

ANAKOVA

bagian 3



Model ANAKOVA dua faktor dan satu variabel konkomitan :

$$Y_{ijk} = \mu + \tau_i + \beta_j + (\tau\beta)_{ij} + \gamma(X_{ijk} - \bar{X}...) + \varepsilon_{ijk} \begin{cases} i = 1, 2, \dots, a \\ j = 1, 2, \dots, b \\ k = 1, 2, \dots, n \end{cases}$$



Contoh

Seorang hortikultoris ingin mengetahui pengaruh pengaruh varietas bunga (faktor A ; LP dan WB) dan tingkat kelembaban (faktor B ; rendah dan tinggi) pada hasil panen bunga (Y). Karena luas tanah pertanian tidak sama, maka ia menggunakan ukuran petak sebagai kontrolnya (konkomitan, X)

Faktor A	Faktor B (Tingkat Kelembaban)			
	B ₁ (rendah)		B ₂ (Tinggi)	
	Y _{i1k}	X _{i1k}	Y _{i2k}	X _{i2k}
A ₁ (Varietas LP)	98	15	71	10
	60	4	80	12
	77	7	86	14
	80	9	82	13
	95	14	46	2
	64	5	55	3
A ₂ (varietas WB)	55	4	76	11
	60	5	68	10
	75	8	43	2
	65	7	47	3
	87	13	62	7
	78	11	70	9



Ingat... Penentuan JKT pada anava dua jalan...

$$y_{ijk} = \mu + \tau_i + \beta_j + (\tau\beta)_{ij} + \varepsilon_{ijk}$$

$$\begin{aligned} & \sum_{i=1}^a \sum_{j=1}^b \sum_{k=1}^n (y_{ijk} - \bar{y}_{...})^2 \\ &= \sum_{i=1}^a \sum_{j=1}^b \sum_{k=1}^n \left[(\bar{y}_{i..} - \bar{y}_{...}) + (\bar{y}_{.j.} - \bar{y}_{...}) + (\bar{y}_{ij.} - \bar{y}_{i..} - \bar{y}_{.j.} + \bar{y}_{...}) + (y_{ijk} - \bar{y}_{ij.}) \right]^2 \\ &= \underbrace{bn \sum_{i=1}^a (\bar{y}_{i..} - \bar{y}_{...})^2}_{JK_A} + \underbrace{an \sum_{j=1}^b (\bar{y}_{.j.} - \bar{y}_{...})^2}_{JK_B} + \underbrace{n \sum_{i=1}^a \sum_{j=1}^b (\bar{y}_{ij.} - \bar{y}_{i..} - \bar{y}_{.j.} + \bar{y}_{...})^2}_{JK_{AB}} + \underbrace{\sum_{i=1}^a \sum_{j=1}^b \sum_{k=1}^n (y_{ijk} - \bar{y}_{ij.})^2}_{JK_S} \\ & JK_T = JK_A + JK_B + JK_{AB} + JK_S \end{aligned}$$



jadi...Penentuan Analisis Variansi untuk Y

$$JK_{A-Y} = nb \sum_i (\bar{Y}_{i..} - \bar{Y}...)^2$$

$$JK_{B-Y} = na \sum_j (\bar{Y}_{.j.} - \bar{Y}...)^2$$

$$JK_{AB-Y} = n \sum_i \sum_j (\bar{Y}_{ij.} - \bar{Y}_{i..} - \bar{Y}_{.j.} + \bar{Y}...)^2$$

$$JK_{T-Y} = \sum_i \sum_j \sum_k (Y_{ijk} - \bar{Y}...)^2$$

$$JK_{S-Y} = JK_{T-Y} - JK_{A-Y} - JK_{B-Y} - JK_{AB-Y}$$



Analog untuk penentuan Anava untuk penentuan X

ANAVA untuk XY

$$JK_{T_XY} = \sum_i \sum_j \sum_k (X_{ijk} - \bar{X}...)(Y_{ijk} - \bar{Y}...) = \sum_i \sum_j \sum_k X_{ijk} Y_{ijk} - \frac{X...Y...}{abn}$$

$$JK_{A_XY} = bn \sum_i (\bar{X}_{i..} - \bar{X}...)(\bar{Y}_{i..} - \bar{Y}...) = \sum_i \frac{X_{i..} Y_{i..}}{bn} - \frac{X...Y...}{abn}$$

$$JK_{B_XY} = an \sum_j (\bar{X}_{.j.} - \bar{X}...)(\bar{Y}_{.j.} - \bar{Y}...) = \sum_j \frac{X_{.j.} Y_{.j.}}{an} - \frac{X...Y...}{abn}$$

$$JK_{S_XY} = \sum_i \sum_j \sum_k (X_{ijk} - \bar{X}_{ij..})(Y_{ijk} - \bar{Y}_{ij.}) = JK_{T_XY} - JK_{P_XY}$$

$$JK_{P_XY} = n \sum_i \sum_j (X_{ij.} - \bar{X}_{...})(\bar{Y}_{ij.} - \bar{Y}_{...}) = \frac{\sum_i \sum_j X_{ij.} Y_{ij.}}{n} - \frac{X...Y...}{abn}$$

$$JK_{AB_XY} = JK_{P_XY} - JK_{A_XY} - JK_{B_XY}$$



ANAVA untuk X, Y dan XY

SV	Y	X	XY	db
A	JKA_Y	JKA_X	JKA_XY	a-1
B	JKB_Y	JKB_X	JKB_XY	b-1
AB	JKAB_Y	JKAB_X	JKAB_XY	(a-1)(b-1)
Sesatan	JKS_Y	JKS_X	JKS_XY	ab(n-1)
Total	JKT_Y	JKT_X	JKT_XY	abn-1



Uji efek Pengaruh A

i. $H_0 : \tau_i = 0, \forall i$

$H_1 : \tau_i \neq 0, \exists i, i = 1, 2, \dots, t$

ii. dipilih α

iii. Statistika Uji:

$$F_{\text{rasio}} = \frac{RK_{A_{(adj)}}}{RK_{S_{(adj)}}}$$

iv. DK: H_0 ditolak jika $F_{\text{rasio}} > F_{(\alpha, a-1, ab(n-1)-1)}$



SV	Y	X	XY	db
A	JKA_Y	JKA_X	JKA_XY	a-1
B	JKB_Y	JKB_X	JKB_XY	b-1
AB	JKAB_Y	JKAB_X	JKAB_XY	(a-1)(b-1)
Sesatan	JKS_Y	JKS_X	JKS_XY	ab(n-1)
Total	JKT_Y	JKT_X	JKT_XY	abn-1

$$JK_{A-E(dip)} = (JK_{A_Y} + JK_{S_Y}) - \frac{(JK_{A_{XY}} + JK_{S_{XY}})^2}{(JK_{A_X} + JK_{S_X})}$$

$$JK_{SA(dip)} = JK_{S_Y} - \frac{(JK_{S_{XY}})^2}{JK_{S_X}}$$

$$JK_{A(dip)} = JK_{A-E(dip)} - JK_{SA(dip)}$$



Tabel anava

SV	Y	X	XY	db
A	JKA_Y	JKA_X	JKA_XY	a-1
Sesatan	JKS_Y	JKS_X	JKS_XY	ab(n-1)
Total	JKT_Y	JKT_X	JKT_XY	abn-1
	=JKA_Y+JKS_Y	=JKA_X+JKS_X	=JKA_XY+JKS_XY	=a-1+ab(n-1)

Tabel anakova A

SV	JK	db	RK(Adj)
A	JKA(dip)	a-1	RKA(dip)
Sesatan	JKS_A(dip)	ab(n-1)-1	RKS(dip)
Total	JKA-E(dip)	a+ab(n-1)-2	

