Blackjack Analysis

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Abstract.
The purpose of the experiment is to compare the efficacy of two distinct blackjack strategies. The strategies are tested for 10,000 rounds of blackjack, 10 times each. The averages and stand deviations are calculated for both strategies across all trials.

1 Introduction

1.1 Problem

The problem to solve is to find the blackjack strategy that yields the highest average number of chips after 10 trials of 10,000 rounds of blackjack.

1.2 Strategy 1

Strategy 1 is dictated by the following table. Where the algorithm hits on any hand score less than 5. The algorithm bets 10 chips each round.

YOUR HAND	DEALER FIRST CARD									
	2	3	4	5	6	7	8	9	10	A
H 18+	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand
H 17	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand
H 16	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 15	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 14	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 13	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 12	HIT	HIT	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 11	Double	Double	Double	Double	Double	Double	Double	Double	Double	HIT
H 10	Double	Double	Double	Double	Double	Double	Double	Double	HIT	HIT
H 9	HIT	Double	Double	Double	Double	HIT	HIT	HIT	HIT	HIT
H 8	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT
H 7	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT
H 6	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT
H 5	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT	HIT

1.3 Strategy 2

Strategy 2 is dictated by the following table. Where the algorithm stays on any hand score less than 9. The algorithm bets 10 chips each round.

YOUR HAND	DEALER FIRST CARD									
	2	3	4	5	6	7	8	9	10	A
H 18+	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand
H 17	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand	Stand
H 16	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 15	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 14	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 13	Stand	Stand	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 12	HIT	HIT	Stand	Stand	Stand	HIT	HIT	HIT	HIT	HIT
H 11	Double	Double	Double	Double	Double	Double	Double	Double	Double	HIT
H 10	Double	Double	Double	Double	Double	Double	Double	Double	HIT	HIT
H 9	HIT	Double	Double	Double	Double	HIT	HIT	HIT	HIT	HIT

2 Methods

Each strategy is made to play 10,000 rounds of blackjack for 10 trials. The algorithm is given 1,000 chips to gamble with. The total amount of chips won (plus the initial 1,000 chips) is recorded each trial. The averages and standard deviations are computed at the end of the experiment. The strategy that wins the most chips on average is deemed the more effective algorithm.

Number of Trials per Strategy

	Strategy 1	**Strategy 2**
# of Trials	10	10

The average chip total after the ten rounds for each algorithm was calculated using the below formula. Where x_n is the chip total for trial n after 10,000 rounds, N is the total number of trials and A is the average chip total.

$$\mathrm{A} = \frac{\sum_{n=1}^{N} x_n}{N}$$

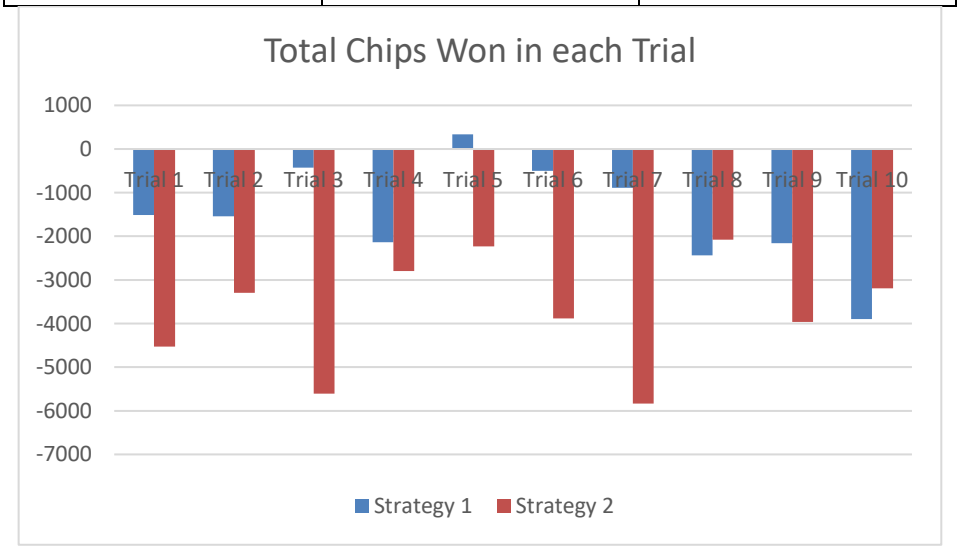
The standard deviation of each algorithm was calculated using the formula below. Where A is the average chip total for a particular strategy, x_n is the chip total for trial n, N is the total number of trials, and s is the standard deviation of a particular strategy.

$$s = \sqrt{\frac{\sum_{n=1}^{N}(A - x_n)^2}{N - 1}}$$

3 Results

Total Chips Won in each Trial

	Strategy 1	Strategy 2
Trial 1	-1515	-4530
Trial 2	-1545	-3295
Trial 3	-425	-5605
Trial 4	-2140	-2795
Trial 5	335	-2235
Trial 6	-500	-3880
Trial 7	-890	-5835
Trial 8	-2440	-2080
Trial 9	-2155	-3960
Trial 10	-3900	-3190
Average	-1518	-3741
Standard Deviation	1219	1224



4 Conclusion

According to the definition of “more effective” discussed in Section 2, Strategy 1 is the more effective algorithm. This was the expected result, as Strategy 1 follows the basic blackjack strategy exactly. However, both strategies averaged a negative total of chips and may be a result of incorrect implementation of the strategy.

Nonetheless, it can be reasonably deduced that Strategy 1 is much more effective than Strategy 2 such that the average chip Total for Strategy 1 was 2,223 chips more than that of Strategy 2.