

Homework 9

1. You are planning on driving to Harrah's Cherokee Casino and Resort every Thursday night for the next year (52 weeks) to play American roulette. You plan to place a single \$100 bet on red, before you head to the nearby Ruth's Chris Steakhouse for a delicious steak dinner. If the roulette ball lands in a red pocket, you get \$200.¹ If the ball lands in a black or green pocket, you get nothing (\$0). Using simulation techniques, estimate your expected winnings after a year of gambling and steaks. Please report both a point estimate and a probability distribution of your expected winnings. What is the probability that you will make money after a year of gambling?
2. For Homework 7 you estimated and assessed the regression model defined by the following R code:

*lm(prestige ~ income + education + income * education)*

For this homework, I would like you to carefully assess the marginal effect of income on prestige.

- Use calculus to identify the predicted impact of a one unit change in income on occupational prestige.
- Assess whether this impact is statistically distinct from zero. Remember that the variance for an estimated marginal effect $\frac{\partial \hat{y}}{\partial x} = \hat{\beta}_x + \hat{\beta}_{xz}z$, where x and z are interacted independent variables, can be calculated using the following formula:

$$V\left(\frac{\partial \hat{y}}{\partial x}\right) = V(\hat{\beta}_x) + z^2 V(\hat{\beta}_{xz}) + 2zC(\hat{\beta}_x, \hat{\beta}_{xz})$$

Because the marginal effect of x depends on values of z, you will need to assess whether the marginal effect is significant across a range of values of z.

- Present a marginal effects plot to graphically show both the marginal effect of income on prestige and the statistical significance of this marginal effect.

¹If you need a introduction on how to play roulette, check this out:
<http://www.hollywoodcasinoaurora.com/Casino/Tables/>)