

Rock and Roll 21 – Card Counting Analysis.

Mathematical Analysis
prepared for David Moss.

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An analysis of the fluctuating expectation inherent to a proposed new casino table game.

Rock and Roll 21

Card-Counting Analysis

Prepared by Charles Mousseau, B.Sc. on May 9, 2008.

Introduction:

1. In Rock And Roll 21, as in any game where cards are drawn from a number of decks that are not reshuffled every hand, the expectation for the player is a function of the cards that remain to be dealt.
2. This report will analyse exactly how the advantage fluctuates in Rock And Roll 21 based on what cards are removed, how often the odds swing into the player's advantage, and the rudimentary details of a simple count system to enable game security.

Methodologies:

1. After running the original calculations with the computer program mentioned in the Rock And Roll 21 Mathematical Analysis Report, the program was modified to run with one ace per deck removed to calculate how the player's expectation changed with that card removed (hereafter referred to as the "Effect of Removal" of that card), for both the Rock/Roll Bets and the Bonus Bet.
2. Step 1 was repeated for each possible card rank, to calculate the Effect of Removal for each card.
3. These Effects of Removal were used to calculate two separate card-counting systems, typical of the kind used in blackjack and its variants.
4. Finally, a computer program was written to analyze each of the 1,000,000 possible deals that could follow from each of 2,160 hands dealt from a one-deck game that was shuffled every six hands, to analyze how often a player with *perfect knowledge* and sufficient time to calculate could identify when he had an edge. Hereafter, this is referred to as the "Theoretical Maximum".
5. Step 4 was repeat for a six-deck shoe, in this case dealing 36 hands in the shoe before reshuffling.

Results:

1. Based on the excess vulnerability of the Bonus Bet in a one-deck game, it is recommended that, should the game be dealt from one deck, the Bonus Bet be only available to bet on the first hand of the deck.
2. Based on all the information in this report, it is recommended for maximum security that the game be dealt from a six-deck shoe, which will result in a main game less vulnerable to counting than traditional blackjack and a sidebet that is less vulnerable to counting than similarly available sidebets.
3. Full results for Effects of Removal and Theoretical Maximums are included in the Appendix.

Report completed on May 9, 2008 by Charles Mousseau, B.Sc.

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Results are deemed reliable.

Appendix of Tables:

Table #1a: Effect of Removal of one card per deck from a six-deck shoe, Rock/Roll Bets.

Card Rank	Effect per six cards.	Break even at..	1.0% edge at..
Ace	0.006810987	-7.94 Aces	-16.75 Aces
Deuce	0.007689908	-7.04 Deuces	-14.84 Deuces
Trey	0.004727589	-11.44 Treys	-24.14 Treys
Four	0.003417393	-15.83 Fours	-33.39 Fours
Five	0.00034871	-155.16 Fives	-327.22 Fives
Six	-0.002509991	+21.56 Sixes	+45.46 Sixes
Seven	-0.004889404	+11.07 Sevens	+23.34 Sevens
Eight	-0.005632478	+9.61 Eights	+20.26 Eights
Nine	-0.004334587	+12.48 Nines	+26.32 Nines
Ten/Face	-0.001943534	+27.84 Tens/Faces	+58.71 Tens/Faces

Table #1b: Effect of Removal of one card per deck from a six-deck shoe, Bonus Bet.

Card Rank	Effect per six cards.	Break even at..	1.0% edge at..
Ace	-0.053368718	+7.10 Aces	+8.22 Aces
Deuce	0.02763925	-13.70 Deuces	-15.87 Deuces
Trey	0.022736443	-16.66 Treys	-19.30 Treys
Four	0.000354065	-1069.74 Fours	-1239.20 Fours
Five	-0.004761907	+79.54 Fives	+92.14 Fives
Six	-0.012755614	+29.69 Sixes	+34.40 Sixes
Seven	-0.029803779	+12.71 Sevens	+14.72 Sevens
Eight	-0.016166262	+23.43 Eights	+27.14 Eights
Nine	-0.008918635	+42.47 Nines	+49.20 Nines
Ten/Face	0.019031424	-19.90 Tens/Faces	-23.05 Tens/Faces

Table #2a: Simulation of Theoretical Maximum player advantage distribution, Rock/Roll Bet.

Player Advantage	1 Deck	6 Decks
<0.0%	68.66%	85.60%
0.0-1.0%	12.50%	10.23%
1.0-2.0%	7.45%	3.24%
2.0-3.0%	4.49%	0.79%
3.0-4.0%	2.55%	0.09%
4.0-5.0%	1.48%	0.05%
5.0-6.0%	1.11%	0.00%
6.0-7.0%	0.56%	0.00%
7.0-8.0%	0.60%	0.00%
8.0-9.0%	0.28%	0.00%
9.0-10.0%	0.14%	0.00%
>10.0%	0.18%	0.00%

Table #2b: Simulation of Theoretical Maximum player advantage distribution, Bonus Bet.

Player Advantage	1 Deck	6 Decks
<0.0%	76.89%	89.88%
0.0-1.0%	2.59%	2.27%
1.0-2.0%	2.15%	1.77%
2.0-3.0%	1.99%	1.34%
3.0-4.0%	1.65%	1.02%
4.0-5.0%	1.60%	0.81%
5.0-6.0%	1.43%	0.65%
6.0-7.0%	1.46%	0.51%
7.0-8.0%	1.15%	0.37%
8.0-9.0%	1.06%	0.30%
9.0-10.0%	0.94%	0.26%
>10.0%	7.09%	0.82%