

0.1 Economics 6818 Quiz 6

Group quiz (groups of four)

1. Assume that x and y are both continuous random variables. Derive $\text{var}(x + y)$ as a function of $\text{var}(x)$, $\text{var}(y)$, and $\text{cov}(x, y)$. How does this simplify if x and y are independent?
2. Consider conditional expectations. Assume some joint density function $f(x, y)$, and some function of x and y , $g(x, y)$. Assume both x and y are continuous random variables. What is?

$$E[g(x, y) : X = x]$$

3. If x is a random variable with $\text{var}(x) = \sigma_x^2$, what is the variance of ax , where a is some parameter. What if $a = \frac{1}{n}$?
4. Can you prove that

$$\begin{aligned}\text{var}[X] &= E[(X - E[x])^2] \\ &= E[X^2] - (E[X])^2\end{aligned}$$

if $E[X^2]$ exists. If so, prove it. If true this formula gives us two ways to calculate a variance. This might come in handy.