CHANGES IN BETTING THE NUMBERS: LATE COMMISSION BUYS AND PUT BETS IN CRAPS

By Bill Zender

Gaming is strictly a numbers industry. In recent months I have been contacted by a number of casino executives searching for the house advantage regarding "late commission" buy betting, and the high multiple odds creation, "put" bets. Neither of these bets were available in craps when I began dealing the game in the mid '70s. Nonetheless, numbers are numbers and regardless of the bet or how the bet was conceived, it's extremely important that every executive understands each different wager's mathematical house advantage, and how it affects the crap games being offered.

Standard "Odds" and Buy Bets

The easiest way to determine the house advantage on the "number" bets in craps is to build a model based on the probability that each number will win or lose, and then tie it to true odds for that specific number. I'll start with the true odds on the numbers 4-10. To construct a model, one first starts by determining the probability that the number will win or lose. With the number 4 (or 10), the probability of rolling a winning "4" results in three possibilities, and rolling the losing 7, six possibilities. Since it requires rolling either a "4" or a "7" in order to achieve a decision, there are only nine possibilities; the rest of the numbers having no effect on this wager. The chances of rolling a "4" are 3 out of 9 rolls (3/9), providing a probability result of 0.3333. If you multiply this probability by the award of 2X, the casino is subject to a negative return of -0.6667. Next, you establish a probability for the chance of rolling a "7" of 6/9, which translates to 0.6667. Of course, the house wins the original wager of 1 unit, so the return to the house is 0.6667. By adding these two return numbers, we can establish the mathematical house advantage (see Model 1).

Model 1: House Advantage on 4-10 True Odds

Pay	Prob.	Return
-2	0.3333	-0.6667
1	0.6667	0.6667
		0.00%

It can be further illustrated that the house offers a zero return on true odds when the player receives this offer on the 5-9, or the 6-8, as well. The only difference is the number of total possible rolls affecting the outcome change. In the case of the 5-9, there are four ways to roll a "5" (or 9), and still six way to roll the "7," for a player winning probability of 4/10 = 0.4, and a house winning probability of 6/10 = 0.6. The 6-8 is also slightly different with 11 possibilities for 5/11 = 0.4545, and 6/11 = 0.5454. The next model illustrates the zero mathematical advantage when applying true odds to both the 5-9 and 6-8 (See Model 2).

Model 2: House Advantage on 5-9 and 6-8 True Odds

True Odds Points 5 & 9			True Odds Points 6 & 8		
Pay	Prob.	Return	Pay	Prob.	Return
-1.5	0.4	-0.6	-1.2	0.4545	-0.54545
1	0.6	0.6	1	0.5454	0.545455
		0.00%			0.00%

We now use the previous model as the base model for the remaining wagers. Because it possesses a serious financial handicap for craps players to make wagers on numbers without first achieving the advantage of the come-out roll, casino operators developed a method where the numbers bet was more attractive. By paying a 5 percent commission on the total amount wagered, management allowed the players to receive full odds payments on the number wagered. For example, if a customer wanted to wager the four, he could do so and receive full odds if the wager won. The casino would receive an advantage requiring the customer to pay 5 percent of his bet for this privilege. What is the house's mathematical advantage on this wager formally known as "buying a number" or buy bet? Most executives will tell you the house advantage is 5 percent, but they would be wrong. The house advantage is slightly less, as noted in model 3.

Model 3: House Advantage on a 4-10 Buy Bet

Buy Bet H.A.% Points 4 & 10		
Pay	Prob.	Return
-1.95	0.3333	-0.65
1.05	0.6667	0.7
		4.76%

Remember that a $100 buy bet requires the player to originally wager $105. In all the models I reduce the baseline bet down to 1 unit; however in the case of buy betting, I increased the single unit by the anticipated commission seen as 1.05 units. It's important to note that the 5 percent commission is taken by the house regardless of whether or not the wager is a player or house winner. When the customer loses the $100 buy bet he's actually losing the original bet

of $105; when the customer wins the bet, he's actually winning only $195 because the $5 commission must be subtracted from the $200 payoff to get the true net cost. Regardless of the number bought, the resulting house advantage is 4.76 percent (see model 4).

Model 4: House advantage on a 5-9 and 6-8 Buy Bets

Buy Bet HA% Points 5/9			Buy Bet HA% Points 6/8		
Pay	Prob.	Return	Pay	Prob.	Return
-1.45	0.4	-0.58	-1.15	0.454545	-0.52273
1.05	0.6	0.63	1.05	0.545455	0.572727
		4.76%			4.76%

How are Place Bets Different from Buy Bets?

During my time dealing craps at the El Cortez Casino in downtown Las Vegas, I recall dealing to a number of gambling junkets that came out of the Rochester, N.Y., area. What made these upstate New Yorkers memorable was their playing characteristic of "buying" all the numbers. From where these dice players came, if you wanted to wager a specific number without going first through the pass of come, you had to buy the bet. "Why not place numbers like 5-9 and 6-8 instead," I asked. They had never heard of such a thing.

What is the difference between buying a number and placing it? First, we need to examine place bet odds and determine why these odds, slightly different from true odds, came to be. Place bets odds are a combination of a customer's flat bet and corresponding true odds. In the case of the 4-10, the place bet odds are 9 to 5, which represents 1 unit wagered flat, which is paid "even money" when it wins, and 4 units receiving true odds of 2 to 1. In this situation, the flat bet gets paid 1 unit while the "odds" units get paid 8 units, for a total of 9 units or 9 to 5. Model 5 illustrates how odds of each place bet are calculated, and for our model examples, the payoff that will be used to calculate the different place bets' mathematical house advantage.

Model 5: Calculating Odds and Average Pay Offs on a 4-10, 5-9 and 6-8 Place Bets

4/10	Bet	Pay	5/9	Bet	Pay	6/8	Bet	Pay
Odds Bet	4	8	Odds Bet	4	6	Odds Bet	5	6
Flat Bet	1	1	Flat Bet	1	1	Flat Bet	1	1
Total	5	9	Total	5	7	Total	6	7
Avg. Pay Off		-1.80	Avg. Pay Off		-1.40	Avg. Pay Off		-1.16667

By determining the average payoff for a base bet of 1 unit, we can easily plug those payoffs into our house advantage model to determine the mathematical advantage for each place bet. Model 6 illustrates the difference in house advantage as compared to the buy bet examples for the same numbers expressed in models 3 and 4.

Model 6: House Advantage on the 4-10, 5-9 and 6-8 Place Bets

Place Bet HA% Points 4/10			Place Bet HA% Points 5/9			Place Buy Bet HA% Points 6/8		
Pay	Prob.	Return	Pay	Prob.	Return	Pay	Prob.	Return
-1.80	0.3333	-0.6	-1.40	0.4	-0.56	1.1667	0.4545	-0.5303
1	0.6667	0.6667	1	0.6	0.6	1	0.5454	0.545455
		6.67%			4.00%			1.52%

It's easy to see why every dealer suggests to the craps customers, "place the 5-9 and 6-8, and buy the 4-10." As a courtesy to each player, the house suggests the wagering method that presents the lowest house advantage. In the case of the 4-10 wager, the house is offering the customer a buy bet on the 4-10 at a savings of almost 2 percentage points. Most craps customers heed the dealer's suggestion, and buy the 4-10 at a house advantage of 4.76 percent, place the 5-9 for 4 percent, and place the 6-8 for 1.52 percent.

Critical Miscalculations: When to Take the Buy Bet Commission

In the 1990s, Biloxi Mississippi opened a number of beach-front and riverfront casinos. From the very beginning, casinos in Biloxi offered "late commission" buy bets on every number on the craps table. Why, I have no idea. I'm not sure if the executives in Biloxi at that time put pencil to paper to determine if late commission, taking the 5 percent commission after the bet wins not before, alters the house's advantage. If they did do the calculation, I don't think they realized how much they would be costing themselves as casino operators.

Since the Biloxi buy bets instruct the dealers to subtract the 5 percent commission only if the wager is won by the player, the original wager is no longer 1.05 units as noted with a traditional buy bet. This changes the bet drastically, especially when a buy wager is made on the 4-10. Model 7 illustrates the decrease in mathematical house advantage from the traditional buy bet's 4.76 percent across the board house advantage.

Model 7: House Advantage on the 4-10, 5-9 and 6-8 Buy Bets When Commission is Collected Late

Late Buy Bet HA% Points 4/10			Late Buy Bet HA% Points 5/9			Late Buy Bet HA% Points 6/8		
Pay	Prob.	Return	Pay	Prob.	Return	Pay	Prob.	Return
-1.95	0.33333	-0.65	-1.45	0.4	-0.58	-1.15	0.454545	-0.52273
1	0.66667	0.66667	1	0.6	0.6	1	0.545455	0.54545
		1.67%			2.00%			2.27%

The decrease is quite costly. Comparing traditional buy bets on the 4-10 to the reduction in Biloxi when only taking the commission on player winners, the house advantage drops a whopping 3 percentage points, or a reduction of approximately 65 percent. The points 5-9 buy bets drop 2.8 percentage points (58 percent drop), and points 6-8 buy bets drop 2.5 percentage points (52 percent drop). This is a serious negative change, so much that the 5-9 buy bet wagers become better for the customer than placing the number; a drop of 2 percentage points (50 percent drop). Personally, I don't understand why any casino executive would elect to make that change.

In recent years, a number of casinos on the Las Vegas Strip are now offering "late commission" buy bets on the 4-10. Driven by the marketing departments, it's becoming the rule instead of the exception. I asked several casino executives if they knew what the change in mathematical house advantage is between the traditional buy bet and the "late commission" buy bet. None of them could tell me the answer.

Extreme Multiple Odds and the Birth of "Put" Bet

Offering multiple odds originated as a marketing tool to drive customers into lesser known casinos in Las Vegas. In the 1970s, casinos that offered 2X odds were considered "rebels," willing to take a chance at allowing the customer to place a larger amount of money on the table while giving the players a wager with no house advantage. As of the turn of the Y2K millennium, it's standard practice to offer 345X odds, and not unusual to see 20X, 50X and 100X odds used on games.

As a side consequence to the need for increasing odds multipliers, a new craps bet evolved known as the "put" bet. This bet originated from the come bet with odds once it reaches a number. The come (or pass) bet is originally subject to a player advantage due to the 2 to 1 advantage of the come-out roll, but once the come bet is put onto a rolled number, the wager suffers a serious disadvantage. The only

reason the come/pass wagers are the least bit attractive is the player advantage this wager experiences on the initial roll of the dice. Why would any player forfeit that opportunity? With the advent of increased multiples of come/pass odds, the players have discovered a new opportunity to lowering the house advantage on the number wagers. For example, players on a dice table where the odds are at a multiple of 10X may forgo the use of place bets and buy bets, and opt to make "put" bets. A put bet is created when the player offers to forfeit the come/pass initial roll of the dice, and request that the dealer "put" his come bet with full multiple odds directly onto the requested number. At first this sounds a bit insane, but once one puts pencil to paper, in this case formulas to Excel spreadsheet, we find that the players are not so insane after all.

Model 8: Calculating Odds and Average Pay Offs on 4-10, 5-9 and 6-8 with Put Bets (10X)

Put Bets 4 & 10	Bet	Pay	5 & 9	Bet	Pay	6 & 8	Bet	Pay
Odds Bet	10	20	Odds Bet	10	15	Odds Bet	10	12
Flat Bet	1	1	Flat Bet	1	1	Flat Bet	1	1
Total	11	21	Total	11	16	Total	11	13
Avg. Pay Off		-1.91	Avg. Pay Off		-1.45	Avg. Pay Off		-1.18

By referring to model 8, one can see that the determination of put bet payoff odds are similar to that of determining place bets. The big difference; multiple odds are not standard. If a casino were to offer 345X odds, the put bet would probably not be requested, but if the casino offered 10X or higher, buy bets and place bets would be ignored by the knowledgeable players. Model 9 exemplifies the mathematical house advantage calculation when offering 10X odds.

Model 9: House Advantage on the 4-10, 5-9 and 6-8 Put Bets at 10X Multiple Odds

Put Bet Points 4/10 (10X)			Put Bet Points 5/9 (10X)			Put Bet Points 6/8 (10X)		
Pay	Prob.	Return	Pay	Prob.	Return	Pay	Prob.	Return
-1.91	0.3333	-0.63667	-1.45	0.4	-0.58	-1.18	0.4545	-0.53636
1	0.6667	0.66667	1	0.6	0.6	1	0.5454	0.54545
		3.00%			2.00%			0.91%

Any multiple larger than 10X, the house advantage on the number bets decreases drastically. For example, put bets made when the house offers 20X odds decrease to 1.67 percent, 0.80 percent and 0.45 percent respectively. Common sense dictates that anyone offering 20X odds or greater needs to prohibit the practice of put bets.

Conclusion

It appears that every chance executives in our industry get, they try to drive down the mathematical advantages in craps. Is this due to market competition, or because no one is taking the time to calculate the mathematic changes? Slight changes in the game of craps affects the house advantage and in the case of "put" bets, multiple odds change the way the game is played. Most casinos should shy away from the practice of "late commission" buy bets unless it's absolutely necessary in order to stay competitive with the immediate competition. Opting for the Biloxi-style buy bet will reduce your buy bet revenue by as much as 50 percent. Unless you can increase buy bet handle by 100 percent, subtracting the 5 percent commission only on winning buy bets does not make financial sense.

Increasing odds multipliers has a secondary cost. If odds multipliers rise above 5X odds, the customers are provided with a betting alternative that reduces the house advantage, and the crap games revenue. Casinos that offer 10X odds across the board will find an increase in customers' request for "put" bets. If management decides to raise the multiplier to 20X, put bets will decrease the average number wager below that of the pass line wager. Management should strongly consider suspending the put bets once odds multiples raise above the 10X mark. Heaven forbid if it's allowed for 50X or 100X odds.

Any future consideration regarding the altering of rules, odds, and/or payouts in the game of craps, need to be thoroughly analyzed before being offered to the public.

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