

Econ 270 Homework 3

Expectation

The following pmf describes the distribution of weights of fresh black truffles in grams. Calculate the expected cost of a randomly selected black truffle if truffles cost \$100 per ounce (there are 28 grams in an ounce)

$$p(14) = .1, p(21) = .15, p(28) = .5, p(35) = .15, p(42) = .1$$

Suppose that $E[X] = 10$ and $E[Y] = -5$. Calculate $E[2X + 3Y]$

Book Questions:

3.31, 3.33, 4.15

Variance

Let X be a random variable with $E[X] = 1, \text{var}(X) = 1$. Let X_1, X_2, X_3 be independent random variable with the same distribution as X . Calculate $\text{var}(X_1 + X_2 + X_3)$ and $\text{var}(3X)$

The standard deviation of height in adult males is 3 inches. Calculate the variance of height in centimeters.

You are given that X and Y are independent with $\text{var}(X) = 1, \text{var}(Y) = 1$. Calculate $\text{var}(X - Y)$

You are given that $E[X] = 5, E[Y] = 10, \text{var}(X) = 2, \text{var}(Y) = 3, \text{cov}(X, Y) = -1$. Calculate $\text{var}(2X - 3Y)$

You are given the following joint probability mass function for x and y , $p(x, y)$: $p(0, 0) = .1, p(1, 0) = .3, p(0, 1) = .5, p(1, 1) = .1$. Calculate the following:

- $E[X], E[Y]$
- $E[X^2], E[Y^2]$
- $\text{var}(x), \text{var}(y)$
- $E[XY], \text{cov}(X, Y), \rho_{xy}$

[hard] The returns of a specific stock has variance of 9, while the returns on a bond has variance 4. The correlation coefficient between the two is -0.5. You own one unit of the stock. Calculate the number of bonds you must purchase to minimize your total portfolio variance

Book Questions:

3.34, 3.35, 3.43, 3.44, 4.16, 4.19a

The following are more abstract, but very useful going forward: 3.45, 3.46, 3.47

CDF

A distribution has CDF $F(x) = 1 - e^{-x}$. Calculate the median of X

A distribution has CDF $F(x) = 1 - (\frac{2}{x})^2$ for $x \geq 2$. Calculate the interquartile range

[moderately hard] X is a distribution with CDF $F(x) = x, 0 \leq x \leq 1$. Calculate the probability that the maximum from a sample of two from this distribution is at least 0.75, i.e. $P(\max(X_1, X_2) \geq .75)$

Book Questions:

3.37, 3.38

Normal Distribution

Book Questions:

4.1 (no need to draw a graph), 4.3, 4.5, 4.6, 4.7, 4.10, 4.37

Binomial Distribution

Book Questions:

4.17, 4.21, 4.22