STA 372-6 Homework 5: Simulation

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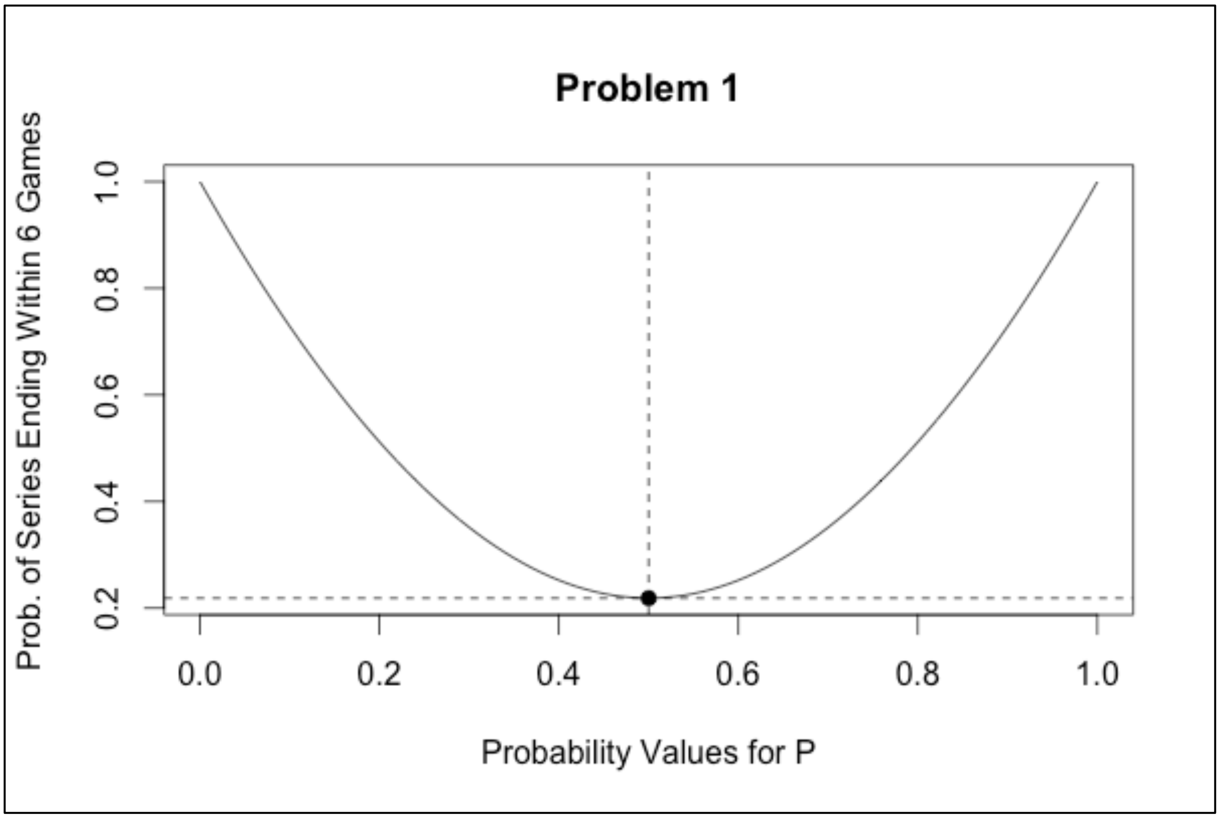
1. The following table shows the possible cases of the series ending before game 7 where p is the probability of team A winning a game:

	A wins	**B wins**
4 Games	p^4	$(1-p)^4$
5 Games	$p^4(1-p)$	$(1-p)^4 p$
6 Games	$p^4(1-p)^2$	$(1-p)^4 p^2$

The total probability of the series ending before the 7th game is the sum of these cases.

$$\boldsymbol{P} = 2p^6 - 6p^5 + 6p^4 - 2p^3 + 3p^2 - 3p + 1$$



Following the code in R, we see the following probability function over the range 0 to 1.
If A and B have equal probability of winning, that is p=0.5, then the probability of ending the game before the 7th is 0.21875. Intuitively, the likelihood of the series ending before the 7th game increases as either team becomes more favored to win.
These same results can be found using the method from class (see R code).

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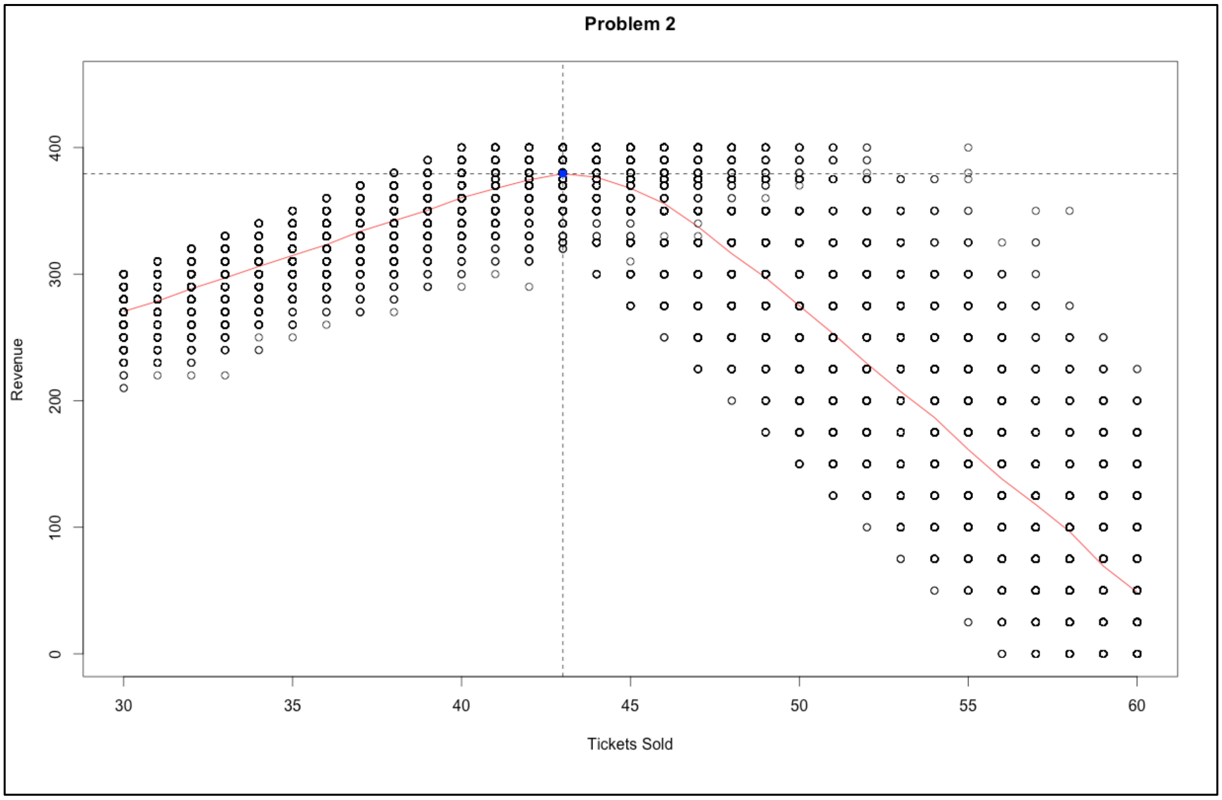
2. The simulation code in R shows the expected revenue of selling 30 to 60 tickets for the 40-person bus.



This shows revenues from the 1000 trials with 0.9 probability of a purchased ticket actually filling a seat. The averages of the revenues are plotted in red. Clearly the highest average revenue occurs at 43 tickets sold with an expected value of $379.32. However this value with vary slightly with each simulation.

3. The R code shows that this modified version of the Monty-Hall game is much harder to win. With 3 doors the probability of winning with switching is 2/3, but with 33 doors and 5 revealed by the host that likelihood drops to approximately 0.034. Though this is significantly smaller than 2/3, it is still greater, on average, than the alternative to not switching which has probability of approximately 0.03 of winning. Thus the player should still switch in this modified game.