Statistics Project—Card Counting in 21

Background: In 1966 Edward O. Thorpe published his black jack strategy book titled Beat the Dealer. This book started a wave of card counters trying to beat the game of 21. The basic premise of the strategy is that knowing the balance of small cards versus face cards and aces determines the favorability of the deck for the player. When the deck is favorable the player increases his/her bet. When the deck is unfavorable, the player decreases his/her bet. This system is reputed to work better for a one deck game than for a multi-deck game. This project compares the distribution of favorable hands for the one deck verses the multi-deck game.

Favorability Measure: Let F be the favorability measure. Consider that the deck consists of four types of cards: low cards (2-6), middle cards (7-9), tens (10,J,Q,K), and aces. As a general rule the more aces and 10's in the deck the more favorable the deck is for the player. The favorability measure is then computed based on the cards seen (i.e. NOT remaining in the deck) as F = (low-tens-aces)/decks remaining. Thus the initial deck has F=0. If after the first hand in a one deck game the player has seen 2,2,4,6,7,8 the F starting the second hand is (4 - 0) / (46/52) = 4.52. Whereas after the same cards in a four deck game the F is (4 - 0) / (46/52 + 3) = 1.03.

Data Collection Plan: For both a one deck and a four deck game play n >100 hands of blackjack using a simple consistent strategy. Record the favorability measure at the beginning of each hand. Have the dealer reshuffle when there are less than 10 cards remaining in the one deck game and less than 20 cards in the four deck game. You should end up with two groups of n numbers, one for the one deck game and one for the four deck game.

The Result Estimator Variable: The essence of this system is that the player will be able to bet more when he/she is more likely to win (high F) and less when he/she is likely to lose (low F). Thus to compare the one deck game with the four deck game we could compute sum(F_iW_i) where F_i is the F score starting hand i and W_i is the wager placed on hand i. To keep things simple stick to three levels of wagers: 1, 2, and 4, and set cutoff F scores to trigger the wager levels. To determine the cutoff scores, play 20 hands from a one deck game and set the cutoffs at 1 and Q3..

Formal Procedures Statement: Write down the procedures for your study and have your instructor critique these procedures.

Collect Data and Compute Statistics: Do both tests on your subjects. You should end up with a table of test results and a table of statistics based on the test results.

Penultimate Meeting: Present your results. If there are problems with the testing procedures resolve them and run the tests again. Discuss what conclusions are justified. Discuss every section of the project report and what your report should have for each section.

Write Project Report Draft: Write your report based on the discussions with your instructor.

Final Meeting: Present your draft report to the instructor. Use your instructor's critique to write the final report.

Write the Project Report.

Additional Project Guidelines:
Due Dates
Report Format
Report Writing Cautions.