Solving the Monty Hall Problem in R

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The Monty Hall problem

This classic probability puzzle is based loosely on Monty Hall's game show *Let's Make a Deal*. The problem as we know it now was made famous in 1990 as a reader's question to Marilyn vos Savant (of *Parade* magazine's "Ask Marilyn"). The reader framed the problem this way:

> Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, revealing a goat. He then says to you, "Do you want to pick door No. 2?" Is it to your advantage to switch your choice?

Marilyn's answer was simple: switch. Switching doubles the probability of winning the car: $Pr[car|switch] = 0.666$; $Pr[car|stay] = 0.333$. Her answer was not popular. The magazine received more than 10,000 letters insisting that vos Savant was wrong and a total fool for suggesting that the contestant switch. Marilyn's follow-up explanations and formal proofs were not enough to satisfy the most serious doubters. Notably, mathematician Paul Erös rejected Marilyn's answer until he was shown a computer simulation.

Your challenge

Write and execute a computer simulation to convince Marilyn's most skeptical readers that switching doors is the best solution to the Monty Hall problem. Code the routine using the R language. Then use `R Markdown` to communicate your findings by answering the questions below.

1. How did you program your simulation? Paste your well formatted code into your answers.
2. Present a table showing the number of simulated games won by the contestant who chose to switch and the number won by the contestant who stayed.
3. Present the same data above graphically (e.g., with a bar chart).
4. Are your findings consisting with Marilyn's arguments? Is it better to switch? Explain.

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