PROJECT – COLD STORAGE CASE STUDY

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Problem 1:

1. Mean cold storage temperature across the seasons:

|  |  |  |
| --- | --- | --- |
| Rainy | Summer | Winter |
| 3.088 | 3.147 | 2.776 |

1. Overall mean for the year = 3.002
2. Standard Deviation for the year = 0.46
3. Assuming normal distribution, probability that temperature drops below 2 C = 1.57%
4. Assuming normal distribution, probability that temperature increases above 4 C = 1.61%
5. Penalty for the AMC company: Probability of both ends is 1.57 + 1.61 = 3.18% and hence the penalty will be 10% of AMC
6. In undertaking ANOVA, the first check was to ensure that the assumptions for ANOVA are met. Assuming random samples as a given in this instance, we test for Normality and Homogeneity as follows:

Normality:

Ho: Temperature is normally distributed

Ha: Temperature is not normally distributed

Undertaking a Shapiro Wilk’s test (alpha = 0.05), the Null hypothesis is rejected.

Homogeneity:

Ho: Groups have equal population variances

Ha: At least one variance is different from the rest

Undertaking a Levene test (alpha = 0.05), the Null hypothesis is rejected.

As such, we need an alternative to ANOVA, and research seems to indicate that the most relevant variant for a nonparametric test was Kruskal Wallis.

Ho: Mean ranks of the groups are equal

Ha: At least one of the mean ranks is not equal to the rest

Given the very low P value, the Null hypothesis is rejected at alpha = 0.05. This was then followed by the post hoc Dunn test to compare the different groups. Output of P value as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Ho: Mean rank of | Ha: Mean rank of | P value | Outcome @ alpha = 0.05 |
| Summer = Rainy | Summer ≠ Rainy | 0.15 | Fail to reject |
| Winter = Rainy | Winter ≠ Rainy | 0.00 | Reject |
| Winter = Summer | Winter ≠ Summer | 0.00 | Reject |

While I am still unclear as to what is to be done when both Normality and Variance tests are rejected, I followed up the above testing with the Tukey HSD test. Output of P value is as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Ho: Mean rank of | Ha: Mean rank of | P value | Outcome @ alpha = 0.05 |
| Summer = Rainy | Summer ≠ Rainy | 0.54 | Fail to reject |
| Winter = Rainy | Winter ≠ Rainy | 0.00 | Reject |
| Winter = Summer | Winter ≠ Summer | 0.00 | Reject |

The above seems to indicate that Winter has the most statistically significant Temperature profile compared to the other two seasons.

Problem 2:

1. Single Sample one-tailed t - test

As Temperature is a continuous random variable, the first option is to choose between the Z test and the T test. Given that the Population SD is unknown (as the instructions specifically stated to use only the second data set), we will undertake a t – test. Again, given the hypothesis, wherein we are only checking if the temperature has crossed the permissible level, this is a one tailed test.

1. Ho: Mu = 3.9

Ha: Mu > 3.9

P value is 0.0047 which is statistically significant and hence the Null Hypothesis is rejected.

1. Based on the foregoing, we can state with a 90% confidence level that the mean temperature did indeed cross the permissible upper limit of 3.9 C. This also intuitively makes sense given the mean for the data set at 3.97 and 15 days of the 35 wherein the Temperature was above 3.9 C.

As such, there is need for corrective action in the cold storage plant as opposed to procurement.