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Overview of the nature and development of gambling from the perspective of probability

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Abstract. In 1654, Pascal and Fermar discussed how two gamblers should fairly divide their winnings after a break in play, and they came up with the right answer for the first time. Many gamblers are convinced that luck is always on their side and the odds of victory are always in their hands because gambling that is based on random games does not require too many skills and strategies to gamble based on the gambler's luck and competitiveness. Can gambling activities that draw large numbers of gamblers actually result in a profit? Making a lot of money through sheer luck is a pipe dream, according to the principles of probability that govern random games like winning and losing in gambling. This paper employs a method based on literature reviews to first assess the core of gambling from a probability perspective, then discuss the previous contributions of gambling, and lastly discuss the significance of probability and the future development of gambling.

Keywords: probability, gambling, social welfare.

1. Introduction

Probability, a branch of mathematics, is fundamental to the world of gambling. In the meantime, we all know that there are gamblers and bankers in any given gambling game. For this reason, comparing the experiences of gamblers and bankers is possible via the lens of probability. In other words, probability is a product of gambling and hence a powerful tool for speculating on the history of the industry as a whole. Through an objective mathematical analysis of probability theory combined with the heart of gambling games, this paper can warn people not to be contaminated with gambling, promote the development of probability theory to some extent, and offer some reference suggestions for social welfare. Bringing math into the real world is encouraged by highlighting the practical applications of probability. Finally, the evolution of gambling online is studied, and some useful recommendations are made for the industry.

2. Using probabilistic knowledge to analyze the essence of gambling

2.1. Analyzing the game from gamblers perspective

Gambling relies heavily on probability, a subfield of mathematics. We are all aware, meantime, that in any casino game, there are both players and bankers. This allows us to glance at the similarities and differences between gamblers' and bankers' experiences from a statistical perspective. Probability, then,

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is an extension of the gambling industry and a potent instrument for making predictions about its long and eventful past. By providing a dispassionate mathematical analysis of probability theory and its application to the core of gambling games, this paper serves to dissuade readers from becoming addicted, advance the field of probability theory, and make some recommendations for the greater good of society. Emphasizing the usefulness of probability helps bridge the gap between the classroom and the working world. Finally, the history of internet gambling is analyzed, and suggestions for improvement are provided. In the next step, we could calculate the probability of a gambler losing everything. When $a = b, p = q$, the probability of a gambler losing everything is $Pn = 1 - n/(m + n)$; the probability of a banker losing everything is $Pm = 1 - Pn = n/(m + n)$. When gamblers and bankers have equal chances of winning or losing, the probability of losing is inversely proportional to the gambling capital. It is clear that bankers always have a huge quantity of money, m>>n, so that the probability of gamblers losing everything is huge and bankers losing everything is very unlikely. Therefore, gamblers will inevitably suffer financial ruin in the long run. While the foregoing is a more perfect scenario, bookmakers do indeed have an inherent edge in the real world ($q > p$). Those that gamble are more likely to quickly go broke. It goes without saying that the casino needs to offer additional perks in order to retain patrons and their money. Consequently, gamblers need to take it when they're ahead or else they'll end up losing it all [1].

From an alternative vantage point, the odds of a gambler's success could be determined. Let's pretend a gambler plays a game where they toss a die and win a sum that is proportional to the square of the number that comes up. The likelihood of making a real profit is determined, for instance, based on the number of times gamblers choose to play (50 in this case). If a gambler plays for 50 rounds, he or she has a 5% chance of winning. Even more radically, their odds of success are 5% at best [2]. It seems that this type of dire circumstances is standard in the majority of gambling games. They have a very little chance of winning, and if they try to play all the time, they would undoubtedly lose.

Further, in a game known as "double gambling method," players double their bet whenever they lose, ultimately risking four times as much as they initially did on each wager. Theoretically, gamblers will win in this instance; however, in practice, gamblers may either not have enough money to bet or may have lost so much money that they had the courage to continue gambling [3]. Gamblers should leave the game on a high note, so as not to completely immerse themselves in it.

It's possible that some problem gamblers believe they have risk perception and may stop when they anticipate a decline in their situation [4]. Though some claim that a higher level of risk means a greater chance of failure, research shows that varied levels of probability and reward produce varying levels of risk perception and risk attraction [5]. Because of their gambling addiction, people can't just stop when they start to feel unsafe.

2.2. Analyzing the game from the banker's perspective

The dealer's game plan is based on a relatively elementary correlation. If their skill sets are equivalent, then the likelihood of bankruptcy decreases as their wealth increases. If you play against a gambler who has a lot of money, you will lose every time. From the gambler's perspective, the banker appears to be filthy rich, guaranteeing a large payout if the banker wins. They may engage in dishonest poker practices in order to increase their wealth. As a result, a wealthy and skilled individual can only increase his wealth over time [4]. Each gambler loses in the long run if their win rate is less than 0.5, and this is true even if the gamblers are playing against each other in a fair game with equal odds of winning and losing and small differences in gambling capital (taking into account the casino's earnings, such as the number 0 in roulette, etc.). Below, the author will provide an alternative to conventional gambling in the form of a lottery game, which is much more accessible to the general public. There is a popular game on the commercial strip, and many people are drawn to it because they believe they can win easy money. Ten black and ten red balls were placed in a small, closed cardboard box by the organizer. The raffle can choose ten balls at random from little cardboard boxes for ten bucks. Prizes are represented by ten balls. The grand reward is 500 yuan, and it's awarded for a roll of either red or black. If you draw 9 red balls and 1 black ball, you win 30 yuan, and if you draw 9 black balls and 1 red ball, you win 30 yuan. There

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are also commemorative awards and placements such as first, second, third, and fourth place. There is no award for matching 5 red balls with 5 black ones. This raffle condition appears to be really beneficial and alluring, yet it is actually somewhat deceiving. Since this is an issue of mathematical statistics, it follows that the lottery organizer will unquestionably benefit from a firm grasp of probability and statistics. Ten balls are randomly selected from a set of twenty identical balls.

$$C_{20^{10}} = 184756$$

The various outcomes can be determined using our calculations. Prizes for each drawing will total 184756, with 88200 being commemorative prizes, 28800 being fourth prizes, 4050 being third prizes, 200 being second prizes, and 2 being first prizes. After deducting the total prize pool from the total number of draws (18,4756), the lottery's net income is 27,4630 yuan [6]. This is supposedly a huge sum, so anyone with a firm grasp of the mathematics behind probability and statistics who works as a bookmaker stands to make a tidy profit. As a result, we can use it to make the world a better place for others who are less fortunate.

3. Conjectures about the future development of gambling

3.1. The importance of probability

Players in a game known as the Montijall dilemma select one of three closed doors in the hopes of winning an automobile that lies behind one of the doors (the other two doors are hidden behind a goat). A door with a sheep behind it will be opened when the contestant chooses a door that has not yet been opened, and the host will then inquire if the participant would like to switch the door that was originally chosen. From a purely intuitive perspective, it seems that the odds of winning are the same regardless of which door is selected, and that switching the selected door doesn't significantly improve those odds either way. Next, from a probabilistic standpoint, assume that the car is behind door A and randomly assign letters A, B, and C to the three doors. There are three possible outcomes, each with its own probability of winning the car: in the first case, the contestant makes their first choice and has a 1/3 chance of selecting door A. For example, if the host chooses door A and the contestant chooses door B, the host's chance of choosing door A is 1/2, the host's chance of choosing door C is also 1/2, and the contestant loses the reward if he or she chooses to change the selected door from B or C, so the contestant's chance of winning the car is $P = 1/3 * 0$. The second case is similar to the third case, the probability of the contestant choosing to select door B and door C for the first time is 1/3 each, the host needs to open the door with a sheep behind the door, then the door must be opened by another door that has not been opened in addition to door A, that is, door C or door B, if the contestant chooses to change the choice at this time, the probability of winning the car is 1, $P = 1/3 * 1 + 1/3 * 1 = 2/3$. After tallying all the data and comparing the facts, it turns out that the outcome is different from the intuitive view that changing the outcome has no impact on the acquisition of the car, and that the likelihood of winning after changing the choice is higher than the probability of winning before changing the option. Real-world applications of probability analysis include improving our ability to make informed decisions by providing a more precise understanding of the likelihood of various outcomes [7]. We can learn from this that it is not always wise to rely solely on our gut feelings when making important decisions; instead, we should consider the probabilities involved.

3.2. The development of gambling

While mathematics benefited greatly from gambling, it also had its drawbacks. Gambling, as is common knowledge, is the cradle of probability. Fermat, Pascal, and Huygens' contributions to the development of probability theory are inseparable from one another. When Pascal was asked by his friend De Moeller, "If A and B meet to bet several games, and A wins the first game and Joan is the winner, they can get all of the gambling money, and now A wins 176 bets, who wins the game first and Joan is the winner?" Pascal sent Fermat the query. Fermat developed a system to catalog every feasible outcome and tally the number of victorious cases. The amount of processing for this approach rapidly scales up as the number of game rounds grows. The expected value approach was proposed by Pascal. Pascal explained

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the connection between Pascal's triangle's numbers and the sought-after combination in his book Arithmetic Triangles. Pascal's triangle can be used to get the coefficient for a binomial expansion, one row at a time. Pascal can so rapidly resolve the question of bet allocation by selecting the appropriate line of Pascal's triangle. Probability and mathematical expectation are included in Fermat and Pascal's work on gambling difficulties, and the pair is distinguished from probability and conditional probability. Huygens was fascinated by the issues they investigated, so he amassed all the gambling problems, spent years researching them, and produced a book on gambling calculations in 1657. Huygens's book is the first comprehensive treatment of probability theory, and its appearance in print constitutes a watershed moment in the field's growth [8]. Gambling, clearly, has added a new dimension to mathematics over the course of history. There will be many other kinds of gambling to try out in the future, opening up new avenues for the study of probability. Additionally, probability theory can be applied to comparable gambling games to develop new, popular games that have the potential to improve people's lives, enrich society, and increase the quality of entertainment available to the general public.

However, as the Internet has grown, a new type of gaming situation has evolved. In the same way that e-commerce and e-sports have arisen as popular forms of online activity, a new kind of online gambling has also emerged among individuals; this new form of gambling is referred to as e-gambling. Anonymity, low cost and simplicity of access, additional benefits, interaction, speed of play, and the potential of playing multiple games at once are among the key reasons for this shift. Despite common belief, there are many risks associated with internet gambling that aren't present in traditional brick-and-mortar casinos. Due to the high probability of encountering someone with malicious intent, the potential for addiction due to the experience's ease, rapidity, and low cost, and the resulting monetary loss. Research shows that online gamblers are more likely to have gambling problems than their offline counterparts. The same is true in Poland, where 268 percent of gamblers who do it online are at risk of becoming addicted, whereas only 11.8 percent of gamblers who do so offline are at risk [9]. It follows that it is presumably simpler to become addicted to internet gambling. With better oversight, online gambling has the potential to reduce instances of fraud or addiction and keep more people out of traps. If you want to prevent being addicted to gambling, it's best to limit the amount of time you spend doing it, whether that's at a casino or online.

4. Conclusion

From the viewpoints of both the bookmaker and the gambler, this paper examines how gambling nearly functions as a response to the pleas of those who would discourage others from gambling. Additionally, by using Montijor to demonstrate the significance of probability and by analyzing the future development trend in light of the past, it's possible that the principle and probability theory of gambling games can be used to the benefit of society in the development of new, more widely played games. Finally, it highlighted the negative aspects of internet gambling and emphasized the need for reduced interaction between those who gamble in person and those who do so online. As for the article's flaws, the primary one is that it doesn't conduct its own original study but rather merely gathers the findings of its predecessors for the purpose of integrating and analyzing them. Second, it's possible that the scope of the research is too narrow; while a topic can be explored from many different perspectives, this article chooses just two. It therefore lacks a holistic treatment of the topic; however, future works will aim to provide a more in-depth analysis in order to produce more trustworthy results. I predict that gambling games will converge around a common set of rules that won't lead as many people astray. Probability theory will continue to advance in part because of gambling. The premise of gambling games can also be used to help people and improve society, and this knowledge will be gained through social welfare groups.

References

[1] HU Shunqi, KONG Weili. Statistical Analysis of Nine Losses in Ten Gambling[J]. China Statistics,2016(02):68-69.

[2] John S Croucher. Using Probability Intervals to Evaluate Long-Term Gambling Success [J].

DOI: 10.54254/2753-8818/12/20230436

Teaching Statistics, 2001, 22(2):42-44.
[3] Paul Slovic, Agata Michalaszek. The relative influence of probabilities and payoffs upon perceived risk of a gamble [J]. Polish Psychological Bulletin, 2010, 42 (2):46-51.
[4] Junyue He. Analysis of logical reasoning and probability problems in illegal gambling[J]. China International Finance and Economics (in Chinese and English),2018(06):288-289.
[5] Haimin Wang, Jinjuan Ma, Heng Zhao, Xuesong Zhou. Probability analysis of winning numbers in double-color lottery [J]. Journal of Taiyuan Normal College(Natural Science Edition) ,2018,17(01):15-20.
[6] FENG Jinshun,LI Jie. Analyzing the essence of gambling with mathematical knowledge[J]. Journal of Shangqiu Vocational and Technical College,2014,13(05):1-3.
[7] YIN Guangbin,ZHANG Haiyan,HAO Yangling. Probability problems in gambling[J]. Science and Technology Information(Science Teaching and Research),2008(23):24+64.
[8] Hu Xiaofei. Mathematics generated by gambling - the origin and development of probability theory[J]. Science and Technology Wind,2013(18):189.
[9] Bernadeta Lelonek-Kuleta, Rafal Piotr Bartczuk. Online Gambling Activity, Pay-to-Win Payments, Motivation to Gamble and Coping Strategies as Predictors of Gambling Disorder Among e-sports Bettors [J]. Journal of Gambling Studies, 2021 (2)33-34.