

Linear Combinations of Normal Variables

1 Sums and Differences

$$\mu_{x+y} = \mu_x + \mu_y$$

$$\mu_{x-y} = \mu_x - \mu_y$$

$$\sigma_{x+y}^2 = \sigma_x^2 + \sigma_y^2$$

$$\sigma_{x-y}^2 = \sigma_x^2 + \sigma_y^2$$

2 Multiples

$$\mu_{ax+by} = a\mu_x + b\mu_y$$

$$\mu_{ax-by} = a\mu_x - b\mu_y$$

$$\sigma_{ax+by}^2 = a^2\sigma_x^2 + b^2\sigma_x^2$$

$$\sigma_{ax-by}^2 = a^2\sigma_x^2 + b^2\sigma_x^2$$

3 Addition vs Multiplication

$$E(X_1 + X_2) = E(2X_1)$$

However

$$Var(X_1 + X_2) \neq Var(2X_1)$$

$$Var(X_1 + X_2) = \sigma_1^2 + \sigma_1^2 = 2\sigma_1^2$$

$$Var(2X_1) = 4\sigma_1^2$$