Stat 134: Bivariate Normal Review

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Problem 1: Slices of a Normal Cake

Let X and Y be independent standard normal random variables.

a. Find $P(X > 0, Y > X)$

b. Find $P(X > 0, Y > \sqrt{3}X)$

c. Find $P(X > 0, Y > cX)$ for $c > 0$

Stat 140, HW11, Q6

Imagine the relevant volume under the joint density surface, like a slice of a bell-shaped cake.

Problem 2: Like Mother Like Daughter?

Heights of mothers and daughters in population follow a bivariate normal distribution with correlation 0.5. Both variables have mean 5′4″ and standard deviation 2″.

a. Of daughters with above average height, what percent are shorter than their mothers?

b. What percent of daughters are 3 inches taller than their mothers?

Variation of 6.5.2 in Pitman's Probability

Problem 3

Two random variables X and Y are bivariate normal with correlation 0.5. Their marginal distributions are $X \sim N(1,1)$ and $Y \sim N(3,4)$

a. Find $E(X|Y=6)$

b. Show X and $Y-X$ are independent.

What do we know about correlation and independence with bivariate normals?

Q7, Stat134, Fall 2015 Final

Problem 4

Suppose that W has normal (μ, σ^2) distribution. Given that $W = w$, suppose that Z has normal$(aw+b, \tau^2)$ distribution.

a. The joint distribution of W and Z is bivariate normal. Find its parameters.

b. What is the distribution of Z?

c. What is the conditional distribution of W given $Z = z$?

Hint: $E(E(Y|X)) = E(Y)$ and $E(X^2) = Var(X) + E^2(X)$

Ex 6.5.9 in Pitman's Probability