

# Contents

<b>Preface</b> .....	v
<b>Introduction</b> .....	vii
 <b>Part I Strategy</b>	
<b>1 The Game</b> .....	3
1.1 History of Casino Blackjack and Its Analysis .....	3
1.2 Rules, Procedures, and Terminology .....	5
<b>2 Playing the Hand</b> .....	9
2.1 Basic Strategy .....	9
2.1.1 Expected Return with Variant Rules and Procedures .....	13
2.1.2 Expected Return vs. Return on Investment .....	13
2.2 Composition-Dependent Play .....	14
<b>3 Tracking the Cards</b> .....	15
3.1 Linear Counts .....	16
3.2 Choosing a Counting Vector .....	17
3.3 Unbalanced Counting Vectors .....	19
3.4 Relating the True Count to the Expected Return .....	20
<b>4 Betting</b> .....	21
4.1 Yield, Risk, and Optimal Bet Strategies .....	21
4.1.1 Camouflage .....	26
4.2 Betting Proportional to Current Capital .....	27
4.2.1 Multiple Hands with Rescaling .....	28
4.3 Back-Counting and Table-Hopping .....	29
<b>5 Playing the Hand When the Count and Bet Vary</b> .....	31
5.1 Play Strategies that Vary with the Count .....	31
5.1.1 Reconsidering the Counting Vector .....	31
5.1.2 Count Dependence of the Play Parameters .....	33

5.1.3	The Insurance Bet .....	34
5.2	Counter Basic Strategy for the Variable Bettor.....	35
<b>6</b>	<b>Synthesis and Observations .....</b>	<b>37</b>
6.1	A Practical, Nearly Optimal Strategy .....	37
6.2	Blackjack as a Recreation vs. a Profession .....	43
<b>Part II Analysis</b>		
<b>7</b>	<b>Play Strategies .....</b>	<b>47</b>
7.1	Basic Strategy, Large Number of Decks .....	47
7.1.1	Analytical Framework .....	47
7.1.2	Expected Player Return .....	49
7.1.3	Frequency of Tied Hands .....	52
7.1.4	Multiple Simultaneous Hands: Return, Variance, and Covariance .....	53
7.1.5	Expected Number of Cards Used per Round .....	56
7.2	Basic Strategy, Small Number of Decks .....	58
7.2.1	Analytical Framework .....	58
7.2.2	Expected Return, and Optimal Basic Strategy, vs. Number of Decks.....	61
7.2.3	Surrender; Insurance .....	62
7.3	Play Parameters Dependent on Identities of Initial Cards .....	63
7.3.1	Comparison with Previous Authorities.....	65
<b>8</b>	<b>Card Counting .....</b>	<b>67</b>
8.1	Analytical Framework .....	67
8.1.1	Asymptotic Distribution .....	67
8.1.2	Expected Return; Invariance Theorem .....	70
8.1.3	Hermite Series .....	72
8.2	Expected Return at Nonzero Depth .....	73
8.3	Optimizing the Counting Vectors .....	75
8.4	Optimizing the Counting Vectors: Many-Cards Limit .....	76
8.5	Computation of the Derivatives of the Expected Return.....	78
8.6	Unbalanced Counts .....	78
Appendix 1 Asymptotic Distribution of Card Likelihoods .....		79
Appendix 2 Eigenmodes .....		80
<b>9</b>	<b>Bet Strategies.....</b>	<b>81</b>
9.1	Risk and Capitalization.....	81
9.1.1	Risk in a Game with Fixed Return .....	81
9.1.2	Optimal Betting When Return Fluctuates: Expected Capital and Risk .....	85
9.1.3	Connections with Finance .....	89
9.1.4	Properties of the Risk and Expected Capital Expressions .....	90

9.1.5	Optimal Betting When Return Fluctuates: Bet Strategy.....	93
9.1.6	Yield When the Bet Size Is Discrete; Wong Benchmark Betting.....	98
9.2	Betting Proportional to Current Capital .....	100
9.2.1	One Hand per Round.....	100
9.2.2	Multiple Simultaneous Hands .....	103
9.3	Back-Counting and Table-Hopping.....	105
9.3.1	Entry .....	105
9.3.2	Entry and Exit .....	107
9.3.3	Entry and Departure.....	110
9.3.4	Entry, Exit, and Departure .....	112
Appendix 1	The Risk of Ruin Formula .....	113
Appendix 2	Chain Rule Convolution .....	114
<b>10</b>	<b>Play Strategies with Card Counting .....</b>	<b>115</b>
10.1	Count-Dependent Playing Strategy .....	115
10.1.1	Counting Vector Optimal for Play Variation Alone .....	117
10.1.2	Single Counting Vector Optimal for Bet and Play Together ..	119
10.1.3	Two Distinct Counting Vectors .....	121
10.1.4	Insurance with Variable Betting .....	122
10.2	Counter Basic Strategy .....	124
	<b>References.....</b>	<b>127</b>
	<b>Index.....</b>	<b>129</b>



<http://www.springer.com/978-1-4419-0252-8>

Risk and Reward

The Science of Casino Blackjack

Werthamer, N.R.

2009, XVIII, 131 p., Hardcover

ISBN: 978-1-4419-0252-8