

Blackjack Strategy Simulation Report – Made by Adityavardhan Iyengar

Overview

This document summarizes the results of Monte Carlo simulations for various blackjack strategies across 10,000 games each. The objective is to analyze how different betting and playing strategies impact the player's expected return (EV), win percentage, and overall bankroll.

1. Naive Playing Strategies

1.1 Random Play (Hit or Stand at Random)

Results:

- Player Wins: 4054 (40.54%)
 - Dealer Wins: 4924 (49.24%)
 - Pushes: 1022 (10.22%)
 - Poor performance with no strategic base
-

1.2 Hit if < 17 , else Stand

Results:

- Player Wins: 4011 (40.11%)
 - Dealer Wins: 4875 (48.75%)
 - Pushes: 1114 (11.14%)
 - Net Return: -864.00 units
 - EV per game: -0.0864 units
 - Expect to lose 0.08 per 1 unit bet
-

1.3 Basic Heuristic Rule

If value ≤ 11 : Hit

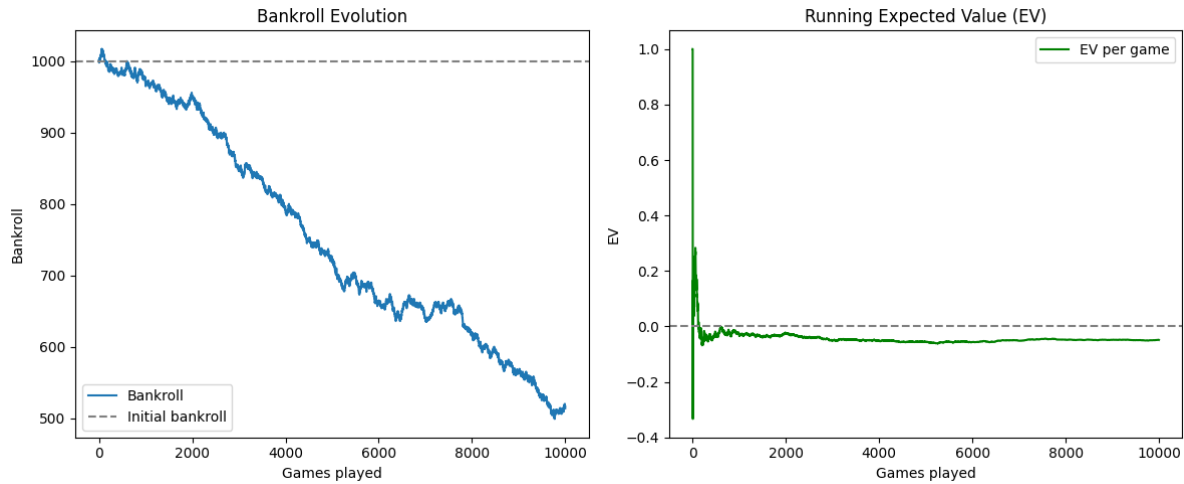
If $12 \leq \text{value} \leq 16$ and dealer ≥ 7 : Hit

Else: Stand

Results:

- Player Wins: 4279 (42.79%)
- Dealer Wins: 4765 (47.65%)

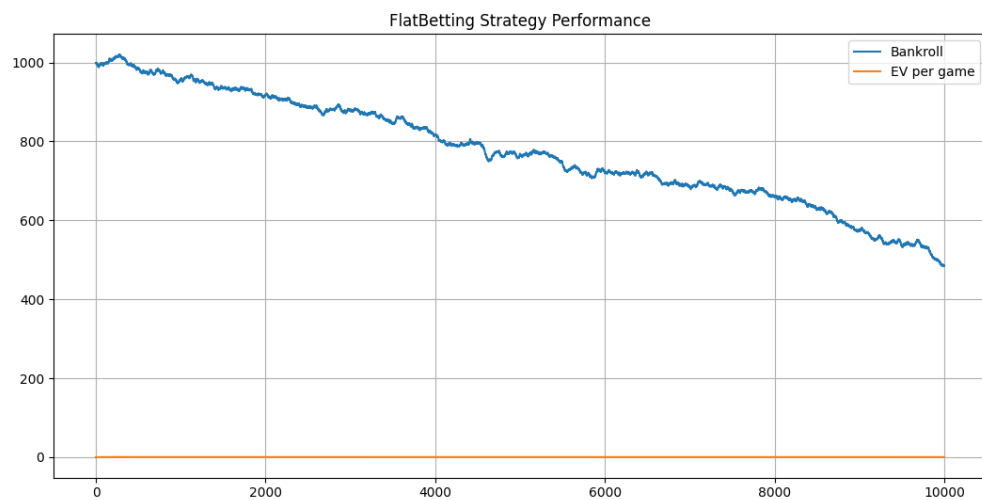
- Pushes: 956 (9.56%)
- ↑ Net Return: -486.00 units
- ↑ EV per game: -0.0486 units
- Better than previous naive methods



2. Betting Strategy Simulations

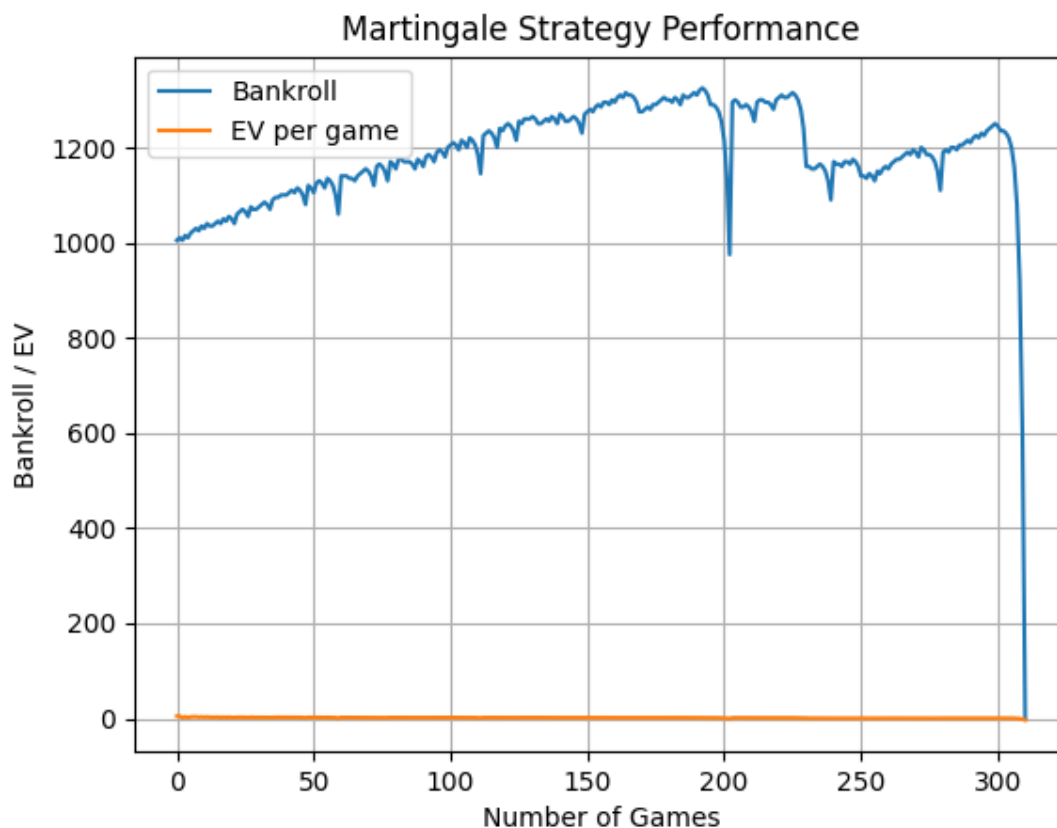
2.1 Flat Betting

- Bet same amount every round
- Player Wins: 4288 (42.88%)
- Dealer Wins: 4803 (48.03%)
- Pushes: 909 (9.09%)
- Net Return: -515 units
- EV per game: -0.0515 units



2.2 Martingale

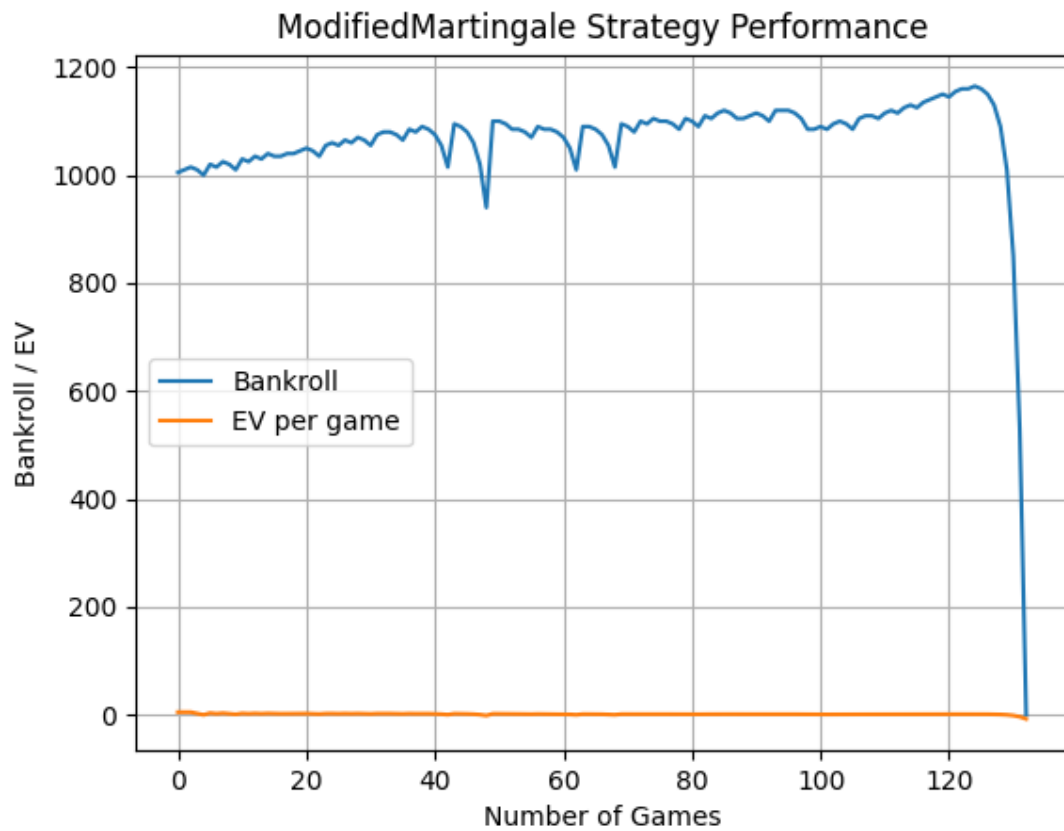
- Double bet after loss **Results:**
- Games Played: 311
- Player Wins: 125 (40.19%)
- Dealer Wins: 150 (48.23%)
- Pushes: 36 (11.58%)
- Net Return: -1000 units
- EV per game: -3.2154 units
- Final Bankroll: 0 (bankruptcy)



2.3 Modified Martingale

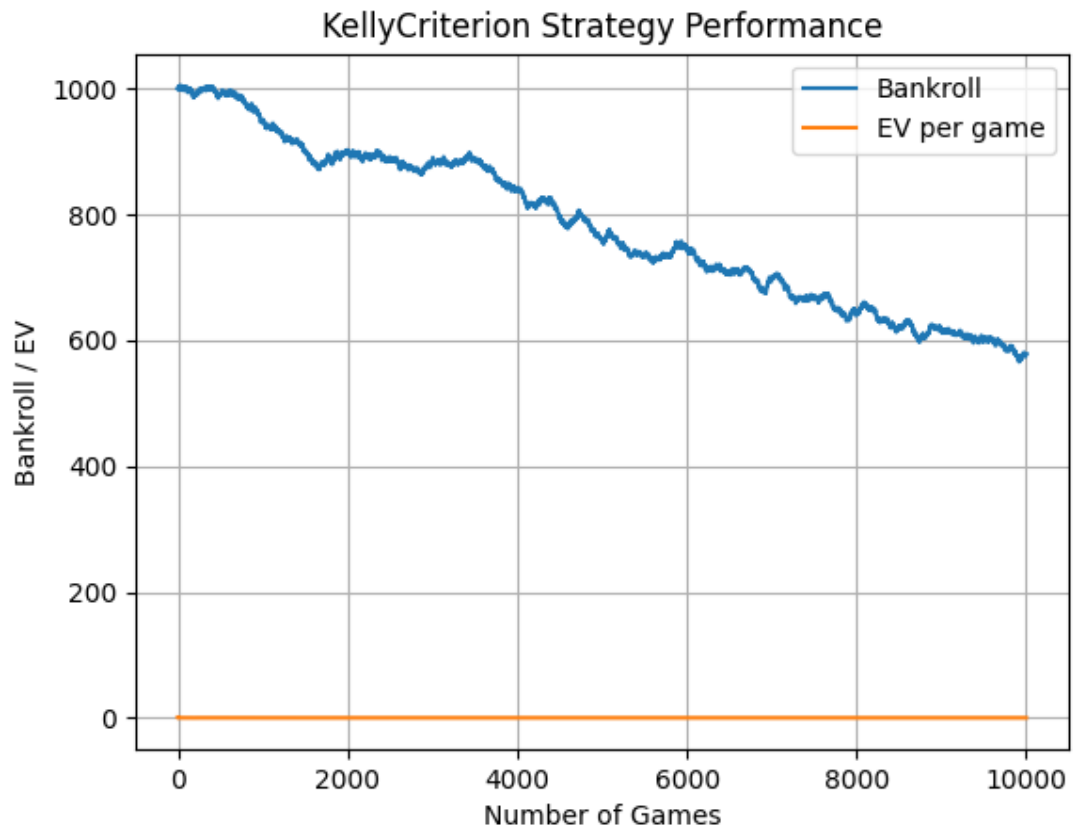
- Stop after gaining 1 unit, then reset **Results:**
- Player Wins: 49 (36.84%)
- Dealer Wins: 70 (52.63%)
- Pushes: 14 (10.53%)
- Net Return: -1000 units

- EV per game: -7.5188 units
- Final Bankroll: 0



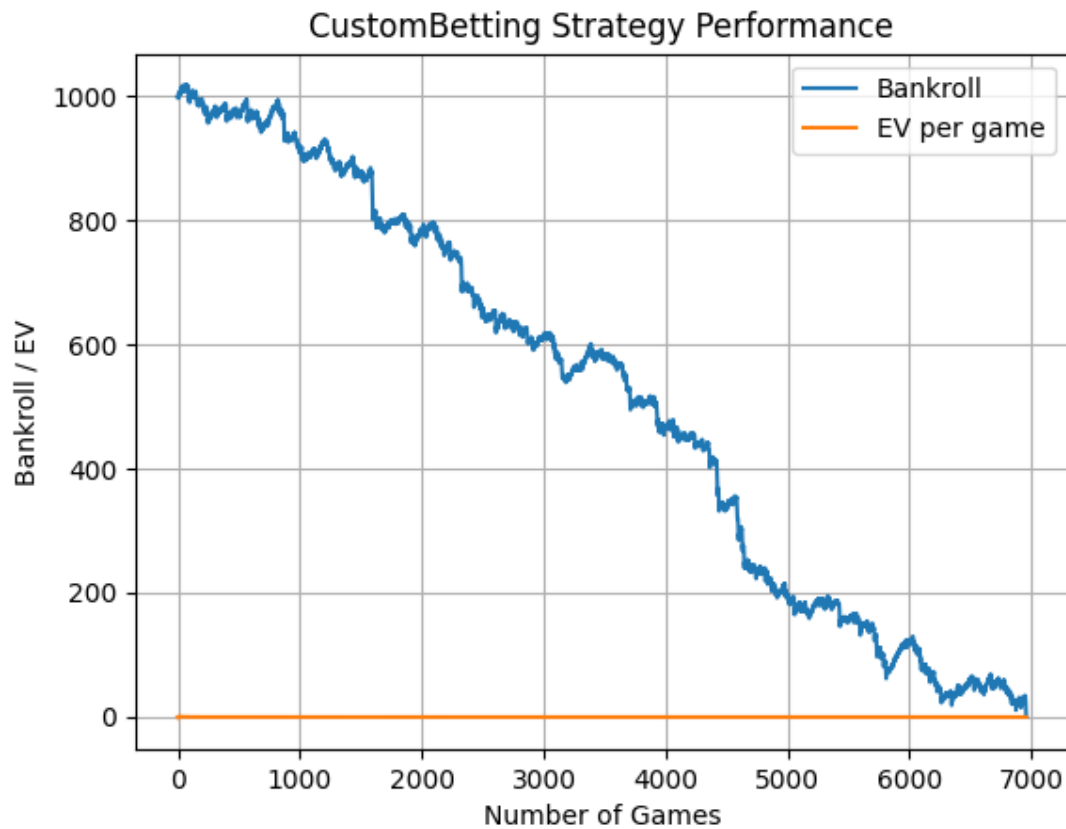
2.4 Kelly Criterion

- Bet size is a % of bankroll based on perceived edge **Results:**
- Player Wins: 4324 (43.24%)
- Dealer Wins: 4745 (47.45%)
- Pushes: 931 (9.31%)
- Net Return: -421 units
- EV per game: -0.0421 units
- Slightly better bankroll preservation



2.5 Custom Betting

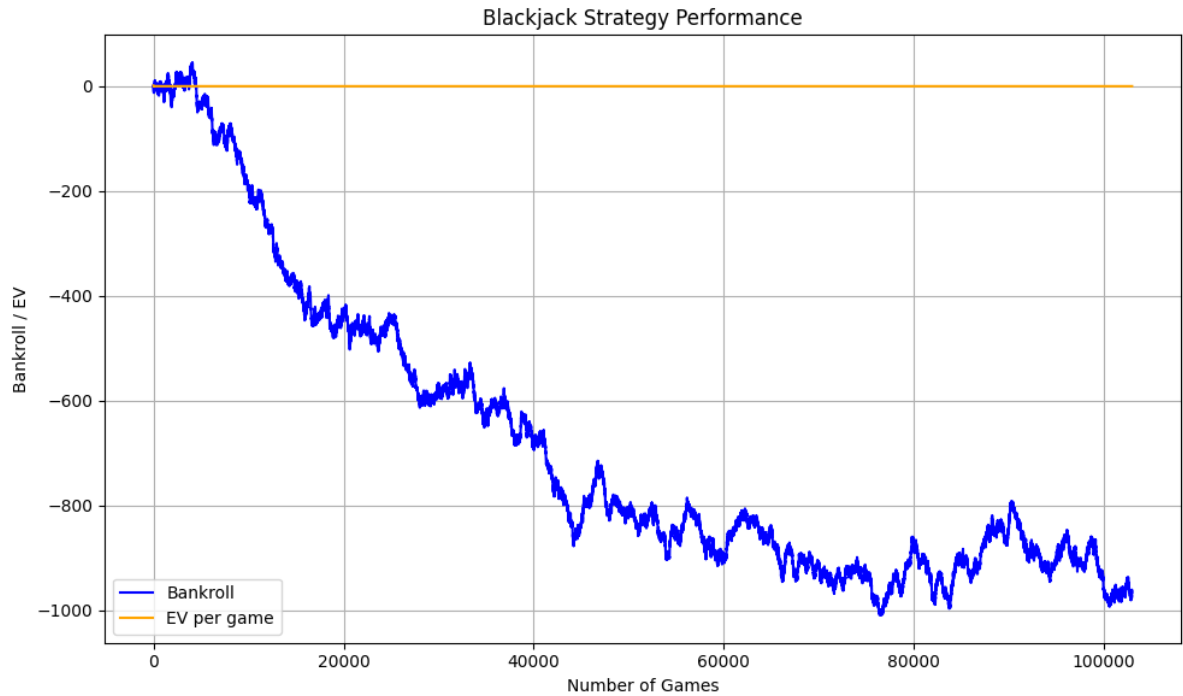
- Increase bet after each loss by 1 unit **Results:**
- Player Wins: 2947 (42.35%)
- Dealer Wins: 3394 (48.78%)
- Pushes: 617 (8.87%)
- Net Return: -1000 units
- EV per game: -0.1437 units
- Final Bankroll: 0



3. Optimal Play Strategy

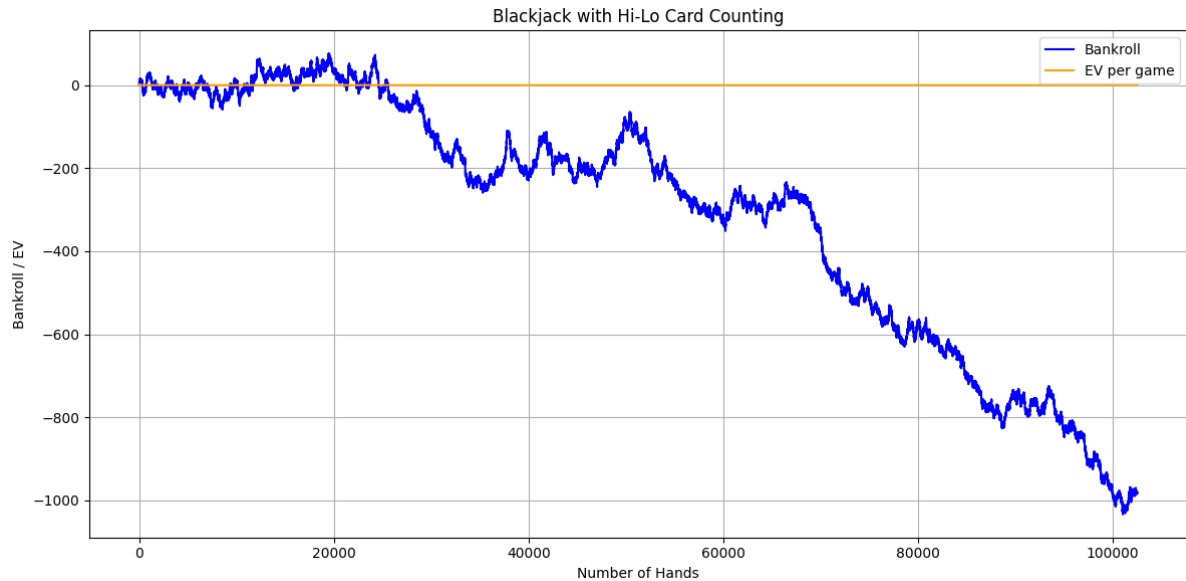
3.1 Basic Strategy

- Uses blackjack optimal decision chart **Results:**
- Wins: 43984 (42.73%)
- Losses: 50613 (49.17%)
- Pushes: 8334 (8.10%)
- Net Return: -966.00 units
- EV per game: -0.0094 units
- Std Dev of Bankroll: 282.77 units



3.2 Hi-Lo Card Counting

- Adjust bet and decisions using running count **Results:**
- Wins: 44071 (42.99%)
- Losses: 50469 (49.24%)
- Pushes: 7966 (7.77%)
- ↑ Net Return: -982.50 units
- EV per game: -0.0096 units
- ROI per 100 hands: -0.96 units



4. Conclusion

- Basic Strategy minimizes expected loss to **~0.009 units per game**
- Naive strategies lead to high loss per game
- Martingale and modified martingale fail due to high drawdowns and eventual bankruptcy
- Kelly is better but still negative EV due to house edge
- Hi-Lo counting performs similarly to basic due to cut-card (penetration) reset

5. Visualization

- Each simulation produced a **graph** of:
 - Bankroll over time
 - Expected Value (EV) over time

End of Report