Modeling a
Chance at
Blackjack!
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Modeling a Chance at Blackjack

Introduction:

The main problem with gambling: losing lots of money. Gambling is exciting and deceiving. We see the big sign display million dollar jackpot rewards. That possibility to win big keeps us at the tables and on the slots. But more often than not, we end up leaving with less than we brought. What if you knew what would happen each night before spending a penny? It would solve many people's problems. I plan to simulate such an event, playing a game with some of the best odds anyone can find in a casino, Blackjack.

It is said that the game can be beaten, and some of the best card counters are proof of this. *Blackjack: Play Like the Pros* written by John Bukofsky, a man banned from all casinos in Las Vegas, estimates that a proficient card counter can gain a 51% chance of beating the house. This essentially means that a card counter, in the long run, will never lose money! Amazing. Such information is exciting, and has inspired me to model my chance at the game.

Formulation:

OVERVIEW

What would happen if I walked into a casino and played 500 hands of blackjack, and how does that compare to some of the world's best blackjack players? I coded a blackjack simulator that will tally my wins, losses, and ties. I will analyze this data and compare it to winning percentages and the potential gain of a card counter. Everyone wants to know how they would fare at the tables, and, for me, it's time to find out. Wish me luck!

Note that basic strategists are not beginners. They are professional blackjack players with the best of strategy that doesn't include card counting.
BLACKJACK SIMULATION

I will play 2,500 hands of blackjack on my simulator with my best abilities. The simulator keeps track of wins and losses, so I will be able to calculate my exact win percentage using the following formula.

\[ \text{Winning \%} = \frac{\text{Total Wins}}{\text{Total Hands} - \text{Total Ties}} \]

Note that I will take pushes out of the equation because nothing results from a push; the player is simply returned their original bet.

Following my simulation, I will try a few other strategies, calculate their winning percentages, and compare them to my base strategy. I will do this in hopes of finding a strategy comparable to the 50%+ win rates of the world’s best (assuming my strategy isn’t).

ASSUMPTIONS

For consistency, I have to set some Blackjack rules that often vary in casinos. The dealer will play with one deck and shuffle after every five hands. The player may only split once and cannot double down following a split. Ties don’t count against the win percentage. Betting is assumed to be constant with $10 per hand and double downs will result in a doubled bet of $20. Now that the formula is outlined and the guidelines are set it’s time to run the simulations!

Results:

WHAT I FOUND

After playing 2,500 hands of blackjack (in intervals of 500) I am sick of the game, and my results aren’t satisfying either:

<table>
<thead>
<tr>
<th>Me</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
<th>WIN %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wins</td>
<td>205</td>
<td>216</td>
<td>199</td>
<td>210</td>
<td>220</td>
<td>1050</td>
<td>45.82</td>
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<tr>
<td>Losses</td>
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<td>248</td>
<td>274</td>
<td>243</td>
<td>232</td>
<td>1243</td>
<td></td>
</tr>
<tr>
<td>Push</td>
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<td>36</td>
<td>27</td>
<td>47</td>
<td>48</td>
<td>207</td>
<td></td>
</tr>
<tr>
<td>Bust</td>
<td>105</td>
<td>137</td>
<td>133</td>
<td>120</td>
<td>101</td>
<td>596</td>
<td></td>
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<tr>
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<td>22</td>
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<tr>
<td>wBJ</td>
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<td>31</td>
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<tr>
<td>IBJ</td>
<td>11</td>
<td>27</td>
<td>29</td>
<td>13</td>
<td>21</td>
<td>101</td>
<td></td>
</tr>
</tbody>
</table>

My skill in blackjack doesn’t match up with the best card players, and these results prove that. I’m about five percent behind the best.
MONEY LOSS

So how much money will I lose? As I mentioned, I will assume that I bet $10 per hand. My double down and blackjack win/loss rates are assumed to be the same as those found in my simulation, as well.

Spending $1,000 on blackjack, I would lose $50.76

$500, I would lose $28.80.

After 2,500 hands, I lost $1,440. Whereas a basic strategist would break even and a card counter would gain a small amount. The general trend seen here: the more I spend, the more hands I play, the more money I will lose. I might get lucky with a few hands, but long term blackjack would not be wise for me.

OTHER STRATEGIES

We can see that my strategy is not going to win me any money, so I want to analyze some other strategies. I'm hoping that I can find a strategy that is better than mine, and maybe even close to 50%. After looking at my results table, I notice that almost half of my losses are due to a bust. It seems logical to think that eliminating all busts will result in fewer losses. I based some strategies off of this idea. Let's take a look...

- Stand = always stand, no matter the hand
- Hit to 11 = only hit to a value of 11
- Dealer = hit to soft 17
Eliminating all busts, didn’t help my win percentage at all, in fact it made it worse. This is because I was losing to dealer hands with higher values. Avoiding busts is not the way to go.

I also incorporated a strategy where I hit to soft 17 (just like a dealer would). In essence, I’m playing exactly like the dealer would. This strategy actually improves my win percentage to about 48%, and inspires me to try similar strategies.

I tried hitting to 11, with subpar results. I will try hitting to 12, then 13, then 14, and so on, all the way up to 21 where I will only stop hitting on a 21 or bust. This allows me to test and compare both the always stand and always hit extremes, as well as everything in between to find the best generic strategy out there!

After 2,500 hands with each strategy...

![Win Percentages Graph](image)

The results are less than surprising. This graph shows why dealers are made to hit up to soft 17. It’s the best generic strategy out there, and unfortunately, the only strategy better than my base strategy.

Though none of these strategies are practical to use (boring and generic), one can extract some information from this graph to better understand the game of blackjack. It’s generally better to hit when holding a value of 16 or lower. Hitting on higher values than 17 greatly reduces the chance at victory. Also, standing early is not necessarily better than hitting to higher values of 16 or 17 even with the potential to bust.

THE BOTTOM LINE

After 2,500 hands on the blackjack simulator, I found my win percentage to be about 45%. So in the short term Blackjack is okay for me to play and I may get lucky, but I have to be careful because
eventually my good fortune will run out and I will start to lose money. If I want to see better results, I should hit on values less than 17.

Discussion:

After many, many simulations, I think it’s safe to say that I’m not the best blackjack player, and that I shouldn’t play too often. If I had more time, I would have incorporated betting into my simulator. It would have made calculations with money loss/gain much easier. I also would have analyzed more strategies like double down every time. I would have also looked at rule variations, like playing with multiple decks because they affect winning chances.

Conclusion:

The results are in. I am not a Blackjack pro, and if I play the game, I will probably end up losing money. If I ever get ahead, I should probably quit because my luck will run out! 2,500 hands of blackjack map me a 45% chance of victory.

In an effort to better my chances, I analyzed a number of different strategies. Although I wasn’t able to find a strategy as good as card counting professionals, I did find some useful information about Blackjack. Hitting to 17 is the best strategy in any general situation. Card value takes priority over bust potential until that value reaches 17. From now on, if I ever doubt my next action in a hand, I will hit to 17 because I’ve shown it wins 47-48% of the time (better than my strategy level at 45%).

After modeling the game of Blackjack, the best pointer I can give players: When in doubt, hit to soft 17!

It saddens me to admit that I won’t be spending large amounts of time at the blackjack tables when I turn 21 next week, but at least I know now before losing all my money.