

RULES & MATHEMATICAL ANALYSIS OF

***COMMISSION
FREE
BACCARAT***

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Commission Free Baccarat

The structure of this game was created to speed up the game pace of traditional Baccarat. With Commission Free Baccarat the hands per hour may increase from 35 to more than 100 hands per hour. This is not a new game but rather a new operating system for Mini and Midi Baccarat. The one difference in this game is when the Banker's side wins with a 3 card total of 8, the Banker wager is a push and does not win, Player wager is a push and does not lose. The Tie+ wager replaces the original Tie wager and has two ways to win. The Tie+ wager acts as an insurance wager on all 3 card totals of 8 on the Banker's side. With the Tie+ wager all ties win 8 to 1 and all 3 card 8 totals on the Banker's side win 3 to 1. If both the Player's hand and Banker's hand results in identical totals, it is Tie and Banker's neither hand win or lose, Player's hand (0 to 5) lose, (6 to 9) push. Players may wager on the Player, Banker, or Tie+ only or a combination of the Player and Tie+ or the Banker and Tie+. Player may not wager the combination of the Player and the Banker or the combination of all three.

Pay table for the Player bet, the Banker bet, and the Tie +

OUTCOME	BANKER BET	PLAYER BET	TIE+
Banker's total is greater than the player's total. Banker has a 3-card 8.	Push	Push	Wins 3 to 1 if the player also wagered on the banker bet. Otherwise, lose.
Banker's total is greater than the player's total. Banker does not have a 3-card 8.	Wins 1 to 1	Lose	Lose
Player's total is greater than the banker's total.	Lose	Wins 1 to 1	Lose
Banker's total is equal to the player's total. 0 to 5	Push	Lose	Wins 8 to 1
Banker's total is equal to the player's total. 6 to 9	Push	Push	

The Game

Baccarat is played with eight standard 52 card decks. All cards count as face value. Ace equals one. Deuce equals two. All tens and face cards or any combination of them have no value. So: 9+5=4. Jack + Ace=1.

The game begins when four (4) cards are dealt alternately from the shoe. First card to the Player, second card the Bank, third to the Player and fourth to the Bank. If the point count of either hand is 8 or 9, it is called a “natural” and no additional cards are drawn. If the Bank does not have a natural, the Player will always draw a third card on totals of 0-1-2-3-4 and 5 and stand with 6-7-8 and 9. The cards are dealt according to fixed rules. There are no options regarding drawing the third card for either the Player’s or the Banker’s hand. No more than one additional card will be drawn to each hand. The hand closest to 9 wins.

If both the Player’s hand and the Banker’s hand results in identical totals, it is a tie and Banker’s neither hand wins or lose. Player’s hand 0 to 5 lose, 6 to 9 push.

These charts describe the fixed rules governing the drawing of additional cards.

Rules: Player

When the first two cards total: 0-1-2-3-4-5 Draws
 6-7 Stands
 8-9 Natural Stands

Rules: Banker

When the Player stands on 6 or 7, then the Banker will always draw on total of 0-1-2-3-4 and 5, and stand on 6-7-8 and 9.

When the Player does not have a natural, the Banker shall always draw on the totals of 0-1 or 2 and then observe the following rules:

When first two cards total:

Banker Having	Draws When Player’s Third Card is:	Does Not Draw When Player’s Third Card is:
3	0-1-2-3-4-5-6-7-9	8
4	2-3-4-5-6-7	0-1-8-9
5	4-5-6-7	0-1-2-3-8-9
6	6-7	0-1-2-3-4-5-8-9
7	Stands	Stands
8-9	Natural-Neither Hand Draws	

ANALYSIS

To analyze the game, programs were written in Java to cycle through and evaluate all possible permutation outcomes of the game. The following is an outline of the steps executed by the program:

1. Cycle through all 416×415 ways to deal 2 cards to the player from an 8-deck shoe. For each set of 2 player's cards, cycle through all 414×413 ways to deal 2 cards to the banker from the remaining 414-card shoe.
2. For each set of 2 player's cards and 2 banker's cards in step 1, cycle through all 412 ways to deal the player's third card and all 411 ways to deal the banker's third card.
3. Based on the value of the 2-card hands dealt in step 1, determine whether or not the player would have taken a third card. If so, use the first card dealt in step 2. Also determine whether or not the banker would have taken a third card. If so, use the second card dealt in step 2.
4. Determine the final point total for both the player and the banker. Compare the totals and store the results.

After running the program, the number of permutations of each possible outcome of the game was outputted. This information was then used to calculate the expected value¹ of the player bet, the banker bet, and the tie bet. The following tables summarize these results and show each bet's respective house edge.

Table 2. Player bet analysis summary.

OUTCOME	PAYS	PERMUTATIONS	PROBABILITY	FREQUENCY	RETURN
Player Wins	1	2,230,518,282,592,250	44.6247%	1 in 2.2	44.6247%
Tie +, 0-5	-1	167,714,415,529,728	3.3554%	1 in 30	-3.3554%
Tie +, 6-9	0	307,913,010,943,488	6.1602%	1 in 16	0.0000%
Banker Wins, 3-card 8	0	146,752,024,801,280	2.9360%	1 in 34	0.0000%
Banker Wins, non - 3 card -8	-1	2,145,500,541,636,608	42.9238%	1 in 2.3	-42.9238%
Total		4,998,398,275,503,350	100.0000%		-1.6545 %
				House Edge	1.6545 %

¹ The expected value is defined as the weighted average of all possible outcomes of an event. Suppose there are n possible outcomes of an event. Let x_i = value of the i th outcome and p_i = the probability the i th outcome. Then expected value = $\sum x_i * p_i$, for $i = 1, 2, \dots, n$.

Table 3 Banker bet analysis summary.

OUTCOME	PAYS	PERMUTATIONS	PROBABILITY	FREQUENCY	RETURN
Player Wins	-1	2,230,518,282,592,250	44.6247%	1 in 2.2	-44.6247%
Tie +	0	475,627,426,473,216	9.5156%	1 in 10.5	0.0000%
Banker Wins, 3-card 8	0	146,752,024,801,280	2.9360%	1 in 34.1	0.0000%
Banker Wins, non 3-card 8	1	2,145,500,541,636,600	42.9238%	1 in 2.3	42.9238%
Total		4,998,398,275,503,350	100.0000%		-1.7009%
				House Edge	1.7009%

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Table 4 Tie bet analysis summary, player also wagered on the banker bet.

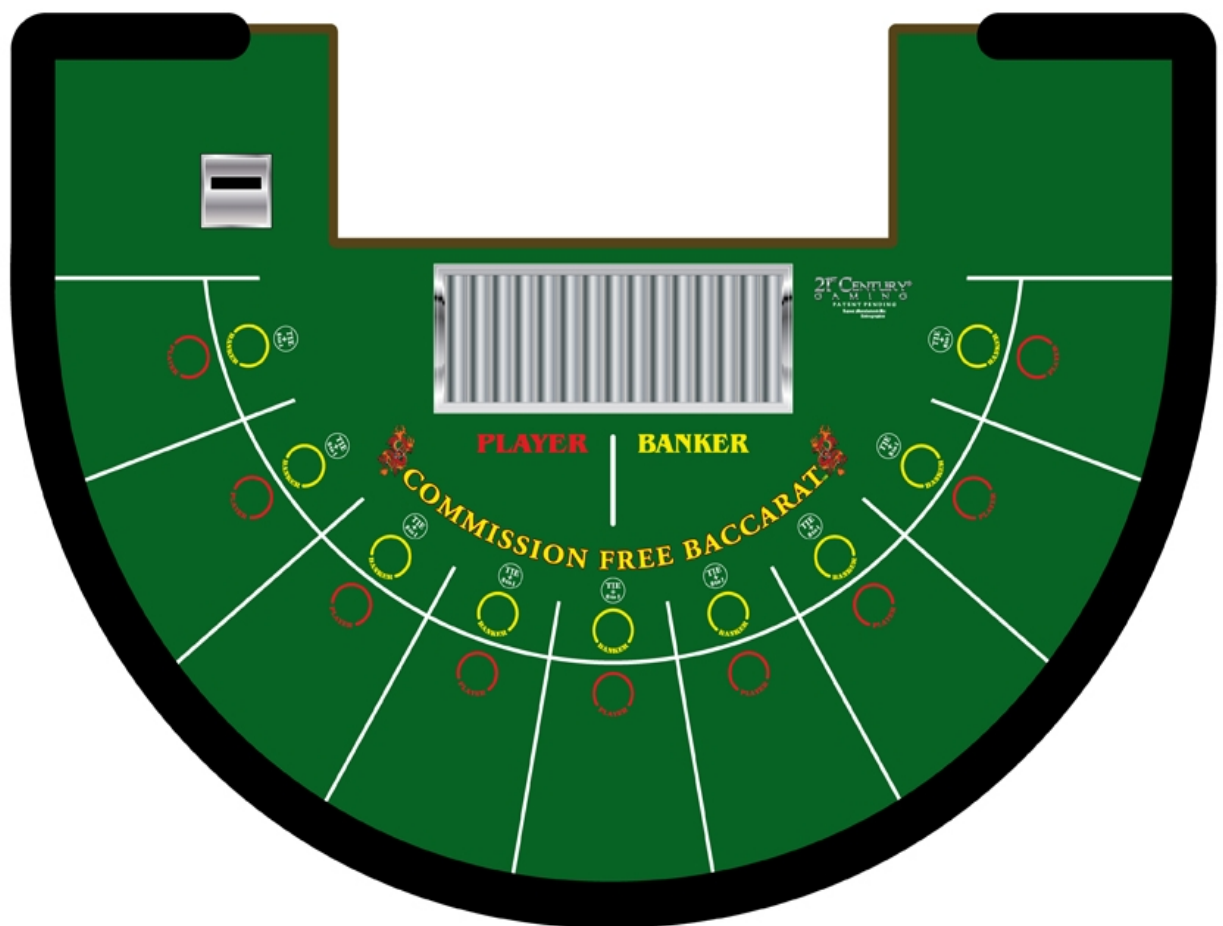
OUTCOME	PAYS	PERMUTATIONS	PROBABILITY	FREQUENCY	RETURN
Player Wins	-1	2,230,518,282,592,250	44.6247%	1 in 2.2	-44.6247%
Tie +	8	475,627,426,473,216	9.5156%	1 in 10.5	76.1248%
Banker Wins, 3-card 8	3	146,752,024,801,280	2.9360%	1 in 34.1	8.8079%
Banker Wins, non 3-card 8	-1	2,145,500,541,636,600	42.9238%	1 in 2.3	-42.9238%
Total		4,998,398,275,503,350	100.0000%		-2.6157%
				House Edge	2.6157%

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Table 5 Tie bet analysis summary, player did not wager on the banker bet.

OUTCOME	PAYS	PERMUTATIONS	PROBABILITY	FREQUENCY	RETURN
Player Wins	-1	2,230,518,282,592,250	44.6247%	1 in 2.2	-44.6247%
Tie	8	475,627,426,473,216	9.5156%	1 in 10.5	76.1248%
Banker Wins, 3-card 8	-1	146,752,024,801,280	2.9360%	1 in 34.1	-2.9360%
Banker Wins, non 3-card 8	-1	2,145,500,541,636,600	42.9238%	1 in 2.3	-42.9238%
Total		4,998,398,275,503,350	100.0000%		-14.3596%
				House Edge	14.3596%

Table Layout



1. Player wager (red)
2. Banker wager (yellow)
3. Tie + wager (white)

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Pay table for the Player bet, the Banker bet, and the Tie +

OUTCOME	BANKER BET	PLAYER BET	TIE +
Banker's total is greater than the player's total. Banker has a 3-card 8.	Push	Push	Wins 3 to 1 if the player also wagered on the banker bet. Otherwise, lose.
Banker's total is greater than the player's total. Banker does not have a 3-card 8.	Wins 1 to 1	Lose	Lose
Player's total is greater than the banker's total.	Lose	Wins 1 to 1	Lose
Banker's total is equal to the player's total. 0 to 5	Push	Lose	Wins 8 to 1
Banker's total is equal to the player's total 6 to 9	Push	Push	

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