

16-1-2026

Main effects model

$$\hat{\beta}_0 = 7.8$$

$$\hat{\beta}_1 = 20.2$$

$$\hat{\beta}_2 = 24.0$$

$$Y = b_0 + b_1 X_F + b_2 X_Y$$

(sex) (smoking)
↓ ↓

$$\hat{\mu}_{MN} = \hat{b}_0 = 7.8$$

$$\hat{\mu}_{MY} = \hat{b}_0 + \hat{b}_2 = 7.8 + 24 \approx 32$$

$$\hat{\mu}_{FN} = \hat{b}_0 + \hat{b}_1 = 7.8 + 20.2 = 28$$

$$\hat{\mu}_{FY} = \hat{b}_0 + \hat{b}_1 + \hat{b}_2 = 7.8 + 20.2 + 24.0 = 52$$

Μοντέλο με αλληλεπίδρασης (Interaction effects models)

$$Y = b_0 + b_1 X_F + b_2 X_Y + \underbrace{b_3 X_F X_Y}_{\text{interaction term}}$$

Κατηγορ.	X_F	X_Y	Y
MN	0	0	b_0
MY	0	1	$b_0 + b_2$
FN	1	0	$b_0 + b_1$
FY	1	1	$b_0 + b_1 + b_2 + b_3$

Effect sex

$$N: \mu_{FN} - \mu_{MN} = b_1$$

$$Y: \mu_{FY} - \mu_{MY} = b_1 + b_3$$

b_1 = effect X_F σε Smoking = N

$b_1 + b_3$ = effect X_F σε Smoking = Y

$$b_3 = \text{effect } X_F \text{ σε } Y - \text{effect } X_F \text{ σε } N$$

effect wv kanvrafalos so effect wv Sex

Effect Smoking

$$M: \mu_{MY} - \mu_{MN} = b_0 + b_2 - b_0 = \underline{b_2}$$

$$F: \mu_{FY} - \mu_{FN} = b_0 + b_1 + b_2 + b_3 - b_0 - b_1 = \underline{b_2 + b_3}$$

b_2 = effect wv kanvrafalos $\alpha_{\text{sex}} = M (=0)$

b_3 = effect smoking ga F - effect smoking ga M

$$\hat{b}_0 = 9.5$$

$$\hat{b}_1 = 16.8$$

$$\hat{b}_2 = 20.6$$

$$\hat{b}_3 = 6.8$$

ΓΕΝΙΚΩΣΗΣ

<u>Χρώμα</u>	<u>Επάγγελμα</u>	<u>Τόπος Διαμ.</u>
R ← <u>ref</u>	BC : blue collar ^{ref}	A : Αζζικί <u>ref</u>
G X_G	O : office X_O	S : Αθασσικά X_S
B X_B	M : mixed X_M	E : Εναξία X_E
Y X_Y		

Main effects

$$Y = b_0 + b_1 X_G + b_2 X_B + b_3 X_Y + b_4 X_O + b_5 X_M + b_6 X_S + b_7 X_E$$

main effects
χρώμα
effect
Επαγγ.
effect
Τόπου

Πως ελέγχουμε αν το χρώμα σχετίζεται με τον Y?

$$H_0: b_1 = b_2 = b_3 = 0$$

$$H_1: \text{Zonfax. Eva} \neq 0$$

Interactions

$$Y = b_0 + \underbrace{b_1 X_G + b_2 X_B + b_3 X_Y}_{\text{}} + \underbrace{b_4 X_O + b_5 X_M}_{\text{}} + b_6 X_S + b_7 X_E$$

$$+ b_8 X_G X_O + b_9 X_G X_M + b_{10} X_B X_O + b_{11} X_B X_M$$

$$+ b_{12} X_Y X_O + b_{13} X_Y X_M +$$

$$\vdots + b_{23} X_M X_E \left[+ b_{24} X_B X_O X_A + \dots + b_{44} X_Y X_M X_E \right]$$

Evita

Interaction terms : πρότερα zur διαρκή
 μεροφ μιας ανξ. καρυ. μεζαδ
 με τις διαρκή μιας
 αγγυ

Μοντέλα Analysis of Covariance (ANACOVA)

Μοντέλα με κατηγορικές και ποσοτικές
μεταβλητές

Παράδειγμα

Τιμές διαμερισμάτων
σε BOS, CHI, NY
 X_{BOS} X_{CHI} Ref

$$Y = b_0 + b_1 X_{CHI} + b_2 X_{BOS}$$

<u>City</u>		Size
BOS	X_{BOS}	<u>scale</u>
CHI	X_{CHI}	
NY	← ref	

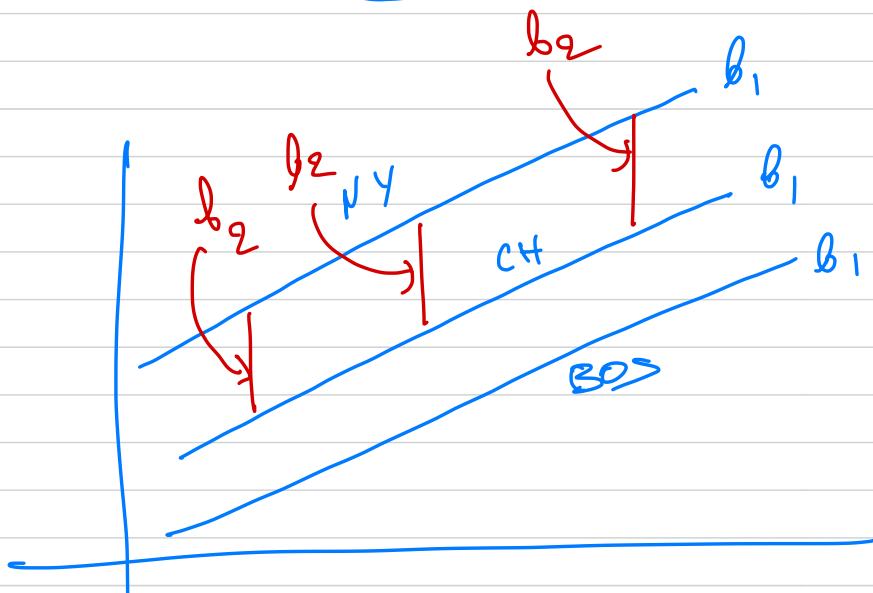
Main effects model

$$Y = b_0 + \underbrace{b_1 \cdot \text{Size}}_{\text{size}} + \underbrace{b_2 X_{CHI} + b_3 X_{BOS}}_{\text{city}}$$

4 παράμετροι

City	X_{BOS}	X_{CHI}	$Y = b_0 + b_1 \text{Size} + b_2 X_{CHI} + b_3 X_{BOS}$
NY	0	0	$Y = b_0 + b_1 \cdot \text{Size}$
CHI	0	1	$Y = b_0 + b_1 \cdot \text{Size} + b_2 = (b_0 + b_2) + b_1 \cdot \text{Size}$
BOS	1	0	$Y = b_0 + b_3 + b_1 \cdot \text{Size}$

Effect size (κ from w's net size) = b_1 α of η
is net



Τεχνική παραγωγής

$$Y_{CHI} = b_{0CHI} + b_{1CHI} \cdot \text{Size}$$

$$Y_{BOS} = b_{0BOS} + b_{1BOS} \cdot \text{Size}$$

$$Y_{NY} = b_{0NY} + b_{1NY} \cdot \text{Size}$$

6 παράμετροι

Effect city.

$$\mu_{CHI} - \mu_{NY} = b_0 + b_2 + b_1 \text{size} - b_0 - b_1 \text{size} = b_2$$

$$\mu_{Bos} - \mu_{NY} = b_3$$

→ average size

Interactions model (Bos = ref)

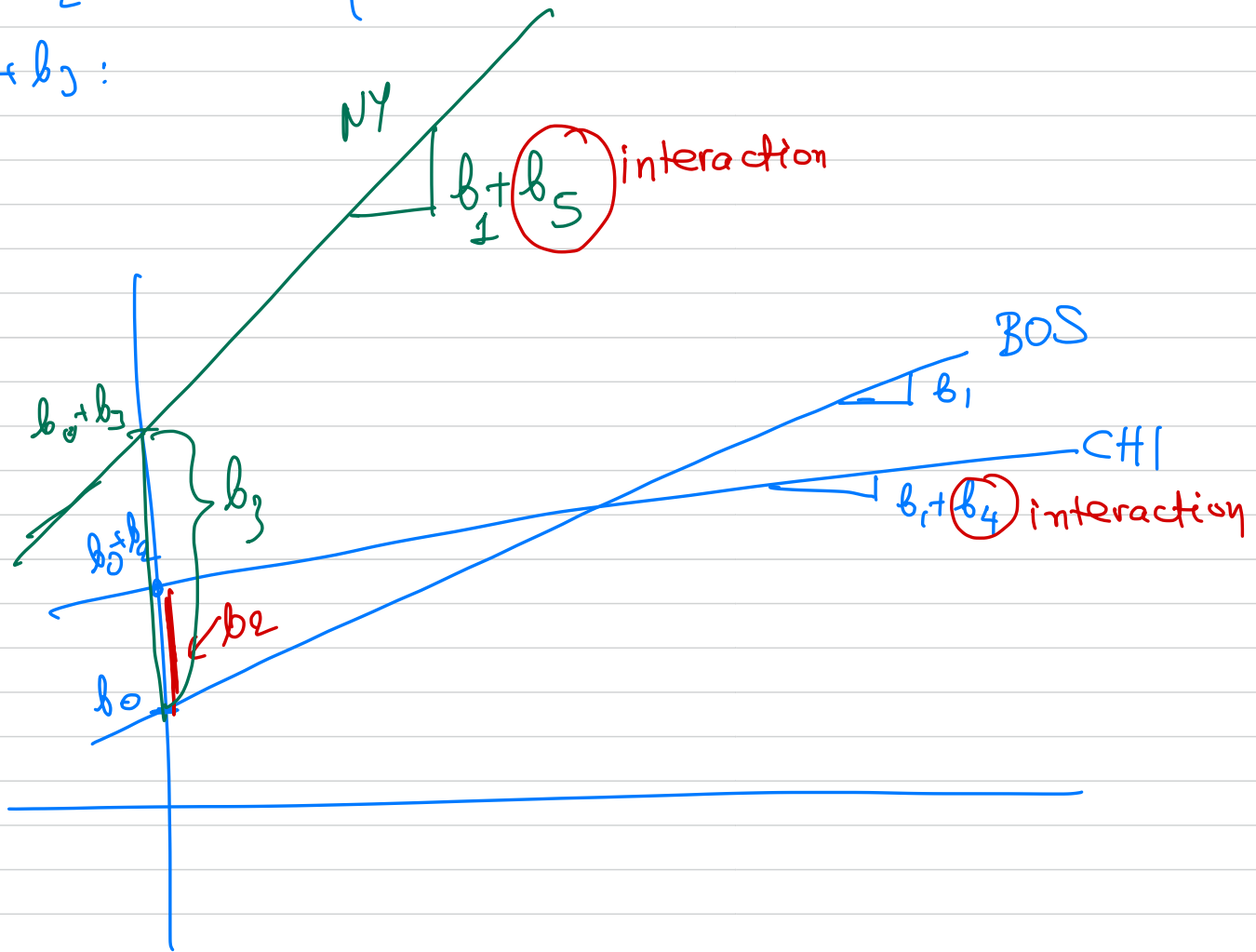
$$Y = b_0 + b_1 \cdot \text{size} + b_2 \cdot X_{CHI} + b_3 \cdot X_{NY} \\ + b_4 \cdot X_{CHI} \cdot \text{size} + b_5 \cdot X_{NY} \cdot \text{size}$$

City	X_{CHI}	X_{NY}	Y
Bos	0	0	$b_0 + b_1 \cdot \text{size}$
CHI	1	0	$(b_0 + b_2) + (b_1 + b_4) \cdot \text{size}$
NY	0	1	$(b_0 + b_3) + (b_1 + b_5) \cdot \text{size}$

b_0 :

$b_0 + b_2$: $\sigma_{\text{rad. ipol}}$

$b_0 + b_3$:



Παράδειγμα

