

# **Analysis of Imperial Pai Gow Sidebet**

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## **Analysis of Imperial Pai Gow**

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### **Description of Imperial Pai Gow:**

Imperial Pai Gow is a sidebet to be played in conjunction with Pai Gow Poker. The player has the option to place an additional wager (besides his regular Pai Gow Poker bet). This wager will win if either of the following conditions are met:

- The Player can make one of the hands listed in the payables below. The player may make his hand by using ANY of his 5 cards, regardless of how he sets his Pai Gow hand.
- The Dealer has a Pai Gow hand of a 9-high, 10-high or Jack-High. A Pai Gow hand is one that does not contain at least a Pair.

If both conditions are met, then the Player will be paid for BOTH. For example, if the Player has a Four of a Kind and the Dealer has a 10-high hand and payable IPG-01 is in use, he will be paid 25 to 1 for his Four of a Kind and an additional 25 to 1 for the Dealer's 10-high hand.

Please note, Players bonus payouts on the Dealer / Banker Hand will be based on the Banker or Dealer Hand that the Player's hand is being compared to.

The Player will be paid according to one of the following paytables.

Hand	IPG-01 Pays*	IPG-05 Pays*	IPG-08 Pays*	IPG-12 Pays*	IPG-13 Pays*	IPG-14 Pays*	IPG-15 Pays*	IPG-16 Pay*
Player Hands								
Five Aces	1000	500	500	1000	500	1000	1000	1000
Royal Flush	200	200	200	200	200	200	200	200
Straight Flush	50	50	50	50	50	50	50	50
Four of a Kind	25	25	25	25	25	25	25	25
Full House	5	5	5	5	5	5	4	5
Flush	3	3	3	3	4	3	4	4
Three of a Kind	2	2	2	2	2	2	2	2
Straight	2	2	2	2	2	2	2	2
Dealer Hands								
9-High	100	100	100	200	100	100	100	100
10-High	25	20	20	20	20	20	20	20
Jack-High	5	10	5	5	5	10	5	5

\*All payouts are 'To 1' as the original wager is returned to the Player as well

It should be noted that for this sidebet that the Joker will continue to behave as the Joker does in Pai Gow. It can be used ONLY as an Ace or to complete a Straight or a Flush (or a Straight Flush).

## Analysis Methodology:

A computer program was created that dealt each of the 154,143,080 unique 7-card hands that can be dealt from a 53-card deck (standard 52 card deck plus a Joker). The computer program ranked each hand according to the highest possible 5-card Poker hand that could be created from each. For any hand that could not make at least a Pair, the highest-ranking card was tabulated to determine the frequency of each of the winning Dealer hands.

A second program was written that simulated 125 million hands dealt (Player AND Dealer) to determine the frequency of when the Player will win for BOTH his own hand AND the Dealer hand. As will be explained in more detail later in this report, this frequency is required to not double count the return of the Player's wager when he wins on both conditions in the same hand.

## Results:

The frequencies of the winning hands are shown in the table below:

Hand	Occurrences	Frequency
Player Hands		
Five Aces	1,128	0.0007%
Royal Flush	26,132	0.0170%
Straight Flush	184,832	0.1199%
Four of a Kind	307,472	0.1995%
Full House	4,188,528	2.7173%
Flush	6,172,088	4.0041%
Three of a Kind	7,672,500	4.9775%
Straight	11,034,204	7.1584%
Dealer Hands		
9-High	31080	0.0202%
10-High	248640	0.1613%
Jack-High	963480	0.6251%

The payback of the wager can be calculated by multiplying the frequencies shown above by the payout of each winning hand (including the return of the original wager). Since it is possible for the Player to win on both the Player AND Dealer hand, his original wager would be 'double counted' in these cases. As such, we subtract 1 unit for the frequency of this double-win, which was determined to be 0.1553% by the simulation program.

This payback calculation for each payable is shown in the tables below:

Payback Calculation IPG-01			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	1001	0.7325%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	6	16.3038%
Flush	4.0041%	4	16.0165%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	101	2.0365%
10-High	0.1613%	26	4.1939%
Jack-High	0.6251%	6	3.7503%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>93.9952%</b>

Payback Calculation IPG-05			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	501	0.3666%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	6	16.3038%
Flush	4.0041%	4	16.0165%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	101	2.0365%
10-High	0.1613%	21	3.3874%
Jack-High	0.6251%	11	6.8756%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>95.9481%</b>

Payback Calculation IPG-08			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	501	0.3666%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	6	16.3038%
Flush	4.0041%	4	16.0165%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	101	2.0365%
10-High	0.1613%	21	3.3874%
Jack-High	0.6251%	6	3.7503%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>92.8228%</b>

Payback Calculation IPG-12			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	1001	0.7325%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	6	16.3038%
Flush	4.0041%	4	16.0165%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	201	4.0528%
10-High	0.1613%	21	3.3874%
Jack-High	0.6251%	6	3.7503%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>95.2050%</b>

Payback Calculation IPG-13			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	501	0.3666%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	6	16.3038%
Flush	4.0041%	5	20.0206%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	101	2.0365%
10-High	0.1613%	21	3.3874%
Jack-High	0.6251%	6	3.7503%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>96.8269%</b>

Payback Calculation IPG-14			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	1001	0.7325%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	6	16.3038%
Flush	4.0041%	4	16.0165%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	101	2.0365%
10-High	0.1613%	21	3.3874%
Jack-High	0.6251%	11	6.8756%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>96.3140%</b>

Payback Calculation IPG-15			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	1001	0.7325%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	5	13.5865%
Flush	4.0041%	5	20.0206%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	101	2.0365%
10-High	0.1613%	21	3.3874%
Jack-High	0.6251%	6	3.7503%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>94.4755%</b>

Payback Calculation IPG-16			
Hand	Frequency	Pays	Contribution
Player Hands			
Five Aces	0.0007%	1001	0.7325%
Royal Flush	0.0170%	201	3.4076%
Straight Flush	0.1199%	51	6.1154%
Four of a Kind	0.1995%	26	5.1863%
Full House	2.7173%	6	16.3038%
Flush	4.0041%	5	20.0206%
Three of a Kind	4.9775%	3	14.9326%
Straight	7.1584%	3	21.4753%
Dealer Hands			
9-High	0.0202%	101	2.0365%
10-High	0.1613%	21	3.3874%
Jack-High	0.6251%	6	3.7503%
Double Win	-0.1553%	1	-0.1553%
<b>Total</b>	<b>19.8455%</b>		<b>97.1928%</b>



The following table summarizes the paybacks of each payable. The win frequency for each payable is 19.8455%. 0.1553% of the time the Player will win for both the Player and Dealer hand.

Paytable	Payback	House Advantage
IPG-01	93.9952%	6.0048%
IPG-05	95.9481%	4.0519%
IPG-08	92.8228%	7.1772%
IPG-12	95.2050%	4.7950%

Paytable	Payback	House Advantage
IPG-13	96.8269%	3.1731%
IPG-14	96.3140%	3.6860%
IPG-15	94.4755%	5.5245%
IPG-16	97.1928%	2.8072%