**Date:** 12 September, 2015

**Experiment No. 5**

**Aim:** To perform Wald – Wolfowitz run test.

**Experiment:** Test whether the two samples are homogeneous or not using Wald – Wolfowitz Run test.

Sample 1: 24 35 12 50 60 70 68 49 80 25 69 28 28 11 88

Sample 2: 31 37 34 54 75 45 75 26 45 45 59 94 48 63 45

**Theory:**

Wald–Wolfowitz run test is used to examine whether two random samples come from populations having same distribution. This test can detect differences in averages or spread or any other important aspect between the two populations. This test is efficient when each sample size is moderately large (greater than or equal to 10).

**H0:** Two sample come from populations having same distribution.

**H1:** Two sample come from populations having different distributions.

Test Statistic: Let r denote the number of runs. To obtain r, list the n1+ n2 observations from two samples in order of magnitude. Denote observations from one sample by x’s and other by y’s. Count the number of runs.

Critical Value: Difference in location results in few runs and difference in spread also result in number of runs. Consequently, critical region for this test is always one- sided. The critical value to decide whether or not the number of runs are few, is obtained from the table. The table gives critical value rc for n1 (size of sample 1) and n2 (size of sample 2) at 5% level of significance.

Decision Rule: If r < rc, reject H0.

Tie: In case *x* and *y* observations have same value, place the observation x(y) first if run of x(y) observation is continuing.

**Algorithm:**

1. Open the file “runin.txt” to read the data and “runout.txt” to write the results using pointers.
2. Scan the number of observations from each sample in the array and merge them in r[ ].
3. Formulate a dummy array in[ ] which contains only two values “1” and “2” for each sample and it has the same size as that of r[ ].
4. Sort the array r[ ] in ascending order and swap the elements of in[ ] in the same line as that of r[ ].
5. Calculate the number of runs using if- else function.
6. Calculate the mean and variance of the runs.
7. Use normal test for large samples to test for hypothesis.
8. Results are expected in the file “runout.txt”.

**Results:**

Total number of runs is equal to 14.

E(r) =16 Var(r) = 7.24

At 0.05 level of significance, the normality test leads to acceptance of H0.

We can conclude that samples are homogenous.

**Conclusion:**

Using two sample run test, we have proved that that the two samples are homogenous.