MODERN

POKER THEORY

BUILDING AN UNBEATABLE STRATEGY
BASED ON GTO PRINCIPLES

MICHAEL ACEVEDO

D+B

Michael Acevedo

Michael Acevedo is a professional online tournament player, coach and leading poker theorist. In 2013 he quit his job as a financial analyst to pursue his dream of becoming a professional poker player. His background as a mathematician and expertise in process improvement helped him master the theoretical aspects of poker. He started playing online professionally in 2014 and has earnt over $1,500,000 in online tournament cashes.

During the last few years Michael has worked alongside some of the brightest minds in modern poker, including WSOP bracelet winner Martin 'Nizmojiz' Kozlov, WCOOP bracelet winner and PLO coach Fernando 'jnandez87' Habegger and the living legend, three-time triple crown winner and author, Jon 'Apestyles' Van Fleet. Michael makes educational poker videos and content for training websites and staking groups including pocarr.com and coaches hundreds of players from around the world. He has become one of the most recommended tournament coaches in the pocketfives.com coaching directory.

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FOREWORD

I first met Michael when he was a low- to mid-stakes grinder and I became his coach. From the start of our first session, I was struck by his level of enthusiasm and theoretical knowledge. When he showed me the Heads-Up Display (HUD) he had constructed in Hold'em Manager, I was impressed, and even a little envious. The HUD was about the most functional and deep-diving HUD I had ever seen and I have used quite a few paid-for HUDs. What really stood out was the incredible degree of attention to detail, and I was astounded by the amount of work it must have taken him.

That HUD, combined with Michael's background knowledge and eagerness, led me to invite him into a study group of which I was a member and which also included elite, high-stakes players such as Stephen Chidwick, Elio Fox and Martin Kozlov. There was a catch, though. Michael had to read four out of five chapters of Will Tipton's Expert Heads Up No Limit Hold'em in two days because we were reviewing the final chapter. This book is not exactly a page-turner and I had created the study group simply because I wanted some personal accountability around reading it and practicing. Frankly, I did not expect Michael to actually read it all but he showed up claiming he had, so I quizzed him and verified he'd done the reading and, still somewhat cautiously, let him into the group.

I must admit, another selfish reason I invited Michael to join the group is that I thought he might be happy to work on some of the Excel spreadsheets and other data-organizing tasks that we really didn't want to do. We were just beginning to learn PioSOLVER back then and Michael was a big help in structuring our findings and optimizing our studying. I would like to think that this was the moment when Michael began to discover his passion for studying theory, unearthing new ideas and doing the data-crunching necessary to get novel information.

However, the real reason why I made the offer to Michael is that I value hard work,

persistence and enthusiasm above pretty much any other trait, even intelligence. As well as being very bright, Michael clearly has all three of these crucial traits.

I do not subscribe to the common high-stakes attitude of keeping knowledge hidden to keep the losing players losing. When I first started playing the cleverest players were, arguably, those who won the most as very little "modern" information (in the form of solvers, Nash and ICM calculations) existed at the time. Back then, players often formed social groups where they would exchange ideas and build on each other's insight. I was lucky enough to be in the right place at the right time and, from the beginning, surrounded myself with brilliant poker players. Now, with the existence of solvers, one can generally get objective answers to any question. Therefore, it is no longer the most intelligent or the most popular who make the most money, but rather those who are willing to put in the hours, grinding away and tinkering with these powerful but frustrating programs.

I know or know of pretty much everyone in the high stakes MTT community, with perhaps a few exceptions. I am certain that Michael has ran more sims and collected more data than any other individual I know. This book is a product of all that number-crunching combined with Michael's incredible aptitude for organizing and presenting data. Most, if not all, of the ranges that Michael includes in these books are GTO ranges that agree with my own GTO solutions. I must confess that I am almost never playing exact GTO, that I am constantly jumping between models and finding ways to widen and adapt based on my observations of my opponents. After all, poker is still a game of playing the player. However, I do use all these models as base points, routinely switching or adapting models to fit the player frequencies that I'm up against. Using GTO ranges as a base strategy is pretty much the only way to study. Also, if you know what the unexploitable frequencies are, it is much easier to identify when others are playing in a way that is open to exploitation.

This book is very comprehensive and, with all of the mathematical equations, could even be intimidating to some. However, even if you skip the math, this book can be used as a reference guide for pre-flop raising and 3-bet ranges, push/fold charts and a glossary for nearly every poker term. As an advanced player, I found the flop chapters to be most instructive and I feel certain that there is no other book with this level of flop analysis. The use of equity buckets to visually describe equity distribution is a simple and effective way to find patterns without getting too lost in the minutiae.

For those reading the book, I offer a few pieces of general advice. First, if you are averse to math or think it isn't necessary to play good poker, you are both right and wrong. Sure, you can be a winning player without knowing the math behind a lot of the assumptions. However, if you truly want to master the game in a comprehensive way, I believe that math is necessary. Even if you hate math, you are indirectly doing math by trying to make winning plays. A strong foundation in math just means your

EV estimations are more precise.

Second, all of this work off the table might seem silly since we do not actually do math or consult charts at the table that often. However, the more time off the table you put in, the more you begin to see patterns so that, finally, after some experimentation, playing and hard work, all of the knowledge becomes part of your unconscious and instinctive understanding.

Third, if you're reading this, you're probably putting off some of the more difficult sections of the book. Get back to work!

Jon Van Fleet (Apestyles), July 2019

INTRODUCTION

An Unspoken Truth

For years, top poker players have had access to private software that has helped them increase their edge even further but now the poker landscape is evolving. Software is becoming more and more sophisticated while also becoming more easily accessible to the general public. Today, anyone can get access to modern equity calculators, push/fold apps, range analysis software, EV decision trees and GTO solvers. When I first started playing online and learned about these tools, I assumed the top players were the ones who had mastered them and knew the math behind each and every possible situation. However, I couldn't have been more wrong. Even with the proliferation of these advanced tools, most poker players do not want to spend thousands of hours becoming proficient with each of them and they certainly do not want to set up dedicated servers to run week-long GTO calculations.

So, how do world-class players manage to get access to the most advanced poker theory without having to spend thousands of hours actually in the lab? They outsource the work! They get mathematicians and game theory experts to fulfill this task for them so they can spend their time doing what they enjoy the most; winning everyone's money at the tables.

I know this to be true because I am one of those specialists who has been creating cutting-edge content for them. Over the past few years I've been making theory videos and webinars for online staking groups, as well as private articles for my students. I have also sold in-depth GTO solutions to world-class players. I used to tell everyone that I was a professional poker player, but it was until the moment I wrote these very words that I realized that's not what I've actually been doing. My playing volume, both live and online, has been laughably low over the last few years.

I suggest my students use a ratio of 80% play to 20% study, but my own ratio has probbaly been the exact opposite! Even so, I have good results and managed to rank as high as 117th worldwide on the PocketFives sliding leaderboard. I guess I can't really call myself a professional poker player if playing poker is the aspect of poker I spend the least amount of time doing. Having said that, I fully understand that playing is vitally important and I believe that if I wasn't playing at all I wouldn't be able to help my students the way I do. It is very important for the coach to stay up to date on the metagame and to know what his students are dealing with at the tables. I love the game of poker and, after finishing writing this book, all I want to do is hit the tables with everything I've got.

Modern Poker Theory is the culmination of years of research and coaching. I have put my heart into this book and did my best to make it different from all other theory books, most of which present heavy-duty theoretical work with little or no consideration for practical application. My goal is to make game theory accessible to everyone, so players won't have to spend all of their time running calculations and can instead do what they are supposed to be doing: playing poker!

What is the Game of Poker all About?

There are many reasons people play poker. Some play to have fun and socialize, others play for the thrill of running a big bluff or outthinking their opponents, and others play for the glory of winning a tournament, a bracelet, or making a living. Whatever their motivations are, no one plays poker to lose money and so, at their core, all poker players share the same goal (even if they do not realize it) which is to generate and maximize profit!

- ♦ What is profit?
- ♦ Profit = opponent mistakes - our mistakes

If you play in an environment where most players are simply terrible and play for a lot of money (such as in the golden age of online poker right after the Money-maker Effect and before Black Friday) you can play quite poorly and still make a lot of money, as long as your opponents play worse than you. In fact, the opposite is also true. You could be the ninth best player in the world but if you made a point to only play against the eight players who are better than you, you will get destroyed.

In the current poker ecosystem, exploitative play will still make a lot of money but, as the average player becomes more skilled, the ratio of good players to bad players constantly increases. This leads to smaller edges because vigilant Villains are trying to exploit us at the same time as we are trying to exploit them and we no longer have the luxury of being able to ignore our own game. Many famous "top

players" who failed to adapt and improve over the last few years have seen the game pass them by, forcing them to quit or move down because they can no longer beat the games.

Of the two components of the profit equation (our mistakes and our opponents' mistakes) you have little to no control over how your opponents play, other than selecting good games to play. However, you can always work on minimizing your own mistakes.

So how do you generate and maximize profit?

♦ Fix leaks in your own game and find what others are doing wrong.
♦ Adjust to exploit them.

That's it. That is the GTO study premise. It is not only about balance and equilibrium. It is about understanding the game at its core and actively using that knowledge to generate value.

MTT EQUILIBRIUM STRATEGIES: PLAYING FIRST IN

The equilibrium strategies presented in this chapter were generated with modern solvers and super-computers, based on cEV for 9-max tables with a 12.5% ante. This is a typical tournament environment, but it is up to you to adapt them to your respective games.

In tournaments, players have to navigate many different stack sizes but, unfortunately, there is a limit to the content that can be included in a single book, so we will focus our study on some the most important stack depths where most of the tournament action happens (these being 15bb, 25bb, 40bb and 60bb).

For deep-stacked no-ante situations (typically the first few levels of a tournament) there is less dead money in the pot, so ranges are generally tighter and the equilibrium strategies are very similar to those of cash games except there is no rake. This results in speculative hands increasing in value. Calling bets and playing post-flop becomes more attractive.

Playing First In

As mentioned previously, with stack depths shorter than 10bb, it is correct to play a push/fold game because the EV loss with short stacks is negligible compared to a more complex strategy.

It is vitally important that you think ahead before making your pre-flop decision. Take note of your own stack depth as well as the players remaining to act and their

stack depths. Assess the likelihood of them re-raising or calling.

You should know before you raise if your hand is a raise-fold or a raise-call. It could be the case that your hand can call an all-in against the range from one position but not from another, or that you can call a 15bb all-in but not a 20bb all-in. You also need to know if your hand works better as an open shove or a min-raise so you don't find yourself in a difficult spot if you min-raise, an opponent shoves and then you don't know what to do.

This might seem like way too many variables to consider, especially for inexperienced players, but it is important to be always mindful and aware of your situation and to avoid autopiloting.

There are many online players who play great poker when playing only one table but make frequent blunders when multi-tabling due to silly mistakes that could have easily been avoided by paying closer attention.

Bet-sizing

After extensive testing with solvers, my general assessment is that RFI bet-size does not have a significant impact on your bottom line as long as you are using somewhat reasonable bet-sizes and play reasonable ranges for that bet-size. The bigger the bet-size, the fewer hands you can play profitably. If you decide to open to 3bb, you are forced to play a tighter range than if you decide to open for a min-raise, otherwise you will lose money with the bottom of your range.

The sweet spot for RFI bet-size seems to be somewhere between 2bb and 2.5bb from BN to UTG, and 2.5bb to 3.5bb in blind vs blind battles.

I recommend min-raising when stack depths are in the rejam region (less than 25bb) for two main reasons:

♦ Raise-folding from a short stack is quite expensive and you don't want to overcommit yourself. For example, if you raise to 3x from UTG with 10bb and the BB goes all-in, you will need to call 7bb to play for a 14.6bb pot. Getting better than 2-to-1 pot odds, you will be committed to call off with any two cards in your reasonable raising range. If you instead min-raised, you would have to call 8bb into a 13.6bb pot, getting 1.7-to-1 pot odds, which allows you to fold the worst hands in your range.

♦ One of the main weapons players have when facing open raises with shallow stacks is to rejam all-in and, against bigger raise sizings, the Villains will get a better price on their rejams. For example, if you are in the CO and open to 2.5x with a 20bb effective stack, the BB has to

risk 19bb to win 5.125bb. This bet needs to work

$$\frac{19}{(19 + 5.125)} = 78.76\%$$

of the time. If instead you open to 2x, this bet needs to work

$$\frac{19}{(19 + 4.625)} = 80.42\%.$$

Your 3-bet and squeeze sizings will vary according to the player's position and stack depth as shown in *Tables 43 and 44*.

Stack Depth (bb)	IP	SB	BB	Versus Open
<20	All-in	All-in	All-in	2x
20-23	All-in / 5bb	All-in / 5.5bb	All-in / 5.5bb	2x
24-27	All-in / 5.5bb	All-in /6.5bb	All-in /6.5bb	2x
28-35	6	All-in /7bb	All-in /7bb	2.3x
36-45	7	8	8	2.3x
46-65	7.5	9	9	2.3x
66-99	8	9.5	9.5	2.3x
100+	8.5	10	10	2.5x

Table 43: MTT Recommended 3-bet Sizings

Stack Depth (bb)	IP	SB	BB	Versus Open
<20	All-in	All-in	All-in	2x
20-23	All-in / 6bb	All-in	All-in	2x
24-27	All-in / 6.5bb	All-in /7bb	All-in /7bb	2x
28-35	All-in /7bb	All-in /7bb	All-in /7bb	2.3x
36-45	8	All-in /10bb	All-in /10bb	2.3x
46-65	8	10	10	2.3x
66-99	10	12	12	2.3x
100+	10	13.5	13.5	2.5x

Table 44: MTT Recommended Squeeze Sizings

At stack depths 30–35bb and greater, the threat of getting rejammed is lower because of the higher risk/reward ratio. This means you can increase your raise size to 2.3x and not worry too much about giving the Villains a better price on their re-

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jams. By increasing your raise size, you cut down the Villain's implied odds, making it tougher for them to peel with the weaker hands in their range. With 100bb+, the RFI size can be 2.3-2.5x; I've seen some regs going bigger than that, but I haven't found substantial evidence that going any bigger yields a higher EV.

In general, you want to have bigger bet-sizes when deep stacked and when out of position. I like using a smaller 3-bet size from the SB than from the BB, because the SB has to worry about the BB waking up with a hand, so the smaller sizing saves a few chips when this happens. Also, the SB 3-betting range is in general less polarized than the BB, so it doesn't mind getting called as much as the BB does.

If the 3-bet size requires you to invest over 1/3 of your stack, you will be pot-committed unless your hand is absolute trash, so I wouldn't recommend investing over 1/3 of your stack with a terrible hand. In that case, you are better off going all-in instead, reducing your opponent's strategic options to calling the all-in or folding.
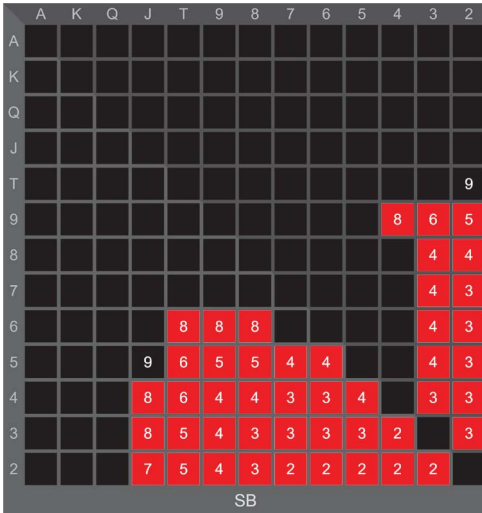
With fewer than 40bb, all 4-bets are only all-in because if you choose non-all-in 4-bet-sizes you would either be pot-committed or would have to use an extremely small size, which will give the Villains too good of a price to take the flop and realize equity. With 50bb to 100bb, you start to see non-all-in 4-bets to 2.25-2.5x when IP and 2.5-3x when OOP. All 5-bets are always all-in.

In modern online MTTs, some players still use smaller bet-sizes than recommended. This is mostly because people still fold too often to small bet-sizes. However, as the games evolve, bigger bets will become the norm because players now understand that calling small raises and realizing equity is always an option. This is the reason why the old silly click-back 5-bets and 6-bets are now pretty much extinct.

As explained in the General Guidelines for Pre-flop Bet-sizing section in Chapter 4, the earlier the position the smaller your bet-size should be, so use a slightly smaller bet RFI and 3-bet sizes from EP. Increasing your bet-size as you move closer to the BN is a valid strategy that I use in my games, but it comes at a cost of increasing the complexity of your strategies and I haven't found solid evidence of this having a really large impact on your bottom line. So, using a simpler, easier to execute strategy with fewer bet-sizes is recommended.

Short Stack Push/Fold Charts

The following charts *(Hand Ranges 88-95)* were generated with HRC using FGS. The numbers in the cells represent the maximum number of big blinds that can be pushed with that hand for each position. Hands in black can be pushed when having 10bb or less. For example, the SB can only push 95o with 5bb or less, but can push 95s with 10bb or less.

Hand Range 88:
Stack Depths for SB Push

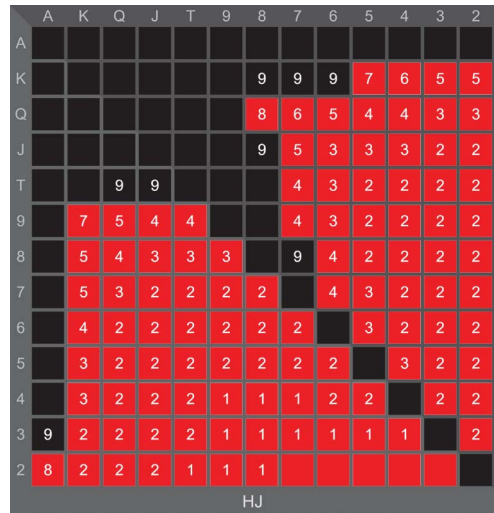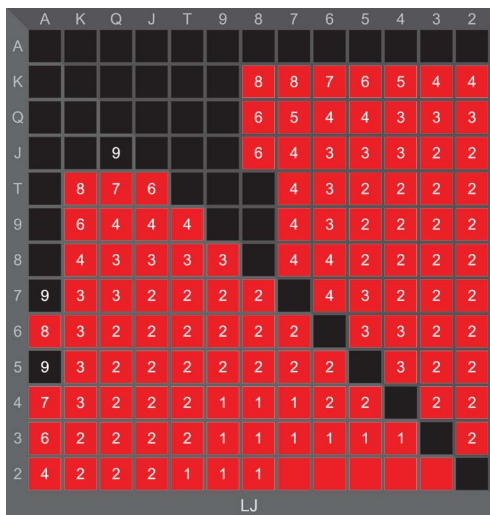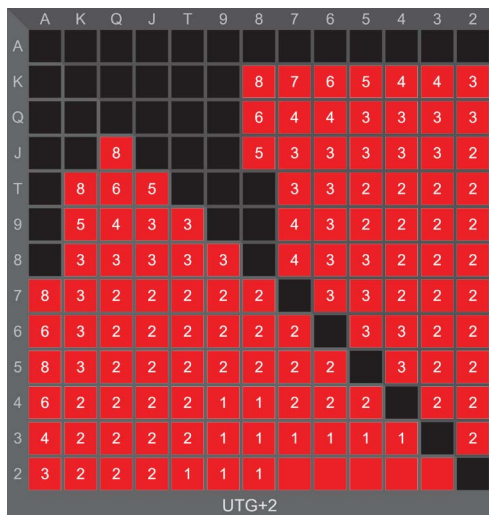|	A	K	Q	J	T	9	8	7	6	5	4	3	2
A													
K													
Q													
J													
T													9
9										8	6	5	
8											4	4	
7											4	3	
6				8	8	8					4	3	
5			9	6	5	5	4	4			4	3	
4			8	6	4	4	3	3	4			3	3
3			8	5	4	3	3	3	3	2			3
2			7	5	4	3	2	2	2	2	2		
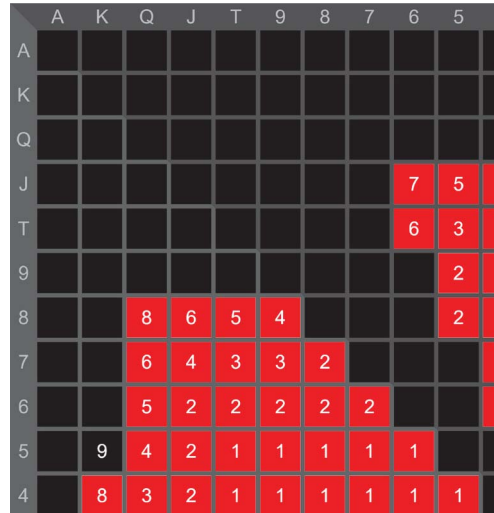
Hand Range 89:
Stack Depths for BN Push

	A	K	Q	J	T	9	8	7	6	5
A										
K										
Q										
J									7	5
T									6	3
9										2
8			8	6	5	4				2
7			6	4	3	3	2			
6			5	2	2	2	2	2		
5		9	4	2	1	1	1	1	1	
4		8	3	2	1	1	1	1	1	1

Hand Range 90:
Stack Depths for CO Push

	A	K	Q	J	T	9	8	7	6	5	4	3	2
A													
K										9	8	7
Q								8	7	6	5	4
J								6	4	3	3	2
T								8	4	2	2	2
9		9	7	6	5			3	2	2	2	2	2
8		7	5	4	3	3			3	2	2	2	2
7		7	3	2	2	2	2			2	2	2	1
6		6	3	2	2	2	2	2		3	2	2	1
5		4	2	2	2	2	2	2	2		2	2	2
4		3	2	2	2	1	1	1	1	1		2	1
3		3	2	2	1	1	1	1	1	1	1		1
2		2	2	2	1	1	1						

Hand Range 91:
Stack Depths for HJ Push

	A	K	Q	J	T	9	8	7	6	5	4	3	2
A													
K						9	9	9	7	6	5	5	
Q						8	6	5	4	4	3	3	
J						9	5	3	3	2	2	2	
T			9	9				4	3	2	2	2	2
9		7	5	4	4			4	3	2	2	2	2
8		5	4	3	3	3		9	4	2	2	2	2
7		5	3	2	2	2	2		4	3	2	2	2
6		4	2	2	2	2	2	2		3	2	2	2
5		3	2	2	2	2	2	2	2		3	2	2
4		3	2	2	2	1	1	1	2	2		2	2
3	9	2	2	2	2	1	1	1	1	1	1		2
2	8	2	2	2	1	1	1						

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Hand Range 92:
Stack Depths for LJ Push

	A	K	Q	J	T	9	8	7	6	5	4	3	2
A													
K							8	8	7	6	5	4	4
Q							6	5	4	4	3	3	3
J			9				6	4	3	3	3	2	2
T		8	7	6				4	3	2	2	2	2
9		6	4	4	4			4	3	2	2	2	2
8		4	3	3	3	3		4	4	2	2	2	2
7	9	3	3	2	2	2	2		4	3	2	2	2
6	8	3	2	2	2	2	2	2		3	3	2	2
5	9	3	2	2	2	2	2	2	2		3	2	2
4	7	3	2	2	2	1	1	1	2	2		2	2
3	6	2	2	2	2	1	1	1	1	1	1		2
2	4	2	2	2	1	1	1						

LJ

Hand Range 93:
Stack Depths for UTG+2 Push

	A	K	Q	J	T	9	8	7	6	5	4	3	2
A													
K							8	7	6	5	4	4	3
Q							6	4	4	3	3	3	3
J			8				5	3	3	3	3	3	2
T		8	6	5				3	3	2	2	2	2
9		5	4	3	3			4	3	2	2	2	2
8		3	3	3	3	3		4	3	3	2	2	2
7	8	3	2	2	2	2	2		3	3	2	2	2
6	6	3	2	2	2	2	2	2		3	3	2	2
5	8	3	2	2	2	2	2	2	2		3	2	2
4	6	2	2	2	2	1	1	2	2	2		2	2
3	4	2	2	2	2	1	1	1	1	1	1		2
2	3	2	2	2	1	1	1						

UTG+2
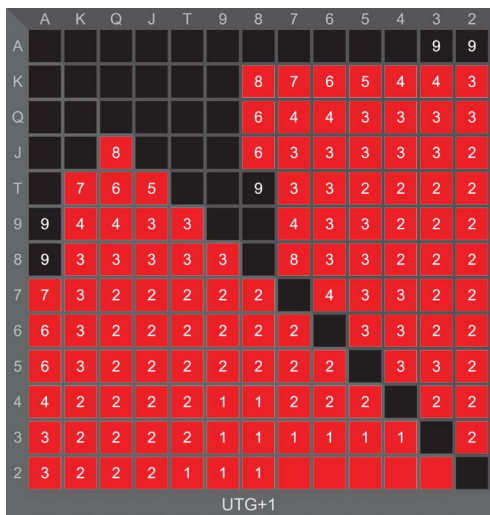
Hand Range 94:
Stack Depths for UTG+1 Push

	A	K	Q	J	T	9	8	7	6	5	4	3	2
A												9	9
K							8	7	6	5	4	4	3
Q							6	4	4	3	3	3	3
J			8				6	3	3	3	3	3	2
T		7	6	5			9	3	3	2	2	2	2
9	9	4	4	3	3			4	3	3	2	2	2
8	9	3	3	3	3	3		8	3	3	2	2	2
7	7	3	2	2	2	2	2		4	3	3	2	2
6	6	3	2	2	2	2	2	2		3	3	2	2
5	6	3	2	2	2	2	2	2	2		3	3	2
4	4	2	2	2	2	1	1	2	2	2		2	2
3	3	2	2	2	2	1	1	1	1	1	1		2
2	3	2	2	2	1	1	1						

UTG+1
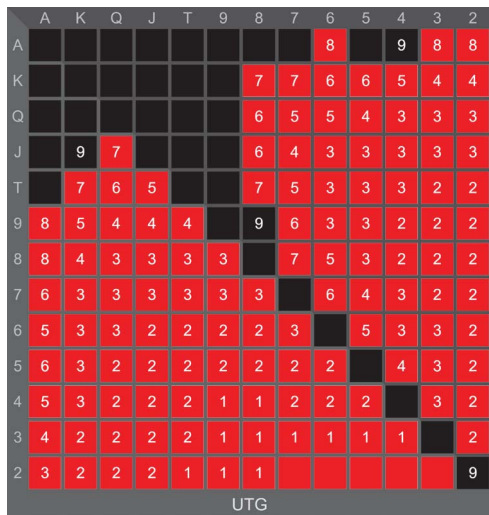
Hand Range 95:
Stack Depths for UTG Push

	A	K	Q	J	T	9	8	7	6	5	4	3	2
A								8		9	8	8	
K							7	7	6	6	5	4	4
Q							6	5	5	4	3	3	3
J		9	7				6	4	3	3	3	3	3
T		7	6	5			7	5	3	3	3	2	2
9	8	5	4	4	4		9	6	3	3	2	2	2
8	8	4	3	3	3	3		7	5	3	2	2	2
7	6	3	3	3	3	3	3		6	4	3	2	2
6	5	3	3	2	2	2	2	3		5	3	3	2
5	6	3	2	2	2	2	2	2	2		4	3	2
4	5	3	2	2	2	1	1	2	2	2		3	2
3	4	2	2	2	2	1	1	1	1	1	1		2
2	3	2	2	2	1	1	1						9

UTG

We now move on to examine the best way to react when the action is folded to you. We will consider all positions from the small blind round to UTG and all differ-ent stack depths from 10bb to 80bb.

Small Blind PFI Strategy

The SB is the position where you get to VPIP the largest number of hands when it folds to you (83% on average). This is due to the fact that the SB has a discount to enter the pot and has to worry about only one player left to act. *Table 45* is a summary of SB GTO Action Frequencies by stack depth:

SB	Actions Frequency				Total VPIP
Stack	All-in	Raise (Non All-in)	Limp	Fold	
10bb	51.00%	0.00%	28.60%	20.40%	79.60%
12bb	42.20%	0.00%	40.00%	17.70%	82.30%
15bb	23.70%	0.00%	61.50%	14.80%	85.20%
17bb	18.00%	16.3% (2.5x)	50.10%	15.60%	84.40%
20bb	13.00%	17.3% (2.5x)	54.80%	14.90%	85.10%
25bb	1.80%	29.8% (3.3x)	50.50%	17.90%	82.10%
30bb	0.00%	31.8% (3.5x)	48.20%	19.90%	80.10%
40bb	0.00%	26.4% (3.5x)	54.40%	19.20%	80.80%
60bb	0.00%	15.1% (3.5x)	69.90%	15.00%	85.00%
80bb	0.00%	12.0% (3.5x)	74.80%	13.20%	86.80%
				Avg VPIP	83.14%

Table 45: SB GTO Action Frequencies by Stack Depth

Small Blind Strategy at 15bb

With 10-15bb stacks, play a push/limp/fold strategy and as stacks get deeper, you should push fewer hands, resulting in limping becoming the dominant strategy.

At 15bb, the solver likes to push hands that have good blockers such as Ax, Kx, and hands that have a lot of equity against calling ranges but bad post-flop EqR, such as small pocket pairs (66-22), and hands that have a ton of equity but would struggle to call a jam themselves such as suited connectors (98s-65s). The limping range consists of high equity hands that can call an all-in, such as pocket pairs (77+), broadways, suited Ax and Kx and hands such as Q2o, J8o, T4s and 73s that have fine equity in limped pots but don't mind limp-folding against a jam *(Hand Ranges 96-98)*.

At 17bb, the SB starts to have a non-all-in raise size, and the raise size gets bigger as stacks get deeper, from 2.5x at 17bb to 3.5x at 30bb. At deeper stacks, the solver likes to use even bigger raise sizes (up to 5x) but there is no substantial EV loss by using 3.5x, and so I believe that using sizes bigger than 3.5x is overkill.

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Hand Range 96: SB vs BB (15bb)
● *All-in 23.7% /* ● *Limp 61.5% /*
● *Fold 14.8%*

Hand Range 97: SB vs BB 15bb (Limp vs All-in)
● *Call 21.3% /* ● *Fold 78.7%*

Hand Range 98:
SB vs BB 15bb (Limp vs 3x Raise)
● *All-in 12.9% /* ● *Call 49.1% /* ● *Fold 38%*

Hand Range 99: SB vs BB (25bb)
● *All-in 1.8% /* ● *Raise 3.3x 30% /*
● *Limp 50.3% /* ● *Fold 17.9%*

Small Blind Strategy at 25bb

At 25bb, the SB open pushing range starts to disappear. The only hands that want to open push are baby pairs (44–22) and some offsuit mid Ax (A9o, A8o). The strategy becomes raise/limp/fold *(Hand Range 99)*.

The limping range is made of some traps with the strongest Ax (AKo–A9o), mid pocket pairs (99–44) and many hands with good equity that don't want to raise

and be forced to fold against a jam, such as KTo, Q9s and 76s. The raising range is again polarized and is made up of the strongest hands that can call a jam, such as pocket pairs (66+), offsuit Ax (A8o+), suited Ax (A5s+) and the strongest broad–ways. The rest of the raising range is focused on having a blocker, such as A7o–A2o, Kxo and hands with decent playability in single raised pots, such as KJo, QTo, J8s, and 74s. *(Hand Ranges 100–102).*

Hand Range 100:
SB vs BB 25bb (Limp vs All-in)
● *Call All-in 15.2% /* ○ *Fold 84.8%*

Hand Range 101:
SB vs BB 25bb (Limp vs 3.3x Raise)
● *All-in 11% /* ● *Call 43.7% /* ○ *Fold 45.4%*

Hand Range 102:
SB vs BB 25bb (3.3x Open vs All-in)
● *Call All-in 30.1% /* ○ *Fold 69.9%*

Hand Range 103: SB vs BB (40bb)
● *All-in 0% /* ● *Raise 3.5x 26.4% /*
● *Limp 54.4% /* ○ *Fold 19.2%*

Small Blind Strategy at 40bb

At 40bb, there is no all-in range and most hands are played as a mixed strategy, with the strongest hands being raised more often than limped and the weaker hands being limped more often than raised *(Hand Range 103)*.

After limping and facing a 3.5x raise, the SB will defend by going all-in with 5.9% of their range, including pocket pairs (99, 88, 77, 33, 22), strong Axo (AQo, AJo) and a small frequency of weak Axo (ATo, A5o, A4o).

The SB also has a non-all-in re-raise to 2.75x that includes the strongest hands that are happy to stack off pre-flop, such as 55+, AT+, and KQs, and some bluffs with good blockers such as Axo and Kxo *(Hand Ranges 104-105)*.

Hand Range 104:
SB vs BB 40bb (Limp vs 3.5x)
● All-in 5.9% / ● Raise 2.75x 6.4% /
● Call 42% / ● Fold 45.6%

Hand Range 105:
SB vs BB 40bb (3.5x Open vs 2.75x 3-bet)
● All-in 13.1% / ● Call 40.4% /
● Fold 46.5%

Small Blind Strategy at 60bb

The common trend seen as stacks get deeper is the increase in the limping frequency and a reduction in the raising frequency. There aren't any hands that play a pure raising strategy, but there are many that play a pure limping strategy.

At 60bb, after limping and facing a raise, stacks are too deep to limp/shove, and so the only re-raising size is to 3.4x. The limp/reraising range is made of the best hands that are happy to stack off pre-flop and hands with good blockers and some board coverage *(Hand Ranges 106-107)*.

Hand Range 106: SB vs BB (60bb)
● *Raise 3.5x 15.1% /* ● *Limp 69.9% /* ○ *Fold 15%*

If you raise and face a 3-bet, you are still a bit too deep to simply jam 60bb. The only hands that want to do that are AKo and A5s with a small frequency, so you are safe to simply ignore this branch of the tree and use only a 2.6x 4-bet-sizing. The hands that should be 4-bet are KK, QQ, AK, and AQo, plus some bluffs made with blocker hands. Notice that the solver likes to slowplay AA, calls with a lot of suited hands and folds most offsuit and disconnected hands to the 3-bet *(Hand Range 108)*.

Hand Range 107:
SB vs BB 60bb (Limp vs 3.5x)
● *All-in 0% /* ● *Raise 3.4x 11.7% /*
● *Call 47% /* ○ *Fold 41.3%*

Hand Range 108:
SB vs BB 60bb (3.5x Open vs 2.75x 3-bet)
● *All-in 2% /* ● *Raise 2.6x 8.4% /*
● *Call 44.5% /* ○ *Fold 45.1%*

THE FLOP CONTINUATION-BET (C-BET)

Flop c-betting is one of the most important topics in poker. It is a complex subject that has been studied and discussed by poker players and theorists for decades. Contrary to most typical theory books, I decided to begin the flop discussion with the BB instead of leaping directly into c-betting. This is because I want readers to first develop a good conceptual understanding of betting in general, how the post-flop action is a function of the players' relative positions, range distributions and SPR. After studying OOP betting and the power of position, all that is left in order to understand the flop c-bet is to analyze the situation from the IP player's point of view.

Just as we did when studying the donk bet, for this section we will use the aggregated data from thousands of GTO solutions with stack depths 20bb, 30bb and 40bb with standard GTO MTT starting ranges. The ranges in your own games might be different to the ones used for these simulations, but I have found that, as long as the ranges used are "reasonable", the overall results for post-flop play won't be significantly affected. If the standard ranges in your own games differ too much from the equilibrium strategies, you can still benefit by understanding equilibrium and then applying the principles discussed in this chapter to understand how your standard ranges are different from GTO and how you can deviate from equilibrium to further attack the imbalances introduced in the new strategies. Getting your own solver and running some custom simulations can help you better understand this effect and find good exploitative lines against population tendencies.

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In the previous section we found that, from a GTO point of view, there isn't too much incentive for OOP to bet out on the flop, but what about IP? What is their equilibrium strategy? Are they incentivized to bet or check? Can they play a pure strategy that always checks back the flop without a significant EV loss in the way the BB can?

Strategy	EV
GTO 4 Bet sizes	70.9784
100% Check	66.8104
EV Difference	4.168
EV loss in bb	0.258416
EV loss bb/100	25.8416

Table 109: Result of IP Playing 100% Check Back

If IP plays a strategy that always checks back the flop, they will have an EV loss of 26bb/100, so c-betting the flop is of *massive importance* to IP. In this section, we will study the principles behind the flop c-bet and use that knowledge to effectively develop sound c-betting strategies.

Overall Flop Metrics

This analysis starts on IP's decision point after the BB checks. For these calculations, we used simulations where the BB had the option to donk bet. However, donk betting happens very infrequently and, in general, checking GTO ranges will remain well balanced even when donk betting is widely used. Therefore, we can expect IP's overall strategy to not be affected and be applicable to players who have a GTO donking range and players who check 100% of the time.

Players who have a non-GTO donking range are in general quite exploitable as their donking range tends to be always strong or always weak, so all you need to do against them is figure out their strategy. If they always donk strong, you can start to overfold the bottom of your range when they bet and bet at a high frequency when they check. If they donk weak, you can bluff raise them on the flop, trap them with your really strong hands that don't need much protection, and check back the flop a little more than usual to avoid being x/r by a checking range that is heavily skewed towards strong hands.

IP	EQ	EV	EQR
UTG	63%	73%	115%
BN	59%	67%	115%
Average	60%	69%	115%

Table 110: IP vs BB Overall Metrics

Both the BN and UTG over-realize their equity by 15%, but since UTG's range has higher equity, they are able to capture a bigger portion of the pot than the BN *(Table 110)*.

BN EQB

- Strong: 22%
- Good: 43%
- Weak: 29%
- Trash: 6%

BB EQB (vs BN)

- Strong: 7%
- Good: 25%
- Weak: 23%
- Trash: 45%

UTG vs BB

- Strong: 30%
- Good: 46%
- Weak: 22%
- Trash: 2%

BB EQB (vs UTG)

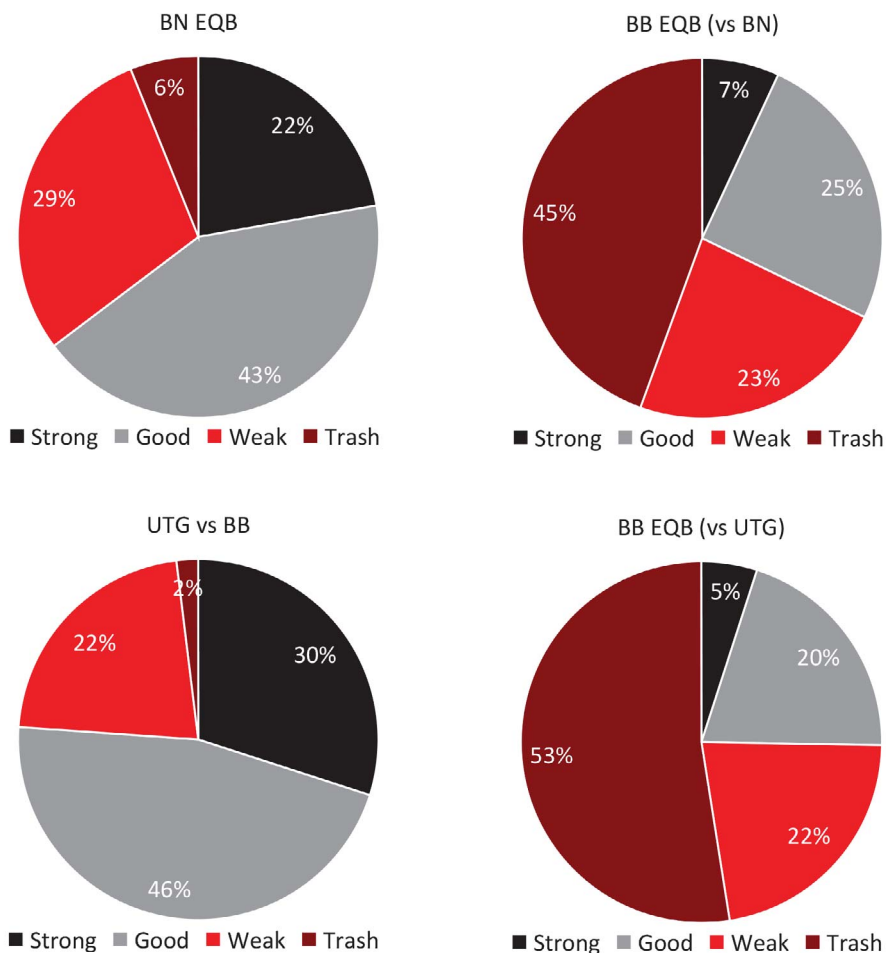- Strong: 5%
- Good: 20%
- Weak: 22%
- Trash: 53%

Diagram 38: BB vs IP Equity Buckets

Clearly IP has the overall range advantage. As expected, UTG's ~15% range is much stronger than the BN's ~44% range *(Diagram 38)*. This aligns well with UTG's higher c-bet frequency.
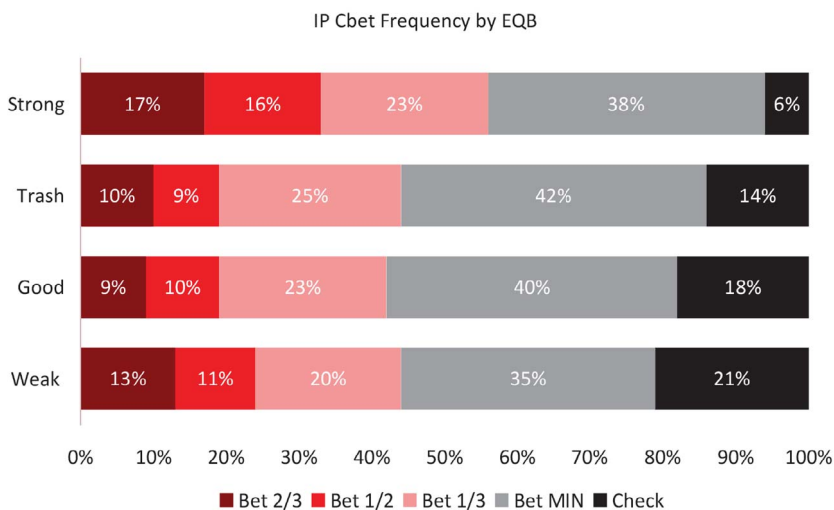
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IP Cbet Frequency by EQB

	Bet 2/3	Bet 1/2	Bet 1/3	Bet MIN	Check
Strong	17%	16%	23%	38%	6%
Trash	10%	9%	25%	42%	14%
Good	9%	10%	23%	40%	18%
Weak	13%	11%	20%	35%	21%

Diagram 39

Strong hands

Strong hands are incentivized to bet and increase the size of the pot but, as we know, betting only your high-equity hands and checking your low-equity hands would be a highly exploitable strategy. For this reason, IP also has to bet some weaker hands on the flop so that the c-betting range remains balanced.

Sometimes checking back strong hands works well in situations when they don't need as much protection. When they block the Villain's continuing range, or when they are so nutted that it doesn't matter if you give a free card so the Villain can catch a small piece or start bluffing, checking behind with some of your strong hands makes sense. This is referred to as *trapping*. An added benefit is that checking strong hands also helps protect your checking range.

Good hands

Good hands also benefit by betting and gaining value from worse hands as well as for protection to get some folds from hands that have equity. However, sometimes it makes sense to check back your good hands when the BB's range is very polarized to hands that are either stronger than yours or have very little equity. By checking behind, you give the Villain a chance to pick up some equity with trash hands or start bluffing with them, while keeping the pot size under control when you are beat. This action is often referred to as *pot controlling*.

Weak hands

Weak hands benefit from checking back when the Villain's range is strong and you risk getting x/r and pushed off your hand. However, they do well as *semi-bluffs* when your opponent's range is generally weak and cannot x/r you at a high frequency.

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Trash hands

Trash hands will not improve too often when checked back, so they are in general c-bet more often than weak hands. They mostly benefit from having fold equity. If called, they will still have some equity in the pot, but their equity is sufficiently low that you don't mind having to bet/fold them vs a x/r. Betting your trash is often referred to as a *pure bluff*.

IP Cbet Frequency by Position

	Bet 2/3	Bet 1/2	Bet 1/3	Bet MIN	Check
UTG	17%	19%	30%	25%	9%
BN	11%	9%	19%	43%	18%
Average	12%	12%	22%	39%	15%
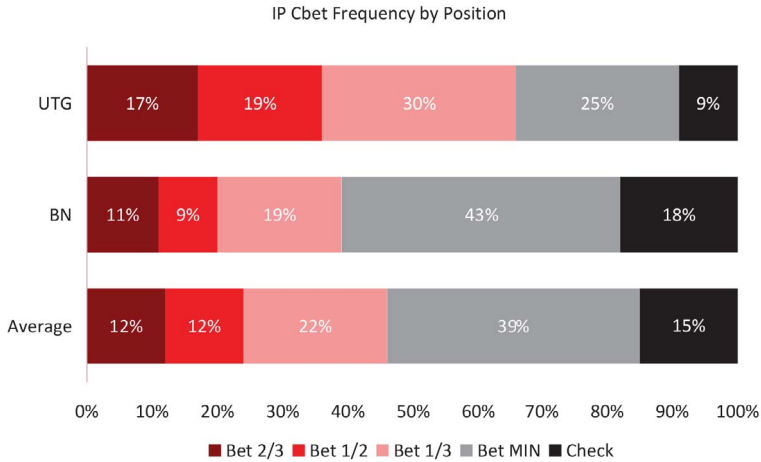
Diagram 40

UTG's c-bet frequency and bet-sizes are bigger than the BN because the UTG range is stronger than that of the BN. In general, the more strong hands your range has compared to your opponent's, the more frequently you can bet. This is because the more strong hands your betting range has, the more you can bet other hands in your range because your range is protected. The fact that UTG's range is in general stronger than the BN's also allows the use the bigger bet-sizes more frequently *(Diagram 41)*.

IP Cbet Frquency by Stack Depth

	Bet 2/3	Bet 1/2	Bet 1/3	Bet MIN	Check
40bb	16%	9%	22%	37%	16%
30bb	14%	13%	19%	40%	14%
20bb	7%	13%	25%	38%	17%

Diagram 41

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The bigger sizes are generally used less often when stacks are shallower, and the use of bigger bets (and even overbets) becomes more relevant when stacks are deeper. This makes sense because, in general, when stacks are shallow, big bets aren't needed to get all the money in across two or three streets. There is no need to overcommit large portions of your stack when the SPR is low. The only exception is the all-in bet, which gets used more often when stacks get shallow, because the risk/reward ratio is much better when all your chips are going in and you are guaranteed to realize your equity *(Diagram 41)*.
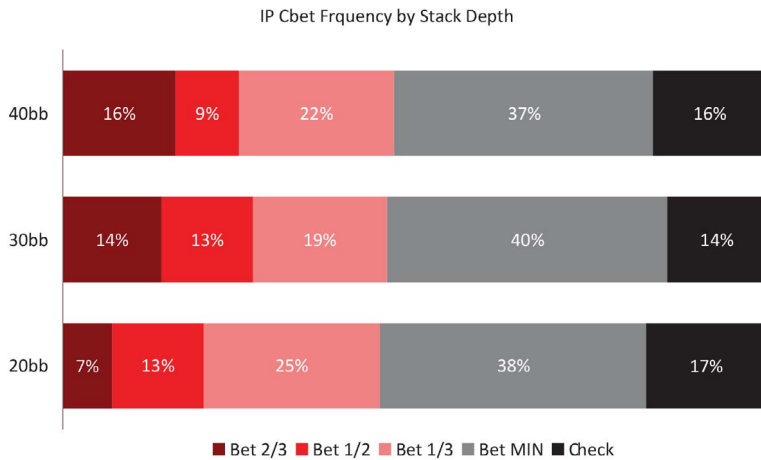
IP Cbet Frequency by Possible Straights

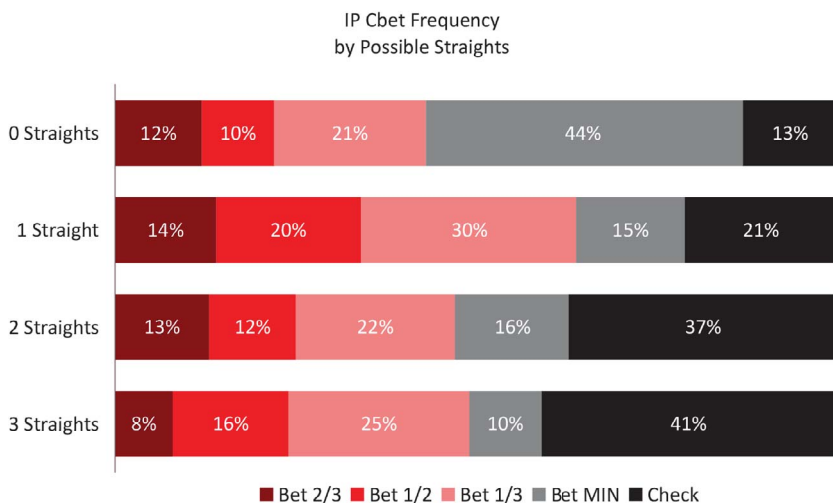|	Bet 2/3	Bet 1/2	Bet 1/3	Bet MIN	Check
0 Straights	12%	10%	21%	44%	13%
1 Straight	14%	20%	30%	15%	21%
2 Straights	13%	12%	22%	16%	37%
3 Straights	8%	16%	25%	10%	41%

Diagram 42

Since the BB has more offsuit connectors than IP, flops with more possible flopped straights will, as expected, favor the BB. So, the c-bet frequency decreases as there are more straights possible on the flop. Flops with zero flopped straights are the highest c-bet ones.

Within the flops with zero possible straights, we can create a subcategory for the number of possible open-ended straight draws *(Diagram 42)*.

Not surprisingly, the flops with three OESDs are the ones with the lowest c-bet frequency and with the larger bet-sizes, as the BB will have more possible straight draws and IP's strong hands need more protection *(Diagram 43)*.

The only 2xx flop is 222 and it is c-bet 100% of the time. Axx flops are the second most c-bet flops, with a 96% c-bet frequency. 3xx flops are only 333, 322 or 332 and are c-bet 93% of the time. Kxx flops are c-bet 88%, Qxx and Txx are c-bet 85% and, as expected, middle and low flops are c-bet at the lowest frequencies, with 6xx being the lowest at only 62% *(Diagram 44)*.

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IP Cbet Frequency by OESDs

	Bet 2/3	Bet 1/2	Bet 1/3	Be: MIN	Check
0 OESDs	9%	9%	21%	53%	8%
1 OESDs	10%	10%	21%	47%	12%
2 OESDs	9%	9%	22%	46%	14%
3 OESDs	20%	13%	20%	26%	21%

■ Bet 2/3 ■ Bet 1/2 ■ Bet 1/3 ■ Be: MIN ■ Check

Diagram 43

IP Cbet Frequency by Rank

	Bet 2/3	Bet 1/2	Bet 1/3	Bet MIN	Check
2XX	21%	34%	42%		3%
	17%	21%	30%	28%	4%
3XX	5%	13%	53%	22%	7%
	7%	8%	17%	56%	12%
JXX	10%	10%	23%	44%	13%
	7%	9%	21%	48%	15%
TXX	13%	11%	23%	38%	15%
	8%	10%	38%	20%	24%
9XX	16%	11%	17%	31%	25%
	17%	9%	15%	28%	31%
5XX	12%	9%	27%	18%	34%
	15%	8%	18%	23%	36%
6XX	15%	8%	21%	18%	38%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

■ Bet 2/3 ■ Bet 1/2 ■ Bet 1/3 ■ Bet MIN ■ Check

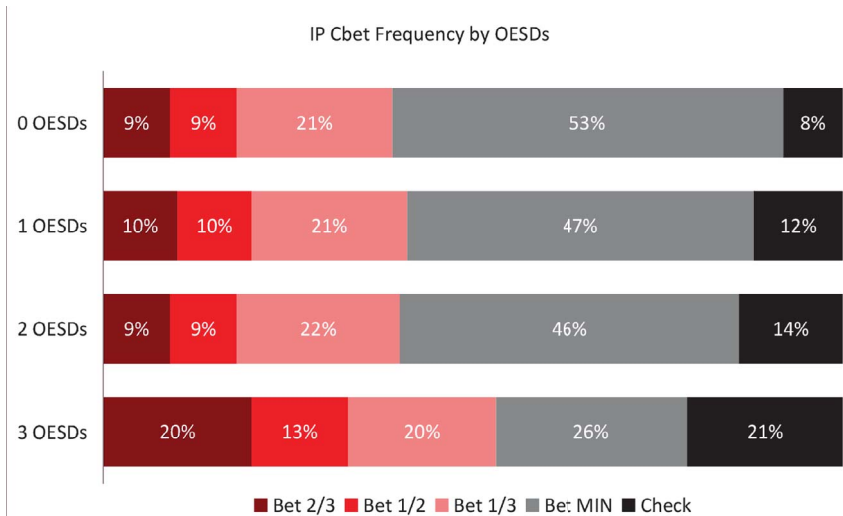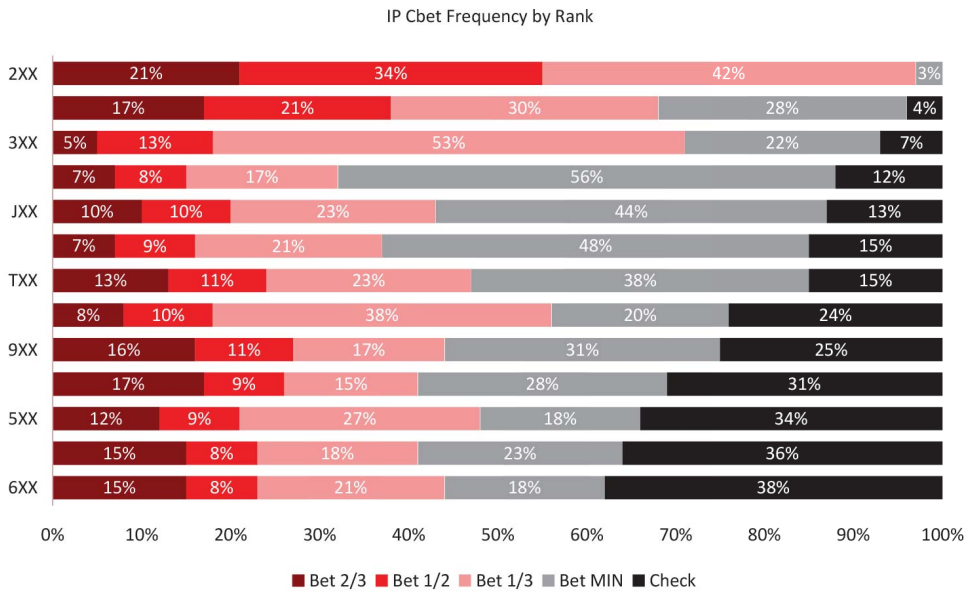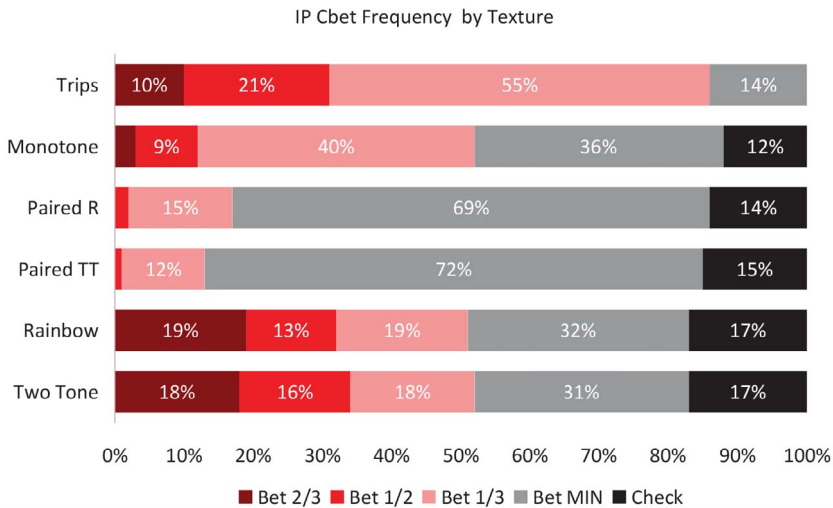*Diagram 44*

Diagram 45

Diagram 45 shows how often IP should bet in terms of the flop texture. Clearly, paired boards should be frequently min-bet. This will be examined in greater detail in the forthcoming sections.

Flop C-betting by Structure

The flop structure is one of the key characteristics that drives post-flop play as the strategies differ drastically if the flops feature trips, are paired, or are unpaired.

Trips are by far the absolute best flops for IP, who can capture on average 81% of the pot on this texture. Paired boards, on the other hand, give the BB a lot of strong hands, polarizing their range and allowing them some counterplay. This range polarization is one of the main reasons why betting very small is optimal on paired boards. Small bets force the BB to reveal a lot of information about their holding, as there are a lot of trash and weak hands the BB has to fold, regardless of IP's bet-size, and IP loses the minimum when having to bet/fold the flop with the bottom of their range.

In general, small bets are preferred when IP's range has this type of depolarized distribution with the bulk of hands being good, but not great, and a low frequency of trash and weak hands. In situations where IP's range distribution is more polarized with a bigger proportion of strong, weak and trash hands, bigger bet-sizes are used more often.
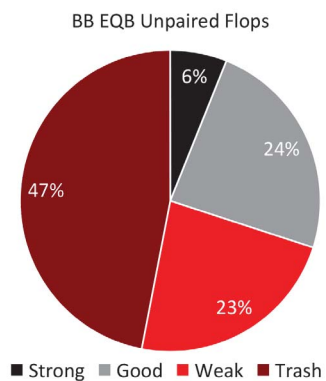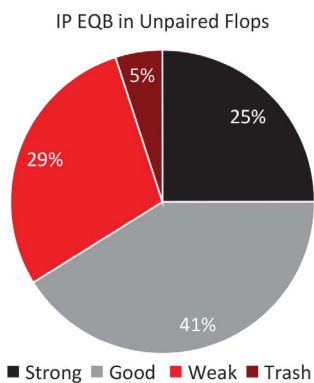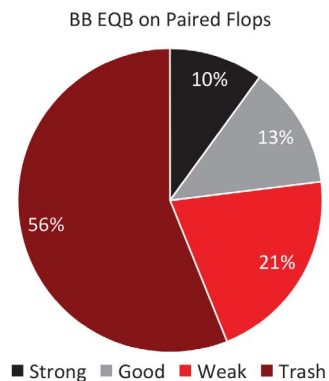
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IP EQB on Trips

16% Strong · 65% Good · 17% Weak · 2% Trash

■ Strong ■ Good ■ Weak ■ Trash

BB EQB on Trips

4% Strong · 9% Good · 25% Weak · 62% Trash

■ Strong ■ Good ■ Weak ■ Trash

IP EQB on Paired Flops

23% Strong · 53% Good · 20% Weak · 4% Trash

■ Strong ■ Good ■ Weak ■ Trash

BB EQB on Paired Flops

10% Strong · 13% Good · 21% Weak · 56% Trash

■ Strong ■ Good ■ Weak ■ Trash

IP EQB in Unpaired Flops

25% Strong · 41% Good · 29% Weak · 5% Trash

■ Strong ■ Good ■ Weak ■ Trash

BB EQB Unpaired Flops

6% Strong · 24% Good · 23% Weak · 47% Trash

■ Strong ■ Good ■ Weak ■ Trash

Diagram 46

Structure	% Total	EQ	EV	EQR
Trips	0.24%	64%	81%	126%
Paired	16.94%	61%	68%	112%
Unpaired	82.82%	59%	69%	116%

Table 111: IP Metrics by Flop Structure

Bet Frequency by Structure
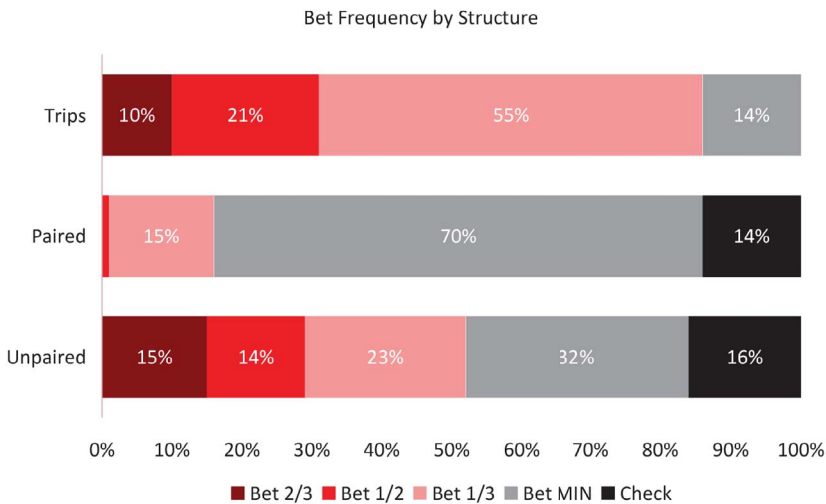

Diagram 47

IP Cbet Frequency by Flop Family (Trips)
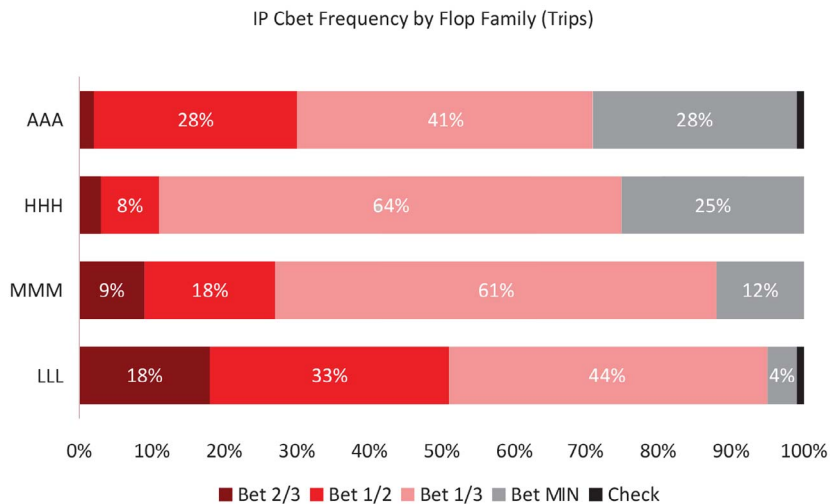
Diagram 48

On flops featuring trips, there is a clear pattern of bigger bet–sizes being used more often on the lower ranks, while 1/3-pot is the most frequently seen bet-size.

On paired flops, min-betting is clearly the preferred bet-size for most flop ranks, although 1/3-pot is preferred on flop families AAM, AAL and LLL, 1/2-pot is seldom used, while 2/3-pot is never used. The most checked families are MMH, HHA, LLM, LLH, LLL, MMM, MML and LLA. As expected, flops with the paired card being of low or middle rank tend to benefit the BB more than IP, and so they get checked more often than flops that contain a paired high card or an ace.

IP Cbet Frequency by Flop Family (Paired)

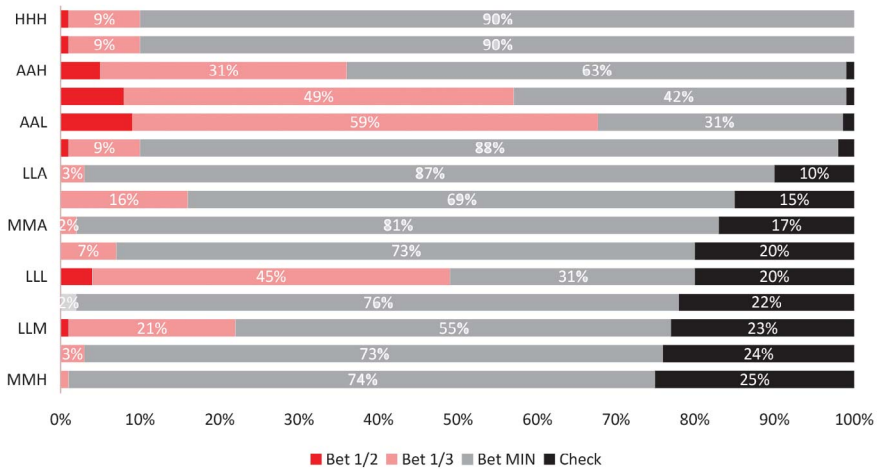| Family	Bet 1/2	Bet 1/3	Bet MIN	Check
HHH	9%		90%	
	9%		90%	
AAH		31%	63%	
		49%	42%	
AAL		59%	31%	
	9%		88%	
LLA	3%	87%		10%
		16%	69%	15%
MMA	2%	81%		17%
		73%		20%
LLL		45%	31%	20%
	2%	76%		22%
LLM		21%	55%	23%
	3%	73%		24%
MMH		74%		25%

Diagram 49

IP Cbet Frequency by Flop Family (Unpaired)

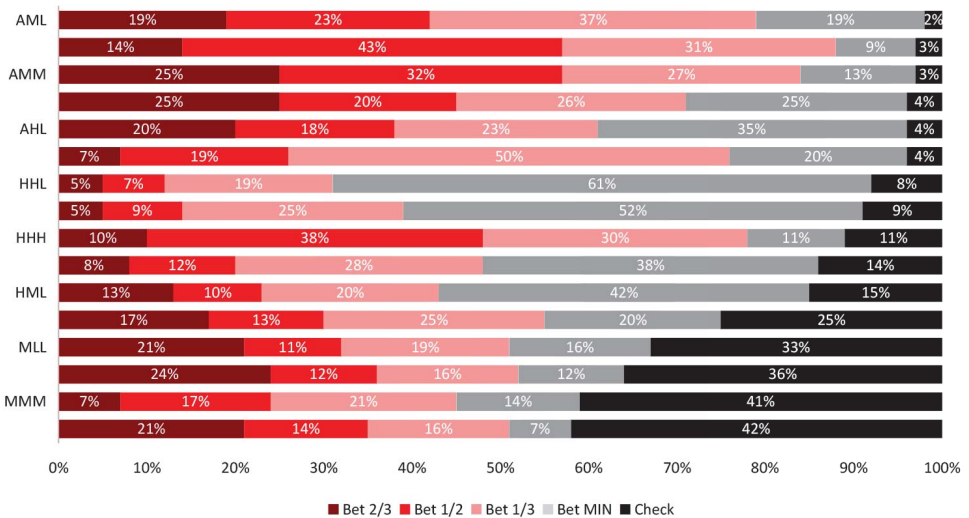| Family	Bet 2/3	Bet 1/2	Bet 1/3	Bet MIN	Check
AML	19%	23%	37%	19%	2%
	14%	43%	31%	9%	3%
AMM	25%	32%	27%	13%	3%
	25%	20%	26%	25%	4%
AHL	20%	18%	23%	35%	4%
	7%	19%	50%	20%	4%
HHL	5%	7%	19%	61%	8%
	5%	9%	25%	52%	9%
HHH	10%	38%	30%	11%	11%
	8%	12%	28%	38%	14%
HML	13%	10%	20%	42%	15%
	17%	13%	25%	20%	25%
MLL	21%	11%	19%	16%	33%
	24%	12%	16%	12%	36%
MMM	7%	17%	21%	14%	41%
	21%	14%	16%	7%	42%

Diagram 50

On unpaired flops, the least c-bet flop families are LLL, MMM, MML, MLL and HMM. We still see a lot of bet-size mixing, so we have to look deeper into the un-paired flop textures to get a better idea of how to approach them.

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