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Research on the Analysing the Winning Possibility in Blackjack Gambling Game

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Abstract: In a society where everything depends on money, money becomes a requirement of life. People type on computers, wash dishes, and even post videos online, all to make money. This would be considered as "low risk, low reward". Conversely, gambling is a "high risk, high award" way of gaining money. People tend to gamble for a faster way of gaining money. "Blackjack" in this example, is a poker card game that is very popular among gamblers. It is proven that it is unreasonable to Gamble since RTP proves it and house-edges that the game itself is not profitable. All in all, whether players are gambling for fun or profit, players should not gamble. Addiction is more scary than losing money. The best way to prevent this is not to gamble, which is straightforward. There are also some ethical and illegal moves by the gambling district, like luring underaged audiences into gambling or making advertisements targeted to lower-aged audiences to encourage them to gamble.

Keywords: winning possibility, blackjack gambling game, RTP

1. Introduction

1.1. Research Background

In a society where everything depends on money, money becomes a requirement of life. People type on computers, wash dishes, and even post videos online, all to make money. This would be considered as "low risk, low reward". Conversely, gambling is a "high risk, high award" way of gaining money. Players do not need any skill or education certificate; it also does not require labor. However, risk exists. Why is gambling important, players may ask? It is approximately 0.56% of the world's GDP. This doesn't seem much, but if it's put in numbers, it would be 0.54 trillion USD, which is a lot. It is also shown that 20% of the world's population has gambled before. On the negative side, 6% of college students have serious gambling problems, and more than 2/3rd of gamblers engages in gambling-related criminal activities [1]. This topic is interesting because "gambling" is like online cocaine. Gamblers are losing millions and millions of dollars every day while gambling providers are making millions and millions of dollars every day; why is this happening, and is gambling rigged?

1.2. Literature Review

Gambling is an ancient human activity found in almost all cultures and most parts of the world [2]. This could date back to 2300 BC when the first known record of gambling started. This may not be shocking to some, but if players think this through, people started gambling approximately 4300 years

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ago. Sure, it was a concept of people taking risks in losing/winning with probably no consequences, but it was still a shockingly long time ago. This was before any sort of poker, roulette, or any of these recent gambling existed. The conception of winning with the consequences of losing something started way back in humanity, which could be why gambling is so popular nowadays. Gambling is accepted and legalized in most countries and cultures. In some countries, it is a national pastime. However, "problem gambling" is a rising issue in all gambling-legal countries; this is the concept of degenerate gambling, in other words, gambling more when a player loses. It is found that in ALL gambling-legalized countries, PG exists [3]. Some propose that PG only exists in specific ethnic groups and countries, but this was later denied by - Blaszczynski et al., 1998, GAMECS Project, etc. These studies show that PG exists in every culture, with gambling allowed. There isn't any correlation between cultures, countries where the gambler is in, or the ethnicity of the gambler to PG. It exists everywhere.

Most researchers interpret gambling by examining or analyzing gambling related to mental illness or other psychological factors, while the lesser part of the researchers research the consequences of gambling. This essay will focus on the theoretical and mathematical interpretations of gambling, using statistics and facts to explain the "gamblers never win" Phenomenon.

1.3. Research Framework

The legendary poker game "blackjack" is one of the most popular gambling games that ever existed, and this would be focused on blackjack. To start, explaining what blackjack is would be a good approach; by explaining how the game works, people tend to understand better the differences between winning/losing. After the explanation, listing some winning and losing conditions would help stabilize the audience's understanding. After that, the mathematical part and formulas come into play, as well as the explanation of "RTP", house edges, and the correct play out of the book. At last, this paper will give a brief conclusion on whether one should play gamble. Is gambling rigged? And why gambling eventually leads to a loss in money.

2. Case Description

Blackjack can be traced back to the early 17 century and is still considered a very popular gambling game in the 21st century [4]. The game itself is relatively complicated, with many decisions to make. The game starts by randomly shuffling 4-8 full sets of cards, depending on which provider's blackjack player is playing. There is the dealer and the player. There are 6 player seats and one dealer, no matter the amounts of players present. The one with the bigger number of points wins, and the one with the larger amount of points wins the one with the smaller amount. From 2 to 10, everything will be the same, but JQK doesn't equal 11, 12, and 13. Instead, they will all be just 10. The Ace could be either 1 or 11. The maximum number of "points" a player can get is 21. Anything more than 21 would be considered a bust, and the player loses all player bidding instantly. The game starts with the dealer having 2 cards randomly picked from the pile, and the dealer shows one of the cards and hides the other. On the other hand, the player gets 2 cards as well, but both cards would be revealed to everyone. The player can now make a few decisions: hit, stand, or double down. Hit is by drawing another card and adding the point on the preexisting 2 cards, stand is doing nothing, and double down is the same as hit, but the player's bid now multiplies by 2, making the player lose or win more. The player can hit and stand or hit and hit. The amount of hits the player gets is unlimited. However, the player cannot double down after hitting or hit after standing. The biggest score a player can score is 21; anything above that will result in a bust, meaning that the player loses all player bidding. If a player somehow got a 21 score, they will immediately be paid 1.5x the amount the player bid, called a "blackjack". If the player normally wins the game, the dealer busts, the dealer loses, and the player

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gets paid 2x the amount the player bid. And if the player and the dealer have equal points, it is called a push, where the player gets the player bid back and doesn't win anything or lose anything. The player could do this, while dealers have a specific set of rules they have to follow. In some casinos, This could continue hitting until 16. In contrast, in other casinos, it could continue hitting until 17. In this little example, it is very obvious that continuing to hit until 17 is the better place to go since the RTP is higher. This is because the player has 1 more card that the dealer can bust, making the player's chances of winning much bigger. If the dealer gets an ace on the starting hand, players can do insurance, betting side bets on the dealer, not the player. RTP, which stands for return to player, is a number between 0-100; the larger it is, the more the gambler benefits. If it's 99, it means that when players gamble 100 USD, they would get 99 USD. But obviously, this is just a theory; the player could gamble 1 million USD and get 15 million USD at the end of the day, or the player could get 0 USD since the player's lost it all. Normally, for online casinos, above 96.5 RTP would be viable. House edge is just 100-RTP; the lower it is, the better it is for the gambler. Discussion about this topic of blackjack will be done later on. Is blackjack rigged? Should players gamble? What is the best strategy? These questions will be answered shortly.

3. Analysis of the Problem

First, it is important to understand that blackjack is a customizable game; every provider can make up the payoffs. For example, some casinos use 6 decks at every table, and some use 8 decks at every table. Some pay 1.5x the original bet for blackjack, and some pay 1.25x the original bet. These factors can heavily affect how much the RTP and house edge is on blackjack. First, as said above, it is important to acknowledge that some preset factors already affect the RTP and house edge. About shuffled decks, it is obvious that 1 full deck is the best for the player. This is because the player can count the cards, thus calculating a reasonable play. This, however, is not the case in most casinos. Most casinos use 6-8 piles of deck in a single shuffle. This decreases the counting card's efficiency and allows players to actively play more of the game (since players need to count more cards if they want to "win more"). For insurance, it is taking the bet on blackjack on the dealer's side when the dealer gets an ace on the starting hand, drastically increasing the chance of the dealer hitting a blackjack. There are 13 cards. Four are 10 valued cards (10, J, Q, K) that will give the dealer blackjack. So, the ratio is 4:9 for the player winning the bet. But the casino will only pay players 2 to 1, so the house edge is almost 6 percent. For RTP, 100-6=94 means that the player would lose 6 dollars for every 100 dollars the player bet on insurance, so now it is obvious that insurance is a bad play in blackjack, or is it? Some may ask that if only a small amount of 10 valued cards has been pulled from the deck, wouldn't the house edge be less? This is partially true, but most gambling providers start at a desk with random cards taken out of the deck, so "counting cards" wouldn't be the play. After all, gambling is gambling. If the provider doesn't gain profit, why would gambling still exist? Other than insurance, there are also 2 other side-bet types: perfect pairs and 21+3. In perfect pairs, there are 3 types of payoffs: Mixed pair (two of the same value but different suit and color. paying 5:1), Coloured pair (two of the same value and the same color. paying 12:1), Perfect pair (two of the same card. paying 25:1) [5]. These seem like a great side-bet, but if math were implemented, the house edge would be around 2%, 3%, or up to 10%, depending on the casino's edging rules. With 21+3, 21+3 is 3 cards, 2 of the players' cards, and 1 of the dealers' visible cards. Some types would be Flush (all cards are suited/united, paying 5:1), Straight (all cards consecutive, paying 10:1), Three of a kind (not the same suit paying 30:1), Straight flush (consecutive cards same suit paying 40:1), Suited triple (three of the same card paying 100:1) [6]. As Poker Stars EPT Barcelona calculated, the house edge depends on the number of decks used, "8.78% for four decks, 7.81% for five decks, 7.14% for six decks, and 6.29% for seven decks" [7]. In the end, the side bets are not worth it. It adds up the house edge a lot and does not require any skill. Onto busting, bust equals that the player instantly loses all

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his biddings without any other conditions, so players will try to prevent busting. The probability of busting increases when the value of the player's hand increases, but that is the logic in blackjack. Table 1 proves that when the player value of the player's hand increases, the probability of busting increases.

Table 1: Player and Probability of Busting.

Hand value	Possibility of busting
11 or lower	0%
12	31%
13	39%
14	56%
15	58%
16	62%
17	69%
18	77%
19	85%
20	92%

This is for players busting and losing, but a question arises: when does the player hit and stand? In Table 2, there is a possibility of the dealer busting based on the initial hand, and this is because the dealer has its own set of rules. The dealer could be described as a robot who has to follow the scripts, and the dealer cannot decide to hit or stand on its own; instead, it has to follow the casino's playbook.

Table 2: Possibility of the Dealer Busting.

Dealer's card	Dealer's probability of busting
ace	18%
2	35%
3	38%
4	40%
5	42%
6	43%
7	26%
8	24%
9	23%
10	23%

It's quite obvious that the best chances of the player winning is by the dealer having a 4,5,6 starting hand. On average, the dealer has a 28.36% busting in every hand. Ideally, the player wants to stand when their chances of busting are bigger than the dealer's; otherwise, it is the dominant strategy. After all these different types of house edges, Table 3 shows the different RTPs for different types of blackjack (different payoffs, different amounts of decks shuffled, and different variants of side bets). Remember that the RTP on the table only represents if players are hitting/standing, doubling down, or splitting correctly at all times, which most gamblers don't.

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Table 3: Different RTPs for different types of blackjack.

variant	House-edge	RTP
Classic Blackjack	0.13%	99.87%
Blackjack switch	0.16%	99.84%
Vegas strip blackjack	0.35%	99.65%
Atlantic city blackjack	0.36%	99.64%
Spanish blackjack	0.38%	99.62%
Bonus blackjack	0.39%	99.61%
Blackjack surrender	0.39%	99.61%
European blackjack	0.42%	99.58%
High streak blackjack	0.42%	99.58%
variant	House-edge	RTP

The RTP seems pretty fair at first; for classic blackjack, if a player gambles 100 dollars, the player would only lose 13 cents on average, adding that the player had a fun time at the casino gambling, chatting, and enjoying himself. While in reality, this is somewhat impossible. RTP is the theoretical payoff, and there is a possibility that the player will lose 20 consecutive hands and all players' money or win 20 consecutive hands and possibly double up the player's money. But the RTP here is all over 100 - which makes sense because casinos need money to survive. Not only will the player lose money in the long run, but it also means that it is more likely to lose 20 hands in a row than winning 20 hands in a row. This also means that if players play EVERY hand correctly and make the mathematical correct option at all times, even the blackjack pros can fail to do this. Realistically, if players are a beginner at blackjack, a player's RTP at classic blackjack would most likely be 90% more than 99.87% since humans make mistakes. Now, 90% RTP is not ideal; think of it as putting $100 in a machine, and the machine splits the player out $90, and the player does this 10 times. In a blackjack scenario, if a player plays 10 times 100 dollar bid hands, on average, the player will lose $100 after the 10 hands. Yes, if the player is lucky today, the player may win 8 out of the 10 hands and profit, but the player could also be unlucky and lose 8 of the 10 hands today and end the day with a loss. Please note that the provider has provided the RTP in Figure C, and normally, people would think that it is pure luck, but blackjack requires skill, and the High RTP is only to lure people into gambling longer and more. Online slots don't require any skill; they only require chances, and that has an average of 95%-97% RTP, which is much lesser than blackjack, but the "real" blackjack RTP might be somewhere around 95%-97% as well [8]. Because humans tend to make mistakes, and players have to consider emotions as well, if players lost 5 hands in a row, the player would be more likely to double down on a 4(bad card, bad decisions). Last but not least, these assumptions are based on the prediction that the casino is not being rigged. Being rigged does not necessarily mean the RTP is less than 100, but the fact that the casino is using some "external" tools to make the gambling more in favor of themselves. This could be that the dealer is using the trick to leave out a dozen of 10 valued cards or using the dashboard to modify the card's number in an online casino. Believe it or not, this has happened in several online casinos. Overall, the "real" RTP is less than $\approx$99.6%. Players will lose in the long run, no matter player skills, player budget, or anything else.

4. Suggestions

Here comes the important question: Should players play blackjack just for the sake of profit or for the sake of entertainment? Is blackjack rigged? Should players gamble? These are some very interesting questions. As in prior, if RTP is less than 100, it's 100% a losing game in the long run, so if players play blackjack just for profit, they should stop. There is also a concept of the "never winning

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policy" in gambling. This is the fact that the provider has basically "infinite" money, while the player budget is somewhere around 1,000, for example. The word "infinite" can be used a bit irrationally. The money the gambling providers have is "Finite", but due to how little money the customer has compared to the gambling providers, there is no need to say that the gambling provider's money is limited. Even if a player brings a couple million dollars into a casino, it is still a very small amount of money to the casino. A very big misconception is that "millionaires" can buy the casino. The casino generated around 2.5 m - 5 m every day. Back to the concept, if the player were to win a lottery with very few chances and profit 500k USD, for example, that's still nothing to the gambling provider because they have millions or even billions of dollars in storage, depending on the size of the casino. If the player were to put 1000$ in a jackpot with infinite money, the player has absolutely no chance of winning, which also applies in this situation. It's better to gamble for fun and entertainment than trying to gain profit out of it as the central purpose. Lots of gambling providers have unethical acts like promoting gambling to teenagers or even children [9]. Like using gaming advertisements, pop-up ads on websites, etc. All with the problem of luring online users that are specifically under-aged to gamble. Some were undercover, like the pop-up ads on various websites, while some were right up in the open and could lure underage people into gambling. This could be sponsorship from sports events/tournaments or showing a gambling advertisement with under-aged people acting inside it. This could be crucial since showing underage actors in gambling ads is legal. There are some ethical concerns within the gambling industry. But for the gambling itself, is it rigged? Rigged counts as officially making the game unfair, like knowing the card's value before dealing or swapping the card with the deck purposefully, etc. This could happen in casinos; it exists. However, this rarely happens nowadays, but this isn't to say gamble all player money because it's fair. The player is still going to lose even if the casino is legit. Based on the RTP and the house-edge, it's still not recommended to gamble financially. Whether it's on the mathematical side or the psychological side, gambling is not beneficial. It makes players do impulsive behavior, as well as losing player money. So, players should never gamble at any time with any amount of money. Losing money is scary, and people want to prevent it from happening. But what's bad about gambling is degenerate gambling. People want to gamble more, gamble irresponsibly, bid more after every loss, etc [10]. This type of gambling can easily tear down families, and gambling is not recommended in any circumstances.

5. Conclusion

All in all, the gambling industry is very interesting and very dark at the same time. Some people gamble for fun, and some people gamble for life. These are 2 different concepts. Depending on which one player is, it shows a clear option of whether the player should gamble or not. The rules of blackjack are relatively simple since it is a well-known gambling game with some dark sides to it. For example, in the rules, some major flaws manipulate the gambler. Take insurance as an example. The RTP of the original game is already below 100, which is fine, but why would they still lower the RTP by offering side bets? These bets should be included in the calculation of the original game. Another aspect is that many gambling businesses try to advertise and lure underaged people into gambling, which is strongly illegal and unethical. With the addition of trying to use the audience's perspective, like having an advertisement about someone winning millions and millions of dollars, which is what the audience would like to happen. But it will never happen. Not only is it unethical, but it is also mathematically unlikely to profit from gambling. This makes sense if players think about it. Casinos rent buildings, employ staff, and provide free food/internet or other services. If the gambling business is not making money, how would they make up the fees and expenditures they use? Even if this makes sense, gambling will most likely result in a loss of money. As stated above, the dealer has the dominant strategy against the player. This means that it is not a good idea to gamble for the sake of profit to blackjack because, in the long term, the player will lose money. This is due

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to the existence of house edges. All in all, whether players are gambling for fun or profit, players should not gamble. Addiction is scarier than losing money.

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