

Homework (1)

1] Find the correlation coefficient $\rho(x, y)$

$x \backslash y$	-2	0	5	$P_x(x)$
1	0.15	0.25	0.2	0.6
3	0.2	0.05	0.15	0.4
$P_y(y)$	0.35	0.3	0.35	1

$$\rho(x, y) = \frac{\text{COV}(x, y)}{\sigma_x \sigma_y}$$

$$1] E(x) = 1(0.6) + 3(0.4) = 1.8$$

$$2] E(x^2) = 1^2(0.6) + 3^2(0.4) = 4.2$$

$$3] E(y) = -2(0.35) + 0 + 5(0.35) = 1.05$$

$$4] E(y^2) = (-2)^2(0.35) + 0 + 5^2(0.35) = 10.15$$

$$5] E(xy) = (1 \times -2)(0.15) + 0 + (1 \times 5)(0.2) + (-2 \times 3)(0.2) + 0 + (3 \times 3)(0.15) = 1.75$$

$$\sigma_x = \sqrt{E(x^2) - [E(x)]^2} = \sqrt{4.2 - (1.8)^2} = 0.979795$$

$$\sigma_y = \sqrt{E(y^2) - [E(y)]^2} = \sqrt{10.15 - (1.05)^2} = 3.0079$$

$$\text{COV}(x, y) = E(xy) - E(x)E(y) = 1.75 - (1.8)(1.05) = -0.14$$

$$\rho(x, y) = \frac{\text{COV}(x, y)}{\sigma_x \sigma_y} = \frac{-0.14}{(0.979795)(3.0079)} = \boxed{-0.0475}$$