

The Mathematics of Gambling:

Letters From Readers

by Edward O. Thorp

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Q: *I wondered if you could send me the best reference sources available which correctly extend your Beat the Market techniques to the options market.*

Over the past 10 years I have applied your book to warrant hedging with some success. I am an amateur, but in the 5 hedges I attempted, I averaged an approximate net annual gain of 26%. But good situations are getting harder to find, and the options market seems the place to go. L.R.

A: A good book on the subject is *The Stock Options Manual* by Gary Gastineau. A journal which is devoted largely to options theory is the "Journal of Financial Economics." See especially the January-March 1976 double issue. Some of the articles I have written include "Extensions of the Black-Scholes Option Model," Contributed Papers 39th Session of the International Statistical Institute, Vienna, Austria, August 1973, pp. 1029-1036; "Options in Institutional Portfolios: Theory and Practice," Proceedings, Seminar on the Analysis of Security Prices, Vol. 20, No. 1, May 15-16, 1975 (Center for Research Security Prices, Graduate School of Business, University of Chicago) pp. 229-251; "Common Stock Volatilities in Option Formulas," Proceedings, Seminar on the Analysis of Security Prices, Vol. 21, No. 1, May 13-14, 1976 (Center for Research in Security Prices, Graduate School of Business, University of Chicago), pp. 235-276; and "A Public Index for Listed Options," Proceedings, Seminar on the Analysis of Security Prices, Vol. 22, No. 1, May 23-13, 1977 (Center for Research in Security Prices,

Graduate School of Business, University of Chicago), pp.169-205.

Q: *I recently found your Beat the Market book. It seemed so interesting after scanning it that I purchased it despite its vintage.*

You and Dr. Kassouf presented a difficult subject superbly. I programmed your Appendix D equation for the average warrant price and checked it against 20 warrants for one day of each month during the past 18 months. The results were in excellent agreement with the formula results. I then checked the equation against the Value Line Option report. The agreement was so close that I must believe they are using your equation; even the mix agrees.

I am about to use your strategy to invest. I would like to know if you published any additional papers or books.

Again my sincere thanks for taking the time to write such an excellent book. S.S.

A: Value Line Options and Convertibles is one of the best commercially available services on this subject. However, option and convertible pricing theory has advanced greatly since *Beat the Market*. Replace Appendix D by the Black-Scholes theory. For reference see my recent *Gambling Times* columns.

Q: *When are you going to publish a sequel to Beat the Market? I would think it would be interesting to the public to read about your experiences subsequent to its publication. I'll even give you a title, Beat the Market-10 Years Later! Let me know so that I can be your first customer.* J.G.

A: I have had enough new information and adventure for several books since writing *Beat the Market*. I haven't written any since then because my new discoveries have been so profitable that I didn't want to reveal them. However, sometime in the next five years I plan to write about them.

Q: *Would you be interested in investing \$25K on a fee basis?* R.R.

A: I am associated with a group of private investors. The minimum is \$200,000. Sorry.

Q: *I flew to Los Angeles and drove to the campus just to talk to you today, but unfortunately missed you. I have been making my living playing blackjack for some time. Two years ago I became interested in roulette. Since that time, I have spent a multitude of hours and about \$40,000 developing a small computer, plus software, to clock the ball to beat the game in the casinos. Also I have put together a team which I think will be able to get away with winning.*

Your articles in Gambling Times naturally caught my attention. Since I have time and money invested in roulette, an exciting but speculative project, I would love to talk with you about your experiences and knowledge as you might find my experiences interesting.

We won \$20,000 playing in Vegas with our first primitive computer. Encouraged by this success, we spent over a year and \$40,000 building a sophisticated computer we hope to take to Europe.

I know you are in the process of writing another book and are a very busy man, but I hope you can find time to answer a few of my questions. You could possibly be a great help to us. I will call you Thursday. B.N.

A: Congratulations on your successes at roulette, and good luck. It sounds like you are superbly carrying out the methodology I've discussed in *Gambling Times*. I generally decline to accept phone calls about the stock market or gam-

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bling; there are too many for me to handle! But I answer most correspondence.

Q: I have thoroughly studied your book, *Beat the Dealer*, and have become a winner at blackjack. The reason I am writing is two-fold.

First, I think I have detected and error in the tables (3.5 and 8.4) that indicate "standing numbers." For example, in table 3.5, this table indicates that if I have 17, I do not stand unless the dealer shows a 7, 8, 9, 10 or A. It should be the reverse of this. Also, if I have 15, I do not stand no matter what the dealer shows. In both tables, there appears to be an error for the player holding 14, 15, 16, and 17. (Of course, I may be reading the tables incorrectly; if so, this may happen to other readers). J.S.M.

A: The "standing numbers" portion of Tables 3.5 and 8.4 are correct, but many readers have found them misleading. A "standing number" is the least number you should stand on. Think of it as a goal; you keep hitting until you reach it. For instance, if the dealer has a nine up and you have a "hard" hand then the standing number is 17. With a hard total of 16 or less, hit. With a hard total of 17 or more, stand.

Most subsequent authors have solved this problem by expanding the hitting and standing tables into one for hard hands and one for soft hands, and showing what to do for each player total.

Q: I read your book, *Beat the Dealer*, several years ago and enjoyed it immensely. I want to thank you for the enlightenment you gave me on blackjack. Your guidelines for playing the game have been invaluable to me over the years. They have added a great deal of enjoyment to the game, not to mention profits that I would never have had.

Perhaps you are aware that recently, in Las Vegas, they have

been playing a new version of blackjack in which the dealer has both cards up. The dealer takes all ties and blackjack pays even money. If the dealer and the player have blackjack, the player wins. In addition, if the player gets blackjack with the jack and ace of spades or a six, seven, eight of the same suit, he is paid double. Other than that, the rules are identical. They play this way at a new casino called Vegas World.

I have played the game several times and am fascinated by it. I have won playing the game, but I haven't had any basic strategy to follow as you set forth in your book. If you are familiar with this new version, have you done a study of it? I would like to know if the game holds the potential for long range profits when played a certain way. Any information you may have concerning this game would be appreciated. Thank you for your time. B.W.

A: I haven't studied "face up" blackjack. *Beat the Dealer*, revised, page 90, gives a basic strategy for the player, when he knows the dealer's hole card, with the usual blackjack rules. His edge there is 9.9%.

The game, as you describe it, was studied by Braun, Wong, and others. I believe Lance Humble's and Wong's blackjack newsletters give basic strategy and further information. Also, recent issues of *Gambling Times* will help you. The game with correct basic strategy is approximately even, but counting will shift it in your favor considerably.

Q: My deepest thanks for kindly sending me a reprint of your paper on Baccarat with Walden. Much of the proofs and derivations were a bit beyond my expertise, but nevertheless I gained much.

Now that side-bets on "naturals" have been largely eliminated from Nevada baccarat tables, (no doubt mostly due to your own outstanding success with them!), I am still curious. From the above work, can your analysis be applied to the one remaining side-bet, that of ties, which are offered in "mini-baccarat" play, and at some of the regular baccarat tables. E.G.J.

A: Walden and I showed, ("A Winning Bet in Nevada Baccarat," *Journal of the American Statistical Association*, Vol. 61, pp.313-328, 1966), that the probability of a tie in 8 deck Nevada style baccarat is 9.5156%. The corresponding player expectation is -4.8440%. In a subsequent article, "The Fundamental Theorem of Card Counting," *International Journal of Game Theory*, pp.109-119, 1973), we showed that no practical card counting strategies exist for the tie bet. That means that if you tested all possible card counting strategies, none of them would give you a useful advantage!

Q: I agree with you that a computer can eventually beat the best backgammon player. But, I think that's because computers will operate in a maintained "on" state while performing a 'thoughtful' process; humans cannot. For example, the computer's superiority is not a function of its programming (the best player will always be better programmed); rather, it's a function of its non-thinking objectivity, something the best player can never maintain indefinitely. Be that as it may, I would very much like to read any and all of your publications on the subject. Would you be so kind as to send me the citations for them. Thank you, An honor (re: Las Vegas) and a pleasure, G.C.V

A: See my *Gambling Times* columns for September, October and November, 1978, and June and September, 1979. You can order these back issues directly from the magazine. Refer also to *Science News*, Vol. 107, March 22, 1975 issue.

My paper, "Backgammon: Part I, The Optimal Strategy for the Pure Running Game," was presented at the Second Annual Conference on Gambling, June 15-18, 1975. It's presently out of stock, but I'll make more copies for anyone who sends me \$10. 9

ROULETTE

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