Jackson Operations Holiday Adjustment Methodology Summary

Calculation 1: Day-of-week Closure Adjustment ("DOW Closure Adj") (Observed holidays only)

- Hypothesis: If a holiday has no effect, then the volumes of the following business day would equal the sum of the expected volumes for the holiday and the following day.
- Experience has already taught us to reject this hypothesis-- volumes are nowhere close to that level. The data lead to the same conclusion.
- *We call the difference between this hypothetical scenario of zero effect, and what happens, the holiday effect.*
- The DOW Closure Adj is calculated as the average volume of the previous day of the week (for Monday it would be Friday) divided by the average volume of the current day of the week over a specified time period.
    - Example: If Tuesday has volume of 150, and Monday 200, then the Tuesday DOW Adj is 200/150=1.33. This means that if the hypothesis of no effect is true, Tuesday would be 133% higher than usual. This adjustment would be made as (1 + DOW adj) * volume --> 233% * Tuesday's base forecast = Tuesday's adjusted forecast.

Calculation 2: Holiday adjustment.

- Regardless of holiday type, the holiday adjustment is the average variance between the expected volumes (based on recent volumes, aka "baseline forecast") and the actual volumes for a given day that we have identified as being potentially affected by a holiday.
- The baseline forecast differs depending on whether or not the holiday is observed. Either way, the first step is to calculate the baseline as the *13-week centered moving average*, excluding the day in question. In other words, it is the average of the 6 weeks before and the 6 weeks after the day we're testing.
    - Scatterplots and correlations were used to validate that this was an accurate baseline forecast.
- For non-observed holidays, the baseline forecast is directly compared to the actual volume and the average variance is the holiday adjustment.
- For observed holidays, the baseline forecast is not directly compared to the actual volume. Instead, it is first adjusted by the DOW Closure Adj, then compared.
    - Example, using same figures as those in the DOW Closure Adj section: Baseline forecast is 100, which is multiplied by 233% to arrive at an adjusted forecast of 233. The actual volume received was 200. The holiday effect on that particular date is (200-233) / 233 = -0.1416 . In other words, the holiday results in volumes 14.2% lower than the zero-effect hypothesis where the two days' expectations are added together.
    - The holiday adjustment is then calculated as the average difference across 4 years of observances.
- *The calculated adjustment is used for all business days following observed holidays, as the expectation is that volumes are significantly lower than the DOW closure adjustment (eg, Tuesday will not be as high as Tuesday + Monday).*
- *For the remainder of days, the calculated adjustment is used only if the Wilcoxon signed-rank test finds significant difference between the actual volume and baseline forecast*
    - Wilcoxon is used because of paired samples (actual volume for a day v the baseline forecast) and because normality of the differences cannot be assumed on such a small sample (no more than 4 observations for each holiday).