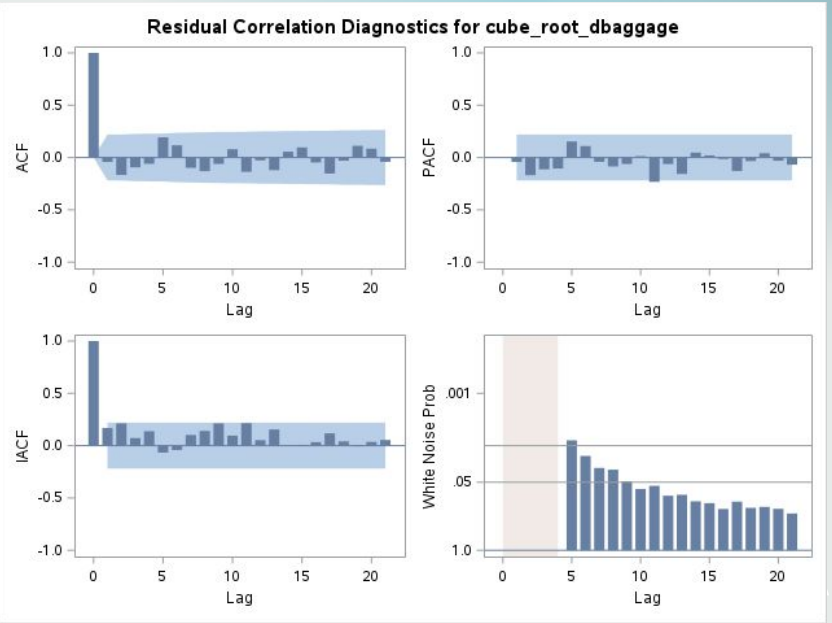

Residual Normality Diagnostics for cube_root_dbaggage
Distribution of Residuals
Normal
Kernel
Percent
30
20
10
0
-33 -27 -21 -15 -9 -3 3 9 15 21 27 33
Residual
QQ-Plot
Residual
20
10
0
-10
-20
-2 -1 0 1 2
Quantile


Forecasts for cube_root_dbaggage
40
20
0
-20
-40
Forecast
80
100
120
140
Obs
Predicted
95% Confidence Limits

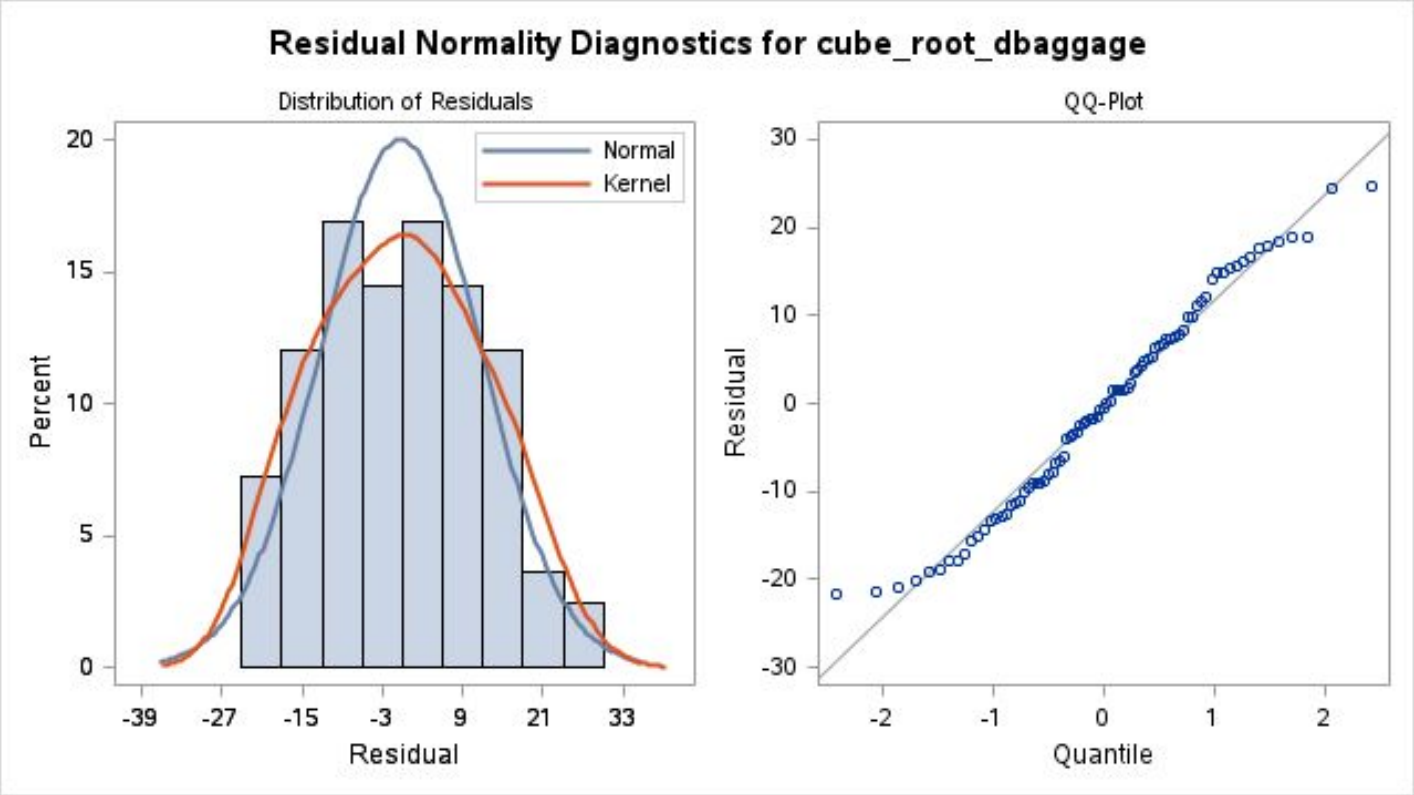


United Airlines ↘





$$\sqrt[3]{z}_t + 0.06133\,\sqrt[3]{z}_{t-11} - 0.93867\,\sqrt[3]{z}_{t-12} = a_t - 0.12464\,a_{t-5} - 0.58448\,a_{t-12}$$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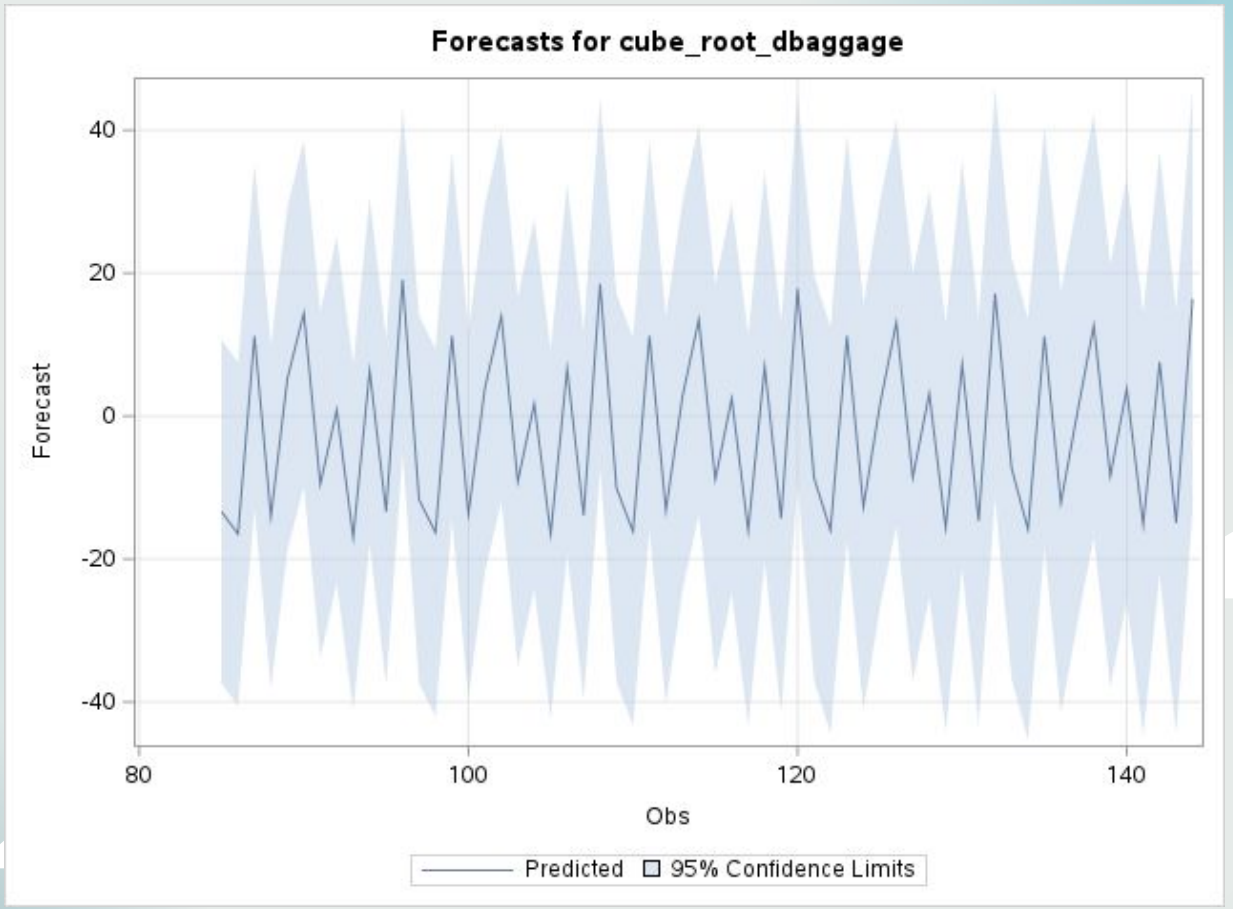
Quantile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95% Confidence Limits

Key Insights

- **Seasonal Variations:** Summer and winter months consistently shows higher lost luggage complaints, aligning with increased travel demand.
- **Operational Impact:** Industry challenges such as flight delays and cancellations in 2007 significantly influences baggage handling efficiency and complaint rates.
- **Forecasting Accuracy:** Autoregressive models provides valuable insights into future trends, aiding in proactive measures for baggage handling improvements.

Conclusion

- **Industry Awareness:** Understanding seasonal and operational factors is crucial for airlines to mitigate lost luggage complaints and enhance passenger experience.
- **Future Considerations:** Continued monitoring of industry trends, technological advancements, and operational strategies can further reduce lost luggage incidents.
- **Call to Action:** Airlines are encouraged to leverage data-driven insights to optimize baggage handling processes and ensure seamless travel experiences for passengers.

This analysis underscores the importance of data-driven decision-making in addressing industry-specific challenges and improving overall service quality within the airline sector. It is to be noted that this analysis does not consider confounding factors such as technological advancements that might help decrease the rate of claims.

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