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Between consumption and investment: A new approach to the study of the motivation to gamble

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Abstract

The purpose of this exploratory research is to present some insight into the general money management strategies of casino gamblers playing table games. This paper introduces a new method of analysis that relies entirely on observations

collected in real casinos. Research into money management strategies could tell us a lot about the players' motivation to gamble. Quantitative empirical data support the view that both the hedonic (i.e., need for arousal) and investment (i.e., desire to win money) dimensions of gambling are important for most gamblers. The results also revealed several puzzling issues regarding the investment dimension, e.g., the notion that moderate desire to win money may constitute an aspect of responsible gambling behavior.

Technical introduction

Even though slot machines constitute the most popular form of gambling, casino table games are still very popular, especially in smaller European casinos. Table games are in many ways more useful for gambling researchers than slot machines. The statistical profile of table games is standardized and well known, while a particular slot machine constitutes more or less a “black box.” Additionally, the players' behavior at the table may be easily recorded by hand (using either paper and pencil or a PDA), since the game is slower and the table layout is more visible than the screen of a slot machine.

In typical casinos, cash wagers are not permitted. Players may only play with chips, so they must buy in, i.e., exchange cash for chips. Money may be exchanged for chips at a cashier's desk or directly at the table. The total amount of money exchanged for chips is called the *drop* in casino terminology. The casino's net win from the games is called the *win*. The table game *hold* represents the percentage of the *drop* that is won back by the casino:

$$\text{hold} = \frac{\text{win}}{\text{drop}}$$

Depending on the game, a typical monthly hold falls between 15% and 25%. Since the *house edge* (i.e., statistical advantage) of casino games is much smaller, this value of the hold indicates that the total amount of cash wagered must be several times the total amount of money exchanged for chips. For example, the house advantage in single-zero roulette is about 2.7%; if the roulette hold is equal to 20%, each $1,000 exchanged for chips generates an average turnover of about $7,400 (see Kilby and Fox, 1997, chap. 13, for a detailed discussion)

Casino managers use the terms *drop, win*, and *hold* to refer to aggregated financial variables from the casino viewpoint. But we may also speak of an individual player's drop or hold. If Mr. X exchanges $500 for chips during his visit and before leaving cashes chips totaling $350, his drop is equal to $500 and the casino hold for Mr. X's visit is equal to 30% ($150/$500). The term *win* is confusing in this case,

because it refers to the casino win (or the player's loss). For the purpose of further analysis, the term *player's daily hold* or PHOLD is defined as

PHOLD = 100% – hold.

PHOLD = 0% indicates ruin (the player has lost all of his or her chips), PHOLD = 100% indicates a tie (at the end of the visit the player's final capital is equal to his or her initial capital), and, finally, PHOLD > 100% indicates that the player earned some money during this particular day in the casino. It will be argued later in this paper that daily PHOLD may constitute a very interesting variable in psychological insights into gambling behavior.

Objectives

This study is a byproduct of a larger research project aimed at building the model of casino gambling in the paradigm of contemporary decision sciences. The question of whether the gamblers are playing for money or for fun constitutes one of the most important general problems in gambling research. This paper is a preliminary attempt to address the following issue:

- **Can consumption and other motives of gambling behavior be analytically separated and quantitatively analyzed?**

Method

Quantitative field studies of casino gambling are extremely rare, and the most extensive research project was carried out in the 1980s by Dutch psychologist Willem Wagenaar and reported in the seminal book *Paradoxes of Gambling Behaviour* (1988). Since then, there has not been much progress in this type of research.

The author of this paper cooperated very closely with two gaming operators owning more than half the casinos and slot-machine venues in Poland. Casino operators granted the author convenient access to the casino floor and even limited access to casino surveillance. Polish casinos are small and rely mostly on table games—roulette, blackjack, and poker. Polish gaming law imposes very strict requirements regarding the registration of entries to the casino and the recording of the games. This allows the researcher (at least theoretically) to access a wide variety of very interesting data concerning gambling behavior.

The purpose of this paper is to analyze gambling behavior on a very general level. A particular visit to the casino may be described by a set of several financial variables, with drop and PHOLD being the most important ones. Let us analyze the following theoretical profile of a gambler: Ms. Y, a blackjack player, comes to the

casino with $100 designated for the game. She plays slightly better than the typical blackjack player, so the house edge for her is equal to 2.0%. She starts playing blackjack, consistently wagering $10 on one box. Ms. Y is a *pure consumer* of gambling—playing is fun for her, and she is prepared to pay a reasonable price. She quits the game either when she loses all of her chips or after an hour of play—whichever comes first. During an hour she usually plays about 120 blackjack deals (slightly more than 120 blackjack hands because of occasional splitting). Her general money management strategy may be described by the following algorithm:

Step 1: Exchange $100 for chips.

Step 2: Start blackjack game (bet on one box).

Step 3: Make $10 bet.

Step 4: If (not ruined) and (played less than 120 deals), then go to Step 3.

Step 5: Quit the game.

The average PHOLD for this strategy is 82.8%, which translates to an average loss during the visit equal to $18.20. Ms. Y has a 47% probability of ruin before playing 120 deals. Additionally, 37% of her visits will end with a tie or a net win. Overall, for a very large sample of visits, Ms. Y's PHOLD values will have approximately a ruin-adjusted binomial distribution.

Now suppose that Ms. Y believes (incorrectly) that blackjack is a good way to earn some money and that a wise gambler just has to quit the game at the appropriate moment. So Ms. Y is now a *pure investor*. She will stop the game immediately if the total value of her chips reaches $150; otherwise, she will continue to play until she loses all of her chips. This will modify the algorithm in the following way:

Step 4: If (not ruined) and (have less than $150 in chips), then go to Step 3.

For this strategy, the average PHOLD is 90.9% (average loss of $9.10) and the probability of ruin is now 41%, but the duration of the game is usually much shorter. The large sample of PHOLD values will have antimodal distribution, with values concentrated around either 0% or 150%. Thus, different money management strategies result in radically different distributions of PHOLD.

The analysis procedure outlined above may be easily reversed. If we know the distribution of PHOLD, we may infer the player's motivation to gamble. The only problem is how to obtain these data. It is unlikely that survey research could provide the scientist with reliable information regarding the distribution of a player's wins and losses (because of, for example, frequent overreporting of wins; see Jamieson, Mushquash, & Mazmanian, 2003). These data may be obtained partially

through observation and partially from casino databases. With the help of the casino operator, the author was able to collect a small sample of players' results. It should be stressed that processing such information creates very serious ethical, legal, and pragmatic challenges. Assuring anonymity and confidentiality is crucial in such a study. Players' names may be erased and replaced with aliases (e.g., a unique number), but this is still not enough, as some financial data are problematic even without an assignment to a specific person (e.g., high rollers may be identified not only by their names but also by the magnitude and the unique values of their wins or losses). The transfer of data from the casino to the author's database involved a complex multistage procedure. For example, players' aliases and financial records were transferred separately and then matched with each other in an encrypted database. Since gamblers are aware that their behavior is recorded in the casino (this is required by gaming law), in my opinion processing such data can be defended on ethical grounds, but this problem is of course open to discussion.

Data

Since Polish casinos are small, the number of frequent visitors is very limited. In addition, the whole procedure of data collection and transfer is time consuming. This study was based on observations from a 6-month period. Twenty players visited a small casino more than 26 times (i.e., more than once a week on average)—their numbers of visits ranged from 28 to 107. Additionally, the data for several less frequent players were also available. The term *player* does not always refer to a single individual, as sometimes the drop is assigned to one person, while in fact two people play the game (e.g., a married couple). Players from the sample represent a wide variety of gamblers: starting from recreational visitors whose daily drop is usually less than 300 zlotys (approx. $75 U.S.) and ending with serious high rollers whose daily drop often exceeds 40,000 zlotys (approx. $10,000 U.S.). They usually play American roulette (single-zero version), but also blackjack and so-called Las Vegas poker (a slightly modified Caribbean stud). Because of the high variance of players' results, 30 or even 100 visits are not enough to adequately compare the distribution of PHOLD with any predicted distribution (e.g., binomial). Instead, the research should focus on the distribution of the most salient points of PHOLD, namely ruins and wins, and on the total casino hold for each player.

As explained in the “Method” section, it is problematic to publish the nominal (i.e., in Polish currency) values or drop. For the purposes of this research, it is enough to present the standardized daily drop for each player, i.e., the value of the drop divided by that player's average drop. Thus, e.g., the value 2.5 indicates that during that visit the player's drop was 2.5 times greater than the player's average drop (e.g., 2,500 zloty if his or her average drop is equal to 1,000 zlotys). The

standard deviation of the drop also refers to the standardized drop.

Readers should be aware that real casino data are quite difficult to analyze because of several factors. While generally these records are reliable (i.e., there are not many errors, omissions, etc.), some statistics may be biased by several events. First, the casino records include severe outliers, e.g., very large wins. This could sometimes lead to an unusually good player's result, even for frequent visitors. Some fraction of habitual gamblers may be ahead even after a year of gambling. Second, sometimes a large drop is artificially generated by cashing out wins and then buying in during the same visit—this is called a *false drop*. Third, sometimes chips are transferred from one player to another, which may seriously bias PHOLD. For example, some loan sharks lend money in the form of chips instead of cash. These problems do not render the data useless; they only imply some modesty in quantitative inferences. Fortunately, a detailed analysis of records and a good knowledge of the environment (players' behavior, casino operation) can help to handle most of these issues.

The issue of financial gains and losses requires one important addition. In Poland, casino wins are tax exempt. Players who have won in a casino may receive (on demand) a *certificate of win*. The control of certificates by tax authorities is imperfect, as tax inspectors concentrate on particular wins and not on a player's balance during his or her gambling history. As a result, casino gambling may help some people to legalize their gray-market income or simply to launder money. Thus, there are gamblers who lose money in casinos but simultaneously receive special benefits as a byproduct of their gambling.

Results

The basic quantitative analysis of players' records revealed several puzzling observations:

1. Drop variability

The first striking observation was the high variance of the drop featured by virtually all players. In the subsample of 20 frequent players (more than 26 visits), the player's maximum drop was at least 8 times greater than his or her minimum drop and for some players it was 100 times greater. The standard deviation of the drop varied from 0.61 to 1.41. There are several possible explanations for this observation. First, the high variance of the drop may simply reflect flows in the gambler's disposable income or free time. For example, the same player will generate a smaller drop during a short visit on a weekday than during a long visit on a Saturday night. The second explanation is based on a player's strategy—a gambler may want to exchange only a small fraction of his or her money in the hope of initial wins, but, after a loss, he or she will buy in again, and so on. False

drop (see the “Data” section above) may also affect drop variability. Finally, the high variability of the drop may be a result of chasing behavior. The next paragraphs will present a method of resolving this problem.

2. Large differences in total hold

The casino hold differed significantly for frequent players, ranging from as high as 55% to as low as a negative hold of –12%. Random noise is definitely not the only reason for this variability. The hold for many high rollers is usually lower than the hold for recreational players. The turnover of their drop is smaller, and some controversial situations (e.g., placing late roulette bets) are typically resolved in their favor—this lowers the effective house edge against a high roller. The choice of games and strategies (see the discussion of the consumption and investment strategies in the “Method” section) may also strongly affect the expected hold.

3. Large differences in the frequency of wins

For the purposes of this analysis, a daily PHOLD greater than or equal to 100% will be considered a win (exact ties are treated as wins because the player gets the enjoyment for free). Values of PHOLD less than or equal to 10% will be considered a ruin. (The 10% range was employed to incorporate the behavior of players who do not wager their last few chips.) The differences in the frequency of wins are even more pronounced than the differences in hold. The percentage of wins in the subsample of frequent players varied from 21% to 74%. The frequency of ruins ranged from 8% to 61%. Assuming a player's strategy is consistent over visits, the number of visits ending with a win should follow a binomial distribution. For 60 visits of a particular player, the large three standard deviations confidence interval is not greater than 40% (e.g., win frequency ranging from 30% to 70%). Again, there should be something more than random noise to explain the observed differences in the frequency of wins.

Players' statistics revealed that the pure investment model—the gambler is motivated solely by the desire to win money—is implausible. In fact, only one infrequent player meets the criteria for this model; his visits ended with either a substantial gain or total ruin. The series of PHOLD and drop for this pure investor is presented in Table 1. Note that this strategy is in fact financially disastrous, ending with a casino hold of over 40% for this player.

For the vast majority of players, both the hedonic (i.e., pleasurable experience) and the investment (i.e., desire to win money) dimensions of gambling are important. However, there are strong individual differences. Table 2 presents the data for four players labeled *High Roller, Investor, Social Gambler*, and *Consumer*. The labels *High Roller* and *Consumer* speak for themselves. The investor is a medium player (i.e., placing medium-sized bets) who definitely wants to win some money but also

enjoys the atmosphere of the casino—so he or she often takes a break between bets, walks to the bar, etc. Additionally, he or she usually takes certificates on winning. The social gambler is a recreational player who is probably not very rich but likes to play and very much enjoys staying in the casino. However, this type of gambler knows of his or her limited resources and does not play heavily. The last two statistics in Table 2 are very important and require some explanation. The average drop is conditioned on whether the visits ended with a win (PHOLD greater than or equal to 100%) or a loss (PHOLD less than 100%) or, simply speaking, the average drop for the subsample of visits ending with a gain or tie (for convenience, this will be labeled WIN_ADROP) and the average drop for the remaining visits (LOS_ADROP) are considered. In a simple consumption model that assumes single buy-in and playing for fun, the values of WIN_ADROP and LOS_ADROP should be equal, regardless of drop variability. However, a compulsive gambler who always attempts to chase losses will report LOS_ADROP substantially greater than WIN_ADROP. However, this difference may also be caused by a cautious strategy in which the gambler simply does not want to exchange all of his or her money at once. Finally, players who frequently generate false drops may report WIN_ADROP greater than LOS_ADROP.

Of course, there exists a continuum of players between pure investors and pure consumers. Other players' records are similar to those of the four players presented in Table 2, although some of them are biased by outliers (single very large wins or very large drops). The casino hold for the high roller is low because of his or her large drop. The high roller buys in frequently, but this is a result not of chasing but of strategy—this gambler makes very large bets, and exchanging a lot of cash at once is inconvenient. The investor also buys in frequently, but his or her betting pattern generally implies low hold, probably below 10% (in this sample of visits this gambler is even ahead). Of course, the statistics from Table 2 will not demonstrate all differences in money management. In this sample, the investor's statistics are very similar to those of the high roller. However, the high roller's bets are more than 10 times bigger, and he or she plays continuously—thus, the expected hold is greater. For both the high roller and the investor, LOS_ADROP is almost three times higher than WIN_ADROP. The hold for these gamblers is low and the frequency of wins is high, so it is implausible to attribute the high LOS_ADROP to chasing behavior. The detailed analysis of their money management strategies is beyond the scope of this paper, but it should be noted that their high frequency of wins is a result of a strategy that leads to many small wins and occasional large losses. However, this is not a Martingale betting pattern; i.e., it is not one that doubles the bet after each loss.

The consumer's data feature high hold, high probability of ruin, and almost identical values of WIN_ADROP and LOS_ADROP. This indicates heavy—but still controlled—hedonic gambling, as there is no evidence of chasing during the visit.

The social gambler falls somewhere in between—he or she maintains spending at a reasonable level, but is not an investor. It seems that problem gambling resulting in loss of control should feature high casino hold, high value of LOS_ADROP, and probably high frequency of ruins. However, it may be difficult to distinguish problematic chasers from some heavy consumers.

Another important observation is the presence of so-called anchors in a player's PHOLD. Anchors are special values that are probably used as stopping signals. If a player's PHOLD value reaches an anchor, the player may be encouraged to quit the game. Anchors are important, since they provide the player with a reason to stop the game before being ruined. People desperately need *some* reasons for their actions, even if they are implausible and artificially created (cf., Shafir, Simonson, & Tversky, 1993). Table 3 presents the distribution of PHOLD for two players: *Tie Lover* and *High Investor*. The first player has an unusually high number of visits ending with an exact tie; the second player never ended the game and had a PHOLD in the 100% to 250% range. In addition to *relative* anchors (e.g., PHOLD = 100%), players also utilize *nominal* anchors, namely, round numbers. Sometimes a player stops the game if his or her capital reaches a certain round value, e.g., 5,000 zlotys, regardless of the drop.

The results of this study also revealed an interesting difference between table games and slot machine gambling. For the majority of casino players, visits ending with a win corresponded to a substantially smaller drop than visits ending with a loss. This is exactly opposite to the result obtained by Schellinck and Schrans (2002) in their study of Canadian VLT players. Schellinck and Schrans found out that players tend to switch from one machine to another to reinvest their wins. This is equivalent to false drop in casino table games. Additionally, the average real (i.e., excluding the false drop) hold for VLT players was equal to about 50%, a value much greater than the typical table game hold.

The strategy that results in a high frequency of wins may be psychologically very attractive, as wins are probably more salient in a player's memory than the exact financial balance. Thus, this strategy may lead to a positive evaluation of the gambling experience, despite the incurred financial loss. However, the cognitive distortion caused by a high frequency of wins should not always be treated as pathology. Many socially desirable activities inevitably incorporate serious cognitive biases, e.g., the voter's illusion in voting (Quattrone & Tversky, 1986) or overconfidence in entrepreneurship (Camerer & Lovallo, 2000). If cognitive bias makes people happy and does not result in dangerous or antisocial behavior, it should not be regarded as undesirable.

Conclusions

One may argue that the presented statistics are unimportant artifacts that reflect issues of secondary importance, such as a preference for multiple small buy-ins. All in all, is it all about the money lost, and not the percentages and conditioned drop? In my opinion, these statistics matter, for several reasons. Nominal loss is meaningless if it is not compared to disposable income. For certain players, losing $50 a day is seriously damaging, while for others spending $1,000 a day in a casino is an insignificant loss. A reasonably low hold indicates that the gambler does not spend much of his or her disposable income on gambling. Frequent buy-ins that lead to high LOS_ADROP look like chasing, but they may constitute —paradoxically—evidence of a self-control strategy, especially if combined with a high frequency of wins and a low hold. My observations from the casino floor indicate that experienced casino gamblers are aware of their limited control, especially the tendency to escalate the size of a bet. They employ several strategies to cope with this problem; e.g., they want larger payoff to be structured, i.e., to contain some high-value chips. These high-value chips are then moved out of sight (e.g., kept in a pocket) in order not to tempt the gambler. The investor presented in Table 2 does not bet on every roulette spin, but spends much time walking on the casino floor, visiting the bar between bets, etc. The strategy to target the PHOLD of 150% described in the “Method” section, while irrational from a statistical viewpoint, leads to a low hold of about 9%. However, if the *target PHOLD* were set to, for example, 250%, and the betting pattern remained the same, the hold would rise to 23%. Thus, gambling in the hope of a win is not particularly dangerous; gambling in the hope of a big win is the real problem. It seems that real problem gambling must incorporate both a desire to win money and a preference for heavy continuous play. But a moderate desire to win some money combined with a preference for slower play may constitute, surprisingly, the least costly way to enjoy gambling, even less than the hedonic consumption of gambling.

There is also another problematic conclusion resulting from this analysis. Recently, Dickerson (2003) proposed a consumer protection model based on “removing the point of sale from the gambling session.” However, this strategy may force a greater single buy-in instead of several smaller buy-ins for players who use frequent buy-ins as a self-monitoring strategy. Thus, the model originally developed to protect players may in fact result in greater losses for a certain class of gamblers. The use of precommitment devices is a complex issue (Elster, 2000), and actions that impair control of certain people may be self-control devices in others.

The author acknowledges that this study is only preliminary. The proposed method is pioneering in behavioral gambling research and faces severe pragmatic, ethical, and methodological difficulties. Because of these problems, only a modest amount of (sometimes transformed) quantitative data was presented in this paper. As a

result, this paper poses several important questions rather than confirming well-specified hypotheses. The real casino data feature strong random noise and many measurement problems. However, actions speak louder than words, and gambling studies should not rely solely on survey-based research and laboratory experiments.

It also seems that a close examination of the gambling environment is crucial for the gambling researcher. The example of certificates of win in Polish casinos revealed that even knowledge of the performance of tax authorities is important for the behavioral study of gambling. Turner and Fritz (2001) acknowledged the importance of knowledge about casino games, but simultaneously they stated that “casinos don't like people researching on their property.” In the author's opinion, this may be caused by the fact that too much attention is paid to the study of problem gambling and too little to the study of gambling behavior in general. Unfortunately, the overemphasis on pathology and the neglect of positive experience are very common in psychological research. Additionally, the problem of cooperation between researchers and the gaming industry resembles the old joke about a man who constantly complained to God about never winning the lottery, and finally God answered: “Give me a chance. Buy a ticket!”

References

For references, please see “A response to comments” by Bartlomiej Dzik.

Tables

Table 1

A series of standardized drop and PHOLD for a gambler who behaves like a pure investor wanting to win money in casino

Visit	Drop (average drop = 1)	PHOLD
1	0.3	600%
2	1.0	0%
3	0.5	556%
4	1.0	0%
5	1.0	0%
6	0.7	0%
7	1.6	200%
8	1.0	0%
9	1.0	0%
10	1.0	0%
11	1.3	0%
12	0.5	0%
13	2.0	0%

Table 2

Statistics for four distinct players showing large differences in money management strategies

Statistics (drop is standardized)	Player			
	High roller	Investor	*Social gambler*	Consumer
Visits	63	54	107	57
Casino hold	10%	(7%)	28%	32%
Frequency of wins	67%	65%	38%	21%
Frequency of ruins	14%	17%	49%	60%
SD drop	0.86	0.94	0.69[a]	0.79
Av. drop/wins	0.63	0.64	0.75	1.01
Av. drop/losses	1.74[b]	1.66[b]	1.15[b]	1.00

Note. Parentheses denote negative hold.

[a]The SD drop of the social gambler is significantly lower than the SD drop of the high roller and the investor ($p < .05$). Other comparisons of the SD drop are n.s.

[b]For the high roller, the investor, and the social gambler, Av. drop/losses is significantly greater than Av. drop/wins ($p < .001$).

Table 3

Distribution of PHOLD for two players with clearly visible anchors

PHOLD range	Number of visits	
	Tie lover	High investor
PHOLD £ 10%	25	28
10% < PHOLD < 100%	8	5
PHOLD = 100%	22	1
100% £ PHOLD < 150%	3	—
150% £ PHOLD < 200%	5	—
200% £ PHOLD < 250%	5	—
PHOLD ³ 250%	8	15

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