PRACTICE LESSON 5

EX. 1

$N = 300$

$r_{xx'} = 0.81$

$S^2_x = 25$

a) $r_{xx'} = \frac{S^2_v}{S^2_x} \rightarrow 0'81 = \frac{S^2_v}{25} \rightarrow S^2_v = 25 \cdot 0'81 = 20'25$

b) $S_e = ?$

$S^2_x = S^2_v + S^2_e \rightarrow 25 = 20.25 + S^2_e$

$25 - 20.25 = S^2_e$

$4.75 = S^2_e$

$2.18 = S_e$

c) $r_{xv} = \sqrt{r_{xx'}}$

$r_{xv} = \sqrt{0.81} = 0.9$

EX. 2

$r_{xx'} = \frac{S^2_v}{S^2_x} = \frac{20}{24} = 0.83$

$S_e = 2 \rightarrow S^2_e = 4$

$\frac{S^2_e}{S^2_v} = 0.10 \rightarrow 2 = 0.1\, S^2_v \rightarrow \frac{2}{0.1} = S^2_v \rightarrow S^2_v = 20$

$S^2_x = S^2_v + S^2_e = 20 + 4 = 24$

EX. 3

$S_e = S_x \sqrt{1 - r_{xx'}} = 6\sqrt{1 - 0.85} = 2,32$

$N = 150$

$S^2_x = 36 \rightarrow S_x = \sqrt{36} = 6$

$r_{xx'} = 0.85$

$S_e = ?$

Otra op/:

$r_{xx'} = 1 - \frac{S^2_e}{S^2_x} \rightarrow 0'85 = 1 - \frac{S^2_e}{36}$

$\frac{S^2_e}{36} = 1 - 0.85 \rightarrow \frac{S^2_e}{36} = 0.15$

$S^2_e = 0,15 \cdot 36 = 5.4$

$S_e = \sqrt{5.4} = 2,32$

EX. 4

$r_{xx'} = \frac{S^2_v}{S^2_x} = 0.81 \rightarrow r_{xv} = \sqrt{r_{xx'}}$

$r_{xv} = \sqrt{0.81} = 0.9$

$\frac{S^2_v}{S^2_x} = 0.81$

EX. 5

$N = 500$

a) $r_{xx'} = \frac{S^2_v}{S^2_x} = \frac{8.19}{9} = 0.91$

$S_x = 3 \rightarrow S^2_x = 9$

$S^2_e = 0.81$

$S^2_x = S^2_v + S^2_e \rightarrow 9 = S^2_v + 0.81$

$9 - 0.81 = S^2_v \rightarrow 8.19 = S^2_v$

Otra op/:

$r_{xx'} = 1 - \frac{S^2_e}{S^2_x} =$

$= 1 - \frac{0'81}{9} = 1 - 0'09 =$

$= 0'91$

b) $r_{vx} = \sqrt{r_{xx'}} = \sqrt{0.91} = 0.95$

c) $S_e = \sqrt{0.81} = 0.9$

d) $S^2_V = 8.19$

Ex. 6

$\frac{S^2_e}{S^2_V} = 0.5 \rightarrow S^2_e = 0.5\, S^2_V$

$S^2_x = S^2_V + S^2_e = S^2_V + 0.5\, S^2_V = 1.5\, S^2_V$

$r_{xx'} = \frac{S^2_V}{S^2_x} = \frac{S^2_V}{1.5 S^2_V} = \frac{1}{1.5} = 0.67$

Ex. 7

$r_{xV} = 0.8$

a) $\frac{S^2_V}{S^2_x} = r_{xx'}$ $\quad r_{xx'} = r^2_{xV} = 0.64$

b) $Se = S_x\sqrt{1 - r_{xx'}} = 6\sqrt{1-0.64} = 3.6$

$S_x = 6$

Ex. 8

DERIVACIÓN 1, TRANSPARENCIA 7

$N = 300$

$\Sigma X = 1800$

$\Sigma x^2 = 2100$

a) $\boxed{\bar{V} = \bar{X}} = 6$

$\bar{X} = \frac{\Sigma X}{N} = \frac{1800}{300} = 6$

b) $\Sigma E = 0 \rightarrow \bar{E} = \frac{\Sigma E}{N} = \frac{0}{300} = 0$

c) $S^2_x = \frac{\Sigma (x - \bar{X})^2}{N} = \frac{2100}{300} = 7$

d) $S^2_V = ?$

$r_{xV} = 0.8 \rightarrow r_{xx'} = r^2_{xV} = 0.8^2 = 0.64$

$r_{xx'} = \frac{S^2_V}{S^2_x} \rightarrow 0.64 = \frac{S^2_V}{7}$

$0.64 \cdot 7 = S^2_V$

$4.48 = S^2_V$

e) $Se = ?$

$S^2_x = S^2_V + S^2_e \rightarrow 7 = 4.48 + S^2_e \rightarrow 7 - 4.48 = S^2_e$

$2.52 = S^2_e \rightarrow Se = \sqrt{2.52} = 1.59$

DERIVACIÓN 6, TRANSPARENCIA 10

f) $\boxed{r_{xe} = \frac{Se}{S_x}} = \frac{1.59}{2.65} = 0.6$

$S^2_x = 7 \rightarrow S_x = \sqrt{7} = 2.65$

g) $\frac{S_e^2}{S_x^2} = \frac{2.52}{7} = 0.36$

Other way:

$$r_{xx'} = 1 - \frac{S_e^2}{S_x^2} \rightarrow 0.64 = 1 - \frac{S_e^2}{S_x^2} \rightarrow \frac{S_e^2}{S_x^2} = 1 - 0.64 = 0.36$$

Ex. 9

$S_x^2 = 25 \rightarrow S_x = \sqrt{25} = 5$

$\frac{S_v^2}{S_x^2} = 0.81 = r_{xx'}$

a) $S_e = S_x\sqrt{1 - r_{xx'}} = 5\sqrt{1 - 0.81} = 2.18$

b) $S_{vx} = S_e\sqrt{r_{xx'}} = 2.18\sqrt{0.81} = 2.18 \cdot 0.9 = 1.96$

c) $S_{ep} = S_e\sqrt{1 + r_{xx'}} = 2.18\sqrt{1 + 0.81} = 2.18 \cdot \sqrt{1.81} = 2.93$

Ex. 10

$r_{xx'} = 0.75$

$n = 0.5$

$$R_{xx'} = \frac{n \cdot r_{xx'}}{1 + (n-1)\, r_{xx'}} = \frac{0.5 \cdot 0.75}{1 + (0.5-1) \cdot 0.75} = 0.6$$

Ex. 11

$r_{xx'} = 0.70$

$R_{xx'} = 0.85$

$EI = 60$

$$n = \frac{R_{xx'}(1 - r_{xx'})}{r_{xx'}(1 - R_{xx'})} = \frac{0.85(1 - 0.70)}{0.70(1 - 0.85)} = \frac{0.255}{0.105} = 2.43$$

$$n = \frac{EF}{EI} \rightarrow 2.43 = \frac{EF}{60} \rightarrow 2.43 \cdot 60 = EF$$

$$145.80 = EF$$

$$146 \simeq EF$$

$Added = EF - EI = 146 - 60 = 86$

Ex. 12

$EI = 140$

$r_{xx'} = 0.98$

$R_{xx'} = 0.8$

$$n = \frac{R_{xx'}(1 - r_{xx'})}{r_{xx'}(1 - R_{xx'})} = \frac{0.8(1 - 0.98)}{0.98(1 - 0.8)} = 0.08$$

$$n = \frac{CF}{EI} \rightarrow 0.08 = \frac{EF}{140} \rightarrow 0.08 \cdot 140 = EF$$

$$11.2 = EF$$

$$11 = EF$$

$Remove = EI - EF = 140 - 11 = 129$

Ex. 13

$N = 150$

$S_1^2 = 49$

$r_{11} = 0.8$

$S_2^2 = 81$

$$r_{22} = 1 - \frac{S_1^2}{S_2^2}(1 - r_{11}) = 1 - \frac{49}{81}(1 - 0{,}8) = 0{,}88$$

- When the heterogeneity increases, the reliability coefficient also increases.

Ex. 14

X_1	X_2	$X_1 X_2$	X_1^2	X_2^2
5	8	40	25	64
7	15	105	49	225
9	15	135	81	225
10	20	200	100	400
5	7	35	25	49
7	12	84	49	144
5	5	25	25	25
6	8	48	36	64
2	4	8	4	16
1	0	0	1	0
57	94	680	395	1212

$$r_{x_1 x_2} = \frac{N\Sigma X_1 X_2 - \Sigma X_1 \Sigma X_2}{\sqrt{[N\Sigma X_1^2 - (\Sigma X_1)^2]}\ \sqrt{[N\Sigma X_2^2 - (\Sigma X_2)^2]}}$$

$$r_{x_1 x_2} = \frac{10 \cdot 680 - 57 \cdot 94}{\sqrt{[10 \cdot 395 - 57^2]}\ \sqrt{[10 \cdot 1212 - 94^2]}}$$

$$r_{x_1 x_2} = \frac{6800 - 5358}{\sqrt{[3950 - 3249]}\ \sqrt{[12120 - 8836]}}$$

$$r_{x_1 x_2} = \frac{1442}{\sqrt{701}\ \sqrt{3284}} = \frac{1442}{26{,}48 \cdot 57{,}31} =$$

$$= \frac{1442}{1517{,}57} = 0{,}95$$

Ex. 15

$S_V^2 = 144$

$S_e = 9 \longrightarrow S_e^2 = 81$

$$r_{xx'} = \frac{S_V^2}{S_X^2} = \frac{144}{225} = 0{,}64$$

$$S_X^2 = S_V^2 + S_e^2 = 144 + 81 = 225$$