DISEÑO DE EXPERIMENTOS  
(UN FACTOR)

$Y_{ij} \sim N(\mu_i; \sigma^2)$ independientes; \(i = 1, ..., I; \ j = 1, ..., n_i; \ \sum_i n_i = n\)

$\bar{y}_i = \frac{1}{n_i} \sum_j y_{ij} ; \ \bar{y} = \frac{1}{n} \sum_i n_i \bar{y}_i.$

$\hat{\mu}_i = \bar{y}_i = \frac{1}{n_i} \sum_j y_{ij} , \ i = 1, ..., I$

$\hat{\sigma}^2 = S_R^2 = \frac{1}{n-I} \sum_i \sum_j (y_{ij} - \bar{y}_i)^2$

$IC_{1-\alpha}(\mu_i) = \left( \bar{y}_i \pm t_{n-I, \alpha/2} \frac{S_R}{\sqrt{1/n_i}} \right)$

$IC_{1-\alpha}(\sigma^2) = \left( \frac{(n-I)S_R^2}{\chi^2_{n-I, \alpha/2}} ; \frac{(n-I)S_R^2}{\chi^2_{n-I, 1-\alpha/2}} \right)$

Tabla ANOVA:

<table>
<thead>
<tr>
<th>Sumas de cuadrados</th>
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<tbody>
<tr>
<td>$SCE = \sum_i n_i(\bar{y}_i - \bar{y})^2$</td>
<td>$I-1$</td>
<td>$SCE$</td>
<td>$F = \frac{SCE/(I-1)}{SCR/(n-I)}$</td>
</tr>
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<td>$SCR = \sum_i \sum_j (y_{ij} - \bar{y}_i)^2$</td>
<td>$n-I$</td>
<td>$SCR$</td>
<td></td>
</tr>
<tr>
<td>$SCT = \sum_i \sum_j (y_{ij} - \bar{y})^2$</td>
<td>$n-1$</td>
<td></td>
<td></td>
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$IC_{1-\alpha}(\mu_i - \mu_j) = \left( \bar{y}_i - \bar{y}_j \pm t_{n-I, \alpha/2} \frac{S_R}{\sqrt{1/n_i + 1/n_j}} \right)$
DISEÑO DE Experimentos  
(DOS FACTORES SIN INTERACCIÓN)

$Y_{ijk} \sim N(\mu + \alpha_i + \beta_j; \sigma^2)$ independientes; $i = 1, \ldots, I; \ j = 1, \ldots, J; \ k = 1, \ldots, K$

\[ \bar{Y}_{..} = \frac{1}{IJK} \sum_i \sum_j \sum_k y_{ijk} \]  
\[ \bar{Y}_{i..} = \frac{1}{JK} \sum_j \sum_k y_{ijk} \]  
\[ \bar{Y}_{.j.} = \frac{1}{IK} \sum_i \sum_k y_{ijk} \]  
\[ \hat{\mu} = \bar{Y}_{..} \]  
\[ \hat{\alpha}_i = \bar{Y}_{i..} - \bar{Y}_{..} \]  
\[ \hat{\beta}_j = \bar{Y}_{.j.} - \bar{Y}_{..} \]  
\[ \hat{\sigma}^2 = \frac{1}{IJK - I - J + 1} \sum_i \sum_j \sum_k (y_{ijk} - \bar{Y}_{i..} - \bar{Y}_{.j.} + \bar{Y}_{..})^2 \]

Tabla ANOVA:

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<td>$SCE(\alpha) = JK \sum_i (\bar{Y}<em>{i..} - \bar{Y}</em>{..})^2$</td>
<td>$I - 1$</td>
<td>$\frac{SCE(\alpha)}{I - 1}$</td>
<td>$F(\alpha)$</td>
</tr>
<tr>
<td>$SCE(\beta) = IK \sum_j (\bar{Y}<em>{.j.} - \bar{Y}</em>{..})^2$</td>
<td>$J - 1$</td>
<td>$\frac{SCE(\beta)}{J - 1}$</td>
<td>$F(\beta)$</td>
</tr>
<tr>
<td>$SCR = \sum_i \sum_j \sum_k (y_{ijk} - \bar{Y}<em>{i..} - \bar{Y}</em>{.j.} + \bar{Y}_{..})^2$</td>
<td>$IJK - I - J + 1$</td>
<td>$\frac{SCR}{IJK - I - J + 1}$</td>
<td></td>
</tr>
<tr>
<td>$SCT = \sum_i \sum_j \sum_k (y_{ijk} - \bar{Y}_{..})^2$</td>
<td>$IJK - 1$</td>
<td></td>
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siendo los estadísticos:

\[ F(\alpha) = \frac{SCE(\alpha)/(I - 1)}{SCR/(IJK - I - J + 1)} \]  
\[ F(\beta) = \frac{SCE(\beta)/(J - 1)}{SCR/(IJK - I - J + 1)} \]

\[ IC_{1-\alpha}(\alpha_i - \alpha_j) = \left( \bar{Y}_{i..} - \bar{Y}_{j..} \pm t_{IJK-I-J+1,\alpha/2} \frac{S_R}{\sqrt{\frac{1}{JK} + \frac{1}{JK}}} \right) \]  
\[ IC_{1-\alpha}(\beta_i - \beta_j) = \left( \bar{Y}_{.i.} - \bar{Y}_{.j.} \pm t_{IJK-I-J+1,\alpha/2} \frac{S_R}{\sqrt{\frac{1}{IK} + \frac{1}{IK}}} \right) \]
DISEÑO DE EXPERIMENTOS
(DOS FACTORES CON INTERACCIÓN)

\( Y_{ijk} \sim N(\mu + \alpha_i + \beta_j + (\alpha \ast \beta)_{ij}; \sigma^2) \) independientes; \( i = 1, \ldots, I; \ j = 1, \ldots, J; \ k = 1, \ldots, K \)

\[
\bar{y}_{..} = \frac{1}{IJK} \sum_i \sum_j \sum_k y_{ijk} ; \quad \bar{y}_{i.} = \frac{1}{JK} \sum_j \sum_k y_{ijk} \nonumber ; \quad \bar{y}_{.j} = \frac{1}{IK} \sum_i \sum_k y_{ijk} ; \quad \bar{y}_{ij.} = \frac{1}{K} \sum_k y_{ijk}
\]

\[
\hat{\mu} = \bar{y}_{..} \nonumber ; \quad \hat{\alpha}_i = \bar{y}_{i.} - \bar{y}_{..} \nonumber ; \quad \hat{\beta}_j = \bar{y}_{.j} - \bar{y}_{..} \nonumber ; \quad (\hat{\alpha} \ast \hat{\beta})_{ij} = \bar{y}_{ij.} - \bar{y}_{i.} - \bar{y}_{.j} + \bar{y}_{..}
\]

\[
\hat{\sigma}^2 = S_R^2 = \frac{1}{IJ(K-1)} \sum_i \sum_j \sum_k (y_{ijk} - \bar{y}_{ij.})^2
\]

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<tr>
<td>( SCE(\alpha) = JK \sum_i (\bar{y}<em>{i.} - \bar{y}</em>{..})^2 )</td>
<td>( I - 1 )</td>
<td>( \frac{SCE(\alpha)}{I-1} )</td>
<td>( F(\alpha) )</td>
</tr>
<tr>
<td>( SCE(\beta) = IK \sum_j (\bar{y}<em>{.j} - \bar{y}</em>{..})^2 )</td>
<td>( J - 1 )</td>
<td>( \frac{SCE(\beta)}{J-1} )</td>
<td>( F(\beta) )</td>
</tr>
<tr>
<td>( SCE(\alpha \ast \beta) = K \sum_i \sum_j (\bar{y}<em>{ij.} - \bar{y}</em>{i.} - \bar{y}<em>{.j} + \bar{y}</em>{..})^2 )</td>
<td>( (I - 1)(J - 1) )</td>
<td>( \frac{SCE(\alpha \ast \beta)}{(I-1)(J-1)} )</td>
<td>( F(\alpha \ast \beta) )</td>
</tr>
<tr>
<td>( SCR = \sum_i \sum_j \sum_k (y_{ijk} - \bar{y}_{ij.})^2 )</td>
<td>( IK )</td>
<td>( \frac{SCR}{IK} )</td>
<td>( F(\alpha \ast \beta) )</td>
</tr>
<tr>
<td>( SCT = \sum_i \sum_j \sum_k (y_{ijk} - \bar{y}_{ij.})^2 )</td>
<td>( IJK )</td>
<td>( \frac{SCR}{IJ(K-1)} )</td>
<td>( F(\alpha \ast \beta) )</td>
</tr>
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</table>

siendo los estadísticos:

\[
F(\alpha) = \frac{SCE(\alpha)/(I - 1)}{SCR/IK(J - 1)} ; \quad F(\beta) = \frac{SCE(\beta)/(J - 1)}{SCR/IK(J - 1)}
\]

\[
F(\alpha \ast \beta) = \frac{SCE(\alpha \ast \beta)/(I - 1)(J - 1)}{SCR/IK(J - 1)}
\]

\[
IC_{1-\alpha}(\alpha_i - \alpha_j) = \left( \bar{y}_{i.} - \bar{y}_{.j} \pm t_{IJ(K-1),\alpha/2} S_R \sqrt{\frac{1}{IK} + \frac{1}{JK}} \right)
\]

\[
IC_{1-\alpha}(\beta_i - \beta_j) = \left( \bar{y}_{i.} - \bar{y}_{.j} \pm t_{IJ(K-1),\alpha/2} S_R \sqrt{\frac{1}{IK} + \frac{1}{IK}} \right)
\]
**REGRESIÓN LINEAL SIMPLE**

$Y_i \sim N(\beta_0 + \beta_1 x_i; \sigma^2)$ independientes, $i = 1, \ldots, n$

\[
\hat{\beta}_0 = \bar{y} - \frac{\text{cov} \, \bar{x}}{v_x} \\
\hat{\beta}_1 = \frac{\text{cov} \, v_x}{v_x} \\
\hat{\sigma}^2 = S_R^2 = \frac{1}{n-2} \sum_i (y_i - \hat{y}_i)^2 = \frac{1}{n-2} \sum_i (y_i - \hat{\beta}_0 - \hat{\beta}_1 x_i)^2
\]

**IC$_{1-\alpha}$(β) =** \(\left( \hat{\beta}_0 \pm t_{n-2,\alpha/2} \frac{S_R}{\sqrt{\frac{1}{n} + \frac{\bar{x}^2}{nv_x}}} \right) = \left( \hat{\beta}_0 \pm t_{n-2,\alpha/2} \text{(error típico de } \hat{\beta}_0) \right)\)

**IC$_{1-\alpha}$(β) =** \(\left( \hat{\beta}_1 \pm t_{n-2,\alpha/2} \frac{S_R}{\sqrt{\frac{1}{nv_x}}} \right) = \left( \hat{\beta}_1 \pm t_{n-2,\alpha/2} \text{(error típico de } \hat{\beta}_1) \right)\)

**IC$_{1-\alpha}$(σ²) =** \(\left( \frac{(n-2)S_R^2}{\chi^2_{n-2,\alpha/2}} ; \frac{(n-2)S_R^2}{\chi^2_{n-2,1-\alpha/2}} \right)\)

**Tabla ANOVA:**

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<tr>
<td>$SCE = \sum_i (\hat{y}_i - \bar{y})^2$</td>
<td>1</td>
<td>$\frac{SCE}{1}$</td>
<td>$F = \frac{SCE_{1}}{SCE/(n-2)}$</td>
</tr>
</tbody>
</table>
| $SCR = \sum_i (y_i - \hat{y}_i)^2$ | $n - 2$ | $\frac{SCR}{n-2}$ | \[SCE \]
| $SCT = \sum_i (y_i - \bar{y})^2$ | $n - 1$ | \[SCE \]

\[r = \frac{\text{cov} \, \sqrt{v_x v_y}}{\sqrt{v_x v_y}} ; \quad SCR = nv_y (1 - r^2) ; \quad SCT = nv_y \]

\[IC_{1-\alpha}(\text{valor medio de } Y) = \left( \hat{y}_0 \pm t_{n-2,\alpha/2} S_R \sqrt{\frac{1}{n} + \frac{(x_0 - \bar{x})^2}{nv_x}} \right) \]

\[IC_{1-\alpha}(\text{valor individual de } Y) = \left( \hat{y}_0 \pm t_{n-2,\alpha/2} S_R \sqrt{1 + \frac{1}{n} + \frac{(x_0 - \bar{x})^2}{nv_x}} \right) \]
REGRESIÓN LINEAL MÚLTIPLE

\[ Y_i \sim N(\beta_0 + \beta_1 x_{i1} + ... + \beta_k x_{ki}; \sigma^2) \text{ independientes, } i = 1, ..., n \]

\[ \hat{\sigma}^2 = S_R^2 = \frac{1}{n-k-1} \sum_i (y_i - \hat{y}_i)^2 = \frac{1}{n-k-1} \sum_i (y_i - \hat{\beta}_0 - \hat{\beta}_1 x_{i1} - ... - \hat{\beta}_k x_{ki})^2 \]

\[ IC_{1-\alpha}(\beta_j) = \left( \hat{\beta}_j \pm t_{n-k-1;\alpha/2}\text{ (error típico de } \hat{\beta}_j) \right), \quad j = 0, ..., k \]

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<td>( SCE = \sum_i (\hat{y}_i - \bar{y})^2 )</td>
<td>( k )</td>
<td>( \frac{SCE}{k} )</td>
<td>( \frac{SCE}{SCR/(n-k-1)} )</td>
</tr>
<tr>
<td>( SCR = \sum_i (y_i - \hat{y}_i)^2 )</td>
<td>( n-k-1 )</td>
<td>( \frac{SCR}{n-k-1} )</td>
<td></td>
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<td>( SCT = \sum_i (y_i - \bar{y})^2 )</td>
<td>( n-1 )</td>
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\[ R^2 = \frac{SCE}{SCT} = \frac{SCT - SCR}{SCT} \quad ; \quad F = \frac{R^2}{1-R^2} \frac{n-k-1}{k} \]

REGRESIÓN LOGÍSTICA

\[ Pr(Y_i = 1) = \frac{1}{1 + e^{-\hat{\beta}_0 - \hat{\beta}_1 x_{i1} - ... - \hat{\beta}_j x_{ji} - ... - \hat{\beta}_k x_{ki}}} \text{ para } i = 1, ..., n \]

\[ IC_{1-\alpha}(\beta_j) = \left( \hat{\beta}_j \pm z_{\alpha/2}\text{ (error típico de } \hat{\beta}_j) \right) \text{ para } j = 0, 1, ..., n \]

Regla de clasificación de los individuos:

- Si \( \hat{\beta}_0 + \hat{\beta}_1 x_1 + ... + \hat{\beta}_k x_k > 0 \), clasificamos como \( Y = 1 \)
- Si \( \hat{\beta}_0 + \hat{\beta}_1 x_1 + ... + \hat{\beta}_k x_k < 0 \), clasificamos como \( Y = 0 \)