

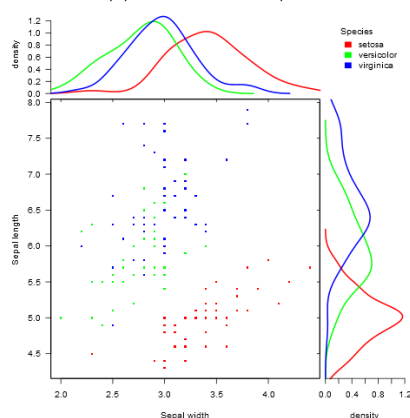
Economics 403A: Homework 2
Fall 2017, UCLA
Instructor: Dr. Rojas

Due Date: Oct 26, 2017

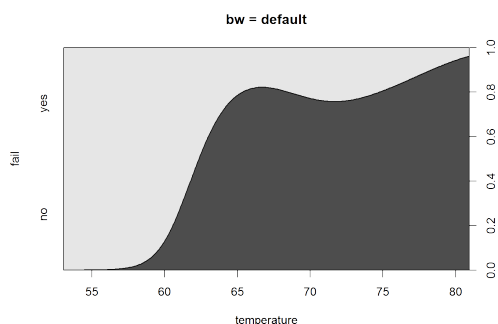
All problems require detailed worked out solutions to receive full credit. All problems are worth the same.

1. Using any economics and or financial data of choice with at least 3 related variables, generate the following plots along with their respective interpretations (included are samples of what they should look like):

- (a) Scatter plot with marginal densities. Hint: Use the `marginal_plot` function available at https://github.com/ChrKoenig/R.marginal_plot.



- (b) Conditional Distributions. Hint: Use the `cdplot` function from the ‘graphics’ package.



- (c) Hint: Use the `mvtnorm` function from the ‘mvtnorm’ package.

2. Let X and Y have the joint density $f(x, y) = cx(y - x)e^{-y}$, $0 \leq x \leq y < \infty$.

- (a) Find c
- (b) Find $f_{X|Y}(x|y)$ and $f_{Y|X}(y|x)$
- (c) Find $E(X|Y)$ and $E(Y|X)$

3. R Exercise: Plot a histogram of monthly returns of your favorite stock (use at least 10 years of data), and fit an appropriate distribution. Comment on your fit. Use this distribution to compute $P(r > 10\%)$, where r = return.
4. R Exercise: Let X have p.d.f $f(x) = 3x^2$, $0 < x < 1$. Find $P(0.20 \leq X \leq 0.50)$. Hint: Use the `integrate` function in R.
5. Suppose X and Y have joint density function

$$f(x, y) = c\sqrt{1 - x^2 - y^2}, \quad x^2 + y^2 \leq 1.$$

- (a) Find c and analytically and numerically (using R)
 - (b) Sketch the joint density function using R
 - (c) Find $P(X^2 + Y^2) \leq \frac{1}{2}$ analytically and numerically (using R).
 - (d) Find the marginal densities of X and Y . Are X and Y independent random variables?
 - (e) Find the conditional densities.
6. Suppose that on each play of a certain game a gambler is equally likely to win or to lose. Suppose that when he wins, his fortune is doubled, and that when he loses, his fortune is cut in half. If he begins playing with a given fortune c , what is the expected value of his fortune after n independent plays of the game?
 7. Let X and Y have a bivariate normal density with zero means, variances σ^2 , τ^2 , and correlation ρ . Find:
 - (a) $E(X | Y)$
 - (b) $\text{var}(X | Y)$
 - (c) $E(X | X + Y = z)$
 - (d) $\text{var}(X | X + Y = z)$
 8. Solve this problem in R with at least 10,000 samples. You can set it up as a simulation as well. If X and Y are i.i.d. standard normal distributions, find the value of $E[X^2 | (X + Y = 1)]$.