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Book Review: The Theory of Blackjack

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The Theory of Blackjack.

Peter A. Griffin. Las Vegas: Gambler's Book Club, 1981, 214 pp. \$8.95.

The Theory of Blackjack is a fundamental contribution to our understanding of this game. It is also unusually well written and amusing. This book is for readers having some familiarity with blackjack and blackjack card counting systems. Those who don't can browse in the references for adequate background.

The book will interest two classes of readers. The first class includes good players who wish to become more expert at blackjack or who simply want answers to questions about the mathematics and theory of the game. The second class of prospective readers are those with a more mathematical background who, like the author, are intrigued by the "solutions to the myriad of mathematical questions posed by this intriguing game."

Peter Griffin has been an insightful theorist of blackjack for about 20 years. His many contributions to our understanding of the game are largely embodied in this book. His most significant contribution is the development of a general method for evaluating and comparing the infinitude of card counting systems.

The basic ideas of blackjack card counting systems are as follows:

1. For each specified subset of cards there is an optimal player strategy and a corresponding player expectation, and there is a feasible computer program to determine them. This assumes that the rules and circumstances are specified. An example of a rule is that the dealer hits soft 17 but not hard 17. An example of a circumstance is that there are three players at the table playing one hand each; you are the last of the three players to act; and you can see the other players' cards at all times.

2. The first major discovery in blackjack was that for a full deck of cards there is a strategy, now called the basic strategy, which gives the player an expectation currently between about -1% and -1% , depending on the rules and circumstances. This strategy was developed mainly by Baldwin and coauthors.

3. The second and most important discovery in blackjack was that the player expectation varies substantially as the cards are used from the pack. This led to the basic idea of card counting. Find a rule for keeping track of cards that identifies when the deck is significantly favorable. When this happens, place large bets. Otherwise, place small bets. In the long run, the player wins a majority of large bets. Even if he loses a majority of his small bets, he has a net positive expectation and high probability of a long run gain.

Various ways of counting cards lead to various compressed versions of the spectrum that would be obtained with perfect knowledge. Any particular card counting procedure gains in two ways. First, the counting system identifies favorable decks relative to a constant strategy such as the basic strategy. Second, the card counting system has a strategy that is optimal relative to it and that if used instead of the basic strategy leads to further improvement in the player's expectation. The gain of the card counting strategy for betting divided by the gain from perfect knowledge is the betting efficiency. The gain from the card counting strategy due to improved play at the hands divided by the gain that would arise from a perfect strategy is the strategic efficiency. To develop the concepts of betting efficiency and strategic efficiency, Peter Griffin used a linear approximation that is approximately valid over a large part of the collection of subsets of cards that arise in play.

He defines the "efficiency" of a card counting system as "the ratio of the profit accruing from using the system to the total gain possible of perfect knowledge and interpretations of the unplayed set of cards." He shows that, to within a linear approximation, the efficiency is "directly related, and in some cases equal to the correlation between the point values of the card counting system and the single card payoffs approximating the blackjack situation considered." Think of efficiency, then, as the ratio of the power of a card counting system to the power of perfect play. "Power" is the standard deviation of the (approximately) normal distribution of player expectations.

The ability of a card counting system to identify player advantages comes from two sources. First, the player's expectation varies with the changing composition of the cards even though he plays his cards with a fixed strategy. Second, the player can improve his expectation by varying his strategy as the composition of the deck varies. So we have two sources for the player advantage.

Peter Griffin shows how to estimate the betting efficiency and also

the playing efficiency of any card counting system, and he computes these efficiencies for a number of interesting systems. Card counting systems may be characterized by parameters. For example, one popular system counts the cards 2 through 7 as $+1$ when they are used up, counts 8's as 0, and counts 9's, 10's and aces as -1 . The total points at any start are the count, and the total points divided by the number of unplayed cards remaining is called the true count. This true count is an example of what Griffin calls a parameter. Thus, this counting system, which is presented in the reviewer's book *Beat the Dealer*, is a one parameter card counting system. Griffin shows that the strategic efficiency of the best one parameter system is about 70% and its betting efficiency is about 90%. Conversely, the strategic efficiency of the best betting system is about 55% and the betting efficiency is about 100%.

Griffin goes on to study multiparameter systems that lead to a substantial improvement in the combination of strategic efficiency and betting efficiency. However, this comes at a substantial increase in practical difficulties for the player. One such scheme counts aces separately. They are valued as zero for strategy purposes and are used to adjust the true count parameter for betting purposes. David Heath studied a system that groups cards into low (2, 3, 4, 5), intermediate (6, 7, 8, 9), and high (10, J, Q, K), with aces treated separately. The system can be described by two parameters (high card richness and low card richness) plus the ace count.

In other chapters Griffin considers the consequences of errors by the player and the consequences of approximations to the best playing strategies, betting strategies, and counting systems. He also discusses how things change with different rules, with many decks and a number of other variations.

The book is filled with intriguing anecdotes and examples. It also has information about the 5th National Conference on gambling, held in October 1981.

The book is a pleasure to read. It is difficult to do it justice in a review that is shorter than the book itself. I strongly recommend it.

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