Handout for Lecture 9

Distribution, Expectation, Variance

ECON 340: Economic Research Methods — Instructor: Div Bhagia

X is a random variable.

- Expectation of X, $\mu_X = E(X) = \sum_x xf(x)$
- Variance of X, $\sigma_X^2 = Var(X) = E[(X - \mu_X)^2] = \sum_x (x - \mu_X)^2 f(x)$
- Standard deviation of X, $\sigma_X = \sqrt{\sigma_X^2}$

If X is a random variable and $Y = a + bX$, then Y is also a random variable with

- $E(Y) = a + bE(X)$
- $Var(Y) = b^2 Var(X)$

You are at a fair and considering playing the following game — flip a coin, if you get heads, you gain \$10, else you lose \$10. Denote X as your winnings/loss from the game.

1. Find the expected value, variance, and standard deviation of X.

2. You look up and realize that you have to pay \$5 in order to play the game. So your actual winnings/loss from the game will be $Y = X - 5$. Find the expected value, variance, and standard deviation of Y.

3. You see another stall offering a lower stakes game — flip a coin, if you get heads, you gain \$5, else you lose \$5. Your winnings/loss from this game will be $Z = 0.5X$. Find the expected value, variance, and standard deviation of Z.