TOPIC: ANOVA

Analysis of Variance (ANOVA) is basically an arithmetic method for breaking down in a total variation in collected data into component representing the source of variation. The source of variations is determined by the criteria used to classify the observation.

**ANOVA MODELS**

The statistical models used in Anova are linear relation to the effect of different levels of factor involved in the experiment along with one or more terms representing error effect. The effects of the factors in an experiment may be fixed, random or mixed given rise to 3 types of models in Anova.

1.FIXED EFFECT MODEL (FEM): Here the experimenter uses all the treatment (or levels of factor) about which inference have been made. The inferences mode is therefore restricted to the treatment used in the experiment the model is fixed because a repetition of the experiment could bring the same set of treatment into the new experiment in order words randomization is not employed in the selection of treatment because they are already fixed and its main objective is to test the significance among the means of the treatment.

2.RANDOM EFFECT MODEL; This is also called component of variance model. The treatment used are random sample from a population of all treatment of interest. Therefore, a repetition of the experiment will bring a new set of treatment. The experimental does not look for differences among group means of the treatment use. But in whether or not, there is a significant variability among all possible different group.

1. MIXED EFFECT MODEL: also called mixed effect model because it combines the features of fixed and random model i.e. some level of a factor may be fixed while some may be random. Of this 3, the fixed effect model is the simplest and most frequently used.

The assumptions are:

* + - 1. The treatment and environmental effect are additive.

2.The experimental errors are independent

3. homoscedasticity: homogeneous variances

4. The errors are normally distributed with zero and common variable

5. We assume randomness

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**COMPLETELY RANDOMISED DESIGN (CRD):** This is the simplest type of Anova and it is also called a one-way classification or one way Anova. It involves a random allocation of treatment to experimental unit without restriction and the probability of receiving any particular treatment is the same for all experimental unit.

**RANDOMIZED BLOCK DESIGN (RBD)**

Here we restrict randomization into what we call block, unlike completely randomized per block it is restriction if we have the same number of treatments per block is called Balance Randomized

The model for RBD is given as Y= for i= 1,2,..i, j=1,2,,…j

**Advantages of CRD over RBD**

1. It improves precision because it has maximum degree of freedom
2. It is flexible i.e. any number of treatment/replicate can be used
3. It can be analyses with the least computational complication

CRD Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source of variation | Sum square | Degree of freedom | Mean square | F |
| Between sample column mean (treatment’s) | SSC or SSt | t-1 |  |  |
| Within sample (Error) | SSE | N-t |  |
| Total | SST | N-1 |  |  |

RBD Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source of variation  | Sum of square | Degree of freedom d.f | MS | F-ratio or F-value |
| Between columns (Treatments)Between Rows (Blocks)Error(Residual)Total | SSCor SStSSBSSESST | t-1b-1(t-1) (b-1)N-1 | MSt=MSB=SSE= | FF= |

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Solution: Regarding treatments as treatments and doctors as blocks

Hypothesis

Ho: Treatments are the same

Hi: Treatments are not the same

Ho: Doctors are the same

Hi:  Doctor are not the same

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Treatments1 2 3  | y.j |
| Doctors | 1 | 58 | 56 | 65 | 179 |
| 2 | 49 | 54 | 52 | 155 |
| 3 | 60 | 71 | 39 | 170 |
| 4 | 76 | 58 | 49 | 183 |
| Yj. | 243 | 239 | 205 | Y..= 687 |

ii.Fertilizer are equally effective

Correction Factor: C= , = 

SST= Total sum of square= 

=40449-39330.75=1118.25

SStrt = Sum of square of treatments =

=39548.75-39330.75=218

sum of the square of block SSB= = 

Error sum of squares 1118.25-154.24-218=746.01

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source of Variance | Df | S.S | MSS | FC | F |
| Treatment | 2 | 218 |  | 0.8766 | 5.14 |
| Block | 3 | 154.24 |  | 0.4135 | 4.14 |
| Error | 6 | 746.01 |  |  |  |
| Total | 11 | 1118.25 |  |  |  |

Since 0.8766< 5.14, we accept the null hypothesis that there is no difference between the three treatments. Also since, 0.4135< 4.14, we accept the null hypothesis that there is no significance difference in the ways the blocks (Doctors)