

Proof_normality

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Provide a proof that, if the residuals for ANOVA is normally distributed, each cell in ANOVA is also normally distributed.

We denote:

- (1) Y_{ij} as the observation in the i th treatment and j th replicate.
- (2) μ as the overall mean.
- (3) τ_i as the effect of the i th treatment.
- (4) ϵ_{ij} as the residual error term.

The ANOVA model thus can be represented as:

$$Y_{ij} = \mu + \tau_i + \epsilon_{ij}$$

Given that the residuals ϵ_{ij} are normally distributed, we need to show that each cell mean is normally distributed.

Thus, we define a variable Z for a particular cell i :

$$Z = \mu + \tau_i + \epsilon_{ij}$$

Since μ and τ_i are constants, and ϵ_{ij} is normally distributed, Z is also normally distributed because it is a linear combination of normally distributed variables.

Therefore, each cell in the ANOVA table is normally distributed.