Simulation of Card Counting Strategy in Black Jack

By Ryan Heilman

Problem

The problem of "beating the house", has long fascinated gamblers and laymen alike. Thanks to movies and television, the most popular strategy is that of counting cards, a method used in the popular casino game, Black Jack. While most believe the process to be that of which only geniuses can take to task, it is actually quite simple. The most popular system today is the "Hi-Lo" strategy, invented by mathematician, Harry Dubner. "Hi-Lo" is a simple plus minus strategy that assigns a value to each card (2-6 = +1, 7-9 = 0, and 10-A = -1). A player would start the count at zero and then add the value of each card dealt to the running count. This running count is then divided by the number of decks remaining to get what is known as the "true count." The game is still played with basic Black Jack strategy, but the amount the player bets is governed by the count; a low count would mean one wants to bet small, while a high count signifies a larger bet should be placed.

With the mathematics on our side, the question becomes, "Is this something I could go to Vegas for a weekend and win hundreds of thousands of dollars with?" or "Would I be lucky to make 100,000 dollars in a year doing this?" Regardless of which outcome is possible, the underlying problems to be solved are, how much should at bet and at what count, what is the minimum bankroll one should sit at a table with, and most importantly; how often will I win.

Approach

First off, a basic dealing system will need to be put into place by defining a function that will deal two cards to each player at the table and subtract these cards from the list. The "value" of every card dealt will then be added to the running count. The most difficult part will then be to add and subtract to the bankroll of the player based on the basic rules of Black Jack, when to hit, when to stay and who actually wins the hand.

The simulations variables will be the initial bankroll and values of how much is bet depending on the count. The simulation will be stopped when the bankroll either reaches a predetermined "winning" amount, such as 40,000 dollars, or when the bankroll has been depleted to zero. "Successful" variables will be determined by how often these changes reach the predetermined "winning" bankroll. From there, multiple factors, given in the objectives section, will be taken into account to decide how effective each change of variable is.

Objectives

- Find how often each variable reaches "winning" bankroll over complete depletion.
- Determine optimal betting pattern based off of running count.
- How many hands must be played to reach "winning" bankroll?
- Find minimum initial bankroll to reach "winning" bankroll.