



**PLAY
OPTIMAL
POKER 2
RANGE
CONSTRUCTION**

ANDREW BROKOS

PLAY
OPTIMAL
POKER 2: RANGE
CONSTRUCTION

by Andrew Brokos

Play Optimal Poker 2: Range Construction

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PREFACE

I began writing this book in the Mojave Desert. The quiet and the solitude were a welcome respite from Las Vegas, where I'd just spent two months competing in the World Series of Poker. My series came to a spectacular end as I finished in 125th place in the \$10,000 Main Event.

The deep run was good for sales, and nearly as gratifying as making Day 5 was the flood of tweets and emails I received from readers praising *Play Optimal Poker*. Despite the many frustrations of writing and self-publishing, I was eager to get started on a sequel.

I finished writing *Play Optimal Poker 2* in solitude of a different kind. When I should have been gearing up for fifteenth WSOP, I was instead isolated in my home so as not to become a vector for the spread of the Covid-19 virus. At times it felt futile to dedicate so much effort to writing about a card game while people around the world suffered, but with poker rooms shuttered, I was also grateful for the opportunity to monetize my time.

In my most self-aggrandizing dreams, I imagine that there might be some greater value in this game we love, some useful modes of thought that it cultivates. I imagine that learning to make better decisions might contribute in some small way to a better world more capable of responding to this and other unforeseen challenges.

Game theory teaches us to make decisions under conditions of uncertainty, and never in my lifetime has the world felt more uncertain. Never has it been more clear that my outcomes—**payoffs**, in the parlance of game theory—depend not only on my own actions but on the actions of others.

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Unlike poker, this is not a zero-sum game, and we are not competing against one another. My greatest hope of all, which does not seem so wild, is that we will find the means to cooperate in pursuit of positive-sum, win-win outcomes. Because never in my lifetime has it been more clear that we are all in this together.

May we all make more optimal decisions!

Andrew Brokos

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INTRODUCTION

You are playing No-Limit Texas Hold 'Em. The turn card has just been dealt, and it's a third club. You double-check your cards, but unfortunately, they have not changed: you've got no flush, no straight, not even a pair. Your only hope is the Ace of clubs you hold, which gives you roughly a 1-in-5 shot at rivering the nuts. You watch your opponent for a glimmer of fear or excitement, but he's stone-faced. The clock is ticking. It's decision time. Do you bet or take a free card?

If this hand sounds familiar, that's because the first volume of *Play Optimal Poker* opened with a similar thought experiment. This time, however, you're playing the turn rather than the river, which opens a Pandora's box of complications.

Before the river, ranges are not simply polarized or condensed like the ones we focused on in the first book. In formulating your turn strategies, you and your opponent must both plan for the river. Hands can change value, so even if you are bluffing the turn, you might end up value betting the river, or vice versa.

With three clubs on the board, betting with the Ace of clubs is appealing in part because you know your opponent does not have the nuts. Even if you are called, your draw gives you equity and allows you to anticipate value betting club rivers. Anticipating potential future value increases the profitability of bluffing the turn.

In fact, calling this bet a bluff is not quite accurate. Depending on the circumstances, Ace-high could be the best hand. Your turn bet could even be called by worse hands, such as weaker flush draws against which you would be a big favorite!

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This is not a straight-forward value bet, either. You are not hoping for a call. You may cause hands stronger than yours to fold, and you benefit even when your opponent folds weaker hands, by denying them the opportunity to draw out on the river.

Whatever we call it, this is starting to sound like a pretty appealing bet. But wait a minute! We can't decide until we also consider the value of checking. It's not enough to determine that betting is profitable; to be **optimal**, betting must be more profitable than checking.

A fourth club could come just as easily if you check as if you bet. Suppose your opponent knew you would always bet the turn when you held the Ace of clubs. How could he take advantage of that information?

If you checked and a fourth club came on the river, he could be sure you did not have the nuts. That would enable him to bet a polarized range into your condensed range, which, you may recall from *Play Optimal Poker*, is a rough spot for you to be in. It would be a wide polarized range as well, because he could treat not just the Ace-high flush but also the King-high flush as the nuts, making huge bets with those hands and balancing them with many bluffs.

Your betting range would be in danger as well. If your opponent knew you would always bet the turn with the Ace of clubs, he would have less incentive to pay you off on club rivers. That would reduce your incentive to bet the turn in the first place, because some of the value of your bet lies in anticipating a value bet on club rivers.

If you always checked the turn with the Ace of clubs, you would run into similar problems. Your opponent could bet a **polarized** range on club rivers after you bet the turn and refuse to pay you off on club rivers after you check the turn.

Do you see where this is going? We are working our way toward an **equilibrium** where you are **indifferent** between betting and checking the turn with the Ace of clubs.

Making you indifferent requires a much more complicated strategy from your opponent than simply adjusting his bluffing and bluff-catching frequencies. It requires him to **balance** how often he bluffs and how thinly he value bets club rivers after you bet the turn and after you check the turn. It requires similar adjustments to his bluffing and bluff-catching strategy on non-club rivers, especially Ace rivers. It may even require adjustments to calling and raising frequencies on the turn, as getting check-raised after **semi-bluffing** the nut flush draw will be unpleasant for you.

An imbalance in any of these areas creates an exploitative opportunity for you, but it also creates a potential liability. If your opponent is too passive on the turn, you may strictly prefer betting your nut flush draws. If he is too aggressive on the turn, however, betting may be a mistake. Then again, betting and shoving over a check-raise could be the best **exploit** of all!

The bottom line is that concepts like equilibrium and indifference and balance are much more complicated on early streets. In the first volume of *Play Optimal Poker*, I was routinely torn between the urge to explain every nuance and the desire to keep things simple. Game theory is intimidating enough without constant caveats and exceptions and complications. As a result, that book focused heavily on the dynamic of polarized versus condensed ranges and treated hands as though they were always clearly distinguishable as value, bluff-catcher, or bluff.

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Poker is rarely so simple. Before the river, most hands benefit to some degree from both calls and folds. We tend to label the ones that get most of their value from calls as “value bets” and the ones that get most of their value from folds as “bluffs”, but the line between them can be blurry.

Because board textures and hand values change from street to street, players must consider not only the current strength of their hands but also how strong those hands will be on various runouts. The value of betting a polarized range on future streets gives players incentive to bet, call, and raise with a more diverse set of hands on early streets than they would if there were no further opportunities for betting.

Though the first volume of *Play Optimal Poker* touched on these more complicated decisions, this second volume will address them in much greater depth. We will continue to use the scenario format to isolate discrete concepts, but the scenarios will mostly be realistic poker situations rather than toy games.

As decisions get more complex, it becomes increasingly difficult to wrap our human brains around the details of the solutions. For simple spots like pre-flop all-in or fold decisions, we can memorize relatively unexploitable strategies. With deep stacks and multiple betting opportunities, however, we must rely on heuristics: which player should be more inclined to bet, and why? Should she use large bets, small bets, or a combination of the two? Which hands are best for calling, raising, and folding?

This requires understanding and balancing multiple strategic objectives. Most poker players focus on the wrong objectives: avoiding tough decisions, for instance, or maximizing their chances of winning the current pot.

Instead, you should think of early street play in terms of realizing and denying equity immediately and in terms of building a foundation for ranges that will **realize** and **deny equity** effectively on future streets.

A central lesson from *Play Optimal Poker*, to which we will return in the first chapter of this sequel, is that **nut hands**—meaning not just the literal nuts but any hand strong enough to bet for value—overperform their equity, winning on average a larger share of the pot than they would if there were no betting.

Conversely, medium-strength hands underperform their equity because they frequently face lose-lose propositions. When confronted with a bet, these hands either fold away equity—quite a lot of equity, if your opponent is bluffing—or put more money into a pot they are not likely to win. Even when confronted with a check, medium-strength hands must weigh the risk of betting into stronger hands against the risk of permitting weaker hands to realize equity.

The really tricky part is that “nut hand” and “medium-strength hand” are relative terms. It is not as simple as saying that one-pair hands are medium-strength while stronger hands are nutty. In some cases, third pair is strong enough to bet for value. In others, a full house is merely medium-strength.

Much of the skill in poker lies in making these judgment calls. This book will not help you get dealt Aces or flop sets any more often than you already do. It will, however, help you make more strong hands by giving you the tools to recognize and even create situations where you can bet more thinly for value. It will also help you deny equity to your opponents by recognizing and creating opportunities to pressure them, turning even some high-equity hands into medium-strength holdings

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with no good options. Early street play in big bet games like no-limit hold 'em is about maneuvering into situations where you can bet a polarized range while avoiding situations where you will be vulnerable to such bets yourself.

The polarized versus **condensed** range dynamic remains fundamental. River play is all about polarized versus condensed ranges, and earlier streets are mostly about setting up profitable river situations while avoiding unprofitable ones.

You can think of early street play as building the foundation for your strategies on later streets. When you bet or call the flop, you are not only playing the current street; you are also choosing to take your hand to the turn in a particular way. Whether and how you put money into the pot on the flop influences the size of the pot on the turn and the range of hands your opponent will hold. Making these choices deliberately, guided by clear strategic objectives, ensures you will have the right tools to make the most of the opportunities presented by the next round of betting.

This is why we use the metaphor of **range construction**. You are building something, choosing players for a team or tools for a toolbox. Your success depends on predicting the challenges and opportunities ahead and assembling a team with the right combination of skills. You need players who will play well individually but also complement one another, amplifying each other's strengths and compensating for each other's weaknesses.

Getting the balance exactly right is impossible. Fortunately, your opponents won't get it exactly right either. As with anything in poker, you don't have to be perfect; you just have to be better than the people you are playing against.

This book will guide you on your journey toward building better ranges. It will help you ask the right questions, set the right objectives, and use the right heuristics to guide your thinking.

Before delving into range construction, we will briefly review key concepts from *Play Optimal Poker*. This will be just a review. If you are not already comfortable with concepts like equilibrium, exploitability, and polarized and condensed ranges, I recommend reading the first volume before you read this one. While you should be able to take plenty of valuable, actionable information from this book even if you have not read *Play Optimal Poker*, you will get more out of it if you have.

By the end of this book, you should be able to...

- ♠ Factor future betting into early-street decisions.
- ♠ Use leverage to make better bluffing decisions on early streets.
- ♠ Weigh the value of denying equity against the value of keeping the pot small.
- ♠ Build bigger pots with strong hands.
- ♠ Preserve the equity of marginal hands.
- ♠ Make more nuanced continuation betting decisions.
- ♠ Recognize when and how to split your range.
- ♠ Construct reasonably balanced ranges in real time.
- ♠ Adapt your strategy to changes in position, pot size, and board texture.
- ♠ Incorporate tournament-specific considerations into game theoretical analysis.

A RECURRING HYPOTHETICAL

The most useful advice I have received about using **game theory solver** software came from Alex Sutherland, creator of GTO Range Builder, when we interviewed him on Episode 177 of the Thinking Poker Podcast. He advised our listeners—and me—to think of solvers not as answer keys where you look up the right way to play a hand but rather as tools with which you conduct experiments.

Scientists have their microscopes, and we poker players have our solvers. We cannot expect to memorize the details of even a single solver-generated solution, let alone run such solutions for every scenario we might ever encounter. Rather, we conduct experiments, changing a single variable to see how that changes the output. From the results, we derive principles and heuristics with which to make better decisions when sitting at a poker table.

This book follows that model. When we investigate solutions to hypothetical situations, the goal will not be to learn how to play that exact situation. Rather, it will be to better understand the game as a whole by comparing that solution to other, similar ones we have investigated.

Toward that end, many details will remain the same from scenario to scenario. Except for one chapter where we explicitly look at playing out of position as the pre-flop raiser, our scenarios will always involve a first-position (under-the-gun, or UTG) raiser named Ivan heads up against a big blind (BB) caller named Opal. Ivan's name starts with an 'I' because he is always in position. Opal's name starts with an 'O' because she is always out of position.

You will not need to do any solver work of your own to use this book. I will include screenshots of solutions when we need them, and I will walk you through how to analyze them. I include the necessary details for those who wish to reproduce the scenarios for themselves, but that is entirely optional.

The lessons from these scenarios apply far beyond the specific examples from which they are drawn. These scenarios are simply hypotheticals to help us examine concepts like leverage, range advantage, and equity realization that apply to any poker situation. Indeed, much of what we learn will not even be specific to no-limit hold 'em, though that is the game from which we will take our examples.

Below are the starting ranges and game parameters (stack sizes, permitted bet sizes, etc.) that will be the defaults for our scenarios. When scenarios differ from these defaults, they will include their own parameters in their introductory discussion. These parameters closely resemble those of the Get Real! scenario from Chapter 4 of *Play Optimal Poker*, enabling us to make comparisons with the results of that scenario as well.

Most examples assume a nine-handed \$1/\$2 no-limit hold 'em cash game. The UTG player raises to \$6 (3 big blinds), and only the BB calls. On the flop, the pot is \$13 (6.5 big blinds), and the players have \$197 (98.5 big blinds) remaining in the effective stacks, for a **stack-to-pot ratio (SPR)** of about 15.

I tried to keep the players' starting ranges simple so it would be easier to wrap your head around the differences between them. I am not claiming this is what an UTG raising range or a BB calling range **should** look like; I use these ranges primarily because they are useful for highlighting the strategic concepts we will investigate.

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The PioSolver grids below show the players' default starting ranges. The highlighted squares are the hands in the players' starting ranges, the building blocks from which they will construct subsequent ranges for checking, betting, calling, and raising.

The "1" in the lower right-hand corner of a square indicates that the player plays that hand with 100% frequency. For example, Ivan will raise with AA from UTG 100% of the time he is dealt it. When his raise is called, AA is therefore in his starting range on the flop 100% of the time.

To keep things simple, I have not used any **mixed strategies** in these opening ranges. If Ivan were to raise A9s half the time he was dealt it UTG, we would see it lightly shaded, with a ".5" in the lower right-hand corner of that box.

Ivan's UTG Opening Range

AA	AKs	AQs	AJs	ATs	A9s	A8s	A7s	A6s	A5s	A4s	A3s	A2s
1	1	1	1	1	0	0	0	0	1	1	1	1
AKo	KK	KQs	KJs	KTs	K9s	K8s	K7s	K6s	K5s	K4s	K3s	K2s
1	1	1	1	1	0	0	0	0	0	0	0	0
AQo	KQo	QQ	QJs	QTs	Q9s	Q8s	Q7s	Q6s	Q5s	Q4s	Q3s	Q2s
1	1	1	1	1	0	0	0	0	0	0	0	0
AJo	KJo	QJo	JJ	JTs	J9s	J8s	J7s	J6s	J5s	J4s	J3s	J2s
1	0	0	1	1	0	0	0	0	0	0	0	0
ATo	KTo	QTo	JTo	TT	T9s	T8s	T7s	T6s	T5s	T4s	T3s	T2s
0	0	0	0	1	1	0	0	0	0	0	0	0
A9o	K9o	Q9o	J9o	T9o	99	98s	97s	96s	95s	94s	93s	92s
0	0	0	0	0	1	1	0	0	0	0	0	0
A8o	K8o	Q8o	J8o	T8o	98o	88	87s	86s	85s	84s	83s	82s
0	0	0	0	0	0	1	0	0	0	0	0	0
A7o	K7o	Q7o	J7o	T7o	97o	87o	77	76s	75s	74s	73s	72s
0	0	0	0	0	0	0	1	0	0	0	0	0
A6o	K6o	Q6o	J6o	T6o	96o	86o	76o	66	65s	64s	63s	62s
0	0	0	0	0	0	0	0	0	0	0	0	0
A5o	K5o	Q5o	J5o	T5o	95o	85o	75o	65o	55	54s	53s	52s
0	0	0	0	0	0	0	0	0	0	0	0	0
A4o	K4o	Q4o	J4o	T4o	94o	84o	74o	64o	54o	44	43s	42s
0	0	0	0	0	0	0	0	0	0	0	0	0
A3o	K3o	Q3o	J3o	T3o	93o	83o	73o	63o	53o	43o	33	32s
0	0	0	0	0	0	0	0	0	0	0	0	0
A2o	K2o	Q2o	J2o	T2o	92o	82o	72o	62o	52o	42o	32o	22
0	0	0	0	0	0	0	0	0	0	0	0	0

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Opal's BB Calling Range

AA 0	AKs 0	AQs 1	AJs 1	ATs 1	A9s 1	A8s 0	A7s 0	A6s 0	A5s 0	A4s 0	A3s 0	A2s 0
AKo 1	KK 0	KQs 1	KJs 1	KTs 1	K9s 1	K8s 0	K7s 0	K6s 0	K5s 0	K4s 0	K3s 0	K2s 0
AQo 1	KQo 1	QQ 1	QJs 1	QTs 1	Q9s 1	Q8s 0	Q7s 0	Q6s 0	Q5s 0	Q4s 0	Q3s 0	Q2s 0
AJo 1	KJo 1	QJo 0	JJ 1	JTs 1	J9s 1	J8s 0	J7s 0	J6s 0	J5s 0	J4s 0	J3s 0	J2s 0
ATo 1	KTo 0	QTo 0	JTo 0	TT 1	T9s 1	T8s 1	T7s 0	T6s 0	T5s 0	T4s 0	T3s 0	T2s 0
A9o 0	K9o 0	Q9o 0	J9o 0	T9o 0	99 1	98s 1	97s 1	96s 0	95s 0	94s 0	93s 0	92s 0
A8o 0	K8o 0	Q8o 0	J8o 0	T8o 0	98o 0	88 1	87s 1	86s 0	85s 0	84s 0	83s 0	82s 0
A7o 0	K7o 0	Q7o 0	J7o 0	T7o 0	97o 0	87o 0	77 1	76s 1	75s 0	74s 0	73s 0	72s 0
A6o 0	K6o 0	Q6o 0	J6o 0	T6o 0	96o 0	86o 0	76o 0	66 1	65s 1	64s 0	63s 0	62s 0
A5o 0	K5o 0	Q5o 0	J5o 0	T5o 0	95o 0	85o 0	75o 0	65o 0	55 1	54s 0	53s 0	52s 0
A4o 0	K4o 0	Q4o 0	J4o 0	T4o 0	94o 0	84o 0	74o 0	64o 0	54o 0	44 1	43s 0	42s 0
A3o 0	K3o 0	Q3o 0	J3o 0	T3o 0	93o 0	83o 0	73o 0	63o 0	53o 0	43o 0	33 1	32s 0
A2o 0	K2o 0	Q2o 0	J2o 0	T2o 0	92o 0	82o 0	72o 0	62o 0	52o 0	42o 0	32o 0	22 1

On the flop, Opal must check, and Ivan may check, bet \$4 (approximately 33% of the pot), or bet \$9 (approximately 66% of the pot). Either player may bet 75% or 200% of the pot on the turn and 75% or 200% of the pot on the river. Raises of 50% of the pot are allowed, and Opal may **donk bet** the turn or river for 50%. A “donk bet” means she is betting the turn or river after checking and calling the previous street.

Those familiar with PioSolver may wish to see the exact parameters, which I have reproduced below. If this image does not mean anything to you, don't worry about it; you aren't missing out on anything.

Betting Options and Game Parameters

Starting Pot: <input type="text" value="13"/>		
EffectiveStacks <input type="text" value="194"/>		<input type="button" value="clear all"/>
<input type="checkbox"/> change only betting structure when loading configuration		
Flop IP	Turn IP	River IP
Bet sizes: <input type="text" value="33,66"/> %	Bet sizes: <input type="text" value="75,200"/> %	Bet sizes: <input type="text" value="75,200"/> %
Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %
<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin
<input type="checkbox"/> Don't 3-bet	<input type="checkbox"/> Don't 3-bet	<input type="checkbox"/> Don't 3-bet
<input type="button" value="Copy from IP to OOP"/>		
Flop OOP	Turn OOP	River OOP
Bet sizes: <input type="text" value=""/> %	Bet sizes: <input type="text" value="75,200"/> %	Bet sizes: <input type="text" value="75,200"/> %
Raise sizes: <input type="text" value="50"/> %	Donk sizes: <input type="text" value="50"/> %	Donk sizes: <input type="text" value="50"/> %
<input type="checkbox"/> Add allin	Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %
	<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin
all-in threshold: <input type="text" value="67"/> % of the initial effective stack.		
"Add allin" only if less than <input type="text" value="500"/> % of pot		

KEY CONCEPTS FROM VOLUME ONE

The first volume of *Play Optimal Poker* dealt primarily with the dynamic of polarized versus condensed ranges. A **polarized range** consists of very strong and very weak hands but nothing in between. A **condensed range** is the opposite: it consists of medium-strength hands that will beat weak hands at showdown but lose to strong ones.

When hands are not likely to change value, which in real poker games is mostly just on the last betting street, then playing these ranges is simple and straightforward. The player with the polarized range bets all his strong hands plus enough weak hands to make his opponent indifferent to calling.

Indifferent is a term with very specific meaning in game theory. It means that a player has no preference between two or more strategic options. In poker terms, it means those options have the same **Expected Value (EV)**.

The player with the condensed range is indifferent between calling and folding if the bettor's range contains the right **balance** of value bets and bluffs. This balance is a function of pot odds. A pot-sized bet offers calling odds of 2:1, so the betting range should contain two value bets for every one bluff. If it does, then calling has an EV of \$0, just as folding does, and the player facing the bet is indifferent between the two.

A player holding a condensed range has no incentive to bet. She cannot expect better hands to fold or worse hands to call. Her **optimal strategy** is to check and, if faced with a bet, call at a frequency that makes her opponent indifferent to bluffing.

This frequency, too, is a function of pot odds. A pot-sized bet risks 1 unit to win 1 unit, a “unit” here referring to the size of the pot. A player with a condensed range must call half the time to make her opponent indifferent to bluffing with such a bet. If she does so, then he wins just as often and just as much as he loses, giving his bluff an EV of \$0. Because \$0 is also the EV of checking a hand that will never win at showdown, he is indifferent between these options.

When one player bluffs at optimal frequency and the other calls at optimal frequency, there is an **equilibrium** where neither player can unilaterally improve his outcome. Each player is winning as much as he or she possibly can given the opponent’s strategy. If one player were to **deviate** from the equilibrium, for instance by calling at higher than optimal frequency, then her opponent could **exploit** her with a deviation of his own—by not bluffing, in this example.

An equilibrium does not mean that neither player has an advantage; it simply means each is doing the best they can within their constraints. In fact, a condensed range is at an inherent disadvantage to a polarized one. The opportunity to bet is worth something to the player with the polarized range; he increases his EV by betting. Because poker is a **zero-sum game**, that means the player with the condensed range loses EV when faced with a bet.

Concepts like indifference and equilibrium are easiest to conceptualize in these simple cases, but they are at the heart of how game theory applies to poker. If you can predict what your opponent will do in a given situation, then the best strategy is to exploit his play. If you know he will fold bluff-catchers on the river, then you throw balance to the wind and bet all your weak hands.

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When you cannot make such predictions, either because your opponent is very good or simply because you don't know what he will do in a particular situation, then you have nothing to exploit. The best you can do is strive to make him indifferent, to deny him opportunities to make profitable plays.

A well-sized continuation bet on the flop makes an opponent indifferent to calling and/or raising many hands, but the EV equation is not as simple as comparing bluffing frequency to pot odds. Many other factors influence the flop decisions: Could the hand improve on later streets? If it does, could it win additional value bets? If it does not, could it find profitable bluffs? Will the opponent bet again on the next street? Etc.

Game theory solver software such as PioSolver can account for these considerations and more with mathematical precision. Our human brains cannot. Instead, we must rely on heuristics and other mental shortcuts to help us sort through these complicated factors.

One useful shortcut is **targeting**. When you bet, you should have in mind the specific hands you are trying to present with a difficult decision. Many of your opponent's decisions will be trivial: he will definitely not fold his strongest hands, and he probably will fold his weakest ones. The ones in the middle are the ones you target, and getting specific about what those are will help you choose the right bet size, identify your best bluffing candidates, and determine how thinly you can value bet.

Targeting is especially helpful when playing exploitatively. *Play Optimal Poker* lays out a process for identifying and taking maximum advantage of exploitative opportunities:

The Four-Step Exploitative Process

Envision the Equilibrium

Make a Read

Identify the Exploits

Determine the Degree of
Deviation

Other useful concepts discussed in *Play Optimal Poker* include **equity advantage** and **nuts advantage**. Though often lumped together under the umbrella of “range advantage”, these are actually two distinct concepts that do not always go hand-in-hand.

A player who would win more often at showdown if there were no further betting has the equity advantage. The player who could more easily have strong hands—not necessarily the literal nuts—has the nuts advantage and can bet a polarized range.

In real poker scenarios, ranges are not strictly polarized or condensed. Even when you are more likely to have the nuts, your opponent may still have strong hands. The risk of running into his strong hands limits your ability to overbet and bet for thin value, though the informational value of being in position makes it a bit easier to get away with these things.

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The risk of a raise further complicates matters. Strictly polarized ranges do not really mind getting raised. The strong hands have trivial calls and the weak hands have trivial folds. It is the thin value bets that suffer the most from a raise, as they get turned into bluff-catchers. When they fold, they risk forfeiting the pot to a weaker hand. But when they call, they often lose an additional bet to a stronger one.

Understanding the function of bets and raises helps you choose appropriate targets and craft **maximally exploitative** strategies. Once you know that raises mostly punish thin value bets, then you know to raise less often against players who do not make thin value bets.

This is the underlying message of *Play Optimal Poker*, and the one that will continue to guide us in this sequel: understanding equilibrium is the key to playing exploitatively. To recognize your opponent's mistakes, you must know what his strategy **should** be. To find the most profitable exploits, you must understand your own equilibrium strategy and how to deviate from it.

HOW TO USE THIS BOOK

This is a sequel to *Play Optimal Poker*. It builds on concepts from that book and assumes the reader is familiar with those concepts. The preceding section reviewing key concepts from *Play Optimal Poker* is intended as a refresher for those who read the book some time ago. If you are not familiar with these concepts, you should read *Play Optimal Poker* before continuing with this book. You will get more out of the chapters that follow if you have that background.

Like its predecessor, this book is organized around scenarios designed to highlight specific concepts. Some are less-complex versions of poker called toy games. Most are realistic no-limit hold 'em hands. In all cases, they are hypotheticals focused on specific aspects of range construction: how to play out of position, for instance, or when you do not have a nuts advantage. As such, the lessons are broadly applicable. This is a book about thinking in terms of ranges; it is not a book about playing as an early position raiser against a big blind caller.

The best way to learn from these scenarios is to work through them slowly. This book is not designed to be read passively, like a novel. Think of it like a textbook; you will retain more information if you pause to consider the details of each scenario and to answer the questions for yourself before you read the explanations.

The scenarios are mostly stand-alone examples that will make sense when considered in isolation. The most interesting aspects are those that change from scenario to scenario, however, highlighting what is significant about the differences between two scenarios. For this reason, especially on first reading, you should progress through them in order.

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The details of each scenario are less important than the process by which we arrive at those details. In other words, the exact frequency with which a player calls or raises a continuation bet depends on the specifics of the situation and will vary from hand to hand; don't waste your brain power trying to memorize those numbers. Instead, pay attention to what factors cause a player to raise more or less often, and what makes certain hands better or worse for raising. This is the knowledge that will help you make better decisions over the felt.

CHAPTER 1: LEVERAGE

OVERVIEW & OBJECTIVES

Leverage refers to the possibility of future betting. Unlike on the river, a player who calls a bet on the flop or turn is not guaranteed to see a showdown. Because she might face a difficult decision and possibly lose EV on a future street, she cannot be sure that the price she is getting to call on the current street is the final price she will need to pay to see showdown. Consequently, it can be correct for her to fold even when she seems to be getting a good price on the current street.

Because hands in a polarized range profit from betting, they benefit from leverage. Betting the turn, whether for value or as a bluff, is more profitable if you can anticipate profitably betting the river.

Conversely, the medium-strength hands in a condensed range lose value to leverage. Calling the turn is less profitable when it risks another tough decision on the river.

Though most relevant early in a hand, considerations about future betting should influence even river decisions. In *Play Optimal Poker*, we found that once we introduced raising to the Ace-to-Five Game, both players' equilibrium strategies involved less betting than in the original version of the game. Thin value bets are less appealing when you risk getting raised by a polarized range that will turn your hand into a bluff-catcher.

By the end of this chapter, you should be able to:

- ♣ Appreciate how the possibility of future bets influences betting and calling decisions on early streets.
- ♣ Use leverage to generate additional fold equity on early streets.
- ♣ Approximate unexploitable bluffing frequencies when betting a polarized range across multiple streets.
- ♣ Plan ahead when sizing bets on early streets.
- ♣ Develop calling strategies that make your opponents indifferent to a variety of bluffing lines.

SCENARIO: THE TWO-STREET CLAIRVOYANCE GAME

To isolate the effects of leverage, we will revisit the Clairvoyance Game from *Play Optimal Poker* and add a second street of betting. If you have not read *Play Optimal Poker* or have forgotten the details of this game, don't worry; everything you need to know is reproduced below.

Each player antes \$1 and has \$3 remaining in his or her stack. Opal is always dealt a K, while Ivan is randomly dealt either an A or a Q. Each knows the other's range.

There are two betting streets, but hands never change value. On the first betting street, called the "turn", Opal always checks. We won't bother giving her the option to bet or raise, because we have already seen that she would never use that option at equilibrium. Ivan may check or bet any amount between \$1 and \$3.

Faced with a bet, Opal may call or fold. If she calls a bet of less than all-in, then she checks again on the "river", and Ivan may check or bet any amount that he wants. Opal may once again call or fold. If the hand goes to showdown, then the higher card wins.

Reminder

In Play Optimal Poker, we solved a one-street version of the Clairvoyance Game. It will be valuable to compare that game to this one, so here's a quick reminder of the solution:

Opal's optimal strategy was to make Ivan indifferent to bluffing by checking and calling a bet at a frequency equal to $1 - \frac{Bet}{Bet+Pot}$. Ivan's optimal strategy was to bet the largest amount that he could, even if that was many times the pot, with all his As. He made Opal indifferent to calling by also betting his Qs at a frequency equal to $\frac{Bet}{Bet+Pot}$. Ivan's bluffing frequency and his EV increased with the size of his bet.

Questions

The questions below prompt you to make some predictions about how a second street of betting will change the equilibrium strategies and the value of the Clairvoyance Game. Do your best to answer them on your own, then read on for explanations.

1. Will Ivan's EV be higher, lower, or the same as a result of this additional betting opportunity?
2. What is Ivan's optimal bet size on each street?
3. Will Ivan ever check an A on the turn?
4. Will Ivan's betting frequency with a Q be higher, lower, or the same on the turn as on the river?
5. Will Opal's calling frequency on the turn be higher, lower, or the same as her calling frequency on the river?
6. Suppose the effective stacks were \$24 after the ante. How much should Ivan bet on the turn, and with what range?

Answers & Explanation

1. Will Ivan's EV be higher, lower, or the same as a result of this additional betting opportunity?

Higher. Ivan's EV in the two-street game is \$1.78, for a profit of \$0.78. In a one-street game with \$3 effective stacks, his EV would be \$1.60, for a profit of \$0.60. A second opportunity to bet increases his profit by 30%!

As we answer the questions below, we will go into more detail about exactly why this is true, but it comes down to leverage. A turn bet with a polarized range is extra profitable because it is backed by the threat of a river bet. Ivan can anticipate profitably betting a polarized range on the river, so the hands that will comprise that river betting range have extra value when called on the turn.

2. How much should Ivan bet on each street?

The math required to work out the optimal bet size is rather complicated, so I will just tell you the solution is to bet the same fraction of the pot on both streets. In this case, that means two half-pot bets: a \$1 bet into a \$2 pot on the turn, followed by a \$2 bet into a \$4 pot on the river. If the effective stacks were \$8, then Ivan would bet full pot on both streets—\$2 into a \$2 pot on the turn, then \$6 into a \$6 pot on the river.

This is called the **geometric growth of the pot**, and it is an important concept when dealing with polarized ranges. No matter how many betting streets there are, a player with a **perfectly polarized** range does best by betting the same fraction of the pot on each street such that the last bet is all-in.

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“Perfectly polarized” means he only bets hands with either 100% or 0% equity, like the A and the Q in this example. Once we introduce draws and the possibility for hands to change value, bet sizing becomes more complicated, but the concept of leverage still applies.

3. Will Ivan ever check an A on the turn?

No. Ivan’s goal when holding an A is to get \$3 into the pot. With two betting opportunities, he has many ways to do this. He could bet \$1 on the turn and \$2 on the river, or \$1.01 on the turn and \$1.99 on the river, or nothing on the turn and \$3 on the river, etc.

He is not indifferent between these options, though. Even if Opal responds as well as possible to each betting line, the geometric growth of the pot is the one that wins Ivan the most money, so he should use it every time.

Ivan does not need to check the turn with an A to be deceptive. Even if Opal knows that he would always bet an A on the turn, she cannot do anything with that information. She cannot just fold all her Ks on the turn because Ivan could be bluffing. When the turn checks through, she cannot profit on the river even if she is sure Ivan would not have checked an A. He should never call a bet with a Q nor bet it if checked to.

At equilibrium, Ivan never takes the line of checking the turn and betting the river, because he never has any value bets with which to balance his bluffs after checking the turn. It may seem like a shame to resign himself to losing the pot after checking the turn, but his EV with a Q is \$0 whether or not he bluffs. It is not worth sacrificing the value of the turn bet when he has an A in order to develop a polarized range for checking the turn and bluffing the river.

Just as in the one-street game, Ivan's deception comes not from doing anything "tricky" when he has the nuts but from balancing his value bets with bluffs. The complication of the two-street game is that he must first determine the most profitable way to play his value hands, then find the appropriate bluffing strategy with which to balance it.

4. Will Ivan's betting frequency with a Q be higher, lower, or the same on the turn as on the river?

Higher. We saw in the original Clairvoyance Game that if Ivan bets \$1 into a \$2 pot, a 3:1 ratio of value bets to bluffs would make a bluff-catcher indifferent between folding or calling a single bet. In this game, though, the bluff-catcher has three options: fold the turn, call the turn planning to fold the river, or call the turn planning to call the river. Ivan's strategy must make Opal indifferent between all three. Folding the turn has an EV of \$0, so he must devise a bluffing strategy that makes Opal's other options \$0 EV as well.

We'll start with calling the turn and folding the river. We know from the original Clairvoyance Game that if Opal calls the turn, Ivan's river strategy will be to bet his last \$2 into the \$4 pot with all his As and 1/3 of his Qs (that's 1/3 of **all** his Qs, not 1/3 of the Qs that bet the turn), or 4/6 of his starting range.

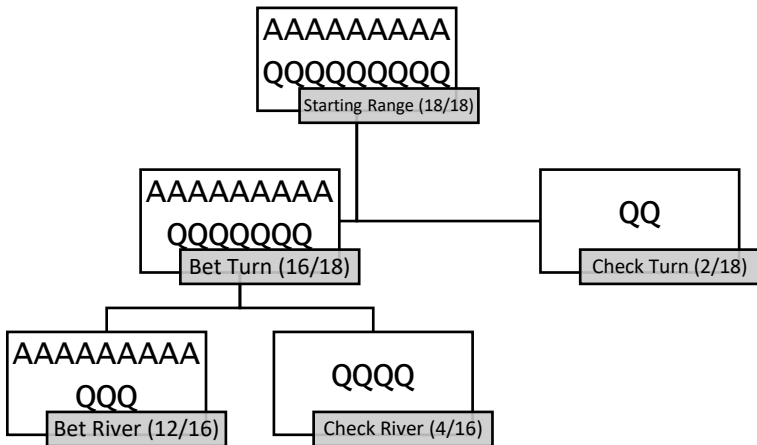
When Opal calls the turn planning to fold the river, her $EV = \$3 * (\%CheckRiver) - \$1 * (\%BetRiver)$. In other words, if Ivan bluffs the turn and checks the river, Opal wins \$3. If Ivan bets again on the river, whether it's a value bet or a bluff, Opal folds and loses the \$1 turn bet.

If we substitute 4/6 for %BetRiver and solve for %CheckRiver, we get 4/18. That means 4/18 of Ivan's

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range should bet the turn and check the river. Of course, he should never check the river with an A, so his checking range will consist entirely of Qs. Qs are only half his range, so to achieve a checking frequency of 4/18 of his range on the river, 8/18 of his Qs should bet the turn and check the river. That is in addition to the 1/3 or 6/18 of his Qs that bet the turn and bet again on the river, so altogether he will bet 14/18 of his Qs on the turn!

Ivan's Betting Strategy



This betting strategy yields a ratio of 9 value bets to 7 bluffs on the turn, much higher than what we would see for a half-pot bet in a one-street game. Ultimately, 12/18 of Ivan's range bets the turn and the river, while 4/18 of his range bets the turn but not the river. That's the 3:1 value-to-bluff ratio we are used to seeing with a half-pot bet, and it's not a coincidence!

When Ivan bets the turn with a Q he is going to bet again on the river, it is essentially a value bet. He does

not mind getting called, because he knows he will bet again and might still win the pot **plus** that extra \$1 Opal just put in. Functionally, his value range on the turn is all his As plus all the Qs that will bet again on the river. He balances that entire "value range" with 1/3 as many bluffs, Qs that will bet the turn and then check the river.

If there were a third betting street and room for another half-pot bet in the effective stacks, Ivan could treat the entire 16/18 of his range that bets the turn as a "value range" on the first betting street and balance those hands by betting another 16/54 of his range as a bluff. That would be all his Qs and then some, meaning that he would just bet his entire range. Even though Opal would be getting immediate pot odds of 3:1 and would know she had the best hand half the time, her optimal strategy would be to fold the flop 100% of the time. Ivan can simply apply too much pressure on future streets. That's the power of leverage.

5. Will Opal's calling frequency on the turn be higher, lower, or the same as her calling frequency on the river?

The same. As usual, the best Opal can do with a K is find a calling frequency that makes her opponent indifferent between betting and checking a Q.

First, let's recognize that Ivan's EV when checking a Q on the turn is \$0. This may not be obvious, because there is still another street to bet, so suppose that Ivan were to check the turn and then bet the river. Opal's strategy would be to look at the pot odds the bet offers and find a calling frequency that makes the EV of bluffing \$0. If Ivan just checks down the turn and river with a Q, that's worth \$0. No matter what Ivan does after he checks the turn, his EV is \$0 with a Q.

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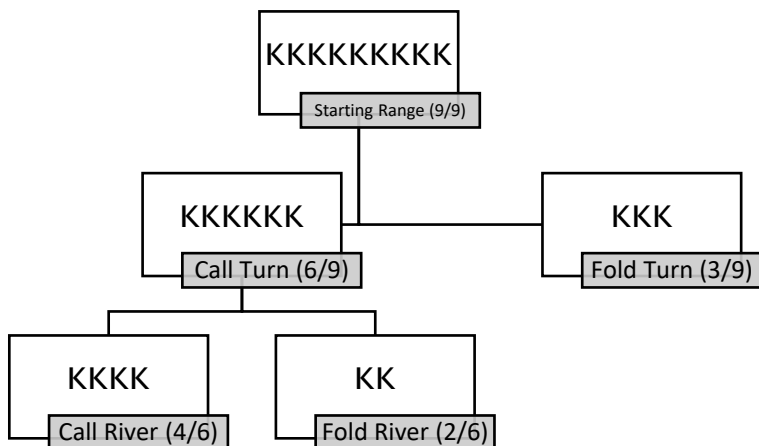
Because Ivan's EV for checking a Q on the turn is \$0, Opal must find a calling strategy that makes the EV of betting a Q also equal \$0. Ivan's EV will be equal to $\$2 * \%Fold + \%Call * (EVWhenCalled - \$1)$.

That last term, $(EVWhenCalled - \$1)$, is a tricky one. Ivan does not automatically lose the pot just because Opal calls his turn bluff. He still gets to play the river, and he might still win the pot. He is putting \$1 into the pot, though, so we must deduct that from whatever playing the river ends up being worth to him.

What is Ivan's EV for playing a Q on the river? It is the same as it always is in the Clairvoyance Game: \$0. After Opal calls the turn, Ivan can either check the river, which has EV of \$0, or he can bluff again. If he bluffs again, Opal will call at a frequency that makes his EV \$0. No matter what he does with it, Ivan's EV with a Q on the river will be \$0.

Thus, the equation simplifies to $EV = \$2 * (1 - \%Call) - \$1 * \%Call$. If we set EV equal to \$0 and solve for %Call, we get 2/3, the same as the bluff-catching frequency against a half-pot bet in a one-street game.

Opal's Calling Strategy



The player with the condensed range treats each bet as an isolated decision. If her opponent bets the turn, she calls with $2/3$ of her Ks. Then, if her opponent bets the river, she calls with $2/3$ of the Ks **that are still in her range**. Ultimately, $2/3 * 2/3$ or $4/9$ of Opal's Ks will go to showdown if Ivan bets twice.

Opal constructs three ranges: one that folds to a turn bet ($1/3$ or $3/9$ of her starting range), one that calls the turn and folds the river ($2/9$ of her starting range), and one that calls the turn and calls the river ($4/9$ of her starting range, $2/3$ of her turn calling range). At each decision point, she calls at a frequency that makes Ivan indifferent to bluffing.

If Ivan were to use different bet sizes—which would be a deviation from his equilibrium strategy—then the numbers would not work out so cleanly, because Opal would have to tailor her calling frequency to the bet size. The idea would be the same, though: each time she faces

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a bet, Opal envisions her current range—the hands she could hold given the actions she has taken so far—and calls with just enough of them to make Ivan indifferent to bluffing **at that decision point**.

The math is easier for the player with the condensed range, but the spot she is in is much tougher. Despite anteing \$1, her EV in this game is only \$0.22. In a one-street betting game with \$3 effective stacks, her EV would be \$0.40, which illustrates dramatically how advantageous it is for the player with the polarized range to distribute the betting across multiple streets, even if the amount of money he ultimately bets is the same.

6. Suppose the effective stacks were \$24 after the ante. How much should Ivan bet on the turn, and with what range?

Ivan should bet \$4 on the turn with his full range. That's a bet of twice the pot, which sets up an all-in bet of twice the pot on the river. Recall that the optimal sizing with a polarized range is the geometric growth of the pot, meaning that Ivan should bet the same fraction of the pot on both streets such that the final bet is all-in.

His river range should include all his As and 2/3 of his Qs, a ratio of two bluffs for every three value bets. That ratio comes from the $\text{Bet}/(\text{Bet} + \text{Pot})$ formula, which in this case yields \$4/\$6.

On the turn, Ivan bets all the hands he will bet on the river plus enough bluffs to reach that 2:3 ratio. In this case, though, he runs out of Qs before he reaches that ratio, so his optimal strategy is just to bet all his Qs on the turn, then give up with 1/3 of them on the river and bluff again with the other 2/3.

It should not even come to that, though, because Opal's optimal strategy is to fold the turn 100% of the time. A polarized range combined with a high stack-to-pot ratio gives Ivan so much leverage that the best Opal can do is give up at the first opportunity!

You can see this dynamic in play when an early position raiser is heads up with a big blind caller on the flop. On the right flop texture, the raiser can profitably bluff with any two cards in part because of leverage. In the next chapter, we will explore just such a scenario.

EQUITY REALIZATION

Early in your poker career, you probably learned about concepts like **pot odds** and **equity**. You may have learned to make calling decisions by estimating your hand's equity and comparing it to your pot odds. For example, a flush draw has about 36% equity against an overpair on the flop. If your opponent made a pot-sized bet, that would offer you 2:1 odds, meaning you would need at least 33% equity to call profitably. Your hand, with somewhat more than that, would seem to be worth a call.

The problem with this analysis is that you are not guaranteed to **realize** all your equity by calling the flop bet. Calling guarantees you will see one more card, but that only gives you an 18% chance of making your flush. If the flop bet were all-in, you could profitably call. Because your opponent will be able to bet again on the next street, however, you must factor that risk into your equity calculation on the flop.

Of course, your opponent may not know you have a flush draw. He may incorrectly check blank turns and allow you to realize the rest of your equity on the river. He may incorrectly bet or call bets when you make your flush. He may even incorrectly fold when you miss your flush! Though we cannot put an exact number on these factors, they all affect the EV of calling the flop bet.

Equity realization is a way to conceptualize how much the betting on future streets will help or hurt a particular hand. You can think of it as a coefficient, r , that serves as a bridge between equity and expected value. Multiply a hand's equity by its equity realization and you get its expected value; $\text{Equity} * r = \text{EV}$.

Consider Opal facing a \$1 turn bet in the Two-Street Clairvoyance game. Against Ivan's equilibrium betting

range, her K has about 44% equity. If she could call and go straight to showdown, that would be worth \$1.32 of the \$3 pot, and she would not be indifferent between calling and folding; calling would be quite profitable for her. However, calling actually has an equilibrium EV of \$0 because she has no way to defend her equity against a balanced, polarized range on the river.

Where does that lost pot share go? This is a zero-sum game, so it must go to Ivan and his polarized range. Which hand in his polarized range gains EV as a result of leverage is trickier to conceptualize.

Against Opal's equilibrium calling strategy, we know a Q has \$0 EV, so any EV she loses must go to Ivan's As. Indeed, the equilibrium EV of an A after Opal calls a flop bet is \$5.33, whereas its equity is only \$4, the size of the pot. The extra \$1.33 comes from the 2/3 of the time that Opal pays off a \$2 bet on the river. Thus, Ivan's As have an r of $\$5.33/\$4 = 1.33$. An r greater than 1 means they benefit from the betting on future streets.

Opal does not **have** to call the river 2/3 of the time, though. She could call more often, in which case the EV of Ivan's As would be even higher, while the EV of his Qs would be negative. She could also fold every time, in which case Ivan's As would have an EV of \$4 and his Qs an EV of \$1.33, because they would win the \$4 pot the 1/3 of the time they bluff. No matter which strategy Opal chooses, she will give up \$1.33 in EV to an equilibrium betting range. By folding more or less often, she determines which hand in Ivan's range gains that EV, but there's nothing she can do to lose less.

Hands that can profitably bet at a future decision point, whether for value or as a bluff, have the potential to realize more than their share of equity, while pure bluff-catchers tend to realize less than theirs. In this

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example, we see that the value hand outperforms its equity while the bluffing hand does not, at least not at equilibrium. Later, we will see examples where the prospect of bluffing profitably on future streets increases the EV of weak hands.

The fact that weak hands have the potential to overperform their equity does not make them **better** than bluff-catchers. Opal's K underperforms its equity, but it is still a better hand with a higher EV than Ivan's Q. It's easy to outperform your equity when your equity is \$0. Equity realization is not a measure of a hand's absolute value; it is just a better estimate of a hand's value than equity alone.

Equity realization is always contextual. It depends on factors like position, board texture, stack sizes, and the composition of each player's range. We cannot draw a conclusion like, "A9o has poor equity realization" in a vacuum any more than we can conclude, "A9o is a bad hand."

Solvers can tell us the exact EV of a hand if both players play an equilibrium strategy on future streets, but in real poker games that rarely happens. Over the felt, you will have to estimate a hand's future EV or equity realization. Working out more precise calculations away from the table can help you make better estimates when real money is on the line.

SCENARIO: EXPLOITATION IN THE TWO-STREET CLAIRVOYANCE GAME

Crafting exploitative strategies is a great way to test your understanding of the equilibrium. If you understand why the equilibrium strategies look the way they do, then you are equipped to think about how to exploit various deviations from the equilibrium. If you find yourself struggling to get started on any of these questions, you may benefit from reviewing the explanation of the equilibrium strategies for the Two-Street Clairvoyance Game.

Each player antes \$1 and has \$3 remaining in his or her stack. Opal is always dealt a K, while Ivan is randomly dealt either an A or a Q. Each knows the other's range.

There are two betting streets, but hands never change value. Opal always checks. Ivan may check or bet any amount between \$1 to \$3.

Questions

1. Suppose Ivan bets \$2 on the turn, which he would never do at equilibrium. How often should Opal call?
2. Suppose Ivan bets \$1 on the turn, and Opal knows his range consists of all his As and $1/3$ of his Qs. How often should she call?
3. Suppose Opal will always fold to a river bet of \$2 or more, but we have no insight into her turn calling strategy. What will Ivan's maximally exploitative strategy look like?

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4. Suppose Opal will always call the river if she calls the turn, but Ivan has no insight into her turn calling strategy. What will his maximally exploitative strategy look like?

5. Suppose after betting \$1 on the turn, Ivan always bets \$1 on the river with his As and \$2 with his Qs. What is Opal's maximally exploitative strategy?

Answers & Explanation

1. Suppose Ivan bets \$2 on the turn, which he would never do at equilibrium. How often should Opal call?

She should call $1/2$ the time. Even in a multi-street game, the player with the condensed range treats each decision independently and finds a calling frequency that makes her opponent indifferent to bluffing at that point. That calling frequency is $1 - \frac{Bet}{Bet+Pot}$, in this case $1 - \frac{\$2}{\$2+\$2}$.

If Opal were to call this bet and then face another bet on the river, that bet would be \$1 into a \$4 pot, so she would call $4/5$ of the time.

Ivan's EV with this bet size is only about \$1.52, down from the \$1.78 he wins with his equilibrium strategy. He loses this value without Opal actively doing anything to exploit his mistake. She simply calls at a frequency that makes him indifferent to bluffing with whatever bet size he chooses. If he chooses a suboptimal size, then he wins less than he would at equilibrium.

2. Suppose Ivan bets \$1 on the turn, and Opal knows his range consists of all his As and $1/3$ of his Qs. How often should she call?

Opal should fold 100% on the turn!

Envision the equilibrium: Ivan should bet $7/9$ of his Qs to make Opal indifferent between folding turn, calling turn to fold river, and calling turn to call river.

Make a read: Ivan is not bluffing enough on the turn.

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Identify the exploit: We know that Ivan can profitably bet all his As and $1/3$ of his Qs on the river, and with no insight into his strategy, we should assume that is what he will do. So, Opal should never call the turn planning to fold the river, because Ivan's entire turn betting range should bet the river as well. She should assume her odds to see showdown are essentially \$3 into an \$8 pot, meaning she would need to win more than $3/8$ of the time to profit. At best she will win the $1/4$ of the time that Ivan has a Q, so she is better off folding right away.

Determine the degree of deviation: Ivan's deviation is small, but because Opal is indifferent between all options at equilibrium, even a small deviation prompts a big shift in her strategy. She has no incentive to call the turn, because she cannot expect to ever win the pot without putting in \$3.

Even with a read that Ivan were going to underbluff the river, it still would not be worth it for Opal to call the turn. The best-case scenario would be if she knew Ivan would never bluff the river, so she could still win the pot against his Qs but fold and avoid paying off the second bet against his As. In that case, her EV would be \$0, so at best, she breaks even on her turn call. If Ivan bluffs even a little on the river, then she loses money.

Many players act as if bluffing the turn obliges them to bluff again on the river. In fact, your turn betting range needs to include some bluffs that will give up on the river or else your opponent has no incentive to call the turn and fold the river. If your opponent knew you always bluffed the river after bluffing the turn, he could exploit you by never calling the turn with hands he did not plan to take to showdown.

3. Suppose Opal will always fold to a river bet of \$2 or more, but we have no insight into her turn calling strategy. What will Ivan's maximally exploitative strategy look like?

Ivan should bet \$1 on the turn with his full range and shove the river if called.

Envision the equilibrium: Opal should call $2/3$ of her hands on the turn, then call the river with $2/3$ of her hands that made it that far. This keeps Ivan indifferent between checking turn, bluffing turn to check river, and bluffing turn to bluff river.

Make a read: Opal is folding too much on the river.

Identify the exploit: Ivan wants to do as much bluffing as he can with that \$2 river bet. That means he needs to get to the river with as many bluffing candidates as possible. He can get to the river in two ways: by checking the turn, or by betting \$1 and leaving \$2 behind. He would rather do the latter, because if Opal ever calls the \$1 and then folds the river, that's even better for Ivan than if he checks and then wins a \$2 pot with a river bluff.

Technically, since we only stipulated that Opal would fold to a \$2 river bet, Ivan could try to bet less than that with his As, but there would be no reason for Opal to pay him off. Opal's best strategy, if she is going to fold the river anyway, is just to fold the turn. That causes her to lose only her ante, which is the best she can do given her river mistake. Any strategy that involves calling the turn would lose more than the ante if Ivan exploits her river folds.

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Determine the degree of deviation: It's huge. Ivan would do even more bluffing here if he could. Unfortunately, once he bets all his Qs, he is out of hands to bluff with.

4. Suppose Opal will always call the river if she calls the turn, but Ivan has no insight into her turn calling strategy. What will his maximally exploitative strategy look like?

Ivan should bet \$1 with his full range on the turn, then shove the river with his As and give up with his Qs.

Envision the equilibrium: Opal should call $\frac{2}{3}$ of her range on the turn, then call the river with $\frac{2}{3}$ of her hands that make it that far. This keeps Ivan indifferent between checking turn, bluffing turn to check river, and bluffing turn to bluff river.

Make a read: Opal is calling too much on the river.

Identify the exploit: If Opal is calling too much on the river, then not attempting to bluff the river is the obvious exploit. However, if calling the turn commits her to calling the river, then Opal's best strategy is just to fold the turn. That gives Ivan incentive to bluff the turn even though he will never follow through on the river.

Determine the degree of deviation: Large. Ivan should never bluff the river if he believes Opal will never fold. Because Opal has additional incentive to fold the turn, however, Ivan can increase his turn bluffing frequency. His maximally exploitative strategy is to bet his entire range, a 1:1 ratio of value bets to bluffs, on the turn, then give up all the bluffs on the river. This makes Opal

indifferent between calling twice and folding immediately on the turn. Her optimal counterstrategy would be to call the turn and fold the river, but we stipulated she will not do that. Her failure to ever call the turn and fold the river is the mistake Ivan is exploiting.

5. Suppose after betting \$1 on the turn, Ivan always bets \$1 on the river with his As and \$2 with his Qs. What is Opal's maximally exploitative strategy?

Opal should always call the turn, then fold to \$1 river bets and call \$2 river bets.

Envision the equilibrium: Ivan should bet the same amount on the river with both his value bets and his bluffs, so that his opponent cannot predict whether he is value betting or bluffing.

Make a read: Ivan is telegraphing his hand strength with the size of his river bet.

Identify the exploit: Opal should always fold to the \$1 river bet and call the \$2 bet. Given that she can anticipate profiting from Ivan's river mistake, she is not indifferent to calling the turn bet; she should always call in order to maximize her opportunities for exploiting him on the river.

Determine the degree of deviation: Huge. There is a reason the cards are dealt face down in poker: any strategy that makes clear the contents of your hand is a major liability!

♦ Play Optimal Poker 2♠

Ivan's strategy sounds absurd in the context of a toy game, but many real poker players play this way. Or, they do the opposite and bet bigger with strong hands than with bluffs. There can be good exploitative reasons for doing this—if Opal will fold too much to a \$2 bet and call a \$1 bet too much, then Ivan's play here would be the maximally exploitative counter-strategy—but that is not the norm.

It sounds logical: when people have strong hands, they want to get called, so they bet small. When they have weak hands, they want to get folds, so they bet big.

This example illustrates the liabilities of that approach. You should be wary of any bet sizing strategy that reveals the strength of your hand, especially against a skilled opponent. Such players are quite good at sniffing out any information you leak.

STATIC AND DYNAMIC BOARDS

The polarized-versus-condensed range dynamic discussed in this chapter assumes a player knows on the flop whether his hand will be nutty on the river. That knowledge enables him to start building a large pot he is assured of winning. But a big part of what makes poker interesting is that hands can and do change value as more cards are revealed.

A crucial skill in poker games with shared community cards, such as hold 'em and Omaha, is assessing not just the current strength of your hand but also its likely strength on the river. That is easier to do on some boards than on others. Boards where hands are less likely to change value are called **static** boards. Those where hands can more easily change value are called **dynamic** boards.

Compare $A\spadesuit Q\spadesuit$ on a $Q\diamond 7\clubsuit 2\heartsuit$ flop to the same hand on a $Q\diamond 9\diamond 7\clubsuit$ flop. In both cases, you have top pair with the top kicker, but swapping the $2\heartsuit$ for the $9\diamond$ dramatically changes the likely future value of your hand.

On the former board, there is a good chance your hand will be strong enough to bet for value on the turn and perhaps even the river. On the latter board, the majority of turn cards will present a new threat. This could be a potential straight, a potential flush, trips, or even a K that reduces your hand to second pair.

If the effective stacks were shallow enough for you to bet most or all the remaining money on the flop, then this difference would not matter much. With deep effective stacks, however, you gain a lot more from betting the first flop than the second.

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When your bet is called on the first flop, you benefit not only from your immediate equity advantage but also from growing the pot, enabling you to make a larger value bet on the turn. If you choose to grow the pot on the second flop, a fair number of turn cards may cause you to regret that decision.

That's not to say that betting is definitively wrong. AQ is still a strong hand on the second flop, and depending on the situation, betting may be better than checking. However, AQ will benefit less from the prospect of future betting, and you won't be able to plan on continuing to bet as part of a polarized range as described in this chapter.

When thinking about whether a board is static or dynamic, many players focus on the presence of straight and flush draws. Often, though, the biggest factor determining a board's dynamism is the size of the cards. On an AK2 flop, top or second pair on the flop will still be top or second pair on the river, and unpaired hands on the flop will still be weak hands on most rivers, even if they pair up. On an 872 board, flopped pairs are much more vulnerable, and almost any unpaired hand will have the potential to improve to top pair.

The presence of a pair or three cards of a suit also makes a board more static. The strongest hands on a monotone or paired flop will probably still be strong on the river.

TEST YOURSELF

1. You are playing a no-limit hold 'em cash game with \$2 and \$5 blinds and \$500 effective stacks. You open from middle position to \$15 with 8♦ 7♦, the big blind calls, and you see a K♠ T♦ 6♠ flop. He checks, you bet \$20, and he calls. He checks to you again on a 2♥ turn. There is about \$70 in the pot and \$465 in the effective stacks. What's your play?

This is a textbook spot to overbet with a polarized range. You don't need to calculate the geometric growth of the pot down to the dollar, but you should think about how to get stacks in. A bet of \$100 would be about 150% of the pot and would leave 150% of the pot in the effective stacks for the river.

Your opponent has passed up multiple opportunities to raise, so he should have a condensed range going into the turn. The 2♥ does nothing to change that.

You, however, have many nutty hands in your range. Depending on the runout, hands as weak as KQ may be strong enough to play for stacks. When you do have strong hands, you cannot count on your opponent doing the betting or raising for you, as that is not how he should play a condensed range. The way to get value from your strong hands is to bet big and let the threat of a bluff provide incentive for your opponent to call.

A large bet size offers poor calling odds to your opponent, enabling you to include many bluffs in your betting range. Because you can anticipate betting a polarized range again on many rivers, you have the leverage to do even more bluffing on the turn. The combination of a nuts advantage and deep effective stacks is a recipe for a big, leveraged bet with a polarized

♦ Play Optimal Poker 2♠

range that includes a lot of bluffs, and this is a good bluffing candidate. The equilibrium strategy here when you can bet either 75% or 150% of the pot on the turn is to overbet 45% of your range!

2. You bet \$100, your opponent calls, and the river is the 3♠. Your opponent checks. There's \$365 in the effective stacks and \$270 in the pot. What's your play?

Check.

Many players struggle with when to give up on a bluff. Thinking in terms of range construction can be a big help.

It's tempting to think, "I can't win if I check, but this is a good scare card and I can plausibly represent a flush, so let's go for it." By that logic, however, you would **never** give up on a bluff here. After all, your reasons for betting have nothing to do with your cards, so they would apply to any weak hand you might hold.

The Two-Street Clairvoyance Game demonstrates how following through on 100% of your bluffs can be exploited. If you have a read that your opponent will overfold in this situation, then for exploitative reasons it could be correct to bet again with all your weak hands. The equilibrium strategy, however, is to have some hands that keep bluffing and some that give up.

In our toy game, Ivan had just one bluffing candidate, so his only decision was the frequency with which he bet that hand on each street. In a real poker situation, you can and should make this decision based on your cards, as some hands are better for bluffing than others.

In this case, the best bluffing hands contain a spade, making it less likely your opponent holds a flush. Ideally, you plan ahead for spade rivers by bluffing hands like A♠ Q♥ on the turn.

Your 8♦ 7♦ is a less appealing bluff because it does not block flushes.

When in doubt, rather than asking whether the river (or turn) card is a good one to bluff, recognize that you should have weak hands in both your bluffing and checking ranges. Then, try to decide which range better suits the hand you hold.

3. You are playing a tournament with blinds of 1K and 2K and a 2K big blind ante. You open to 4500 with A♠ K♠ first to act at a nine-handed table, and the big blind calls. The flop comes T♥ 8♠ 6♥, and the big blind checks. There is 12K in the pot, and you and the big blind both have about 100K behind. What's your play?

Check.

This flop is not particularly favorable for the early position raiser, so he cannot bet into the big blind caller with abandon. Although you should still have an equity advantage over the big blind, you do not have a nuts advantage. The big blind will have more weak hands than you, but he should also have more combinations of straights, two-pairs, and sets.

It is nuts advantage, not equity advantage, that enables a player to use leverage to get away with a disproportionate amount of bluffing on the flop. In this case, when you bet, you must worry about facing a check-raise that would itself be leveraged, making it difficult for **you** to realize equity and show down marginal hands.

The threat of a check-raise makes it unappealing to bet a hand like A♠ K♠ that has good equity but not quite enough to call a raise. It's bad enough to bet and fold to a raise from T♦ 7♦, but it's a disaster to bet and fold to a check-raise from K♥ 7♥.

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Without the benefit of leverage, you cannot get away with as much bluffing on the flop. Given the risk of a check-raise, you should look to bet a more polarized range, including strong but vulnerable hands like JJ, draws like Q♥ J♥ that are strong enough to call a raise, and weak hands like A♦ 2♦ that you won't mind folding to a check-raise.

With A♠ K♠, you would prefer to keep the pot smaller, get closer to showdown, and see the next card, which could easily give you top pair or a draw.

CONCLUSION

The Two-Street Clairvoyance Game demonstrates yet another benefit of polarized ranges: they gain additional value from the threat of future bets. Learning to extract the maximum from situations where you can develop a polarized range is one of the keys to playing optimal poker. Future chapters will delve more deeply into how to orchestrate such situations.

Though not as sexy as betting a polarized range, learning to defend a condensed range against leveraged bets is just as important. The good news is that you do not have to be a mind reader to do it.

You risk tying yourself up in mental knots trying to guess whether your opponents will keep barreling future streets, leading to expensive mistakes when you guess wrong. Opal does not worry about any of that. When Ivan bets, Opal finds a calling strategy that makes him indifferent to bluffing **with that bet**. If he bets again, she crosses that bridge when she comes to it.

This toy game illustrates just how disadvantageous it is to end up in a situation where your range is **capped**, enabling your opponent to attack with a wide, polarized range. It's rare for situations exactly like the two-street Clairvoyance Game to arise in actual no-limit hold 'em games, but that's in large part because avoiding such situations is a core strategic principle. As we investigate real hold 'em scenarios, we will see that much of the strategy revolves around keeping your range uncapped, enabling you to present the threat of a polarized range and deterring your opponent from using leverage to his advantage.

Key Lessons

- ♠ **More leverage means more bluffing.** A player who can anticipate betting a polarized range on the next street can do a disproportionate amount of bluffing on the current street without fear of exploitation.
- ♠ **Spread your bet across multiple streets.** The optimal bet sizing strategy with a polarized range on a static board is to bet the **geometric growth of the pot**—the same fraction of the pot on each street, such that the final bet is all-in.
- ♠ **Call to make your opponent indifferent to bluffing with his current bet.** Defending a condensed range against leveraged bets from a polarized range isn't lucrative, but it isn't especially hard, either. When your opponent bets, you use the familiar $1 - \frac{Bet}{Bet+Pot}$ formula to find an unexploitable calling frequency. If he bets again, then you apply that formula to your current range and call accordingly.
- ♠ **The best defense is avoidance.** Especially with a lot of money behind, avoid capping your range lest you open yourself up to big bets from a polarized range.
- ♠ **Hand values are rarely static in real poker situations.** When they are not, you must weigh the advantages of betting a polarized range against the value of denying equity and future opportunity to your opponent.
- ♠ **Bluffs on early streets often have some chance of improving to winning hands.** This complicates the math of making an opponent indifferent to bluffing and may give a player with a condensed range incentive to bet or raise medium-strength hands.

CHAPTER 2: PROTECTION AND SEMI-BLUFFING

OVERVIEW & OBJECTIVES

When hand values are static, not likely to change, players have little incentive to bet medium-strength hands. Strong hands bet to profit from opponents' calls, and weak hands bet to profit from their folds. In contrast, medium-strength hands profit from neither: they will not be ahead of an opponent's calling range, nor can they expect better hands to fold.

In real poker games, hand values are rarely fixed before the river. The nuts on the flop may be a mere bluff-catcher by the river, while a bluff on the flop may turn into the nuts.

Consequently, reasons for betting before the river are more complicated. Players bet strong hands not only for value but also to protect against weaker hands that may draw out. They bet weak hands not only to get folds but also because those hands might become strong on later streets.

In this chapter, we will investigate a realistic no-limit hold 'em scenario where these considerations factor into an early position raiser's flop strategy.

By the end of this chapter, you should be able to:

- ♠ Weigh the advantages and disadvantages of protection betting.
- ♠ Determine the dynamism of a given flop.
- ♠ Develop linear betting and raising ranges when appropriate.
- ♠ Size bets on the basis on how polarized your range is.
- ♠ Derive practical strategies from game theory principles.

BETTING FOR PROTECTION

Fundamentally, all bets derive their value from one or both of two sources. There is **fold equity**, which is value that a hand gains when an opponent folds, and there is **pot equity**, commonly called **showdown value**, which is how much of the pot a hand will win at showdown.

Pot equity includes both equity in the current pot and money a hand may win or lose as a result of future betting. Fold equity is pot equity you deny to your opponent, the share of the pot he would have won had he played his hand on future streets. For this reason, betting for protection is sometimes called **denying equity**.

In a perfectly polarized range, each hand benefits from exactly one of these sources: bluffs have no chance of winning at showdown and benefit entirely from fold equity. Value bets benefit entirely from pot equity and gain nothing when the opponent folds. This is the case with the Q and the A, respectively, in the Clairvoyance Game.

Speaking in terms of bluffs or value before the river can be confusing, however, because most bets benefit to some degree from both calls and folds. A **semi-bluff**—a bet made with a draw to a strong hand—derives substantial value from the hands an opponent folds, yet it also has a real chance of winning if called. It will not typically be a favorite to win at showdown, but because it also benefits from folds, it may well be a profitable bet.

Conversely, hands that bet for value may be only small favorites when called but benefit considerably from folds. Think of betting 76 on an 863 flop: although you probably won't be in bad shape if you're called, you could easily be behind a better pair, and you're not much of a favorite against draws like T9 or 97. However, you benefit a good

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deal from the hands your opponent will likely fold. Even a seemingly weak hand like QJ has about a 25% chance of drawing out if you allow it to see the river, not to mention that it might successfully bluff you when it misses or value bet when it hits.

At the margins, the lines blur completely. If you check-raise all-in with T♥ 9♥ on an 8♥ 7♥ 3♠ flop, you may well be a favorite when called. Even so, you should be hoping for a fold, because you gain tremendously from almost any hand your opponent folds. Is this a protection bet or a semi-bluff? It doesn't matter what you call it, as long as you understand that its value comes from a mix of fold equity and pot equity.

When we talk about betting for protection, we are rarely talking about protecting against hands as strong as nine-out flush draws or eight-out straight draws. Players tend not to fold such strong draws, and rightfully so. Rather, we are talking about protecting against hands with one or two live overcards to a pair, or hands such as pocket pairs and backdoor draws that could turn into dangerous, hidden threats if the board runs out in just the right way.

The argument for betting into these hands is that, though they may not be favorites to win, they are unlikely to make mistakes on future streets. A player holding 33 on an AJ7 flop is not likely to put more money into the pot unless he turns or rivers a set. Even though JT is a big favorite against such a hand, it has nothing to gain by allowing the player holding it to see two more cards. The player with JT probably will not win anything more than what is already in the pot, but he will occasionally lose the pot and perhaps even an additional bet should a 3 come on the turn or river.

There are other hands JT would like to protect against on this flop as well. Hands such as K8 and Q9 will win at least 12% of the time if allowed to see the river, more if they successfully bluff. Even 65s could back into a winner if given the opportunity. None of these is a big threat by itself, but the cumulative value of folding them all out with a flop bet is significant.

The argument against betting JT on an AJ7 flop is the risk of running into a pair of As or a J with a better kicker. The equity lost by betting into these stronger hands is much greater than that gained by folding out 33 or Q9, so to be worthwhile, the bet would have to get those folds much more often than it ran into those stronger hands.

The other risk of betting JT is getting check-raised. As with any medium-strength hand, JT inevitably loses value when raised. When it calls, it is frequently way behind a strong hand, possibly even drawing nearly dead to a set. When JT folds to a bluff, it forfeits a majority of pot equity. Even when it folds to a strong hand, it loses the opportunity to back into trips or a straight.

Thus, the ideal protection bet is small. Small bets fold out weak hands while keeping losses to a minimum when you run into stronger hands. Even getting odds of 5:1, K8 and 33 will struggle to call a bet on AJ7.

If you only bet small with medium-strength hands, however, you give your opponent incentive to check-raise a polarized range. Some players will not have it in them to make such plays, and against them you can bet small with impunity. Against tougher opponents, you must balance your small protection bets with some “traps”, strong hands that bet small in hope of inducing check-raises.

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Deception comes not from playing contrary to your interests but from finding different types of hands that can benefit from playing in the same way, so that you achieve your objectives while keeping your opponents guessing.

SCENARIO: CONTINUATION BETTING AGAINST THE BIG BLIND

Ivan is first to act before the flop in a nine-handed \$1/\$2 no-limit hold 'em game. He raises to \$6, and Opal calls from the big blind. The flop comes $K\heartsuit 8\heartsuit 8\clubsuit$. Effective stacks are roughly \$200. Starting ranges and game parameters are as defined in the A Recurring Hypothetical section on pages 11-13 of the Introduction.

Ivan's optimal strategy, slightly simplified, is to bet \$4 with his entire range. The following questions prompt you to think about why he can profit from betting any two cards and how various hands in his range benefit from this bet. Try to answer each question for yourself before reading on for the answers and explanations.

1. Which player has the equity advantage on this flop? Why?
2. Which player has the nuts advantage on this flop? Why?
3. The starting ranges here are exactly the same as they were in the Get Real scenario from *Play Optimal Poker*, where we found that UTG's equilibrium strategy was to bet half the pot with only about a quarter his range on an $A\heartsuit 9\heartsuit 6\clubsuit$ flop. Why does Ivan bet so much more often on this $K\heartsuit 8\heartsuit 8\clubsuit$ flop?
4. When Ivan bets $T\heartsuit 9\heartsuit$ on the flop, is this a pure bluff (a hand with little to no chance of winning if called) or a semi-bluff? Why?

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5. When Ivan bets KQ, how does he benefit from Opal's folds? In other words, which hands that Opal will likely fold might benefit from seeing a free card if Ivan checked?

6. If Ivan is not allowed to bet \$4 on the flop and may only check or bet \$9, his betting frequency declines, as you might predict. Which hands would you expect him to check at the highest frequency, and why?

Answers & Explanation

Ivan is first to act before the flop in a nine-handed \$1/\$2 no-limit hold 'em game. He raises to \$6, and Opal calls from the big blind. The flop comes $K\heartsuit 8\spadesuit 8\clubsuit$. Effective stacks are roughly \$200.

1. Which player has the equity advantage on this flop? Why?

Ivan has about 56% equity to Opal's 44%. An early position raiser will have an equity advantage relative to a BB caller on almost any flop simply because his pre-flop range should be much stronger.

If you got this one wrong, you may need to work on distinguishing between equity advantage and nuts advantage. It's natural to see a paired board and think immediately about which player is more likely to have trips. The truth, however, is that even though Opal has more 8s, trips are a very small part of both players' ranges. Ivan still has a significant overall equity advantage because of strong hands like AK, AA, and KK.

2. Which player has the nuts advantage on this flop? Why?

This is a tricky one. Both players have 88, the literal nuts, in their ranges. Ivan is the only player with KK in his range. Such strong hands are rare, though.

What matters most, with a stack-to-pot ratio of about 15, is that Opal is the player with more combinations of trips or better. At this stack depth, trips are always strong enough to check-raise and get all-in, but AA is not. With much deeper stacks, it would be more relevant that

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Ivan has KK while Opal does not. With enough money behind, there would come a point where Opal should not be comfortable getting all-in with her weakest trips.

3. The starting ranges here are exactly the same as they were in the Get Real scenario from *Play Optimal Poker*, where we found that UTG's equilibrium strategy was to bet half the pot with only about a quarter his range on an A♠ 9♥ 6♠ flop. Why does Ivan bet so much more often on this K♦ 8♦ 8♣ flop?

The size of the bet is one factor. In the Get Real! scenario, UTG's options were to bet 1/2 pot or check, whereas in this scenario, his options are to bet 1/3 pot or check. Larger bets should be more polarized, so hands that might be appealing as protection bets for a small size will play better as checks if the alternative is a larger bet.

That accounts for only a bit of the difference in strategy that we see here, though. If we were to change Ivan's bet size to 50% in the current scenario, he would still bet the flop more than 95% of the time.

The main reason why he bets so much more often on K♦ 8♦ 8♣ is that it is a more dynamic flop than A♠ 9♥ 6♠. Hand values run closer together, and most of Ivan's range benefits to some degree from fold equity.

On A♠ 9♥ 6♠, hands like KK and A5 do not want to play large pots but also do not gain much from fold equity. Their value is static, unlikely to change significantly on the turn and river. Most hands that BB would fold are drawing nearly dead against them.

What makes A♠ 9♥ 6♠ so static, despite the flush and straight possibilities, is that when a player pairs the Ace, unpaired hands have little chance of drawing out. Both players have fewer pairs on the K88 flop, and the pairs

they do have are more vulnerable and so more interested in fold equity. When evaluating the dynamism of a flop, the prevalence of live pair outs in both players' ranges usually matters more than the possibility of straight and flush draws.

4. When Ivan bets T♥ 9♥ on the K♦ 8♦ 8♣ flop, is this a pure bluff (a hand with no chance of winning if called) or a semi-bluff? Why?

It is a semi-bluff. Although T♥ 9♥ is drawing nearly dead when called by a King, it can easily draw out on the weaker hands in Opal's calling range. This is related to why Ivan can bet at such a high frequency: even hands that look like total airballs have some equity when called by small pairs, Ace-high, and flush draws.

This is part of why Ivan does so well with a small bet size. In addition to risking less money when betting weak hands like this one, he also has better equity when called. Opal's range for calling a larger bet would include fewer small pairs and unpaired hands against which T♥ 9♥ is drawing live. With a larger bet size, T♥ 9♥ would function more like a pure bluff than a semi-bluff.

5. When Ivan bets KQ, how does he benefit from Opal's folds? In other words, what hands that Opal will likely fold might benefit from seeing a free card if Ivan checked? KQ benefits by getting folds from live Aces, small pairs, and backdoor draws.

When thinking about protection, many players focus immediately on the flush draw. You are not really protecting against such strong draws with a continuation bet, though. Even facing a much larger bet, Opal never

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folds a flush draw at equilibrium. Protection betting is more about folding out weaker draws, such as live overcards and backdoor draws.

6. If Ivan is not allowed to bet \$4 on the flop and may only check or bet \$9, his betting frequency declines, as you might predict. Which hands would you expect him to check at the highest frequency, and why?

He does not strictly check any hands, but those with the highest checking frequency are QQ and JJ. These hands have the least to gain from protection and do not fare particularly well when called.

Because Ks and 8s feature so prominently in Opal's calling range, QQ does not perform significantly better than 99 when called. In either case, Ivan is frequently drawing to two outs. However, 99 gains much more from folds. When Opal folds JT, for instance, that is very good for 99 but not worth much to QQ.

For similar reasons, Ivan checks his weaker Kx (KTs and KJs) and his best unpaired hands (AQ and AJ) somewhat often as well.

The best bets tend to be hands that benefit from both calls and folds. The best checks tend to be hands that do not benefit much from either.

LINEAR RANGES

Play Optimal Poker mostly considered two types of ranges: **polarized**, consisting of strong and weak hands, and **condensed**, consisting of medium-strength hands. Though these concepts are useful on early streets, ranges are most polarized or condensed on the river.

On early streets, players often have incentive to bet or raise **linear** ranges, which consist of medium and strong hands but exclude the weakest hands. Unlike on the river, medium-strength hands can benefit from betting to deny equity.

We see linear ranges most commonly in three scenarios:

1. **Raise-or-fold strategies.** Medium-strength hands usually prefer to check and call, but when those options are off the table, it makes more sense to balance your strongest hands with medium-strength hands rather than with weak ones.

Pre-flop opening ranges are a good example. When the action folds to you on the button, it is often correct to have no calling range at all. You either for a raise or you fold. While you may raise some relatively weak hands, it does not make sense to fold a stronger hand but raise a weaker one. The hands you fold should always be the ones with the lowest EV.

2. **Moving all-in before the river.** With no money behind, all-in bets are not leveraged and so do not benefit from the prospect of future betting. Consequently, the best bluffs for moving all-in before the river tend to be high-equity semi-bluffs rather than weak hands with little chance of winning when called.

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Naturally, ranges for calling an all-in bet are linear as well. Raising with strong hands is not an option (except in multiway pots, but even then it is not often correct), and there would be no reason to fold medium-strength hands while calling with weaker ones.

3. Small bets. Bigger bets tend to be more polarized because the hands that benefit most from betting big are very strong hands that have good pot equity even against the strongest part of an opponent's range and very weak hands that want to maximize fold equity and expect to be in bad shape no matter what range calls them.

Many more hands can benefit from small bets. An opponent's range for calling a small bet should be wide and weak, so medium-strength hands can expect to be ahead when called. These hands also benefit from folding out the weakest hands in the opponent's range.

Because small bets should not generate many folds, it can be hard to profitably include your weakest hands in a small betting range. With sufficient equity advantage, however, such bets can be profitable, especially when they benefit from leverage. And because your opponent's calling range should be so wide, even your weakest hands will have some pot equity when called.

We found in *Play Optimal Poker* that there is little value in raising into a polarized range, as it rarely presents the opponent with a tough decision; he can just fold his weak hands and call his strong ones.

Not so with linear ranges. Semi-bluffs and thin value bets do badly when raised. They either put more money into a pot they are not likely to win, or they fold away substantial equity. The more linear a player's betting range, the more likely his opponent should be to develop a raising range.

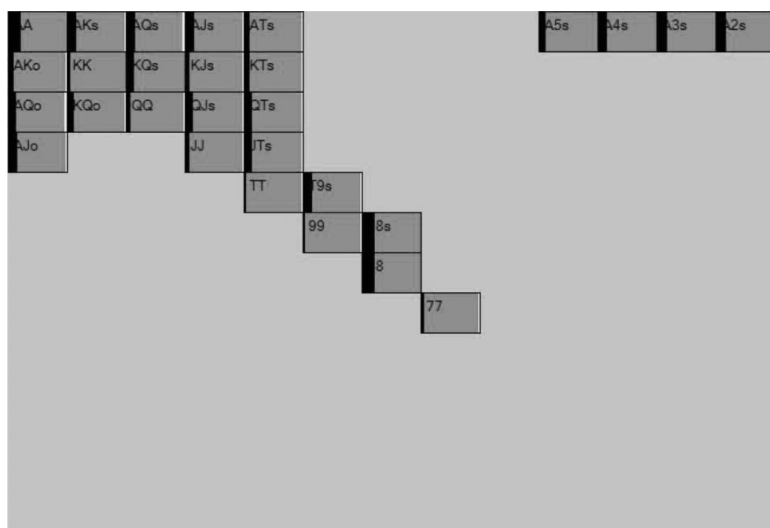
SIMPLIFYING STRATEGIES

This scenario is closer to a real poker game than to a toy game, but it is not exactly no-limit hold 'em, because the players cannot bet any amount they wish. We can conclude that betting small on the $K♦ 8♦ 8♣$ flop is a good strategy for Ivan, but we do not know exactly how small. It is possible he would do even better by betting $1/4$ or $5/16$ or some other small fraction of the pot.

Ivan mostly uses the \$4 bet represented by gray shading in the grid below, but with about 12% of his range, the more darkly shaded portion, he prefers to bet \$9. The slivers of white at the far-right side of some of the boxes represent a small checking range.

For example, AQs is mostly gray because Ivan mostly bets \$4 with it. A bit of its box is darker because Ivan occasionally bets \$9 with it. A tiny bit of the box is white because Ivan very occasionally checks it.

Ivan's Flop Betting Strategy on K♦ 8♦ 8♣



Ivan's range for betting \$9 is more polarized than his range for betting \$4. This is a common dynamic, where optimal strategy may involve splitting one's range across several different bet sizes. Here we see a more polarized range for betting big, a more linear range for betting small, and a condensed range for checking.

Such complex strategies are challenging for human players to implement. Although we can notice some patterns—98, 88, and nut flush draws appear most prominently in the \$9 range—if you were not very careful about randomizing, you could easily end up betting big too frequently with your strong hands. A savvy opponent could exploit this by folding to your large bets and check-raising your smaller ones. There is even a 2% checking range here—good luck implementing that in a balanced way!

As always, you may not be indifferent between these options in a real game situation. Against opponents who rarely check-raise bluff and are too willing to call large bets, a strategy of consistently betting big with strong hands and smaller with the rest of your range might well be best.

Without such a read, however, you should look for strategies that are both profitable and practical to use over the table. A strategy of betting \$4 with his entire range has an EV of \$8.84 for Ivan. The more complex strategy shown above, which adds a small range for betting \$9 pot and an even smaller checking range, has an EV of \$8.85.

That's a lot of work for a penny, and if you screw it up, you could easily cost yourself more than what you'd gain by getting it exactly right. As a human, you are better off sticking to strategies that are simple but effective.

PUSHING EQUITY

It is difficult to identify hard and fast rules that determine betting frequency at equilibrium. Many factors, including board texture, effective stacks, and the composition of both players' ranges, influence it. A good rule of thumb, however, is that a player with a big equity advantage benefits from betting small at a high frequency.

This is sometimes called **pushing equity**. If your range is stronger than your opponent's, you benefit if both players put in more money with their full ranges, which is essentially what happens when you bet a small fraction of the pot with most of your range. Because the bet is small, your opponent should call with most of her range, making the pot larger without dramatically changing either of your ranges.

Of course, your opponent is not required to call with most of her range, but compelling her to fold away small chunks of equity is also to your advantage, even when you hold strong hands. When she calls, you increase the size of a pot that your range is a favorite to win. When she folds, you increase your pot equity to 100%. It's win-win... unless you get raised.

A raise turns the tables, putting you in the unenviable position of having to either call with not-particularly-strong holdings or fold away substantial pot equity. This is where having a big equity advantage comes in handy.

When your range is much stronger than your opponent's, it is hard for her to raise aggressively. So long as you defend at the right frequency, she will not have enough strong hands to balance a lot of bluffs. Her only options will be to raise rarely or to raise a bluff-heavy range.

In the scenario we just examined, Opal's optimal strategy is to check-raise less than 13% of her range, even though Ivan bets 100% of his. She simply does not have enough strong hands to support a wider check-raising range, especially if she also wants to keep some strong hands in her calling range.

Thus, the marginal hands in Ivan's range do not risk much by betting. He does not **want** to get raised, but because the risk is small, the rewards justify betting.

Many human players overreact to the threat of a raise. When you have a significant equity advantage and the wherewithal to defend at a frequency that makes bluffing unprofitable, your opponent cannot profitably raise very often. Either you rarely face a raise and profit from pushing equity, or your opponent will bluff raise too often, in which case you profit by picking off all those bluffs.

Best of all, you do not need to know what your opponent will do. If you can approximate an unexploitable response to anything she does, then betting a wide range when you have a significant equity advantage should outperform checking no matter what her strategy.

TEST YOURSELF

1. You are playing a tournament with blinds of 10K and 20K and a 20K big blind ante. The effective stacks are 900K. You open to 45K with A♠ Q♥ from three off the button, and the big blind calls. The flop comes T♥ 4♠ 3♥, and the big blind checks. What's your play?

This is a good time to push equity with a small bet. Before the flop, the big blind had a lot of incentive to re-raise his strongest hands. Because of the price your raise offered, he also had incentive to call with some very weak hands. That means your range should have a substantial equity advantage on any flop, especially one that does so little to change pre-flop hand strengths.

Although the big blind is more likely than you to pair the 3 or the 4, he is also far more likely to miss entirely. Even though your AQ “missed”, it didn't really need to “hit”. You started with a very strong pre-flop hand, and it is still quite strong on this flop. It is not so strong as to welcome action, but it should be in fine shape if your opponent calls a small bet.

Importantly, your hand benefits from fold equity even if better hands never fold, which they almost certainly will not. Your opponent could easily hold two live cards such as 8♣ 7♣, and you would rather deny them their equity than let them see a free card.

2. The big blind checks, and you bet 35K into the 120K pot. He raises to 80K. What's your play?

You have no pair and no obvious draw, but that does not make this a trivial fold. You need to consider the pot odds and your opponent's incentives.

There is now 235K in the pot, and it will cost you just 45K to call. You need to win less than 20% of the time to make calling profitable. You will not turn a pair that often, but your opponent may check the turn, in which case you will get to see two more cards. If there is a chance you could win unimproved, then calling is correct.

Could your hand be good? Let's look at your opponent's incentives when he chose to raise. There was 155K in the pot, and his raise risked just 80K. Even ignoring any pot equity he may have when called, he'd show a profit on a bluff if you folded more than about 1/3 of the time.

This is a real hand that I played in a World Series of Poker event. Over the felt, my thought process went something like this: On this flop, I'd probably play a simple strategy of betting my entire range for a small size. That might not be quite optimal, but it's probably a close approximation and is certainly easy to implement.

Because I would bet my whole range, I could be holding hands like A♣ 6♣ or 8♦ 7♦ that would be even weaker than AQ. While AQ is far from a monster, the best unpaired hands probably are in the top 2/3 of my range because it's hard to make a pair on this flop.

Backdoor straight and flush draws contribute a bit of value to this hand as well, making it easier to realize equity on turns that do not give me a pair.

As the hand played out, I called the raise, and the turn was the 6♥. My opponent checked, I bet 125K, and he folded.

It's easy to fall into worst-case scenario thinking and decide that, because you'll likely fold to a big bet on many turns, you should just fold the flop. However, you cannot be sure your opponent will bet. If you fold to a bet he has not yet made, you risk exploitation by a player who raises the flop as a bluff and gives up if called.

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Your first job is to find a calling strategy that makes him indifferent to check-raising the flop as a bluff. Because his raise was so small, that means you must call with quite a few hands, not all of them premium. If he bets again, then you cross that bridge when you come to it.

3. You are playing a no-limit hold 'em cash game with \$2 and \$5 blinds and \$1000 effective stacks. You are on the button with A♠ 9♠, and the player to your right opens for a raise to \$15. You know him to be a loose player who likes to see flops. What's your play?

Raise to \$50 or so. Your hand is not quite premium, but it should be ahead of a late position raising range, especially from a loose player. Because you expect your opponent to call often, you should raise a linear range. You are probably going to see a flop, so your raising range should be linear. Your lighter three-bets should be hands that have robust equity and can make the nuts rather than something like J9 offsuit.

4. You raise to \$50, the blinds fold, and the original raiser calls. The flop comes A♦ 8♣ 4♥. Your opponent checks. What's your play?

Checking and betting small are both options, but I prefer checking.

Although you should expect to have a substantial equity advantage against a loose pre-flop caller, this is a static board where protection and equity denial are less important. Consequently, you may wish to bet a more polarized range for a larger size.

With your strongest hands, you are happy to start building a big pot. With your weakest hands, you are happy to get folds from the weaker hands in your opponent's range. But with hands in the middle—hands like this one, and even more so KK and QQ—you do not want to play a large pot, nor do you benefit much from fold equity.

That said, with a big equity advantage, it's hard to go wrong betting small with your entire range. If you are concerned about your ability to balance a checking range, it is safe to bet your full range for a small amount.

CONCLUSION

On early streets, betting and raising ranges are not necessarily polarized. Players have incentive to protect their medium-strength hands and to diversify their ranges so as not to be predictable on future streets.

The player with the equity advantage typically drives the action, especially if he also has the nuts advantage. By betting small with a wide range, he denies equity to the weakest hands in his opponent's range while building a larger pot for the strongest hands in his own range.

His equity advantage also protects him from check-raises. As long as he is prepared to defend his wide betting range at the appropriate frequency, it will not be profitable for his opponent to check-raise him often. Though most of his range does not profit when raised, it is a small risk worth taking in exchange for the value of pushing equity.

Key Lessons

- ♦ **A player with an equity advantage can push equity** by betting at a high frequency, especially if he uses a small bet size.
- ♦ **The player with the nuts advantage can make a big bet or raise with a polarized range.** It will not be profitable to do so at a high frequency, though.
- ♦ **The value of the high-frequency small bet strategy depends on how dynamic the board is.** More dynamic boards call for a more linear betting range.

- ♣ **Protection bets should be small.** The goal is to deny small amounts of equity to weak hands, not to eight- or nine-out draws, while risking the minimum against stronger hands.
- ♣ **Linear ranges lose EV to raises.** Semi-bluffs, protection bets, and thin value bets face tough decisions when raised. They must either call and lose value to strong hands or fold and forfeit pot equity to weak hands.
- ♣ **Simplify strategies.** Equilibrium strategies, especially on early streets, often involve mixing many hands across several different bet sizes. Human players should pick one or two bet sizes and split hands logically between them.
- ♣ **Plan ahead.** An important function of early-street betting is to set up profitable opportunities on future streets and avoid situations in which your range will be capped and therefore vulnerable.

CHAPTER 3: RANGE CONSTRUCTION

OVERVIEW & OBJECTIVES

Opal is in a tough spot on the $K♦ 8♦ 8♣$ flop. She is out of position with a range that, though not completely capped, is much weaker than Ivan's. Worse yet, there is a lot of money behind and three opportunities for her opponent to bet, so even when she has the best hand, she is going to have a tough time getting it to showdown.

How did she get into this mess? To some degree, she signed up for it when she called pre-flop. That is not to say she made a mistake; even knowing she would be at a disadvantage for the rest of the hand, she was getting a good price, and her call closed the action. Playing from out of position with a weak range, she will not realize her full share of equity after the flop, but she will realize more than if she folded.

This is also an unlucky flop for Opal. Although the two 8s give her an opportunity to check-raise a polarized range, this is a tough board to hit, which makes it a tough board on which to defend her equity.

One reason Opal's range is so weak is that she had incentive to re-raise her strongest hands pre-flop. That's a bigger liability on some flops than on others. On many flops, it will hardly matter that she does not have hands like AA or KK, because other hands in her calling range will have improved to be stronger than overpairs anyway. Although that happens with her 8x on this flop, she does not have enough of those hands to compensate for her lack of AA, KK, and AK, and that puts her at a real disadvantage.

Better flops for Opal are those on which she can easily make sets, two pair, and straights, especially if Ivan is less likely to make those same hands. In Chapter 6, we will see that Opal does far better on a $9♥ 7♦ 6♥$ flop.

We know from the Two-Street Clairvoyance Game that Opal's basic strategy with a condensed range will be to check and call at a frequency that makes Ivan indifferent to bluffing at each decision point. One of the things that makes $K♦ 8♦ 8♣$ such a tough flop for Opal, however, is that it is dynamic; it will likely look quite different by the river. Hands that are strong on the flop may not be strong on the river, and hands that were weak on the flop may be nutty on the river. Position will help Ivan respond better to those changes in board texture than Opal can.

Unlike in the toy game, she must choose her calls based not only on her hand's absolute value but also on how the board could develop on future streets, so that she is not overly vulnerable on any runout. Because her range is not entirely condensed, she must also develop a small raising range.

In this chapter, we will look at how Opal constructs her flop ranges to account for the threats of changing board textures and big bets on future streets. By the end of this chapter, you should be able to:

- ♣ Think in terms of playing a range and dividing it into well-constructed calling, raising, and folding ranges.
- ♣ Determine the ranges you should have in a given situation and their relative sizes.
- ♣ Construct ranges around pure strategies, using mixed strategies for balance and board coverage.
- ♣ Consider board coverage and equity realization on future streets when constructing a flop calling range.
- ♣ Develop a check-raising range that will enable you to realize and deny equity on future streets.
- ♣ Adapt your flop strategy to exploit common mistakes from the pre-flop raiser.

RANGE CONSTRUCTION STEP-BY-STEP

The following is a step-by-step process for constructing ranges in any situation. The rest of the book will refer to and reinforce this process, giving you many opportunities to practice using it, just as *Play Optimal Poker* did with the process of crafting exploitative strategies.

Ranges are composed of two different kinds of hands: pure strategies and mixed strategies. A **pure strategy** is a hand you put into a single range with 100% frequency. If you have the nut low and your opponent goes all-in on the river, that's a pure fold—you would never call with it just for the sake of mixing up your play. The nuts, of course, would be a pure call.

You can think of pure strategies as the hands around which a given range is built. If you check-raise a continuation bet on a $K♦ 7♥ 4♠$ flop, 44 and 77 may well belong in your raising range with 100% frequency. The reason you have a raising range at all is to build a big pot with your strongest hands, and if you weren't the pre-flop aggressor, then these smaller sets may be the only nutty hands you could have.

$K♣ 9♣$, on the other hand, would probably be a pure call. It's a classic example of a medium-strength hand that can beat bluffs but does not want to play a large pot. It also is not too concerned with protection, because if you do have the best hand, it's hard to make your opponent fold anything with a substantial chance of drawing out.

Mixed strategies are hands you do not have strong incentive to play one way or another. You can profitably play them in several different ways, enabling you to balance your pure strategies. Draws such as 65 and 86 would likely be mixed strategies on the $K♦ 7♥ 4♠$ flop.

Though too strong to fold to a single bet, they play well as both calls and raises.

To balance your sets, you need to raise some weak hands against which it would be a big mistake for your opponent to fold a good pair. Draws are great candidates for this, because if your opponent does not fold, they may improve to strong hands that will benefit from the big pot you built with your earlier aggression.

Draws can also balance hands like K9 in your calling range. If the turn checks through, K9 will be strong enough to value bet on many rivers, and you will need bluffs to balance those bets. In addition to their obvious value when they improve, draws can serve as bluffing candidates when they miss.

Your mixed strategies also help you with **board coverage**. No matter how the board develops on future streets, it should not be obvious that you have no strong or weak hands in your range. If there are two diamonds on the board, for instance, you need to have flush draws in both your calling and raising ranges. This ensures your opponents cannot deduce from your previous action that you do not have a flush.

But flush draws cannot be the only bluffs in your raising range, because when a flush card comes your range would consist entirely of flushes and strong flopped hands, with no bluffs to balance your value bets. You should mix in a variety of weak hands rather than choosing only the most obvious candidates. When constructing a raising range on $K\spadesuit 7\heartsuit 4\clubsuit$, you will want to raise a mix of $8\spadesuit 6\spadesuit$, $8\heartsuit 6\heartsuit$, and $8\clubsuit 6\clubsuit$ so that you have board coverage for any backdoor flush draw that comes in.

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When doing back-of-the-envelope range construction in real time, start by thinking about what your most common action(s) would be. If you called a pre-flop raise from the big blind, then your default should be to check the flop. If you are facing a bet of $\frac{1}{4}$ pot, then you should mostly call but also have small folding and raising ranges.

Next, consider the exceptions, the rare hands with which you would have strong incentive to take something other than your default action. If those were the only hands you played in a different way—for instance, if you mostly called or folded on K74 and only raised with 44 or 77—your opponents could exploit you by folding to your raises. You should choose a few weaker hands to raise to capitalize on the incentive you have given them to fold. Before calling or folding a weak hand, consider whether it might play better as a raise, or at least whether you ought to raise it at some frequency.

To be clear, this method does not produce perfectly balanced, unexploitable ranges. Most humans cannot do that without the assistance of computers and specialized software. What this process does is approximate the work of a solver in the amount of time available for decision-making in a real poker game, producing reasonably balanced results and avoiding the predictable play that stems from other shortcuts and seat-of-the-pants thinking.

The Range Construction Process



Envision Starting Ranges

Starting ranges, the set of hands with which you and your opponents are likely to arrive at the current decision point, are the jumping off point for strategizing future play. Just as you must input starting ranges for both players before a solver can output a solution, so must you consider the starting ranges of all players when attempting to “solve” a situation in real time. Your starting range gives you the building blocks with which you will construct your ranges for the current decision point, while your opponent’s starting range helps to determine which ranges you should be building in the first place.

This does not have to be a precise combinatoric breakdown, but you should try to answer some basic questions about the two ranges at this point in the hand: Who has the nuts advantage? Who has the equity

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advantage? Is each player's range mostly polarized, condensed, or linear?

The answers to these questions come from the interplay between the prior action and the board. A player who bet into multiple opponents on the previous street, such as an early position pre-flop raiser, likely starts the next street with a stronger range than a player who called getting pot odds and closing the action. A player who bet big on the turn brings a polarized range to the river, while a player who checked and called that big turn bet comes into the river with a condensed range.

New board cards can change those dynamics, though. The right flop can give the nuts advantage to the big blind caller. The right river can uncap the turn caller's range and incentivize her to donk bet a polarized range.

Many players fail to consider these elements in tandem. They either focus entirely on prior action and defer to the last aggressor without regard for changes in board texture, or they focus entirely on the board and play their own hands without regard for the ranges involved.

A final consideration is the role that protection will play in both player's strategies. This, too, is a function of starting ranges and board texture. Even when there are many draws on the board, for instance, there may not be many in your opponent's range, in which case you would have less reason to bet.

Typically, protection is most important when both players have wide ranges. These are the cases where it's easiest for players to hold hands with modest equity but poor equity realization—the kind most vulnerable to small bets—and also hands that are more vulnerable to free cards and thus have more to gain from protection.

Determine Needed Ranges

Answering the above questions gives you the information to determine which ranges you should develop and approximately how large each should be.

With a nuts advantage, you will often develop a polarized betting or raising range and a condensed checking or calling range. The extent of your nuts advantage will determine how wide that range can be.

When the middle of your range values protection, you will want a range for betting smaller. That may mean building a checking range, a linear range for betting small, and a polarized range for betting large. Or, it may mean simplifying to a single bet size or even to betting your entire range.

When holding a condensed range out of position, you often do best by checking your entire range. Even though that may not be the equilibrium strategy, it's typically close enough to be worth the simplification.

When facing a bet, consider how polarized it is. The more polarized, the less inclined you should be to develop a raising range. Against a more linear betting range (e.g., in situations where your opponent has more incentive to bet the middle of his range), raising will play a more important role in your strategy, especially if you have a nuts advantage.

Identify Pure Strategies

Now it's time to start building your ranges. This is not as daunting as it seems, because you can often knock out big swaths at once. When facing a bet, you should be able to quickly rattle off many hands that you would not fold,

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chiefly good draws, top pair, and other strong made hands.

Here is where it pays to have conceptualized in advance the relative size of the ranges you'll need. You must now consider how well that strongest chunk of hands range fills out your desired calling range. When your starting range is strong or the bet you're facing is large, you may not need to continue with much more than your best hands. In extreme cases, you might even fold some seemingly strong made hands!

The harder case is when your starting range is wide or the bet you are facing is small. In that case, you must consider the weaker part of your range in greater detail. How often will you have no pair and no draw? What about weak draws like gutshots and backdoor flush draws? What about weak pairs? If folding all of them will make your folding range too large, then you must consider getting stubborn by calling or raising the best of them, especially if your opponent's bet is small.

“Air” can often be folded without a second thought, but we need to be clear about what exactly “air” means. Not all unpaired hands are “air”. On certain boards, Ace-high or two live overcards can be well worth continuing, especially if they have backdoor draws. These may even be pure calls or hands that mix between calling and raising but never fold.

Resolve Mixed Strategies

After identifying your weakest and strongest hands—those that will always fold and those that will never fold—you are left with a bunch of nebulous stuff in the middle: weak pairs, weak draws, and unpaired hands with potentially live outs. What to do with these will

depend on how your ranges are shaping up. If one is already out of proportion to the other, then most of these marginal hands should end up in the smaller range.

For example, when you are the big blind facing a small continuation bet from the button, it is easier to find hands you want to fold than hands you are eager to continue with. But because the bet is small, you need to continue with a lot of hands. That means you will err on the side of calling or raising these marginal holdings.

If you were the flop aggressor and just got check-raised after betting big on the turn, you need a more substantial folding range and should err on the side of releasing anything marginal.

Mixing is most important when your ranges are already in roughly the right proportions to each other after you sort out the pure strategies. In those cases, you will end up imbalanced if you shunt all the edge cases into one range or the other.

Before you worry about mixing, though, consider how your opponents could exploit a potential imbalance and whether they are likely to do so. For example, if your flop betting range is too wide, the best exploit is an aggressive raising strategy. When facing a passive opponent who will rarely raise, you can exploit him by erring on the side of betting when the decision is close, even though that will make your betting range too wide. Even small deviations by an opponent can incentivize you to play pure strategies with hands that would be mixed at equilibrium.

Board coverage is the other main reason to consider mixing, and you should apply the same test of checking for exploitability here. On which boards would one of your ranges be especially strong or especially weak? If your raising range contains no flush draws, for instance, that

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would give you incentive to mix them between raising and calling (or folding). If it contains no bluffs except flush draws, that would be a reason to mix in some other kinds of draws, so that you can still have a bluffing range when the flush comes in. As before, however, this is less of a concern against opponents who are unlikely to profit from your imbalance.

DEFENDING A CONDENSED RANGE: CALLING VS FOLDING

This scenario will examine the same situation as the previous chapter, but from Opal's perspective. Ivan raises to \$6 first to act before the flop in a nine-handed \$1/\$2 no-limit hold 'em game, and Opal calls from the big blind. The flop comes $K\heartsuit 8\spadesuit 8\clubsuit$. Effective stacks are roughly \$200.

On the flop, Opal checks, Ivan bets \$4, and Opal may either call or raise to \$14. Either player will be allowed to bet 75% or 200% of the pot on the turn and 75% or 200% of the pot on the river. Donk bets and raises of 50% of the pot are allowed.

We will walk through the range construction process step-by-step to see how Opal should respond to Ivan's bet.

Envision Starting Ranges

We discussed starting ranges in the previous chapter, so be sure to review it if you have forgotten which player has the equity and the nuts advantage on this flop.

Determine Needed Ranges

Facing a \$4 bet into a \$13 pot, approximately how large should Opal's folding range be? Roughly speaking, how should she split the rest of her hands between calling and raising?

The first and most important thing to recognize is that Opal should call more frequently than anything else. The bet is small, offering appealing odds even to weak holdings, and because Ivan has the nuts advantage, Opal

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cannot develop too wide of a raising range. Her weaker and more condensed range should mostly defend by calling.

Ivan's betting range is linear, however, meaning it contains many hands that do not want to face a raise. Opal can deny equity to those hands by developing a small, mostly polarized check-raising range. Her equilibrium strategy raises about 13% of her range.

Play Optimal Poker introduced this concept, but it bears repeating now: betting and raising are not the only ways to present opponents with difficult decisions. In fact, as the player with the condensed range, it is mostly **not** how you will present your opponent with difficult decisions. Although Opal has a robust check-raising range on this board, she calls far more often.

By calling with a balanced range designed with future board coverage in mind, she challenges Ivan to make tough decisions about whether to bet or check on later streets. She makes it difficult for him to deny her equity. This is a dilemma for both his weak hands, which must choose whether or not to bluff, and his medium-strength hands, which would like to get thin value and protection but must worry about running into a better hand or getting check-raised on the turn.

Neither Opal's flop action nor the turn card should provide Ivan with solid information about what she plans to do on the turn. Just as in the Clairvoyance Game, some portion of her range that calls the flop will call again on the turn, while some portion will fold. By adjusting her frequencies to the size of Ivan's bet, she makes him indifferent to all his possible bluffing lines: bet once and give up, bet twice and give up, bet three times, etc.

Identify Pure Strategies

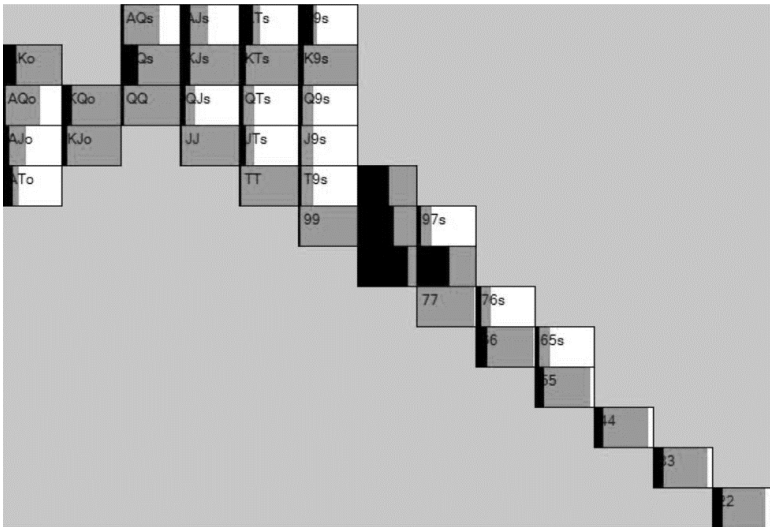
Unlike in the Clairvoyance Game, where Opal only had one hand and had to make Ivan indifferent via the frequency with which she called it, her calling candidates in a real poker scenario are not arbitrary. Most of her range has a strong preference for calling or folding, and only at the margins must she make a decision or randomize her play.

The equity realization formula $EV = \text{equity} * r$ indicates that the profitability of calling depends on two factors: the raw amount of equity a given hand has, and how well that hand will realize its equity. Opal's calling candidates tend to fall into two categories: hands with good equity, even if they are unlikely to be nutty on future streets, and hands with less equity but more potential to turn into strong hands on the right runout. Hands with good equity **and** good equity realization tend to be nutty hands that play best as raises.

From a practical standpoint, the most important thing is to identify the hands that always fold or never fold at equilibrium. Mistakes with these hands will be more costly than calling or folding a bit too much with the marginal ones.

The following PioSolver grid shows Opal's equilibrium strategy for responding to a \$4 bet. The black regions represent raises to \$14, the gray represent calls, and the white represent folds. When a box contains two or more colors, Opal is indifferent between those options, and their relative sizes represent their frequencies. With 22, for example, she is indifferent between all three options but mostly calls.

Opal's Response to a \$4 Bet on K♦ 8♦ 8♣



This may look complicated and overwhelming, but if you focus only on the hands that always fold and those that never fold, it is actually quite intuitive. Opal never folds a pair of 6s or better. She never folds a flush draw, either, mostly mixing between calls and raises with them. The only truly tricky bit is that she rarely folds strong backdoor draws such as A♦ Q♠ and A♣ J♣. Unpaired hands worse than Ace-high always fold unless they have a flush draw—backdoor clubs don't cut it, even as a mix.

Resolve Mixed Strategies: Calling Vs. Folding

Hands with less equity but some potential to become strong on the right runout—big unpaired hands and pocket pairs 77 and below, in this case—usually mix between calling and folding. If you always called with these hands, then your calling range would be too weak on any given runout, leaving you vulnerable to a strategy of pushing equity with small bets on later streets. If you never called with these hands, your opponent's flop bets would be too profitable, and you would be vulnerable to big bluffs on certain runouts. Your opponent, knowing certain cards could not have helped you, could blast away with a polarized range and deny equity to the many medium-strength hands in your range.

The solution must therefore be a mixed strategy of sometimes calling and sometimes folding these hands. Furthermore, the calls must come from a variety of weak hands so you have the potential to improve on as many different runouts as possible. This is how Opal manages to raise many strong hands on the flop without getting stuck with an overly capped range on future streets.

A solver can strike the right balance, selecting a mix of speculative flop calls that will be neither too weak nor too strong on any runout. We can learn from studying solver outputs and then do our best at the table, keeping in mind the objective of holding a roughly balanced range no matter how the board develops so that our opponents cannot predict when we will be strong or weak.

Opal's flop calling range keep Ivan in the dark not only about whether she will fold to future bets but also about whether a particular turn card is good or bad for her. No matter the turn, it will be good for some portion of her calling range and bad for another.

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Even so, some turn cards are better for her than others. Sometimes she gets lucky and catches a card where it is easier to defend her equity, and sometimes she gets unlucky and must accept that Ivan can put more pressure on her because of how the new card improves his range.

For example, an A is a particularly bad turn for Opal. She could make it less so by calling more often on the flop with hands like AQ. While that would increase her EV on A turns, it would decrease her EV on most other cards, where she could find herself facing a large bet while holding no pair and no draw. On balance, her equilibrium strategy is to show up with an A or other strong hand often enough that Ivan cannot pummel her too badly on those turns but not so often that she opens herself up to excessive pummeling on other turns.

Preparing for 2162 possible combinations of turns and rivers is a delicate balancing act, which is why Opal mixes so many different hands into her flop calling and raising ranges. Fortunately, the consequence of getting the exact composition of those ranges wrong is not severe; in most cases, it will just make you slightly more vulnerable on a few specific boards.

The most important turns to focus on are those that occur frequently. Ensuring you are balanced on diamond turns, of which there are nine, is more important than ensuring you are balanced on 8 turns, of which there are two (or one, if you're holding an 8).

Questions

The following questions encourage you to think through Opal's mixed strategies, which is the trickiest part of range construction. Do your best to answer them for yourself before you read on.

1. Getting 17:4 odds, Opal only needs to win about 19% of the pot to call. $A♠ Q♠$ has nearly 37% equity against Ivan's continuation betting range on $K♦ 8♦ 8♣$, so why is she indifferent to calling with it?
2. Pocket 6s without a diamond has 33% equity, a good deal less than $A♠ Q♠$, so why does Opal never fold it?
3. Quad 8s is one of Opal's highest-frequency check-raises. Why doesn't she prefer to slowplay it, as many human players do?
4. Opal raises a mix of different flush draw combinations, but she raises nut flush draws most frequently. Why are nut flush draws so appealing as raises? And if they are so appealing, why does she sometimes call with them while sometimes raising weaker flush draws?
5. What value does $A♦ T♣$ have as a check-raise on the $K♦ 8♦ 8♣$ flop?
6. What value do small pairs like 22 have as check-raises?
7. AK and KQ are strong hands, but they are not nutty. Why does Opal sometimes check-raise them, if she will not be able to keep betting them for value after inflating the pot?

Answers & Explanation

1. Getting 17:4 odds, Opal only needs to win about 19% of the pot to call. A♠ Q♠ has nearly 37% equity against Ivan's continuation betting range on K♦ 8♦ 8♣, so why is she indifferent to calling with it?

This is a function of leverage. Although AQ has good equity relative to Ivan's betting range, much of it is wrapped up in hands that are difficult to play well on future streets. An unimproved AQ may be the best hand even on the river, but does Opal really want to call three streets with it? Does she want to call big bets on the turn and river if she makes a pair of Qs?

It's close, which is why she is indifferent to calling with this hand. Because it's close, something as small as having a diamond would be enough to make her never fold. With a diamond, her decisions are a bit easier and more profitable on diamond turns and rivers, and that increases the profitability of calling (or raising) the flop.

If Opal were guaranteed a showdown after calling the flop, then she would have a higher calling frequency with hands like this, and Ivan would have a lower betting frequency.

2. Pocket 6s without a diamond has 33% equity, a good deal less than A♠ Q♠, so why does Opal never fold it?

It may not seem like much, but 66 has a few outs to a hand that is functionally the nuts, and this dramatically improves its ability to realize equity. On the right boards, it will be a nutty hand that can bet or raise as part of a polarized range rather than a pure bluff-catcher.

3. Quad 8s is one of Opal's highest-frequency check-raises. Why doesn't she prefer to slowplay it, as many human players do?

Many humans will not raise quads because they believe they "have the board crushed", implying that it is hard for their opponent to have a hand strong enough to call a raise when they hold all the 8s.

In this case, though, 8x is not an important part of the opponent's range. In fact, the only 8x in Ivan's range is 88 and 98s. At equilibrium, he calls a small check-raise with any pair, any flush draw, and sometimes even Ace-high. Because Opal wants to build a large pot and does not block most hands with which Ivan will call, 88 plays well as a raise.

Especially when out of position, slowplaying is risky. The risk of getting drawn out on may be negligible, but the risk of failing to grow the pot is considerable. If Opal calls the flop and checks the turn, she risks Ivan checking behind. Then she will find herself on the river with a far smaller pot than she would like.

This is yet another example of how to create deception not by acting contrary to your interests but by playing different types of hands in the same way. Ivan's incentive to put money into the pot comes from the fact that Opal could easily raise weak hands in this situation. To realize his equity against those hands, he must risk paying off her quads.

4. Opal raises a mix of different flush draw combinations, but she raises nut flush draws most frequently. Why are nut flush draws so appealing as raises? And if they are so appealing, why does she sometimes call with them while sometimes raising weaker flush draws?

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In many ways, nut flush draws are better raising hands than lower ones. Ivan does not have a lot of incentive to give action when a diamond turns in a check-raised pot, because so much of Opal's check-raising range consists of either flush draws or trips. Flush under flush happens rarely, but it accounts for a substantial portion of the situations where a lot of money goes in after a diamond turns, so it pays to be on the winning side of that collision.

The problem with raising nut flush draws exclusively is that there is only one A♦ in the deck. If Ivan had it in his hand, then he would know Opal did not have a flush draw when she check-raised. Or, if it came on the turn after she check-raised, he would know she could not have a flush, which would enable him to deny her equity by betting a polarized range.

Raising a mix of flush draws rather than any one combination exclusively also enables Opal to make a pair on a variety of turns. Her check-raising range does not otherwise have many 9s or 6s in it, so having a bit of extra strength when one of those cards turns is part of the value of raising a more diverse mix.

5. What value does A♦ T♣ have as a check-raise on the K♦ 8♦ 8♣ flop?

Because so much of Opal's raising range consists of trips or diamond draws, she will have many strong hands on diamond turns and may struggle to find bluffs to balance them. A hand like A♦ T♣ is excellent for this purpose, because it blocks many flushes in Ivan's range and has outs if called. Much of the value of raising this hand on the flop is setting up bluffs on diamond turns, which are cards on which Opal might otherwise struggle to construct a balanced, polarized betting range.

6. What value do small pairs like 22 have as check-raises?

Opal includes a mix of small pairs in her raising range, all at low frequency. They are often good on the flop, but they are extremely vulnerable, so they benefit immensely from fold equity. Because they have a few outs against trips, they can even function as semi-bluffs.

Whether or not Opal keeps betting these pairs if Ivan calls her raise will depend on the turn card. On cards that are poor for her raising range, she will have better bluffing candidates, and these pairs will mostly check. On cards such as diamonds that are very good for her range, then she needs more bluffs and is more likely to keep betting her small pairs.

Ivan is unlikely to fold a hand better than 22 to a flop raise, but depending on how the board runs out, it is quite plausible that he will fold some by the river. Even though the flop raise is not exactly a bluff, part of the value of raising the flop with small pairs is that it gives Opal the flexibility to turn them into bluffs on future streets when it is favorable for her to do so.

7. AK and KQ are strong hands, but they are not nutty. Why does Opal sometimes check-raise them, if she will not be able to keep betting them for value after inflating the pot?

No matter the turn card, there will be some hands that Opal must check planning to fold. These will be bluffs that failed to win the pot with a flop raise and did not improve.

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These weak checks give Ivan incentive to bet bluffs and vulnerable made hands after Opal checks the turn, which gives her incentive to include some stronger hands in her range for check-raising the flop and checking the turn.

Top pair functions better as a "trap" than very strong holdings like trips. With her strongest hands, Opal would like to continue betting as part of a polarized range. AK and KQ are not strong enough to bet all the way for value, so using them as bluff-catchers after check-raising the flop is not as much of a sacrifice as checking very strong hands would be.

SCENARIO: EXPLOITING FROM THE BIG BLIND

As you may recall from *Play Optimal Poker*, mixing is not always the most profitable strategy against opponents with human flaws. When you can identify exploitable mistakes your opponent is likely to make, it is generally best to focus on taking advantage of those with hands that would be mixed at equilibrium.

Identifying the right exploits on early streets is more complicated than on the river, though. As with other aspects of early street play, it requires you to think ahead and consider the implications of future betting rounds for your current decision.

The following questions prompt you to think about how Opal could exploit deviations from Ivan's equilibrium strategy on this $K\heartsuit 8\heartsuit 8\clubsuit$ flop. Using the Four-Step Exploitative Process, make your own predictions about the maximally exploitative strategy before you proceed to the answers and analysis.

1. What if Opal knew that Ivan would not call a check-raise without trips or a flush draw? How should she adapt her equilibrium strategy to exploit this?
2. Suppose that after Opal checks the $K\heartsuit 8\heartsuit 8\clubsuit$ flop, Ivan checks behind. She knows this is not part of his equilibrium strategy, but she does not know anything about what his checking range might be.
3. Suppose Ivan makes a pot-sized continuation bet of \$13. Opal has no insight into what his range for this bet might be. How should her strategy differ from her response to a \$4 bet?

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4. Suppose Opal knew that if she called the $K♦ 8♦ 8♣$ flop, Ivan would never overbet the turn or river. That is, he would only bet 75% of the pot or check. How should she adapt to exploit this mistake?

Answers & Explanation

1. What if Opal knew that Ivan would not call a check-raise without trips or a flush draw? How should she adapt her equilibrium strategy to exploit this?

Envision the equilibrium: Ivan bets an extremely wide range on the flop, so to make Opal indifferent to raising as a bluff, he must call check-raises at a high frequency. That requires calling with some quite weak hands, including all pairs and even pure **floats** like Th 9h.

Make a read: Ivan is probably folding too often to check-raises. It is also possible that Ivan has a much tighter and stronger betting range than his equilibrium strategy, in which case his tight range for calling a check-raise may be reasonable.

Identify the exploit: Opal should be more inclined to raise as a bluff, especially with good semi-bluffing hands, and less inclined to raise for thin value. For instance, she sometimes raises AK at equilibrium, but that plays better as a call if Ivan overfolds to raises, because she cannot get value from the floats and weaker pairs that would be in his equilibrium calling range.

Importantly, however, if Ivan calls a flop check-raise, Opal should give up a lot on the turn. Her maximally exploitative strategy after raising the flop will involve very little bluffing and a lot of check-folding.

Though counter-intuitive, this is a common dynamic: if you have a very good bluffing opportunity on one street, continuing to bluff on the next street will probably not be profitable. When a player is folding too much, then on the rare occasions when he does not fold, his range is

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excessively strong. You exploit him by collecting heaps of equity from his folds and by taking advantage of the information that his call gives you to avoid putting more money in the pot with weak hands.

Nothing feels worse than paying off a nit. The goal is to apply pressure up to the point where your opponent will make his folding mistakes, then to back off if he continues past that point.

This concept is particularly important on diamond turns, where Ivan will wind up with virtually no weak hands for Opal to pressure with bluffs.

Determine the degree of deviation: Large. Check-raising the flop will probably be very profitable for Opal, but there is a chance that Ivan actually has a balanced calling range and just doesn't make the initial bet at anywhere near optimal frequency. If Opal goes too crazy with check-raises, she will end up rewarding Ivan for this deviation from equilibrium.

She cannot check-raise willy-nilly, but she should raise any reasonable bluffing candidate. She should err on the side of raising weak hands that are otherwise indifferent, and even some hands that are slightly more profitable as calls or folds at equilibrium will be more profitable as bluffs against this player. This will include draws, backdoor draws, and small pairs. In fact, given what a large role diamonds play in Ivan's calling range, a big diamond in Opal's hand will be a significant blocker that noticeably reduces her risk of getting called.

Opal just needs to make sure that she mostly checks and folds if her check-raise is called, especially on diamond turns!

2. Suppose that after Opal checks the $K\heartsuit 8\heartsuit 8\clubsuit$ flop, Ivan checks behind. She knows this is not part of his equilibrium strategy, but she does not know anything about what his checking range might be.

Envision the equilibrium: Ivan never checks at equilibrium. Betting his full range forces Opal either to put in a lot of money from behind or to fold at a high enough frequency that even his worst bluffs are profitable.

Make a read: If you have reason to believe that a specific opponent will have a predictable checking range, then there may be ways to exploit that. However, merely seeing a check doesn't tell you anything about what his checking range looks like or how to exploit it.

Identify the exploit: There may not be one, as for some of Ivan's hands the EV difference between betting and checking is extremely small. In any event, we don't have enough information to determine an exploit.

The good news for Opal is that she benefits from Ivan's check without doing anything in particular, simply because she gets to see a free card with many weak holdings that would have folded the flop. The key now is to avoid doing anything egregiously exploitable that would reward any of Ivan's possible checking strategies. If she were to assume that her opponent could not possibly check trips and call huge bets with weak bluff catchers, for instance, then if he did check trips, she would turn his "mistake" into a profitable trap.

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Determine the degree of deviation: Unknown, but potentially very small. There are quite a few hands in Ivan's range where betting is barely better than checking at equilibrium. If Opal makes any sort of mistake as a result of Ivan's check, the check could easily end up being +EV for him.

Opal should bet a small, polarized range on the turn, but mostly she should check. On balance, she is interested in keeping the pot small and getting free cards and a cheap showdown. She benefits from Ivan's check by taking a free card and getting one street closer to showdown. Betting too often on the turn would undermine that benefit and move her further from her goal.

The turns on which Opal has the highest betting frequency are Ks, and even on those she bets only about 1/3 of her range. On most other cards, her equilibrium betting frequency is 10-20%. She uses a smaller bet size more often than a large one, but on low turn cards, where she has pocket pairs that make full houses but Ivan does not, Opal can leverage her nuts advantage with a narrow overbetting range.

The most important thing to keep in mind is that Opal doesn't want to put more money, on balance, into the pot as a result of Ivan's check than she would have if Ivan had bet, as that would incentivize Ivan to check his strongest hands. The average amount of money that goes into the pot by the river should be roughly the same whether Ivan bets or checks. If it isn't, then this would give Ivan incentive to play weak hands in whatever fashion would result in Opal putting less money into the pot and strong hands in whatever fashion would result in her putting more money into the pot.

3. Suppose Ivan makes a pot-sized continuation bet of \$13. Opal has no insight into what his range for this bet might be. How should her strategy differ from her response to a \$4 bet?

Envision the equilibrium: The equilibrium strategy for a full no-limit hold 'em game involves Ivan betting more than 1/3 pot with some portion of his range. Remember, the output of a solver is limited by your inputs. A bet of 1/3 pot was an arbitrary (well, not arbitrary—it was an educated guess) restriction to make the game tractable. The results of this simulation are not in any way proof that 1/3 pot is the ideal or only acceptable bet size. When I give Ivan the choice of checking, betting 33% pot, or betting 100% pot in a solver, he bets full pot with about 7.5% of his range.

If we gave a solver the option to use four or five different bet sizes on the flop, it might well use all of them, but it would do so in a balanced way. A human would, to say the least, struggle to mix all the different hands in his range across the different bet sizes at the appropriate frequencies and would almost certainly end up doing something exploitable. The good news is that the difference in EV between the very complicated strategy that uses multiple bet sizes and the very simple strategy that bets 1/3 pot with full range is very small (in this case, anyway—we will see some situations, usually on turns and rivers, where using different bet sizes is more important). You should either have an exploit in mind or aim for a simple, unexploitable strategy such as betting small with your entire range.

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Make a read: Even though we found a simple strategy involving a single bet size, a player who uses larger bets is not necessarily making a mistake. The larger bet here does not have to mean anything in particular.

Identify the exploit: We do not have enough information. Ivan may well be doing something exploitable, but if you do not know what, then you are better off trying to find an unexploitable response than guessing at an exploit.

Determine the degree of deviation: Again, not enough information. It's possible there is no deviation at all.

Fundamentally, Opal should fold more often to larger bets. It is OK—correct, in fact—to give Ivan more fold equity when he takes more risk. Opal's ranges for calling and raising should be stronger when faced with a full pot bet than when faced with a 1/3 pot bet, but the same considerations apply: she wants to raise strong hands but keep a few in her calling range and be capable of holding both strong hands and bluffs no matter how the board runs out.

The solver suggests check-raising less than 4% against a pot-sized bet. This is another case where you should simply never raise unless you have an exploit in mind. Otherwise, the risk of exploitation is too high relative to the reward of building such a small raising range.

Against this larger bet, Opal continues only about 40% of her range, as opposed to 70% against the 1/3 pot bet. She mostly folds small pairs, though she is indifferent to calling when one of the cards is a diamond. Even Jacks with a diamond are mixed between calling and folding, while QQ is a pure call. Opal never folds flush draws, but she continues with backdoor draws at a much lower frequency.

4. Suppose Opal knew that if she called the $K\heartsuit 8\spadesuit 8\clubsuit$ flop, Ivan would never overbet the turn or river. That is, he would only bet 75% of the pot or check. How should she adapt to exploit this mistake?

Envision the equilibrium: On the turn and river, Ivan has the option to overbet. This enables him to deny equity to Opal's medium-strength hands when he has a nuts advantage. Opal's flop calling strategy contains some slowplays and some hands that can become strong on various turns to make Ivan indifferent to overbetting. Opal also folds some hands on the flop that have good equity in part because overbets may prevent them from realizing that equity on future streets.

Make a read: Without overbetting, Ivan will not be able to grow the pot to the point where stacks are all-in by the river. He will not apply as much pressure as he could to Opal's bluff-catchers.

Identify the exploit: This is a tricky one. The biggest change to Opal's strategy is to slowplay less. Her folding range remains roughly the same, about 30%. Against a player who will not overbet, though, she check-raises more strong hands and slightly more semi-bluffs. When she has a hand that she wants to play for stacks, she is less likely to get that result by checking and calling. She also does not need to keep nutty hands in her turn and river ranges to make Ivan indifferent to overbetting for thin value. This reduces her calling frequency, because these were hands she was calling at equilibrium.

There is a shift in Opal's calling range away from the small pairs, whose value lies partly in their capacity to

♦ Play Optimal Poker 2♠

turn or river full houses, and toward hands like A♣ J♣. At equilibrium, Opal was indifferent with both A♣ J♣ and 22 but more frequently called with the latter. Her maximally exploitative strategy here is indifferent to calling with 22 and always calls with A♣ J♣. The value of turning an Ace or Jack when she has AJ goes up because she does not have to worry about facing overbets. The value of turning a 2 with 22 goes down because she does not get to profit from overbets.

Determine the degree of deviation: Small. Ivan does not employ overbets often at equilibrium, and even when he does, he is almost always indifferent between overbetting and checking or making a smaller bet. Thus, the changes to Opal's strategy are subtle as well.

The changes are real, though, and there's an important lesson here. Against opponents who are unlikely to make good use of overbets on the turn and river, you should be less inclined to slowplay the flop and more inclined to call with bluff-catchers that would suffer from heavy pressure on later streets. Most of your opponents simply will not apply the kind of pressure they could, and you passively benefit from this error even if you do not actively exploit it.

PLAN AHEAD TO GIVE YOURSELF THE TOOLS YOU NEED ON FUTURE STREETS

Opal carefully constructs her flop calling and raising ranges so she is equipped to play optimally on future streets. Her planning begins as early as pre-flop, with the decision to call Ivan's raise in the first place.

Opal's pre-flop calling range is heavy on hands that are suited and connected. That's not only because of the value of making straights and flushes but also because flopping as little as a backdoor straight or flush draw improves her equity realization. When faced with a flop bet, she wants to have a good pair, a good draw, or at least a draw to a good draw, preferably with one or more overcards to the board. Her pre-flop calling range is designed to flop such hands often.

Big suited and connected cards are no-brainer calls. Opal calls hands that are not particularly connected only if they are suited and contain at least one big card, preferably two. She calls only the very biggest cards that are neither suited nor connected.

She feels the threat of leverage as early as pre-flop, where calling will leave her out of position with a range disadvantage, a lot of money behind, and several betting opportunities standing between her and showdown. She will inevitably face tough decisions later, but she constructs her pre-flop calling range to make those decisions as simple and profitable as she can.

To be clear, I am not asserting that the ranges I assigned to Opal and Ivan for this scenario are optimal or unexploitable. They were created by me, based on ranges created by Poker Snowie, a tool that itself claims only to generate reasonably unexploitable ranges.

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The details are off by a bit, but the big-picture principles are there: especially when out of position, focus on playing cards that are big, suited, and connected. They will give you the tools to maximize opportunities for check-calling and check-raising profitably on the flop. Likewise, focusing on draws, backdoor draws, and live overcards when constructing flop calling and raising ranges will give you the tools to take advantage of good opportunities for bluffing, bluff-catching, and value betting on future streets.

USE HEURISTICS TO CONSTRUCT REASONABLY BALANCED RANGES

Solver outputs always look complicated, but we can boil Opal's flop strategy down to something reasonably intuitive. She never folds a flush draw and rarely folds a pair. Her weakest calls are Ace-highs with backdoor draws, and she sometimes slowplays trips but mostly raises them, balanced by a variety of bluffs.

When interpreting a solver output, start by looking for pure strategies, the hands that take a given action 100% of the time. Purely calling with a hand that a solver would mix between calls and raises or calls and folds is unlikely to be a big mistake, but raising a hand that would be a pure call at equilibrium is much riskier. If you are not finding the low-frequency check-raises with small pairs on this board, that's not a big deal. If you are folding them to a small continuation bet, that's more likely a mistake.

Step one is recognizing that you should call stubbornly against a small bet. With the threshold hands that are indifferent between calling or folding, you can randomize or you can make your choice based on how you expect your opponent to play.

Because Ivan's equilibrium strategy is to bet his entire range, a real-world opponent could not make the mistake of betting too much in this spot. He could, however, bet too rarely. Which bets would he be most likely to miss?

You should try to answer that question for a specific opponent when possible, but I think the easiest bets to miss are medium-strength hands like QQ and JJ. Some players also slowplay reflexively, making them less likely to bet when they flop trips or better.

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Ivan's bluffs are harder to miss. Any remotely serious no-limit player understands the concept of a continuation bet and can probably recognize this as an appealing spot to bet even if he has whiffed the flop entirely. If anything, a real-world opponent's flop betting range is likely to be too weak. He may or may not bet his strong hands, but he will probably bet his weak ones.

For the big blind, this should increase the value of calling with hands that are indifferent at equilibrium. Their value will further increase if your opponent does not apply maximum pressure on future streets. Given that Ivan's optimal strategy involves significant overbetting on many turns, it is reasonable to think that a typical opponent will not implement it perfectly, increasing the equity realization of weaker hands in your calling range. When in doubt, you should err on the side of calling rather than folding hands that are indifferent at equilibrium.

Flush draws are a bit complicated, though, because mixing calls and raises with them is motivated by more than how your opponent will respond to a flop raise; it's also about having board coverage in all parts of the game tree. You want to be capable of making a flush whether you call or raise the flop bet, and that requires sometimes calling and sometimes raising flush draws.

Opal's calling range anticipates likely action on future streets. No matter the turn card, there are bluff-catchers she will fold and bluff-catchers she will call. These will not always be the same hands—on diamond turns, for instance, $A♦ T$ will continue while $A♣ 9♣$ folds, and it will be the opposite on club turns—but she is preparing to have calling ranges on future streets.

Opal will also be able to raise a polarized range on most turns, which will make Ivan indifferent to his thinnest value bets. Even though she can't make him indifferent to bluffing the flop, once she folds away her equity disadvantage, she should be able to make her opponent indifferent to bluffing and to thin value betting in future situations, except on the few runouts that most favor him.

TEST YOURSELF

1. You are playing \$2/\$5 no-limit hold 'em game with \$500 effective stacks. You raise to \$15 with A♦ J♦ from one off the button, and the button re-raises to \$45. The action folds back to you. What's your play?

Call.

If your first thought is that AJ is not a strong enough hand to call a three-bet, you are missing some important context. Your position and the position of the three-better are critical variables in determining your calling range. If you were raising from UTG, this might be a fold, as AJ is one of the weaker hands you would raise in that spot. You should have a much wider opening range from this position, though, making AJ one of the stronger hands in your range. Because of your wider opening range, your opponent should three-bet a wider range than he would if you had raised UTG, and you should call a wider range.

Being suited increases the playability of your hand, making it easier for you to realize equity despite being out of position with a condensed range.

If you knew the button to be a nit who would not take positions into consideration and three-bet only the most premium hands, you could exploit him by folding AJ. Without that read, though, it is more likely he would exploit you if you folded such a strong hand.

2. You call the button's three-bet with your A♦ J♦ and see a J♣ 5♠ 2♣ flop. There is about \$90 in the pot after rake and \$455 in the effective stacks. What's your play?

Check.

As the player with the more condensed range, you should check to the pre-flop raiser. Some flops might favor your calling range over the raiser's range, but this is not one of them. You had incentive to re-raise your biggest pairs before the flop, whereas the button probably has all overpairs in his range. That means he should be the one driving the action.

Large pots can lead players to panic or freeze up. Thoughts like, "I have to win this pot", "I can't let him draw out", and "He probably has an overpair" are understandable but not helpful. Walking yourself through the range construction process keeps you focused on finding the play with the highest EV. The first step is envisioning the starting ranges and determining which player should drive the action.

In this case, it is your opponent, so you should check to him. If he checks behind the flop, then you can start betting a polarized range on the turn, and this hand will likely belong in it.

3. You check, and your opponent bets \$30 into a \$90 pot on the J♣ 5♠ 2♣ flop. Ignore your hand for a moment and consider your range. Should you most commonly raise, call, or fold? Which action should you take least often?

The small bet offers very appealing odds of 4:1, so you should most commonly call, even with weak hands like AQ, KQ, and QT with a backdoor flush draw.

Folding is your next most common action. As the player with the condensed range, you do not have much interest in making the pot larger and should mostly call or fold when facing a bet.

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You do have a few nutty hands in your range, however, as well as some interest in denying equity to the many unpaired overcards in your opponent's range. So, you should have a raising range here. The smaller your opponent's bet, the more inclined you should be to raise. Small bets should be more linear, and linear ranges lose more to raises than polarized ranges do.

4. Which range(s) does your A♦ J♦ belong in?

It is a mix of calls and raises, but mostly a raise, as it is one of the strongest hands in your range. Your opponent should bet often in this spot—many players will bet their entire range—so while you could easily run into an overpair, he will be forced to defend with many hands weaker than yours or risk losing to your bluffs.

Part of what makes AJ a strong hand is that stacks are relatively shallow. Even though you started with 100 big blinds, a lot has already gone in because of your opponent's three-bet. That means you do not need as strong of a hand to get the rest in, and neither does he.

This is another critical bit of context many players miss. A thousand dollars may feel like a big pot for a \$2/\$5 game, but that feel is deceptive. In fact, thinking in terms of dollars at all is misleading. Once you see the flop, you should be thinking in terms of multiples of the pot, and in this scenario getting all-in means risking only five times the pot.

On most runouts, you should be taking your hand to showdown even if your opponent bets all-in. That means you cannot cut your losses against overpairs by just calling to keep the pot small. The pot is already large, so you need to focus on protecting your equity and getting value from hands weaker than your own.

We will explore this concept in greater depth in Chapter 5, which discusses playing with shallow stacks.

5. When you check-raise the J♣ 5♠ 2♣ flop, what should your bluffs be?

Flush draws are obvious candidates, especially the small ones that do not have any showdown value unimproved. You need other bluffs too, however, so your range will not be too strong when the flush comes in. Other good candidates are A4s and A3s, which have gutshots, and 65s and 54s, which block sets. If you would not have these in your pre-flop calling range, KQs is another good candidate, as it blocks KK and QQ and is live against JT. Backdoor spades would make KQ an especially appealing raise.

6. What if your opponent had bet \$55 instead of \$30? How would that change your range's folding, calling, and raising frequencies?

A larger bet offers worse odds, so you should fold more often. It should also be more polarized, so you should raise less often. In my simulation, your response to the \$30 bet is to raise 21% of your range, call 51%, and fold 28%. Your response to the \$55 bet is 17% raises, 41% calls, and 42% folds. Even to the larger bet, AJ is still a high frequency raise.

CONCLUSION

Toy games can tell us the basics: a player with a condensed range should check and, if faced with a bet, call some hands and fold others. But in real poker games where board textures and hand values change, the details matter. The tricky part is determining which hands to call and which hands to raise.

Many players worry too much about whether they currently have the best hand and not enough about how well their hand will play on future streets. Hands with potential to turn into monsters often outperform hands with more raw equity but less playability.

Working with solvers helps us appreciate the underlying principles that drive range construction, even if we cannot perfectly recreate their solutions. Once we know, for instance, that we need to put flush draws in both our calling and raising ranges, then we can ask, “Which draws are better for raising?”, which is a more helpful question than, “Should I raise my flush draws?”

Key Lessons

- ♦ **Focus on playability, not equity.** With deep effective stacks, the value of your hand on future streets is more important than its current equity.
- ♦ **Consider board coverage.** Diversify your calling and raising ranges so that no runout will be obviously good or bad for you.
- ♦ **Small bet sizes compel calling with wider ranges.** Your opponents must call small bets more often or else your bluffs will profit. Small bets compel them

to call with wider, weaker ranges, enabling you to bet weaker hands for value and protection.

- ♣ **Board coverage is more important with deep stacks.** A condensed range is a greater liability when the effective stacks are large relative to the pot. The larger the bet your opponent can make, the more pressure he can apply to your medium-strength hands. The upside, however, is that if he perceives your range as condensed and makes a large bet when you hold an unexpected monster hand, then your reward is great.
- ♣ **You cannot “pot control” from out of position.** Only the player who is last to act can ensure that no bet goes into the pot on the current street. When the out-of-position player checks, her opponent still has the option of betting a polarized range to pressure her medium-strength hands. This is one of the main reasons why being in position is valuable.
- ♣ **Board textures and hand values change from street to street.** In real poker situations, balancing a checking range requires not just checking hands that are currently strong but anticipating what the board may look like on future streets. For example, if you never check a flush draw on the flop, then your checking range may be vulnerable to big bets from a polarized range should the turn or river bring a third card of a suit.
- ♣ **Checking is an imperfect means of pot control before the river.** The player who is last to act can guarantee a look at the next card by checking, which is itself valuable, but he still may face pressure from polarized betting ranges on future streets.

CHAPTER 4: USING LEVERAGE

OVERVIEW & OBJECTIVES

It's one thing to see leverage at work in a simple toy game where one player has a perfectly polarized range and hands never change value. Applying it in real world situations is a good deal trickier. In this chapter, we will follow up on the previous scenario to look at how various turn cards affect the flop aggressor's ability to apply leverage with turn bets.

When the pre-flop raiser continuation bets the flop then bets again on the turn, it is sometimes called **firing a second barrel** or just **barreling**. If he barrels the turn, he can **triple barrel** by betting a third time on the river.

We will also investigate how Ivan should play **without** leverage, when he declines to bet the turn and Opal checks to him again on the river.

By the end of this chapter, you should be able to:

- ♦ Evaluate new board cards for their effect on range advantage.
- ♦ Appreciate the relationship between bet size and range strength.
- ♦ Identify value and bluffing candidates appropriate to the board texture.
- ♦ Factor river play into turn betting decisions.
- ♦ Choose semi-bluffs appropriate to the effective stack size.

USE HAND READING ON THE FLOP TO GUIDE RANGE CONSTRUCTION ON THE TURN

The following scenario revisits the $K\spadesuit 8\spadesuit 8\clubsuit$ flop to investigate how Ivan constructs his ranges on various turn cards after continuation betting the flop. Conveniently, his starting range is the same as it was on the flop, because he made a \$4 continuation bet with 100% of it.

We will not stipulate anything about Opal's range for calling the flop from the BB. We know her range for **seeing** the flop, and we know her **incentives** on the flop. Often, that is all you will know about an opponent; even giving you her pre-flop range was generous.

Game theory is most useful when you do not have solid information about your opponent's strategy. In such cases, you should aspire to give her as many difficult decisions as possible without opening yourself up to exploitation should she deviate from her equilibrium strategy.

Consider Opal's incentives on the flop. She was holding a wide range and facing a small bet that offered her odds of 4:1. That means she should have called with some pretty weak hands: most pairs, flush draws, and probably some Ace-high and backdoor draws. Still, she probably folded her very weakest holdings.

We also know she had more 8s in her range than Ivan, which gave her incentive to check-raise a polarized range. That she did not check-raise makes it less likely that she holds trips. The possibility of Ivan blasting away at the turn gave her some incentive to slowplay trips, however, so while we can discount monster hands from her range, we should not completely rule them out.

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Overall, Opal should have a condensed range with good equity relative to Ivan's betting range, which is literally his entire range for seeing the flop. She should be heavy on pairs, with trips and unpaired hands a smaller but not insignificant part of her range.

This may not be her actual range. Some people love to slowplay, some are terrified of slowplaying, and many will not find a call with hands like $Q♣ J♣$.

Without a read, however, Ivan should not assume any of these things about Opal. He would just be guessing, and if he guessed wrong, he would get exploited. If, for instance, he decided her flop range was stronger than it actually was, then he would miss good bluffing and thin value betting opportunities on the turn. If he decided she could not possibly have trips, then he would make the expensive mistake of overbetting too many hands into her monsters. He would reward what would otherwise be a mistake in her flop play.

Ivan's equilibrium turn strategy is not invalidated if Opal deviates from her equilibrium flop strategy. That is, if Opal shows up on the turn with a range that is wildly different from what it would be at equilibrium, Ivan's strategy should still perform reasonably well. That's what equilibrium means: no matter what Opal does, she cannot achieve an EV higher than what her equilibrium strategy would achieve (though she can and probably would achieve a lower EV).

Suppose Opal chose to always call when she flopped trips, rather than frequently raising as she would at equilibrium. Ivan's equilibrium strategy would involve more bluffing and thin value betting than would be ideal, since it assumes that she will not show up with trips on the turn nearly as often as she will with this slowplaying strategy.

Opal will profit from those aggressive turn bets. However, she had to give up some value on the flop in order to get them. The equilibrium strategy of often raising trips on the flop is not arbitrary; there is real value there that Opal misses out on by not raising. So while she might win back some of that value when Ivan bets more aggressively than he ideally would on the turn, his equilibrium betting strategy will not involve so much betting that she actually does better than if she had just raised those trips on the flop. She may not do any worse with her exploitable strategy, but she will not do better.

It can feel bad when an opponent gets “rewarded” for suboptimal play on an early street. Sometimes, the fish who calls a three-bet with 92o gets the A92 flop, and when he does, he usually gets paid. That does not make his play correct. Consider the casino-goer who puts \$1 into a slot machine. He might get lucky and win a jackpot, but that does not mean his \$1 bet was +EV.

SMALL BETS CAP YOUR OPPONENT'S RANGE

We have seen the dangers of playing a condensed range against a polarized one, especially with multiple betting rounds remaining before showdown. This most recent scenario demonstrates how valuable fold equity can be, even when you hold a strong hand.

Ivan's small bet puts Opal in a tough spot. She would like to raise her strong hands to grow the pot and deny equity. However, she also has many hands that are not strong enough to raise but are too strong to fold to such a small bet. If she raises all her strong hands and calls with her weaker ones, she risks capping her range on future streets, effectively giving her opponent a green light to bet big with a polarized range on the turn and river.

Future cards may improve some of Opal's weak hands to strong ones, but this is more likely on some turns than others. **Blank** cards, those that do not complete any obvious draws, will be especially dangerous for her if she caps her range in this way on the flop.

This is where Opal gets her incentive to slowplay. She must call some strong hands so her calling range will not be too badly capped on blank turns and rivers. As we saw in Chapter 3, her strongest hands are typically not the best slowplaying candidates. These hands profit the most from raising, so it is often second-tier hands that make up the bulk of her "trapping" range.

Even if Opal calls with an optimal number of strong hands, however, her range will still be somewhat capped because she has so much incentive to raise her strongest holdings. Check-raising a polarized range is so valuable that it is generally worth taking that immediate value even though it puts her calling range in a precarious position. She must make the best of a bad situation.

No matter how Opal chooses to resolve this dilemma, it's win-win for Ivan. If she calls many of her strongest hands, then his small flop bets increase in value because they are not denied equity by check-raises. If she raises many of her strongest hands, then he finds himself in more profitable turn and river situations after she calls.

As with any equilibrium strategy, Ivan's small flop bet is not premised on exploiting some mistake in his opponent's strategy (though many human players do fold too much to these bets). Rather, its purpose is to present his opponent with no good options and to use his range advantage to set up lucrative opportunities on future streets.

SCENARIO: BARRELING THE TURN

Ivan is first to act before the flop in a nine-handed \$1/\$2 no-limit hold 'em game. He raises to \$6, and Opal calls from the big blind. The flop comes $K\spadesuit 8\spadesuit 8\clubsuit$. Effective stacks are roughly \$200, and starting ranges are the same as they were in the previous chapter's scenario.

Opal checks, Ivan bets \$4 into a \$13 pot with his entire range, and Opal calls. Future betting options are as defined on page 13 of the A Recurring Hypothetical section of the Introduction.

The following questions step through Ivan's range construction process on four possible turn cards: $A\clubsuit$, $T\spadesuit$, $8\heartsuit$, and $2\spadesuit$. Try to answer them as thoroughly as you can on your own before you read on for the explanations.

Starting Ranges and Needed Ranges

1. Ivan's turn strategy will depend on the exact card that comes, but in general, do you expect him to bet a linear range as he did on the flop or a more polarized range?
2. When Ivan does bet, will he more commonly bet 75% of the pot or 200% of the pot? Why?
3. Rank these four cards from highest to lowest in terms of how much equity Ivan's range has on each.
4. On which of these cards will Ivan have the largest nuts advantage? Why?
5. Rank these four cards from highest to lowest in terms of Ivan's betting frequency, regardless of bet size.

6. Rank these four cards from highest to lowest in terms of how frequently Ivan will bet 200% of the pot.

7. The T♣ opens more potential draws than any other turn card. Will this cause Ivan to do more overbetting? Why or why not?

Identifying Pure Strategies

8. The exact hands Ivan plays as pure strategies will depend on the turn card, but what kinds of hands are likely to be pure bets? What about pure checks?

9. Ivan sometimes overbets KK on a 2♠ turn but never on an 8♥ turn. How do you explain this difference?

Resolving Mixed Strategies

10. When Ivan overbets a 2♠ turn, what are his best bluffing candidates and why?

11. On the A♣ turn, Ivan sometimes checks Q♦ J♦ and sometimes bets J♠ T♠. Given that Q♦ J♦ is the higher equity semi-bluff, why wouldn't Ivan fill out his bluffing range with that hand rather than sometimes bluffing with a much weaker draw?

12. Ivan sometimes bet QQ and JJ on the A♣ turn. How can you explain these bets?

13. What sorts of hands will Ivan mix into his bluffing range on the T♦ turn. What makes each appealing?

Answers & Explanation

1. Ivan's turn strategy will depend on the exact card that comes, but in general, do you expect him to bet a linear range as he did on the flop or a more polarized range? Why?

His betting range will be more polarized regardless of the turn card.

Two factors enabled Ivan to bet his entire range on the flop: a significant equity advantage, and a desire to protect against the weakest hands in Opal's range.

Opal presumably folded many of her weakest hands to the flop bet, so protection will play less of a role in Ivan's turn strategy. Additionally, because Ivan bet all his weak hands on the flop while Opal folded many of hers, their equities will run much closer on most turns. Some cards are particularly good for Ivan, but on average, Opal's range will have slightly more equity than his, so he cannot get away with betting just anything as he could on the flop.

Ivan still has many strong hands with which to support a polarized range, however. Hands like AA and AK can bet again for value on any turn and on many rivers. This enables Ivan to do a fair bit of bluffing as well, especially with draws.

2. When Ivan does bet, will he more commonly bet 75% of the pot or 200% of the pot? Why?

Checking is Ivan's most common turn action, but when he does bet, he uses the 75% pot size he uses more frequently on almost all turns.

The chart below shows his exact strategy, the percentage of his range he bets or checks on each possible turn card. The numbers across the top are the rank of the turn card, and the symbols down the left side are the suits. The darkly shaded portion of a box shows the frequency with which Ivan bets 200% pot on that card. Lighter shading represents 75% pot bets, and white represents checks. The exact frequency of each action is shown in the box, but don't worry if you can't read it; our concern is with the pattern, not the details.

Ivan's Turn Barreling Strategy on K♦ 8♦ 8♣

	2	3	4	5	6	7	8	9	T	J	Q	K	A	
♣	13.84% 26.70% 11.31% ♣K	13.79% 24.65% 8.13% ♣K	13.64% 23.87% 6.64% ♣K	13.49% 23.37% 5.60% ♣K	13.24% 23.27% 4.60% ♣K	11.98% 24.02% 3.13% ♣K	12.29% 34.54% 5.18% ♣K		11.01% 32.78% 3.21% ♣K	7.979% 47.37% 15.16% ♣K	3.209% 31.11% 18.68% ♣K	0.545% 40.20% 54.2% ♣K	5.287% 31.81% 47.89% ♣K	0.585% 33.14% 51.51% ♣K
♦	10.51% 27.4% 62.1% ♣K	10.57% 30.86% 52.4% ♣K	10.4% 31.7% 48.4% ♣K	9.477% 27.59% 42.84% ♣K	7.833% 27.59% 39.82% ♣K	8.1% 33.3% 59.82% ♣K	8.7% 33.3% 59.82% ♣K	8.1% 33.3% 59.82% ♣K	14.75% 34.2% 50.04% ♣K	0.807% 35.4% 58.02% ♣K	0.576% 34.4% 58.02% ♣K	4.844% 41.33% 58.02% ♣K	0.422% 37.8% 58.02% ♣K	3.959% 37.8% 58.02% ♣K
♥	15.36% 21.1% 43.62% ♣K	16.1% 21.1% 43.62% ♣K	14.85% 20.37% 43.62% ♣K	13.7% 20.37% 43.62% ♣K	14.26% 20.37% 43.62% ♣K	16.26% 20.37% 43.62% ♣K	16.26% 20.37% 43.62% ♣K	19.84% 20.37% 43.62% ♣K	15.73% 33.92% 58.42% ♣K	14.15% 33.92% 58.42% ♣K	0.709% 33.92% 58.42% ♣K	6.34% 32.91% 58.42% ♣K	0.491% 30.94% 58.42% ♣K	0.558% 33.35% 58.42% ♣K
♠	15.36% 21.1% 43.62% ♣K	16.1% 21.1% 43.62% ♣K	14.85% 20.37% 43.62% ♣K	13.7% 20.37% 43.62% ♣K	14.26% 20.37% 43.62% ♣K	16.26% 20.37% 43.62% ♣K	16.26% 20.37% 43.62% ♣K	18.44% 20.37% 43.62% ♣K	15.73% 33.92% 58.42% ♣K	14.15% 33.92% 58.42% ♣K	0.709% 33.92% 58.42% ♣K	6.34% 32.91% 58.42% ♣K	0.491% 30.94% 58.42% ♣K	0.558% 33.35% 58.42% ♣K

Ivan mostly uses the 75% pot bet because Opal's range is not completely capped. Although her range consists mostly of medium-strength bluff-catchers, she can have some turned or slowplayed monsters. Ivan's bluffs and his thinner value bets like AA and AK target Opal's medium-strength hands, so he needs to use a size that will present her with a difficult decision when she holds those hands. If he bets too large, she can fold her medium-strength hands without fear of him profiting from bluffs, because his bluffs will lose so much when they run into the top of her range.

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There is a delicate balance between Opal's slowplaying on the flop and Ivan's overbetting on the turn. Opal slowplays just often enough to make Ivan indifferent to overbetting many hands on the turn, and he overbets just enough to make her indifferent to slowplaying the flop. If Ivan overbet turns with abandon, Opal could exploit him by always slowplaying her strongest hands on the flop. If he never overbet the turn, she could exploit him by always raising her strongest hands on the flop.

3. Rank these four cards from highest to lowest in terms of how much equity Ivan's range has on each.

Ivan has 64% equity on the A♣, 50% on the T♦, 46% on the 8♥, and 45% on the 2♠. Ivan's range for betting the flop is heavy on unpaired hands, while Opal's range for calling the flop is heavy on pairs. The bigger the turn card, the more likely it is to give Ivan a pair, so his equity is better on these cards. Aces are especially good for him because he has many in his range, and when he pairs them, he becomes a big favorite against all the Ks in Opal's range.

This chart from PioSolver shows Ivan's equity, as a percentage of the pot, on all possible turns. The numbers across the top are the rank of the turn card, and the symbols along the left side are the suit.

Ivan's Turn Equity on K♦ 8♦ 8♣

	2	3	4	5	6	7	8	9	T	J	Q	K	A
♣	46.264	46.425	46.513	46.485	46.044	47.745		48.453	51.782	53.306	53.023	58.741	64.204
♦	43.879	44.022	44.163	44.462	44.746	46.586		47.719	49.235	50.985	50.965		60.738
♥	45.462	45.626	45.703	45.647	45.085	46.988	46.574	47.314	51.454	52.562	52.081	58.218	63.423
♠	45.462	45.626	45.703	45.647	45.085	46.988	46.574	47.314	51.454	52.562	52.081	58.218	63.423

4. On which of these cards will Ivan have the largest nuts advantage? Why?

Though 8s are not among the better cards for Ivan's equity overall, they increase the relative strength of hands like AK and AA by quite a bit. An 8 on the turn drastically reduces the risk of Opal holding trips, which enables Ivan to make bigger value bets and more bluffs.

5. Rank these four cards from highest to lowest in terms of Ivan's betting frequency, regardless of bet size.

Ivan bets 68% of his range on the A♣, 46% on the T♦, 37% on the 2♠, and 27% on the 8♥. It is no coincidence that he bets more often on cards that are more favorable for him. He has more hands he can bet for value on these cards and consequently gets to do more bluffing as well.

Did you notice Ivan bets much more often on the 2♠ than on the 8♥, even though the latter is slightly better for his equity? Although there is a correlation between equity share and betting frequency, other factors also influence the profitability of betting. As we are about to see, there are interesting patterns related to Ivan's choice of bet size buried in this data.

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6. Rank these four cards from highest to lowest in terms of how frequently Ivan will bet 200% of the pot.

Ivan bets twice the pot with 20% of his range on the 8♥, 15% of his range on the 2♠, 4% of his range on the T♦, and 1% on the A♣. The turn cards that most improve his pot equity are the ones he overbets least often!

This is actually a common correlation: when your range is strong, you have more potential value hands and must offer your opponent a better price in order to present her medium-strength hands with a difficult decision. Betting too large when your range is strong makes it trivial for her to fold medium-strength hands while picking off your bluffs with her strongest holdings.

When your range is weaker, you must bet larger to present medium-strength hands with difficult decisions. If you bet too small, it is trivial for her to call with her bluff-catchers.

The other factor that correlates with overbetting is a nuts advantage. We saw that an 8 gives Ivan more of a nuts advantage than any other card, because it enables him to treat AA and any K as nut hands. When Opal calls an overbet on the turn, Ivan can follow through with a shove for about 150% of the pot on most rivers with these hands. Not only can he balance those river shoves with bluffs, but he can use leverage to bluff the turn out of proportion to what the $\frac{Bet}{Bet+Pot}$ formula would suggest.

With so much incentive to overbet his strongest hands, it is harder for Ivan to make thin value and protection bets with his weaker hands. He must include some strong hands in his range for betting smaller or else he will be vulnerable to check-raises. Taking too many nutty hands out of his overbetting range costs him money, however,

so he ends up with only a small range for betting 75% of the pot, which is part of why his overall betting frequency is low on these cards.

7. The T♣ opens more potential draws than any of the turn cards we have examined so far. Will this cause Ivan to do more overbetting? Why or why not?

No. A larger bet size is not about “charging draws”. Ivan overbets the T♣ with less than 8% of his range, and the value portion of this range is mostly hands like quads and full houses that are not threatened by draws.

With weaker hands like AK, Ivan must weigh the reward of denying equity (Opal folds draws as strong as Q♦ J♦ to an overbet) against the risk of putting so much money in against trips or a full house. Overbetting AK would also cause him to miss value from weaker hands that would call a 75% pot bet.

8. The exact hands Ivan plays as pure strategies will depend on the turn card, but what kinds of hands are likely to be pure bets? What about pure checks?

Monster hands that do not block Opal’s calling range will be Ivan’s most frequent bets. What exactly those are will vary depending on the turn card, but 88 and 98s almost always fit the bill. Even more so than Opal, Ivan does not profit from slowplaying these hands. He is the player with the polarized range, so he should be the one driving the action. These hands may mix between betting 75% and 200% of the pot, but they rarely check.

To maintain board coverage, Ivan constructs his bluffing range with a mix of hand types. When he does purely bet a weak hand, it is usually because of blocker

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effects that make betting definitively better than checking. In Chapter 8, we will look at Ivan's turn betting strategy in greater depth and see some examples of these bluffs.

Ivan's pure checks are mostly medium-strength hands, the sort that bet for thin value and protection on the flop but do not want to play a large pot. Unless they turn a set, hands like QQ and JJ are typically too strong to bluff and too weak to bet for value. Top pair with a weaker kicker such as KJ or KT also tends to check unless it improves.

9. Ivan sometimes overbets KK on a 2♠ turn but never on an 8♥ turn. How do you explain this difference?

Ivan's decision to overbet is not based solely on the strength of his own hand. He must also consider his **target**, the hand(s) in Opal's range from which he can expect to get action.

Opal is most likely to call an overbet with either a K or an 8. Because KK so heavily blocks her from having a K, Ivan mostly targets her 8x when he holds this hand. On an 8 turn, he is no longer ahead of Opal's 8x and must bet smaller in order to target weaker hands for value. With AA, however, he can profitably overbet an 8 turn because he does not block any of Opal's Ks.

10. When Ivan overbets a 2♠ turn, what are his best bluffing candidates and why?

Ivan's best bluffs are flush draws, A2s, T♥ 9♥, and T♠ 9♠. Flush draws are good bluffing candidates because they have a chance to draw out even when called by trips. The other hands make good bluffs because of their

blockers. When overbet bluffing, you want to block the strongest hands in your opponent's range. A2s blocks 22, while these combinations of T9s block T8s and 98s. Although K8s is also one of the strongest hands in Opal's range, a K is too strong for Ivan to turn into a bluff. He does occasionally overbet AK, and while that is a value bet, blocking K8s is a small part of what makes it profitable.

11. On the A♣ turn, Ivan sometimes checks Q♦ J♦ and sometimes bets J♠ T♠. Given that Q♦ J♦ is the higher equity semi-bluff, why wouldn't Ivan fill out his bluffing range with that hand rather than sometimes bluffing with a much weaker draw?

This is a matter of board coverage. Whether he bets or checks, Ivan must be able to make both strong hands and weak hands on diverse rivers including Qs, Ts, and diamonds. That Q♦ J♦ has robust equity and good equity realization make it an obvious bluffing candidate but also means it has high EV when checking. It has high EV no matter how Ivan plays it—one line is not strictly better than the other.

12. Ivan sometimes bet QQ and JJ on the A♣ turn. How can you explain these bets?

As discussed in Question 8, Ivan usually checks his biggest pocket pairs below a K. Non-diamond As are special turn cards, though. They improve so many of the weak hands in his flop betting range that he has a hard time finding good bluffing candidates, and these pocket pairs are no longer so close to the top of his range.

♦ Play Optimal Poker 2♠

Opal has some AQ and AJ in her range, which means Ivan's QQ and JJ do not have as much showdown value as on other turns. Because checking them is less desirable than on many turns and betting them is more desirable, Ivan ends up indifferent between the two lines.

If Ivan does bet these hands on the turn, how he proceeds on the river will depend on the card that comes. On blanks, these pairs usually have just enough showdown value to make checking better than betting. On diamond or club rivers, he sometimes uses them as bluffs if they block the relevant flush. In fact, he never bets Q♥ Q♠ on the turn, as it is the only combo that will not block flushes on any river.

13. What sorts of hands will Ivan mix into his bluffing range on the T♦ turn? What makes each appealing?

The most obvious candidates are AQ and AJ with a diamond. These are not quite pure bets, because Ivan does need to have some flushes in his checking range on various diamond rivers, but the combination of poor showdown value, good blockers, and good equity versus Opal's calling range make these high frequency bets.

The next most obvious candidate is QJ. Despite the diamonds and the pair on the board, a draw to a straight is still valuable. Ivan even bets AQ and AJ without a flush draw.

This is in part a function of his bet size. He uses 75% almost exclusively on diamond turns, which forces Opal to call with a wider range than she would against an overbet. Consequently, if she does call, Ivan can bet for value if he rivers a straight (except on a 9♦ river).

Less obvious bluffs are total airballs like A♠ 5♠. These are not high-EV bets. Rather, they sometimes bet

because they also play very poorly as checks, having virtually no chance of winning at showdown. There is no good play with these hands, but Opal will struggle to defend the weakest part of her range to even a small bet on diamond turns, so they can occasionally steal the pot with little risk.

SCENARIO: BET-CHECK-BET

Human poker players love to continuation bet the flop, check the turn, and then bet the river. They probably love it too much, causing them to miss opportunities to make leveraged bluffs, get more value from top pair, and protect marginal hands with turn bets. There are, however, times when it is correct.

We saw that after betting any two cards on the flop, Ivan checks the large majority of his range on an 8♥ turn. In this scenario, we are going to investigate his play on a blank river—the 2♣—assuming Opal checks to him again. So, the action so far is Ivan opens to \$6 in first position and Opal calls from the big blind. She checks a K♦ 8♦ 8♣ flop, he bets \$4, and she calls. They both check an 8♥ turn, and then she checks again on a 2♣ river. Ivan now has the option of betting \$16 (75% of the pot), betting \$42 (200% of the pot), or checking. If he bets, Opal will have the option of raising 50% of the pot, and Ivan will be allowed to re-raise 50% of the pot.

Assess Starting Ranges

1. Which player has the equity advantage? Why?
2. Which player has the nuts advantage? Why?

Determine Needed Ranges

3. Ivan may bet \$16, bet \$42, or check. Which of these options should he use, and why?

Identify Pure Strategies

4. Which hands will Ivan strictly prefer betting for value rather than checking?
5. What are Ivan's best bluffing candidates? Why?

Resolve Mixed Strategies

6. What are Ivan's other bluffing candidates? How does he choose between them?
7. What if the river were the A♣ instead of the 2♣? What would Ivan's betting range look like in that case?
8. Ivan always bets AA, KK, and 98s on the turn, so he never has better than 8s full of As when he checks back an 8♥ turn and sees an A♣ river. Yet Opal is indifferent between calling and raising her own As on the river. Why, if she can treat any A as functionally the nuts, does she not strictly raise these hands?
9. In the original scenario, Opal was only allowed to raise 50% of the pot on the river. What if she had the option to raise all-in? Would she use it in this scenario (where both players check the 8♥ turn and see an A♣ river)? With what range?

Answers & Explanation

1. Which player has the equity advantage? Why?

Opal does, by a wide margin: 56% to Ivan's 44%. We have seen that the flop action, with Ivan betting his entire range but Opal calling only the stronger part of hers, gave her a range advantage on the turn. Ivan further weakens his range by checking back the turn.

Opal's river check also weakens her range, but not to the same degree, because she can check-raise and thus has some incentive to check strong hands.

2. Which player has the nuts advantage? Why?

Opal does. Although she check-raises some of her 8x on the flop, she can still have quads in her range. She never bets the river with these, as they are excellent check-raising candidates.

If she were to bet them, Ivan would call with a K but rarely raise. But he will also bet a K if she checks, so Opal wins one bet no matter what. The advantage of check-raising is the opportunity to potentially win a second, larger bet if Ivan calls.

3. Ivan may bet \$16, bet \$42, or check. Which of these options should he use, and why?

He either bets \$16 or checks. He has no incentive to bet twice the pot when he cannot have the nuts but Opal can.

Ivan can only profit from value betting a K if Opal calls with worse pairs. Because she has a fair bit of Kx plus some 8x in her range, a large bet would enable her to fold

weaker hands and only continue with a K or better. A \$16 bet targets her pocket pairs, forcing her to call with them at least sometimes to make Ivan indifferent to bluffing.

4. Which hands will Ivan strictly prefer betting for value rather than checking?

Ivan's pure value bets are QQ and any K, targeting Opal's pocket pairs. Hands that reliably beat those pocket pairs can bet for value, even though, as in the case of QQ, they will often lose to her stronger holdings.

Ivan can value bet QQ on the river even though it was mostly not strong enough to bet on the turn. Hands change value only because of new board cards but also because of players' actions. Hands strong enough to call a bet on the flop may not be strong enough to call a second bet even on a blank turn. Hands too weak to value bet the turn may be able to value bet a blank river.

Ivan's turn check weakens his range, and Opal's river check weakens hers. That means QQ is now stronger relative to both players' ranges than it was on the turn.

Ivan can also value bet more thinly on the river because he does **not** have leverage. Leverage makes it harder for Opal to call with marginal hands. That is good for Ivan's bluffs but bad for his thin value bets. So, when betting with leverage, he does more bluffing and less value betting. When betting without leverage, he does more value betting and less checking.

Many players are far too passive in this situation. You may even see people check a K for fear of getting raised. This is simply a misunderstanding about how often a value bet must succeed. The outside chance of a check-raise is not nearly enough to negate the value of betting in this situation.

♦ Play Optimal Poker 2♠

5. What are Ivan's best bluffing candidates? Why?

Ivan always bets his very weakest hands: T9, JT, QJ, QT. His bet targets pocket pairs, which Opal may or may not fold; she is indifferent.

She always folds hands weaker than pocket pairs. That makes Ivan indifferent to betting when he has some chance of beating her unpaired hands at showdown, but he almost always bluffs when he cannot even beat those.

The only exception is when there are blocker effects. Ivan prefers not to block diamonds when he is bluffing, as they are disproportionately represented in Opal's folding range. So, he is indifferent to bluffing T♦ 9♦ but always bluffs T♥ 9♥.

Opal's defending strategy does not make Ivan indifferent to bluffing with **any** weak hand. That would be impossible, because different weak hands have different values for checking, depending on how often they will win at showdown. We saw this in the Ace-to-Five Game from *Play Optimal Poker*, where Ivan was indifferent to bluffing with a 6 but strictly preferred bluffing with a 5, which was the very bottom of his range.

6. What are Ivan's other bluffing candidates? How does he choose between them?

Ivan fills out his bluffing range with hands that have some showdown value when they check, such as Ace-high and his smallest pocket pairs. While these are slightly profitable bluffs, they are also slightly profitable checks, which is why he is indifferent.

He chooses between them based on blockers. We have seen that he does not want to block diamonds, so he is indifferent to bluffing 99 without a diamond but never

bets 99 with a diamond. He actually prefers bluffing 99 to 77, which never bluffs, because the hands have nearly identical showdown value but 9s feature more prominently than 7s in Opal's calling range, so blocking them makes bluffing more profitable.

7. What if the river were the A♣ instead of the 2♣? What would Ivan's betting range look like in that case?

Ivan's strategy on Aces river is simple: he bets for value if he has an Ace, he bluffs if he does not have a pair, and he checks everything else. The only exception is his worst pocket pair, 77, with which he is indifferent between checking and bluffing. Ivan still uses the \$16 bet size exclusively, for the same reason as on K rivers. Any Ace is a very good river for him—only the case 8 would be better—but the fact remains that Opal can have the nuts and he cannot. That means he will not benefit from overbetting.

This river card does so much to improve both players' ranges that Ivan can no longer value bet a K as he would on literally any other river. He will be raised by an A or an 8—or a bluff!—far more often than he will be called by worse. Opal actually folds some Kings to this bet, but occasionally stealing half the pot is not enough to make it profitable—the risk of a raise is too great.

8. Ivan always bets AA, KK, and 98s on the turn, so he never has better than 8s full of As when he checks back an 8♥ turn and sees an A♣ river. Yet Opal is indifferent between calling and raising her own As on the river. Why, if she can treat any A as functionally the nuts, does she not strictly raise these hands?

♦ Play Optimal Poker 2♠

There are two reasons. The first is that Ivan never calls a raise with worse. He either has an A, in which case they chop, or he was bluffing, in which case he folds. So even if Opal is 100% sure she has the best hand, she does not profit by raising.

The second is that if Opal started really shoveling money into the pot whenever she held an A, that would give Ivan some incentive to check KK on the turn. In other words, to exploit her mistake on the river, Ivan would adjust his turn strategy to show up with stronger hands on the river.

9. In the original scenario, Opal was only allowed to raise 50% of the pot on the river. What if she had the option to raise all-in? Would she use it in this scenario (where both players check the 8♥ turn and see an A♣ river)? With what range?

Yes! In fact, she uses the all-in raise size exclusively, with all her 8s and a few bluffs. Because she is raising a polarized range into a condensed range, she wants to put as much money into the pot as possible. If she had multiple opportunities to bet, she would want to leverage the stacks by betting the geometric growth of the pot, as discussed in Chapter 1. This is her last betting opportunity, though, so she just bets it all, even though that is nearly three times the pot.

She has fewer than three combos of the nuts (T8s, 98s, and 87s are all in her pre-flop range, but she sometimes check-raises them on the flop), so despite the large bet size, she can't include many bluffs in her raising range. When she does bluff, it is **not** with the bottom of her range. She cannot profitably put \$190 into the pot with air; the risk of running into KK is too great.

As predicted in the previous question, giving Opal the opportunity to check-raise all-in on the river changes Ivan's play with KK on the turn. He now mostly checks it, because with Opal allowed to make huge river raises, it is useful to have in his range on many rivers besides this one.

When Opal bluffs, she wants to have a K in her hand, because KK is the bulk of Ivan's calling range. With Ax, he is indifferent to calling, but he always calls KK. Opal raises some Kx, and she always raises AK. Even though AK has substantial value as a call, it has even more value as a raise. The risk of running into KK is slim—she blocks 2/3 of Ivan's KK combos—and the reward of folding out chops is worth it. Not to mention she still gets half the pot if Ivan calls with an A.

Note that even though betting an A opens Ivan up to a check-raise from a polarized range, he does it anyway. A \$16 bet forces Opal to defend with much more than just quads. That she can occasionally put him in a bad spot by check-raising reduces the value of his bet, but not so much as to make it unprofitable. Ivan's best strategy is to bet for value when he is very likely to have the best hand and then, if raised, find a calling strategy that makes Opal indifferent between raising and calling when she blocks his Kx.

TEST YOURSELF

1. You are playing a no-limit hold 'em cash game with \$2 and \$5 blinds and \$500 effective stacks. You open to \$15 with 8♣ 7♣ on the button, and the big blind calls. The flop comes K♠ 8♥ 3♠, and the big blind checks. What's your play?

This is a great spot to push equity by betting \$10 or \$15 with a wide range. Although middle pair is in many ways a medium-strength hand, it benefits from betting to deny equity to overcards, and it should be in fine shape against the big blind's range for calling a small bet. A check-raise would put you in a tough spot, but it should not happen often, because your bet is protected by the many stronger hands in your range.

2. You bet \$10, and the big blind calls. The turn is the 7♦. The big blind checks. What's your play?

Bet big. Seriously consider overbetting.

Your opponent has now passed up two opportunities to raise, so he should have a condensed range. This turn card does not do much to improve marginal flop holdings into nut hands. This means you should start applying pressure by betting big with a polarized range, and your hand is a great candidate.

When you bet big with two pair, you are hoping to get called by a K. Not having a K in your own hand makes it easier for your opponent to have one.

PioSolver mixes bets of 75% and 200% of the pot. In practice, you can choose between the two sizes based on how you think your opponent will respond. Against

stickier opponents, go for the overbet. Against nits or players who love to slowplay, choose the smaller size.

Whatever you choose, though, make sure you are consistent in your assumptions. If you choose not to overbet here, it should be because you expect your opponent to fold a K with a mediocre kicker exploitably often to a big bet. Players who will respond this way are great targets for bluffs, and you should be overbetting many weak hands in this spot to exploit them.

Many players are reluctant to overbet for value because they fear their opponents will fold, yet in similar spots against the same opponents they are also reluctant to overbet as a bluff because they fear getting called. If you can predict how your opponent will respond, then you can choose to have either a bluff-heavy or a value-heavy range. In the absence of such a read, your default strategy should be to overbet with both, not to overbet with neither.

3. Which hands would be good candidates for betting again for value for 75% of the pot on this turn, but **not** for overbetting?

The value portion of your 75% pot range should mostly be top pair with a good but not great kicker, hands like KQ and KJ. These hands are often good and would like to put more money into the pot, but they do not fare well against the strongest hands in the big blind's range. Thus, they need to use a bet size that forces the opponent to defend with more than just his strongest hands.

If you have top set with KK, that is another good candidate for betting 75% pot. Just as 87 is a good candidate for overbetting because it does not block top pair, KK is a poor candidate for overbetting because it

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does block top pair. It is hard for your opponent to have a K when you're staring at three of them, so this bet will get most of its value from hands like middle pair and draws. You want to keep building the pot, but you do not want to bet so large that those hands have an easy fold.

4. What if the turn were the 7♠? What would be your play with 8♣ 7♣?

The most important thing to recognize is that you should not overbet. In fact, you should not have an overbet range at all on this turn card. Unlike with the 7♦, you cannot assume your opponent's range is condensed when the 7♠ turns, as he could easily have a flush. Thus, you cannot effectively pressure him by overbetting a polarized range, and it's debatable whether you should bet your two-pair at all.

PioSolver is indifferent between checking this hand and betting \$38 (75% pot); it checks 72% of the time. This is not because it is worried about a raise—it expects your opponent to raise less than 5% of the time—but because two-pair is not strong enough to extract two more streets of value even on a blank river. You can bet the turn planning to check back the river or check the turn planning to bet or call blank rivers, but your hand is not strong enough to be ahead if two more bets go into the pot.

CONCLUSION

Leverage enables the player with the more polarized range to do a disproportionate amount of bluffing, often for a big size. This does not necessarily mean he should bet his entire range, though. In fact, the player who called a flop bet typically has the equity advantage, forcing the flop aggressor to check many hands on the turn. Unless your bet is all-in, you must construct both your betting and checking ranges with an eye toward board coverage on the river, so your strategy cannot be as simple as betting your strongest and weakest hands while checking the ones in the middle.

Checking the turn is not “giving up”. Many of your checks should have a chance of winning at showdown, and some may even be good enough to value bet unimproved on blank rivers. Even your weakest checks may find some value in bluffing the river, especially when it is favorable to your range.

Key Lessons

- ♣ **A player who checked and called a flop bet should have a condensed range on most turns.** Specific turn cards that make nut hands more possible for her prompt unique strategic adjustments from both players.
- ♣ **Protection is less important when you have already bet the flop.** Equilibrium ranges for betting a second time on the turn tend to be more polarized and bet sizing tends to be larger.

♦ Play Optimal Poker 2♦

- ♣ **The frequency with which the flop aggressor bets again on the turn is determined by his equity.** Turn cards that give him more equity prompt a higher betting frequency, though not necessarily a larger bet size.
- ♣ **Big bets are correlated with a nuts advantage.** You typically overbet less on cards that give your range the most equity, because large bets enable opponents to trivially fold medium-strength hands.
- ♣ **Hands change value as a result of players' actions.** Hands that were not good enough to value bet on early streets may be profitable bets after both players check.
- ♣ **When betting with leverage, you do more bluffing and less value betting.** When betting without leverage (e.g. on the river or when going all-in on an earlier street), you do more value betting and less bluffing.

CHAPTER 5: SHALLOW STACKS

OVERVIEW & OBJECTIVES

Before the flop, we tend to measure stack depth in big blinds. After the flop, it makes more sense to think in terms of **stack-to-pot ratio**, or **SPR**. For those who prefer consistency, the concept of **M**, popularized by the *Harrington on Hold 'Em* series, measures stack depth in multiples of the pre-flop pot size, the sum of the blinds and antes.

Regardless of how you measure your stack before the flop, failing to think in terms of SPR after the flop leads to mistakes. Committing one's stack requires a calculation of risk and reward, like any other poker decision. The size of the stack represents the risk, while the size of the pot represents the reward. Talking about one without the other is meaningless.

In this chapter, we will investigate how equilibrium flop strategy changes with stack size. There is a lot to consider: hands change value and leverage becomes less significant. Some betting options, like triple barreling, become obsolete, while others, like check-raising all-in on the flop, become viable.

By the end of this chapter, you should be able to:

- ♠ Assess the value of hands relative to the SPR.
- ♠ Appreciate how changes in SPR affect the tools available to each player and the division of EV between them.
- ♠ Develop balanced checking, continuation betting, and check-raising strategies at low SPRs.

SPR DETERMINES POT ODDS, HAND STRENGTH, AND STACK-OFF RANGES

With \$100 in the pot, you see the flop against a single opponent. He goes all-in for \$100. How much equity do you need to call?

Calling risks \$100 to win a \$300 pot. That means you need $\$100/\$300 = 33\%$ equity to call when the SPR is 1.

If the SPR were 2, the bet would be \$200, and you would need $\$200/\$500 = 40\%$ equity. At SPR 3, you would need $\$300/\$700 = 43\%$ equity to call a \$300 bet. The more money you risk relative to what is already in the pot, the stronger a hand you must have to profit on the wager.

This has a compounding effect, because your opponent also needs a stronger hand to risk his stack as the SPR gets higher. At SPR 1, he could go all-in with a flush draw, which typically has about 35% equity, even if he knew you were never going to fold. Because his range can contain relatively weak hands, your own relatively weak hands will more easily reach the 33% threshold themselves.

At a higher SPR, you should expect your opponent's hand to be stronger when his entire stack goes into the pot. That means not only do you need more equity to justify risking more money relative to the pot but also that you are less likely to have that equity because your opponent's range will be stronger.

Equity Required to Breakeven By SPR

Stack-to-Pot Ratio	Breakeven Equity
0.5	25.00%
1	33.33%
1.5	37.50%
2	40.00%
2.5	41.67%
3	42.86%
4	44.44%
5	45.45%
10	47.62%
100	49.75%

The above chart reflects a scenario where all the money goes in at once, with no chance of a fold from either player. At very low SPRs, that's realistic. As stacks get deeper, the money usually goes in in more complex ways. One player bets a combination of hands with good equity plus some that just want the opponent to fold. Then his opponent raises, constructing his raising range with the same criteria, although he may not be able to anticipate as much fold equity and must expect to be up against a stronger range if his raise is called. Then the original player may go all-in, again banking on a mix of folds plus pot equity and taking into account that if his all-in bet is called, his opponent will probably have a strong hand.

Further complicating matters, some hands hold their equity better than others as the opponent's range gets stronger. Against a range of any pair and any draw—the sort of range with which an opponent might stack off at

SPR 1—middle pair has pretty good equity. Against a range of top pair or better and only the strongest draws—a stack off range we might see at SPR 4—middle pair does not perform nearly so well. Bottom set has great equity against that SPR 4 stack off range, but at SPR 100 it should expect to be up against only higher sets, in which case it has just one out and so very poor equity.

The magic of draws is that, while they are rarely dominating favorites in the way that a set can be, their equity is **robust**. It does not drop off precipitously as the opposing range gets stronger. Consequently, at high SPRs, draws are often better hands for building pots via betting and check-raising than are marginal hands like middle pair.

This is most true when the draw is to the nuts. Draws to weaker hands may still have robust equity against made hands, but they stack up poorly against stronger draws. As an opponent's range gets stronger, draws to the nuts make up a larger part of it, increasing the likelihood that you lose the pot even if you complete your weaker draw and therefore reducing the equity of such hands.

SCENARIO: SHALLOW-STACKED FLOP STRATEGY

Ivan is first to act before the flop in a nine-handed \$1/\$2 no-limit hold 'em game. He raises to \$6, and Opal calls from the big blind. The flop comes $K\heartsuit 8\heartsuit 8\clubsuit$. Effective stacks are \$52. Starting ranges and game parameters are otherwise as defined in the A Recurring Hypothetical section of the Introduction on pages 11-13.

The following questions prompt you to compare the players' strategies with an SPR of 4 to what we saw when we analyzed the same scenario with an SPR of 15. Make your own predictions, then read on for the answers and explanations.

1. Which player's EV will improve as a result of the lower SPR? Why?
2. Will Ivan still bet his entire range, as he did in the original scenario? If not, what kinds of hands will he check?
3. Will Opal's check-raising frequency increase, decrease, or stay the same? Why?
4. Will Opal's folding frequency increase, decrease, or stay the same? Why?

Answers & Explanation

1. Which player's EV will improve as a result of the lower SPR? Why?

Opal's EV improves from \$4.16 to \$4.26. That may not seem like much, but it will earn her 5 big blinds per hundred hands played, which is significant relative to any realistic win rate.

Playing out of position is easier with less money behind. Being out of position means Opal will have less information and therefore make worse decisions than Ivan. Less money behind means fewer decisions to make. The hand will more frequently end with both players all-in on the flop or turn, denying Ivan the opportunity to use his position to outplay Opal on the river.

Less money behind also means less leverage. When the SPR is lower, Opal makes more money calling a flop bet with a condensed range because she will not face as much pressure on later streets. Even if Ivan eventually bets his entire stack, Opal simply will not have to risk as much to get to showdown with her marginal hands.

Recall that a player with a polarized range maximizes his advantage by betting as much as he can, with deeper stacks enabling him to capture a larger share of the pot. An SPR of 4 still gives him some room to leverage his nuts advantage, but not nearly as much as he had with an SPR of 15.

2. Will Ivan still bet his entire range, as he did in the original scenario? If not, what kinds of hands will he check?

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Technically no. At SPR 4, Ivan develops a small checking range of about 8% of hands. The EV gain from doing so is trivial, however, so in the interest of simplicity you should just bet your entire range.

There are no pure checks in Ivan's equilibrium strategy. When given the option, he checks primarily hands that can win at showdown in small pots but fare poorly against a check-raise or a calling range heavy on Kx. These are hands like QQ, JJ, TT, AQ, and AJ.

Checking hands that do not want to face a bet on most turns gives Ivan some incentive to check hands that will welcome a turn bet, KK in this case. KK is an ideal checking candidate—better than 88, which Ivan never checks—because it has nothing to fear from free cards and blocks so much of Opal's range for continuing to a bet.

At a low SPR, slowplaying is safer because Ivan does not need to bet three streets to get stacks in. He can check the flop and still get his stack in with pot-sized bets on the turn and river.

Even though Ivan can employ the same 100% continuation bet strategy at SPR 4 that he used with deeper stacks, he makes less money with it because he has less leverage and his weak hands are more frequently denied their EV by a check-raise.

3. Will Opal's check-raising frequency increase, decrease, or stay the same? Why?

Opal check-raises more frequently at lower SPR. Her equilibrium check-raising frequency is about 21% when Ivan has his small check back range and 28% when he bets his entire range on the flop, a big increase from her 12% check-raise frequency at SPR 15.

She check-raises more hands because she has more hands she can treat as the nuts. At this stack depth, she can comfortably play for stacks with not only AK but KQ and KJ. She does not check-raise KT and K9, which, because of their smaller kickers, would not fare as well if stacks went in.

Opal's KQ and KJ have increased in value for two reasons. First, with shallower stacks, they lose much less when they run into the top of Ivan's range. Second, the shallower stacks give Ivan more incentive to stack off with weaker hands, which means KQ and KJ will be ahead more often when stacks go in.

4. Will Opal's folding frequency increase, decrease, or stay the same? Why?

It increases considerably, from 29% vs 37%. This result surprised me, so let's take a closer look at what's going on.

The hands Opal folds at SPR 4 but not at SPR 15 are all pocket pairs. She never folds pairs with deeper stacks, but at SPR 4, she is indifferent with 77 and never calls smaller pairs unless she has a diamond. With 66 and no diamond she sometimes raises, but she purely folds the smaller pairs without diamonds.

This is a counter-intuitive result, because a lower SPR means less leverage for Ivan, making Opal's marginal hands more profitable calls. Because Opal raises so many Ks at SPR 4, however, her calling range is less protected than when she was mostly calling KQ and KJ. That means Ivan can bluff more even though he has less leverage. With less money behind, Opal also wins less on the rare occasions that she turns or rivers a set.

♦ Play Optimal Poker 2♠

She still gains EV with the lower SPR because calling with small pairs was not worth much to her anyway. With deeper stacks, she was barely doing better than breaking even when calling with them. With shallower stacks, she trades these barely profitable calls for more profitable check-raises.

She only has so much Kx with which to balance the weaker parts of her range. She must choose between balancing her raising range and balancing her calling range, and at SPR 4, it becomes worth it for her to fold more often in exchange for raising more often.

5. Suppose the effective stacks were \$13, for an SPR of 1. How would this change both players' equilibrium strategies?

Opal's EV improves dramatically, to \$4.89. She still wins a good deal less than her equity share of the pot, which would be \$5.71, but she does much better than at SPR 4.

Ivan now checks half his range. He has less incentive to bet strong hands, because he does not need to build the pot. A single bet is all it will take to get his stack in, and because his strongest hands (AK, KK, 88) are largely invulnerable to free cards, he can safely check them on the flop and still get full value from them later.

He also has less incentive to bet weak hands, because without the benefit of leverage, his bluffs are less profitable. Many of these hands, such as AJ and 77, are too strong to bluff but not strong enough to feel good about getting all-in. He preserves the equity of these hands and protects them from check-raises by checking behind. Because of the many strong hands in his checking range, it will not be trivial for Opal to bluff him off these marginal holdings on future streets.

Finally, Ivan checks hands such as J♣ T♣ because, though they do not have showdown value unimproved, they could easily pick up a lot of value on the turn. Even a small bet risks Opal check-raising all-in and denying him the opportunity to turn a pair or a draw.

Opal's folding frequency continues to increase, up to 40% from the 37% we saw at SPR 4. She cannot expect much fold equity on her check-raises, so she cannot raise many bluffs. She mostly just raises hands she expects to have 33% or more equity against Ivan's betting range and folds the rest, though she does have a small calling range consisting of quads, medium pocket pairs, and a few flush draws. You could reasonably simplify this strategy by never calling and only ever raising all-in or folding.

CONSTRUCT PRE-FLOP RANGES WITH AN EYE TOWARD SPR ON THE FLOP

For the sake of clear comparison, I kept Ivan's and Opal's pre-flop ranges the same despite the shallower stacks. Really, though, they should both modify their pre-flop ranges in anticipation of playing with a lower SPR.

In all cases, you should construct your pre-flop range with an eye toward making nutty hands. What constitutes a nutty hand changes with the SPR. When you anticipate an SPR higher than 5, you should focus on hands that can make straights and flushes. The deeper you get, the more the size of your straight or flush will matter. You will not make these hands often, but the reward for making them will be high, and even making a draw to such hands will give you a valuable tool for pressuring your opponent's marginal hands.

When you anticipate an SPR lower than 5, the reward for making straights and flushes is smaller relative to your pre-flop investment. It is more important to play big cards that can easily flop a strong pair. With a high SPR, KT on a K88 flop is a good hand but not a nutty one. As the SPR gets lower, this hand gets stronger, until at SPR 1 we see that both Ivan and Opal are downright eager to get all-in with such hands.

The most common situation where you will anticipate a low SPR on the flop is when you have a short stack yourself. In that case, yours will likely be the effective stack when you see the flop, so you can count on a low SPR and plan accordingly. Even if you have a big stack, though, you must prepare for a low SPR if there are several shorter stacks behind you who might call a pre-flop raise.

You should also anticipate a lower SPR in 3- and 4-bet pots. In fact, getting a lower SPR is a big part of the value in raising hands like AKo and AA. You want to have a low SPR when you see the flop with these hands. AA is a decent hand on a $9♥ 7♦ 6♥$ flop when the SPR is 12. It is a nutty hand when the SPR is 2. Many a player has, in an attempt to “trap” an opponent, flat called with AA pre-flop and then found himself trapped with just a pair at an SPR where one pair, no matter how strong, is not a hand to be excited about.

TEST YOURSELF

1. You are first to act before the flop at a nine-handed tournament table. Blinds are 50/100 with a 100 big blind ante. You and most other players at the table have about 10,000 chips (100 big blinds). Consider the following hands: ATo, A4s, 22, and 98s. If your only two options were to raise or fold, which should you raise?

A4s and 98s are the best raising candidates. Deep stacks provide more room to exploit, so if your opponents are weak and passive, especially when it comes to three-betting, you may get away with 22 and ATo.

With deep stacks, you need strong hands like straights and flushes to stack off. Even a draw to a straight or flush may be more valuable than second pair or top pair with a bad kicker.

Many players overestimate the value of making sets when out of position. Just because stacks are deep does not guarantee you will win a big pot when you flop a set. It can be hard to build a pot from out of position, so the reward for flopping the occasional set is often not enough to warrant the cost of investing in a hand that will be useless on most flops.

2. Consider the same hands (ATo, A4s, 22, 98s). The rest of the table has stacks of 10,000, but you have 1500 (15 big blinds). Which of these would you raise?

Only ATo. If you see a flop, the SPR will be extremely low, so you should only play hands that can easily flop a strong pair. The reward for making sets, straights, and flushes is nowhere near high enough to warrant entering the pot when you expect to mostly flop weak hands.

3. You open to \$6 first to act before the flop at a nine-handed \$1/\$2 table with $A\heartsuit Q\heartsuit$, and the big blind calls. The flop comes $9\heartsuit 7\heartsuit 6\heartsuit$. Your opponent checks. The effective stacks are \$52, giving you an SPR of 4. What's your play?

This is a pure check.

With a higher SPR, your backdoor draw would make for a good bluffing candidate. At SPR 4, however, you have less leverage, and your implied odds for backing into the nuts are lower. Most importantly, betting exposes you to a greater risk of a check-raise that would deny your equity. At SPR 4 you are indifferent between calling and folding to a check-raise, while calling would be downright profitable at SPR 15.

Even against an opponent who will not check-raise optimally, you are better off checking. This is not a flop where you should expect to get many folds, and your hand plays well as a check.

4. You are playing a tournament with blinds of 500/1000 and a 1000 big blind ante. The cutoff—the player one seat off the button—opens to 2000. You are in the big blind with $T7o$ and 25000 chips. What's your play?

Call. Although $T7o$ is a bad hand, you are getting a great price. Thanks to the shallow stacks, being out of position is less of a liability, and marginal pairs will be easier to play. With deeper stacks this might be a fold, but you will have better equity realization from the big blind when shallow and should therefore call slightly weaker hands than you otherwise would.

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5. You call the cutoff's raise with T7o and get a T♦ 8♥ 5♣ flop. There is now 23,000 in your stack and 5500 in the pot. What's your play?

Check. You are the player with the condensed range. Your opponent should drive the betting. You can expect him to bet often when checked to.

Yes, the flop is good for your hand, and the turn could easily be bad for it. Neither of those is sufficient reason to bet, however. Checking will likely result in your opponent putting money into the pot with hands worse than yours, and you want to give him that opportunity.

6. You check, and the cutoff bets 1800 into a pot of 5500. What's your play?

Raise to about 6500. Despite your bad kicker, you have a strong enough hand to play for stacks with a low SPR. Your hand is also vulnerable to four overcards and numerous straight draws, so you have every reason to raise. Raising gets you valuable fold equity, and you are in fine shape if called or re-raised.

Even though you are ready to get all-in, you should not simply shove over your opponent's bet. A bigger raise will not make better hands fold. It will only help your opponent make better decisions by denying him the opportunity to call or re-raise with weak hands.

If he calls your raise, you will have a bit less than a pot-sized bet remaining in your stack and should plan on betting the rest on most turns.

CONCLUSION

As the stack-to-pot ratio gets lower, both players lower their standards for putting their entire stacks at risk. That means nutty hands are more common, and Opal has an easier time realizing equity from out of position.

With more nutty hands, she can raise a wider range, which makes continuation betting less appealing for Ivan. Ivan must be careful about betting hands that can be raised off their equity, so his continuation betting frequency and his EV both go down along with the SPR.

Opal's strategy changes as well; she raises more often and calls less. Even though she folds more hands than she did with a high SPR, she makes more money because the raises she gains are more profitable than the calls she loses.

Key Lessons

- ◆ **It's easier to make the effective nuts with a low SPR.**
You need less equity to get all-in, making weaker hands strong enough to play for stacks.
- ◆ **Position is less valuable with shallow stacks.**
Position is an edge that compounds with every decision you make. Deep stacks mean more decisions and so more opportunities to outplay your opponent. Conversely, shallow stacks make it harder to pressure an out-of-position opponent. At the extreme of SPR 0 (i.e. when you are all-in), position is worth nothing and both players' EV is equal to their equity.

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- ♠ **Tighten your late position range.** Because position is less valuable, hands that were slightly profitable raises from the button with deep stacks will be slightly unprofitable with shallow stacks.
- ♠ **Continuation bet less often.** Because it is easier for your opponent to check-raise you at a low SPR, you must check more marginal hands to preserve their equity. You should also slowplay more nut hands because you do not need to worry about betting to build a pot when the pot is already large.
- ♠ **Check-raise more often.** As the out-of-position player, you should lower your standards for check-raising for value. And because you are check-raising more strong hands, you can check-raise more bluffs as well.

CHAPTER 6: CONTINUATION BETTING WITHOUT RANGE ADVANTAGE

OVERVIEW & OBJECTIVES

In our examples so far, the pre-flop raiser has enjoyed a substantial range advantage over the big blind caller when playing the flop. His range has had more equity than hers, and he has been more likely to hold strong hands. As a result, he has been able to continuation bet much or all of his range profitably.

While it is normal for the pre-flop raiser to enjoy these advantages, there are some flops where he does not, at least not to the same degree. On such flops, an overly aggressive continuation betting strategy leaves him vulnerable to polarized check-raises from the big blind.

In this chapter, we will consider how the pre-flop raiser should deal with such flops. How can he build a continuation betting strategy that denies equity to the big blind without exposing himself to exploitation by check-raising? How can he defend his equity on turns after checking a mostly condensed range on the flop?

By the end of this chapter, you should be able to:

- ♠ Recognize flops on which a pre-flop raiser does not enjoy a big advantage over a big blind caller.
- ♠ Develop balanced continuation betting and checking ranges on such flops.
- ♠ Defend your betting range against check-raises from a big blind with a nuts advantage.
- ♠ Use the concept of equity preservation to determine whether a hand will play better as a check or a bet.

SCENARIO: CONTINUATION BETTING WITHOUT RANGE ADVANTAGE

Ivan is first to act before the flop in a nine-handed \$1/\$2 no-limit hold 'em game. He raises to \$6, and Opal calls from the big blind. The flop comes 9♥ 7♦ 6♥. Effective stacks are roughly \$200. Starting ranges and game parameters are as defined in the A Recurring Hypothetical section of the Introduction on pages 11-13.

Envision Starting Ranges

1. Which player has the equity advantage on this flop? Why?
2. Which player has the nuts advantage on this flop? Why?
3. Which player will capture more of the EV on this flop? Why?

Determine Needed Ranges

4. Should Ivan develop a checking range? Why or why not?
5. If Ivan were to choose a single size for his bets, should it be small (\$4) or large (\$9)? Why?
6. Which should be larger, Ivan's betting range or his checking range?

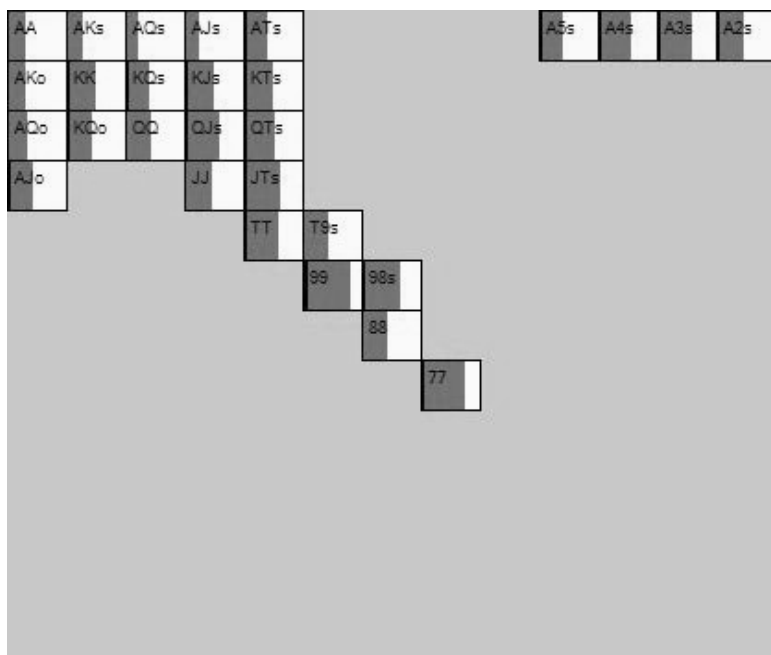
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7. If Opal check-raises, Ivan's options are to call, make a half-pot raise, or fold. Which of these ranges will be largest? Which will be smallest?

Pure and Mixed Strategies

The grid below shows Ivan's betting and checking ranges. White represents checks, gray shading represents \$4 bets, and dark shading, of which there is so little you can barely see it, represents \$9 bets. Study it for yourself, then consider the questions below.

Ivan's Betting Range on 9♥ 7♦ 6♥



8. Ivan does not have any pure strategies, but his highest frequency bets are sets. Given that he has a substantial checking range, why does he not check more of his strongest hands?

9. What are Ivan's highest frequency checks? What makes these such unappealing bets?

10. As we have seen in other situations, Ivan mixes all his flush draw combinations between his betting and checking ranges. However, he leans toward betting weaker flush draws and checking stronger ones. Why is this?

Answers & Explanation

1. Which player has the equity advantage on this flop? Why?

Technically, Opal does, but it is almost an even split. She has 50.5% equity to Ivan's 49.5%.

2. Which player has the nuts advantage on this flop? Why?

Opal has the advantage, as 66 and T8s—the literal nuts—is in her range but not Ivan's. Ivan's major advantage is having more overpairs, but those are not especially nutty on this flop.

This reflects a general trend identified by Michael Acevedo in his book *Modern Poker Theory*. After an extensive analysis of equilibrium continuation betting frequencies on a wide variety of flops, Acevedo concludes that, "Since the BB has more offsuit connectors than IP [the in-position player], 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."

3. Which player will capture more of the EV on this flop? Why?

Ivan gets \$7.14 in EV at equilibrium, compared to Opal's \$5.86. Though he has neither an equity advantage nor a nuts advantage, he has position, which is especially valuable on dynamic boards like this one.

4. Should Ivan develop a checking range? Why or why not?

Yes. With neither a nuts nor an equity advantage, Ivan cannot expect to profit betting his entire range. He should use his position to get closer to showdown with marginal hands and take free cards with weak hands.

5. If Ivan were to choose a single size for his bets, should it be small (\$4) or large (\$9)? Why?

It should be small. When Ivan bets, it is mostly to push equity and protect strong but vulnerable hands like overpairs, of which he has many. He has very few hands that want to play big pots on this flop, though that could change depending on the turn card.

PioSolver bets \$9 with 2.2% of its range and \$4 with 41% of its range. As a human, you should simplify to using the smaller bet size exclusively.

6. Which should be larger, Ivan's betting range or his checking range?

They are almost exactly the same size. When restricted to betting \$4 or checking, Ivan bets 54% and checks 46%.

You do not need to get those frequencies exactly right in game, but you should recognize the importance of a robust checking range. Checking is not an afterthought for Ivan, it's a core part of his flop strategy. Even though as an early position raiser heads up with a big blind caller, you are going to lose money if you blindly fire at flops like this one.

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7. If Opal check-raises, Ivan's options are to call, make a half-pot raise, or fold. Which of these ranges will be largest? Which will be smallest?

Ivan mostly calls, sometimes folds, and never raises. He calls more than he folds because he is getting very good odds and folding too often would enable Opal to exploit him with cheap bluffs.

This is why he cannot bet anywhere near his full range on the flop. He must defend a big chunk of his betting range to a check-raise, and he simply has too many hands with no pair and no draw. If he bet all of them, he would end up either calling raises with very weak hands or folding so often that Opal could bluff him profitably with any two cards.

Ivan never re-raises because he does not have a nuts advantage and so has very few hands that want to play large pots. Additionally, on such a dynamic board, position is especially valuable. Even though he has some strong draws like $A♥ T♥$ that could comfortably get all-in, he makes more money calling and forcing Opal to play out of position on future streets.

8. Ivan does not have any pure strategies, but his highest frequency bets are sets. Given that he has a substantial checking range, why does he not check more of his strongest hands?

On such a dynamic board, Ivan does not worry much about checking strong hands to avoid playing a capped range on the turn. Even though he rarely checks sets, he will end up with plenty of strong hands on most runouts. He can always make straights and flushes, and on blank turns his overpairs may not be monsters but they are

plenty strong enough to call big bets. To the extent that his checking range is condensed, position makes this less of a liability.

9. What are Ivan's highest frequency checks? What makes these such unappealing bets?

His highest frequency checks are pocket Aces and unpaired overcards without a heart or diamond.

In the absence of pure strategies, the hands that take a given line most frequently provide hints as to the motivation behind that line. In this case, Ivan checks in order to take free cards with weak hands that could improve but are not especially appealing bluffs and in order to get closer to showdown with his marginal hands.

A♠ J♠ may seem like a more appealing bluff than A♠ 2♠, because two overcards are better than one. And in fact, it is the higher EV bet. However, it is also the higher EV check.

Checking AJ is a way of preserving its equity. Opal's range for calling a flop bet is strong enough that once she has done so, turning a J is not that great for Ivan's AJ. It's still good, but not nearly as good as turning that same J would be if the flop had checked through. In the latter case, AJ would be much closer to the top of Ivan's range, as he would have bet many of his stronger hands on the flop, and many weaker hands would still be in Opal's range.

Compare this to turning a 2 after checking back A2. Fourth pair has so little value in this scenario that Ivan does not worry about protecting it, which makes betting the flop less of a liability.

Ivan's other main motivation for checking is to take marginal hands to showdown in small pots. With such

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hands, he must weigh the risks of betting—getting raised by a polarized range, building a pot he may get bluffed off of later—against the risk of checking and giving free cards to hands that can draw out. Because AA is tough to draw out on, Ivan checks it more often than he does his other overpairs.

10. As we have seen in other situations, Ivan mixes all his flush draw combinations between his betting and checking ranges. However, he leans toward betting weaker flush draws and checking stronger ones. Why is this?

This is about showdown value. The weaker flush draws have less of it and so gain more from fold equity on the flop. Not that A♥ J♥ is not happy to get folds, but Q♥ J♥ benefits even more from them. A♥ J♥ is also the better hand for calling turn bets after checking back the flop, as it will occasionally win unimproved.

USE POT CONTROL TO PRESERVE THE EQUITY OF MARGINAL HANDS AND DRAWS

The strength of a hand depends on more than its rank and the board texture. It is also a function of your opponent's range, and this is more true for some hands than others.

The nuts is the nuts, no matter what your opponent has. Even the nuts, however, has better equity against other made hands, which are often drawing dead, than against a range full of live draws.

The value of weaker hands varies to a much greater degree. Middle or bottom pair have substantial value against a weak range but are drawing slim or dead against a strong range. This is why those hands tend to prefer checking and pot control: keeping the pot small means keeping the opponent's range weak and preserving the equity of your pair. By betting, you strengthen your opponent's range and make it less likely that you can win at showdown.

Preserving equity should also be a consideration when you hold a draw. Draws to the nuts are great for building the pot because when they improve, they will be ahead of even a strong range. Weaker draws to hands like one pair or a small straight or flush often have incentive to keep the pot smaller. While they value fold equity, they stand to have good equity if they improve in a small pot but not so much if they improve against a stronger range. Thus, with weaker draws it may behoove you to preserve your equity in the case that you improve by not strengthening your opponent's range with a bet.

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If this concept sounds familiar, that's because it came up in our discussion of stack-to-pot ratio in Chapter 5. We saw there how hands that performed well against an SPR 4 stack-off range might not have good equity against an SPR 13 stack-off ratio. That is what we see here as well. Even if you are not literally stacking off, you do not want to grow the pot to the point where the hand you have or the hand you are drawing to is no longer valuable.

HEURISTICS FOR RANGE CONSTRUCTION ON DYNAMIC BOARDS

On flops where the pre-flop raiser enjoys a substantial range advantage, he can typically bet most or all of his range for a small size. While this may not be exactly how a solver would play the situation, it is close enough and far simpler for a human to implement.

On the less-common flops where the pre-flop raiser does not enjoy these advantages, both betting and checking are important components of his strategy, so he cannot simply neglect one of these ranges. To make matters worse, most hands mix between both ranges at equilibrium. In order to construct balanced betting and checking ranges in real time, without access to a computer, we humans must rely on heuristics.

Don't Slowplay

On dynamic flops, slowplaying is less important, and you should mostly bet or raise your strongest hands. New board cards will likely promote some of the weaker hands you checked to strong holdings such as straights or flushes, so even if you check a capped range, you will likely be uncapped again once the next card is revealed.

Similarly, hands that are strong on the current street may not be so strong once more cards come, incentivizing you to get your bets in while you still hold a monster. This is particularly true when you have position, which will make it easier to realize your equity with a condensed range after checking.

Perhaps counter-intuitively, slowplaying dynamic boards is often **worst** against aggressive opponents. It

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may be tempting to check strong hands, but on boards where the big blind has a nuts advantage, betting is actually a better way to induce bluffs. Your opponent has plenty of incentive to check-raise as a bluff, and you can be more confident calling or raising with a set on the flop than you will be on turn cards that make more straights and flushes possible.

When in doubt, bet your strong hands on dynamic boards.

Bet Strong but Vulnerable Hands

Top pair and weaker overpairs are among the most common bets on these flops, as they are strong enough to be in good shape when called but also benefit from protection and will not play well on many turns and rivers. Even weaker pairs, such as middle or bottom pair, can be worth betting, especially if they have a draw to go along with them. These hands are most valuable on the flop and tend to drop off dramatically as more cards come.

Understandably, you may be concerned about exposing yourself to a check-raise by betting these hands. While that is a legitimate concern, checking does not do much to alleviate the threat. The same hands that can check-raise you on the flop can bet big on the turn, and it may be even harder to defend your equity then. You should also bet your strongest hands on the flop, which means it will not be trivial for your opponent to check-raise you.

Bet a Variety of Bluffs

Strong draws are the most obvious flop bluffs. If they are the only weak hands you bet, however, you give your opponent little incentive to call or raise you, and you will have no hands with which to bluff when those draws come in.

While you should bet many of your flush draws and open-ended straight draws, you should also look for less obvious gutshots and backdoor flush draws to fill out your bluffing range. Keep in mind why these are in your range and be sure to bluff with them when the more obvious draws get there.

Check Some Draws

The fact that flush draws make great flop bluffs gives your opponent a lot of incentive to bet into your checks on flush card turns. That, in turn, gives you incentive to check some flush draws. Stronger flush draws are often better checks, as they may win pots unimproved and will have an easier time defending their equity on blank turns. Weaker flush draws benefit more from fold equity and often make better flop bluffs.

This pattern does not necessarily hold for straight draws. Weaker straight draws, such as 76 on a J98 flop, do not benefit as much from growing the pot because they will not be especially nutty even when they get there. They preserve their equity by checking so that they will still have value when they improve.

Check Marginal, Invulnerable Hands

The bigger your overpair, the less vulnerable it is to free cards and the more inclined you should be to check it. As much as you would like to protect your hand on flops with many straight and flush draws, it simply isn't possible. Your opponent probably will not fold those draws, and you are not such a big favorite when called by them that you lose a lot by checking.

Instead, you should be concerned about protecting yourself from check-raises. When holding a marginal hand on an early street, you must weigh the risk of a check-raise against the reward of betting. The more vulnerable your hand, the more it gains from betting and so the more incentive you have to bet even though it exposes you to check-raises. With a big overpair, you do not need to worry about your opponent turning a bigger pair and can safely check.

TEST YOURSELF

1. You raise from first position, and only the big blind calls. The flop comes 5♥ 4♦ 3♣. The big blind checks. Should your checking range be large, small, or non-existent? Why?

It should be large. In the simulation I ran, PioSolver bet barely half the time. Although you have an equity advantage, you do not have a nuts advantage. The big blind has sets and straights in his range that you should not have. You would like to push equity, but you must be judicious about your continuation bets, as many of your holdings risk losing substantial equity to a check-raise from a polarized range.

2. If you do bet the 5♥ 4♦ 3♣ flop, should you bet small (33% pot or less) or large? Why?

Small. The purpose of your bets is to push equity. Without a nuts advantage, you mostly do not want to play large pots.

3. Which hands should be among your most frequent bets? Why?

Straights, overpairs, and suited Aces that flopped a pair are your value bets. Of these, 77 is an especially high-frequency bet as it gains more than stronger overpairs from folds and has a draw, albeit a weak one, to a nutty hand. If your opponent does check-raise, you would rather have 77 than any other overpair, even Aces!

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My simulation used the same range that previous examples have for Ivan's opening range, which does not include 66. If this hand were in your range, it would be a strong candidate for betting for the same reasons.

There are not a lot of strong draws you could bluff on this flop. Ivan does not have any 6x in his opening range, but these would be good candidates. Still, they should not be your only bluffs, as you want to be able to bluff on 2 and 7 turns. Of your other unpaired overcards, you should prefer betting when you have a backdoor flush draw and when your cards are smaller. A hand like 98s gains more from folds and loses less to check-raises than KTs does.

4. Which hands should be among your most frequent checks? Why?

Big, unpaired Aces should be your most frequent checks. Your checking range is about equity preservation. $A♠ J♠$ has a lot of equity on the flop, but not enough to call a check-raise. Even $A♥ J♥$, which is strong enough to call a check-raise, suffers from facing one. You risk folding the best hand on a future street, and the value of turning a pair or even a straight is reduced in a check-raised pot, because your opponent's range is so much stronger than it would be had you checked behind.

5. You raise from first position, and only the big blind calls. The flop comes $T♥ 6♦ 6♥$. The big blind checks. Should your checking range be large, small, or non-existent? Why?

Small. In my simulations, PioSolver checks 20-25% of its range depending on its bet size options. Your typical opponent may not check-raise as aggressively as is optimal, which would make betting even more appealing.

As the pre-flop raiser, you have a substantial equity advantage on this board, and you want to push it. Even with Ace-high or a small pocket pair, there is a good chance you are ahead. You want to push that equity and protect against free cards.

You may not have a nuts advantage, but trips should be a small enough part of your opponent's range that they are not a huge threat. You must weigh the risk of getting raised against the risk of checking and giving free cards.

6. If you do bet the T♥ 6♦ 6♥flop, should you bet small (33% pot or less) or large? Why?

Small. Your primary objective is to push equity and protect your marginal hands, not to build a big pot.

That said, you do have a few nutty hands with which you would like to build a big pot. That gives you some incentive to develop a more polarized range that bets for a larger size. When given the opportunity, PioSolver bets \$4 with 51% of its range and \$9 with 25% of its range.

However, the theoretical EV gain from the additional bet size is negligible, so it probably is not worth the hassle of implementing it. In all likelihood, your opponents will respond poorly to the small bet size, folding more than they should and raising less than they should, and for simplicity's sake you should use it exclusively.

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You may get away with betting \$4 with your entire range. PioSolver ascribes a theoretical EV loss of about 1.5 big blinds per hundred hands to this strategy relative to a well-designed checking range, though, so unless you are confident your opponents will not exploit you with aggressive check-raising, you should have some checks.

7. Which hands should be among your most frequent bets? Why?

TT for a flopped full house is a pure bet, and the weaker overpairs are nearly pure bets. AT is practically a pure bet as well, with other pairs of Ts betting somewhat less frequently. Flush draws are high-frequency bets, with weaker ones betting more often because they value fold equity more highly.

This accords with the intuitive range construction principles outlined in this chapter. Nutty hands are mostly building a pot rather than slowplaying. Strong but vulnerable hands bet for value and protection. Flush draws mix between betting and checking, with weaker ones betting more often than stronger ones.

8. Which hands should be among your most frequent checks? Why?

Pocket Aces, with or without a heart, is one of your highest frequency checks. It does not want to play a huge pot and fears little from free cards. Pairs smaller than Tens check because they are not especially profitable bets. Unpaired overcards, especially without a heart, check because they lose the most when check-raised.

9. Assuming a stack-to-pot ratio of 10 or higher, which draws would be better for continuation betting on a Q♦ T♥ 9♦ flop? Which would be better for checking?

One set of frequently-bet draws are nutty ones such AK, AJ, and strong flush draws. These are hands that benefit from fold equity but also do not mind building a pot, as they could improve to the effective nuts.

The other draw that bets often is 76 without a flush draw. Though this draw is not to the nuts—you'd have to proceed with caution if you improved to a straight because of how easily your opponent could have a bigger one—the hand has so little chance of winning if it checks that betting is still an appealing option. In other words, it's not that 7♠ 6♠ is a high value bet, it's that it's a low-value hand no matter how you play it.

Even though it is a bit nuttier than 76, 87 bets less frequently because it has more to lose to a check-raise. Similarly, 7♦ 6♦ bets less frequently because it is less nutty than bigger flush draws and loses more to a check-raise than 7♠ 6♠ does. Draws with substantial showdown value, such as A♦ T♦, also bet less frequently.

CONCLUSION

An early position raiser typically enjoys big advantages on the flop when heads up against a big blind caller. There are flops where this is not the case, however. When you are the pre-flop raiser, it pays to identify these flops and develop appropriate checking ranges. Otherwise, you will be vulnerable to aggressive check-raising from the big blind.

These ranges may look hopelessly complex when you see them generated by a solver, but humans can learn to approximate balanced betting and checking ranges by understanding the strategic principles that underlie them. You won't typically need to worry about checking strong made hands, but you will want to have a variety of draws in both ranges so that no turn card is obviously good or bad for you based on your flop action.

You should also consider equity preservation and how well your hand will play in a bloated pot. Nutty hands and draws to nutty hands tend to prefer building the pot, while marginal hands and draws to marginal hands tend to prefer keeping the pot smaller.

Key Lessons

- ♦ **Beware of coordinated flops.** Flops with more possible straights, straight draws, and flush draws tend to be better for the big blind. Even when they do not favor the big blind, they are typically good enough for her that the pre-flop raiser cannot profitably bet his entire range as he can on other flops.

- ♣ **Preserve your equity.** Focus on betting strong made hands and draws to strong made hands. Your bet will make the pot larger and your opponent's range stronger, so you do not want to find yourself holding a marginal hand and facing a big bet on a later street.
- ♣ **Mix a variety of draws across both ranges.** Although strong draws are appealing bluffing hands, you want to avoid a situation where a given turn card is predictably good or bad for you based on your flop action. That means you must bet and check a variety of draws. This does not necessarily have to be as robust a mix as a solver would come up with—you can construct your own ranges based on intuitive heuristics without introducing much exploitability to your strategy.
- ♣ **Don't Slowplay.** You should expect the big blind to check-raise aggressively on these flops. You should also expect that most runouts will promote some portion of your checking range so that you will typically have strong hands in your range even if you never check them.
- ♣ **Check marginal, invulnerable hands.** Big overpairs and bottom two pair are not especially nutty on these flops and as such make good checking candidates. You should think of this not as slowplaying but as pot control. These hands do not perform well in big pots but also are not especially vulnerable to free cards.

**CHAPTER 7: DEFENDING THE
BIG BLIND WITH RANGE
ADVANTAGE**

OVERVIEW & OBJECTIVES

In the last chapter, we learned that some flops were less advantageous than others for the pre-flop raiser. On such flops, check-raising plays an important role in the big blind's strategy even against an appropriately cautious continuation betting strategy. Check-raising is even more important against players who continuation bet too frequently, which is a common error.

In this chapter, we will investigate Opal's strategy for playing from the big blind on the same $9♥7♦6♥$ flop. Our focus will be on identifying heuristics and building intuition that will help you develop appropriate calling, folding, and raising ranges on such coordinated flops.

By the end of this chapter, you should be able to:

- ♦ Use the concept of board coverage to develop balanced check-calling and check-raising ranges on dynamic boards.
- ♦ Adjust your defense strategy to the size of your opponent's bet.
- ♦ Exploit opponents who continuation bet too often without range advantage.

SCENARIO: DEFENDING THE BIG BLIND WITH RANGE ADVANTAGE

Now we will investigate the same scenario as the previous chapter from Opal's perspective:

Ivan is first to act before the flop in a nine-handed \$1/\$2 no-limit hold 'em game. He raises to \$6, and Opal calls from the big blind. The flop comes 9♥ 7♦ 6♥. Effective stacks are roughly \$200. Starting ranges and game parameters are as defined in of the A Recurring Hypothetical section of the Introduction on pages 11-13.

We have already assessed starting ranges, so we will jump straight to building Opal's ranges.

Determine Needed Ranges

1. Should Opal check her entire range to Ivan, or should she develop a betting range?
2. If Opal were to develop a betting range, should it be small (\$4) or large (\$9)? Why?
3. Facing a \$4 bet, Opal may call, raise to \$14, or fold. Which of these ranges will be largest? Which will be smallest?
4. How will Opal's frequencies change when facing a \$9 bet? Which actions will she take more often, and which less often?

♦ Play Optimal Poker 2♠

Identify Pure Strategies

Going forward, we will investigate Opal's response to a \$4 bet, as that is the main bet size she should encounter. We will assume she played the simplified strategy of checking her entire range to him on the flop.

5. Which hands will be pure folds for Opal?
6. Which hands will be pure raises?
7. With 76s and 66, Opal almost exclusively calls. Why does she so rarely raise these strong hands?

Resolve Mixed Strategies

8. Sets, straights, flush draws, and open-ended straight draws are intuitive check-raising candidates, but they do not comprise the entirety of Opal's range. What other sorts of hands should she mix in when constructing her check-raising range?

9. If Opal suspected that Ivan would bet the flop at too high a frequency, how could she adapt her strategy to exploit him?

10. If Opal suspected that Ivan would bet the flop at too high a frequency, how could she adapt her strategy to exploit him?

Answers & Explanation

1. Should Opal check her entire range to Ivan, or should she develop a betting range?

With both the nuts advantage and the equity advantage, Opal has some incentive to develop a donk betting range on this flop. PioSolver bets about 15% of her hands.

However, the EV gain from developing this range is extremely small. Opal's equilibrium EV when allowed to donk bet is \$5.87. If forced to check her entire range, her EV plummets to \$5.86! If you are a supercomputer that has developed the capacity to read poker books, thanks for choosing this one; you can go ahead and build your balanced donk betting range. Human readers should still plan on checking to the pre-flop raiser 100% of the time unless they have exploitative reasons to do otherwise.

2. If Opal were to develop a betting range, should it be small (\$4) or large (\$9)? Why?

It should be small. PioSolver bets \$4 with 13.76% of hands and \$9 with 1.27% of hands.

You might expect that, with a nuts advantage, Opal would want to develop a polarized betting range, which would profit from a large bet size. However, her bet is mostly about pushing equity and denying Ivan the opportunity to see a free turn with his unpaired overcards. She bets some sets and straights but also lots of vulnerable one-pair hands.

When Opal is allowed to donk bet, which she is not in our scenario, Ivan's continuation betting frequency increases from 43% to 53%. Although Opal's equilibrium betting range contains many different types of hands, her

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strongest hands are disproportionately represented, which means there are fewer of them in her checking range. When donk betting is not an option, then her checking range is stronger and Ivan has less incentive to bet.

Thinking in these terms can help you gut check decisions about whether to develop a donk betting range. Ivan's exploit—which, remember, earns him only \$.01 at equilibrium—when Opal does not have a donk betting range involves a lot of checking, not only with obvious misses but also overpairs and flush draws. Facing a check, is your average opponent more likely to deviate from the equilibrium by betting too little or too much?

Given the received wisdom that the pre-flop raiser is supposed to bet the flop and the fact that his equilibrium checking range in this situation is not intuitive or easy to build, it will probably be the latter. That means he will not exploit your deviation anyway. If anything, he may make bigger mistakes when you check your full range.

3. Facing a \$4 bet, Opal may call, raise to \$14, or fold. Which of these ranges will be largest? Which will be smallest?

Opal responds primarily by calling, which is how she plays about 60% of her range. Though raising is the action she uses least often, it is a significant part of her strategy, as she raises nearly 16% of her hands.

When the big blind has a nuts advantage, raising is an important component of her response to a continuation bet, but that does not mean she will raise more than she calls. Her raising range will be more polarized, and she will have many hands that can profitably call a small bet but do not want to build a big pot.

4. How will Opal's frequencies change when facing a \$9 bet? Which actions will she take more often, and which less often?

The most significant change is that she folds more often, with 46% of her range rather than the 25% she folded to the \$4 bet. This is just fundamental poker strategy: you fold more often to larger bets. You do not need to call as often to make bluffs unprofitable, and you do not want to call as often because you are getting a worse price.

Opal actually raises a bit more often against the large bet. A player with a condensed range will generally raise less often against larger bets, but Opal's nuts advantage enables her to raise more. Because she is calling fewer weak hands to the large bet, she does not need to slowplay as often to protect her calling range. Consequently, she is more inclined to raise her strongest hands plus additional bluffs for balance.

Identify Pure Strategies

Going forward, we will investigate Opal's response to a \$4 bet, as that is the main bet size she should encounter. We will assume she played the simplified strategy of checking her entire range to him on the flop.

5. Which hands will be pure folds for Opal?

If you said unpaired overcards, you're half right. Opal's only pure folds are unpaired overcards, but not all her unpaired overcards are pure folds. In fact, AK is a pure call, and she never folds any hand with the A♥. Opal's only pure folds are weaker overcards like AJ and KQ without a heart.

♦ Play Optimal Poker 2♠

If you said underpairs to the board, well, she actually never folds those. Opal's small pairs realize equity better on this flop than on many. Because of her nuts advantage, Ivan cannot simply barrel with impunity. Not coincidentally, some of the cards on which her range would otherwise be most condensed—offsuit 2s, 3s, and 4s—are the ones that improve this portion of her range.

Holding a heart makes a surprisingly large difference for the EV of these hands. Calling with 2♣ 2♠ is just barely better than folding. Calling with 2♥ 2♦, on the other hand, is worth more than \$0.50. A backdoor draw to the nut low flush may not seem like much, but it gives Opal another way to win the pot against hands like A♣ A♠.

6. Which hands will be pure raises?

Opal does not have any pure raises, but her most frequent raises are her strongest hands, 99 and T8s. On a dynamic board like this one, she has little incentive to slowplay. Most turn cards will improve some portion of her calling range to a nutty hand, so she does not have to worry about keeping strong flopped hands in her calling range.

Hands like 99 and T8s want to build pots against the stronger part of Ivan's range before the board gets scary. Even when it does not cost them the pot, a turned heart will make it much harder for those hands to get action from lower sets and overpairs.

7. With 76s and 66, Opal almost exclusively calls. Why does she so rarely raise these strong hands?

It comes down to equity preservation. These hands are not so strong once the pot gets large. By the time Ivan bets the flop and calls a check-raise, he has a relatively strong range. Small sets and two-pair lose even more equity on draw-completing turns. Even on a blank runout like 2♣ 3♠, Opal cannot feel great about these hands if Ivan keeps betting. She never raises the turn with 66, and she is indifferent between calling and raising if he bets a third time.

Resolve Mixed Strategies

9. Sets, straights, flush draws, and open-ended straight draws are intuitive check-raising candidates, but they do not comprise the entirety of Opal's range. What other sorts of hands should she mix in when constructing her check-raising range?

When building a large pot, Opal wants to have nutty hands, draws to nutty hands, and blockers to nutty hands on a variety of runouts. The candidates listed above provide her with nuttiness on the most obvious runouts: blanks, board pairs, third hearts, and Ts or 5s. They do not give her everything she needs to balance her ranges on future streets, though.

For one thing, there are other runouts to consider. She needs to check-raise some diamonds in case they come in, and she needs to make some straights when the turn is an 8. For the latter, she check-raises many combinations of Tx but very few of 5x. This is for roughly the same reason that she rarely check-raises 66 and 76: even if she makes the low end of the straight, she won't be able to play it strongly, so she isn't interested in growing the pot with these hands.

♦ Play Optimal Poker 2♠

Opal also needs bluffs when the turn is a heart or a blank. She may not have trouble finding weak hands she could bluff with, but ideally those weak hands will block the strongest parts of Ivan's range. Toward that end, she sometimes check-raises with a bare A♥ or A♦ anticipating profitable bluffs if hearts or diamonds come in on later streets.

10. If Opal suspected that Ivan would bet the flop at too high a frequency, how could she adapt her strategy to exploit him?

First off, she would lose her incentive to donk bet the flop. If Ivan will make betting mistakes, she should give him the opportunity to do so. Then she can raise with whatever hands she was going to bet and win even more.

She should raise more and fold less in general. Because Ivan's range is weaker, Opal's bluff and thin value raises will be more profitable, and her weak hands will win more often when they call. With 76s and 66, for instance, she should be more inclined to raise.

TEST YOURSELF

1. The player in first position raises to \$6 before the flop, and you call from the big blind. The flop comes 5♥ 4♦ 3♣. Should you check your entire range or develop a donk betting strategy? If you were to donk bet, what should your range look like?

The equilibrium strategy includes a significant donk betting range. In the simulation I ran, PioSolver donks half the pot with nearly 24% of the big blind's range. BB has an EV of \$6.23 when allowed to donk bet, compared to \$6.15 when forced to check. That may not seem like a lot, but it amounts to 4 big blinds per hundred hands, which would be a significant chunk of anyone's win rate. Even though the money moves in dramatic swings, poker is ultimately a game of small edges.

That said, BB's donk betting range is not especially intuitive and involves a lot of mixed strategies. Most hands are indifferent between betting and checking, and there are no pure bets. That means that in practice, you should consider how likely your opponent is to make mistakes when you donk bet relative to when you check, and also how likely you are to make mistakes either constructing your donk betting range or playing it at future decision points.

Nutty hands that do not want to let the opponent pot control with overpairs or take free cards with gutshots define the big blind's donk betting range. These are sets and straights, though she also bets strong but vulnerable hands such as overpairs and 65s.

Largely for board coverage reasons, BB bluffs a wide variety of weak hands including straight draws, backdoor flush draws, and various unpaired overcards.

♦ Play Optimal Poker 2♠

2. Suppose you check A♥ T♥ on the 5♥ 4♦ 3♣ flop and your opponent bets \$4. What's your play?

Don't fold. You did not hit the flop *per se*, but it would be a mistake to dismiss your hand as "nothing". You are getting great odds, you may have the best hand, and you have plenty of potential to improve.

At equilibrium, you are indifferent between calling and raising. Your opponent's continuation betting frequency, however, is just 18%. Against a pre-flop raiser who mistakenly bets his entire range, A♥ T♥ plays best as a raise. That's an extreme example, but how many of your opponents have the discipline to check back TT or AJs?

Many big blinds default to calling with hands that are mixed at equilibrium. That may seem like the safer option, but it is the reason why players can thrive despite continuation betting at a much-higher-than-equilibrium frequency. If anything, you should default to the aggressive strategy of raising with hands that would be mixed at equilibrium.

3. The player in first position raises to \$6 before the flop, and you call from the big blind. The flop comes J♦ 9♥ 7♦. Should you check your entire range or develop a donk betting strategy? If you were to donk bet, what should your range look like?

This is not a spot for donk betting unless you have an exploitative reason for doing so. While you may have a slight nuts advantage, it's overwhelmed by the disadvantage of being out of position on a dynamic board. It is simply too easy for your opponent to call your flop bet and then put you in a tough spot on the turn or river.

4. Suppose you check the $J\spadesuit 9\heartsuit 7\spadesuit$ flop and face a continuation bet of \$4. Consider your play with each of the following hands: $T\spadesuit 8\spadesuit$, $J\clubsuit J\heartsuit$, $9\clubsuit 7\clubsuit$, $A\clubsuit J\clubsuit$, $Q\clubsuit J\clubsuit$, $3\clubsuit 3\spadesuit$, $K\heartsuit Q\heartsuit$. Which should you be most likely to raise? Which should you raise least frequently?

You should be most likely to raise T8 and JJ. Slowplaying is generally a poor idea on coordinated boards like this one. Your opponent already has a lot of incentive to call your raise, so you do not need to “act weak” to get action. Your hand may lose value on future streets, so you want to get while the getting is good.

The next most frequent raise is $K\heartsuit Q\heartsuit$. With just King-high, you gain a lot from fold equity, but you also have three outs to the nuts plus your backdoor flush draw. Nutty draws with limited showdown value typically make the best bluffs.

AJ and 97 are poor raising candidates. They look strong on the flop, but they will be tough to play on many turns. As much as you would like to “take it down now”, your opponent is not going to fold the hands you would like him to fold. Raising only sets you up to get outplayed on future streets.

PioSolver does occasionally raise these hands at equilibrium, mostly for board coverage reasons. It raises QJ without a flush draw even more rarely, as that hand suffers from the same problems as AJ but does even less well when called. It is a good bluff-catcher that could get a bit stronger on the right turn, but it is not a hand you want to build a pot with.

Underpairs never raise. They have terrible equity when called, and even the few outs they do have are not all that nutty given how often your opponent will hold a straight, flush, or bigger set if you go to showdown in a

♦ Play Optimal Poker 2♠

large pot. With a diamond, underpairs mix between calling and folding. Without a diamond, they are pure folds.

5. How would your strategy with the above hands change if you instead faced a \$9 bet?

Against a larger bet, your check-raising range should be more polarized. That means you should be more inclined to raise your nuttiest hands—T8 and JJ—and less inclined to raise medium-strength hands like AJ and 97. Even 77 raises much less often against the large bet. QJ actually raises a bit more often, because against a larger bet it functions primarily as a bluff. Calling a large bet is less appealing than calling a small one, but the Q and the J are both good blockers to your opponent's range for continuing to a check-raise.

CONCLUSION

Opal builds her check-raising strategy on many of the same principles as Ivan built his betting strategy. She rarely slowplays strong hands, and she raises a variety of draws with an eye toward board coverage and nuttiness on future streets.

Unlike Ivan, she must also develop a folding range. This leads to her bluffing with some weaker hands than Ivan would, because she cannot simply check and see a free turn card. When the alternative is folding, raising can be appealing with weak hands.

Opal's folding range consists exclusively of unpaired overcards. Against a small bet, she simply cannot afford to fold very often, even with seemingly weak hands such as underpairs. These hands will not win often, but getting immediate odds of 4:1, they don't need to. Because Ivan will not have a nuts advantage on most turn cards, he cannot make heavy use of leverage, which enables Opal to realize equity reasonably well even with marginal hands.

Key Lessons

- ◆ **BB can donk bet.** The big blind has some incentive to develop a donk betting range on flops where she has a substantial nuts advantage. However, doing so tends to add a lot of complexity to her strategy without adding a lot of EV. The best reason for donk betting is as an exploit against opponents you expect to respond poorly to it, especially if you expect them to play reasonably well against a check.

♦ Play Optimal Poker 2♠

- ♣ **Check-raising is important.** Especially if she does not have a donk betting range, the big blind must make aggressive use of check-raises to push her nuts advantage and deny equity to her opponent. This range should mostly consist of strong made hands and a variety of draws so that she will have board coverage on many turns and rivers.
- ♣ **BB rarely folds.** While BB should rarely fold to small continuation bets in any situation, she should call especially often on boards where her opponent does not have a nuts advantage. She realizes equity particularly well on these boards because her opponent will not be able to use leverage to bet aggressively on many turns.

CHAPTER 8: BARRELING THE TURN

OVERVIEW & OBJECTIVES

We found that the early position raiser did not enjoy his usual range advantage on the 9♥ 7♦ 6♥ flop. An interesting dynamic occurs after the big blind checks and calls a small bet, though. Because she has so much incentive to raise her strongest hands, calling condenses her range more than it would on other boards. She mostly folds her weakest hands and raises her strong ones, leaving the marginal hands disproportionately in her calling range.

If she constructs her range well, then this effect is not too dramatic on most turns. She should be able to turn or river monster hands on most runouts and find good bluffing candidates with which to balance them. The degree to which her range will be condensed varies depending on the turn card, and on a few bad ones the effect can be dramatic.

In this chapter, we will investigate how Ivan constructs his ranges on various turn cards to get maximum leverage from whatever nuts advantage he may have.

By the end of this chapter, you should be able to:

- ♠ Distinguish between turn cards that make the board more or less dynamic.
- ♠ Estimate how various turn cards influence equity distribution.
- ♠ Identify turn overbetting opportunities.
- ♠ Balance your betting and checking ranges on various board textures.

SCENARIO: EVALUATING THE TURN

Assume Ivan raised to \$6 in first position and Opal called from the big blind. She checked and called a \$4 bet on a 9♥ 7♦ 6♥ flop. Ivan will have the option of betting either \$16 (75% of the pot) or \$42 (200% of the pot) on the following possible turn cards: 7♥, A♣, 8♠, 2♦. Make your best predictions concerning the questions below, then read on for the answers and explanations.

1. On which of these turns does Ivan have the most equity? On which does he have the least?
2. On which is Ivan's EV highest? On which is it lowest? Why?
3. On which of these cards will Ivan have the highest betting frequency? The lowest? Why?
4. On which of these will Ivan have a substantial overbetting range? What will it look like?

♦ Play Optimal Poker 2♠

Answers & Explanation

1. On which of these turns does Ivan have the most equity? On which does he have the least?

Ivan's Turn Equity on 9♥ 7♦ 6♦

	2	3	4	5	6	7	8	9	T	J	Q	K	A
♣	43.721	44.059	44.118	44.237	46.685	45.591	45.004	44.726	46.997	51.191	52.516	51.348	52.681
♦	44.53	44.802	44.872	44.866	47.24		45.259	44.837	47.161	51.799	53.013	51.718	52.976
♥	49.298	49.493	49.558	49.376		49.907	50.616		51.898	54.259	55.887	54.519	53.949
♠	43.721	44.059	44.118	44.237	46.685	45.591	45.004	44.726	46.997	51.191	52.516	51.348	52.681

The 2♦ is one of the worst turn cards for Ivan. Except for occasionally giving him a flush draw, which Opal could also easily turn, it does nothing to improve his unpaired hands.

The 8♠ is nearly as bad. Opal has so many straight and two-pair combos that Ivan's overpairs are not worth much anymore, and he cannot count on his unpaired hands being good even if they pair up on the river.

The A♣ is one of his best turns. He has much more Ax in his range than Opal does, and this card does not promote any of her draws to nutty hands.

The equity is evenly split on the 7♥.

2. On which is Ivan's EV highest? On which is it lowest? Why?

Ivan's Turn EV on 9♥ 7♦ 6♦

	2	3	4	5	6	7	8	9	T	J	Q	K	A
♣	10.937	10.977	10.986	10.639	11.949	11.45	11.02	10.673	12.13	12.924	12.955	13.285	12.843
♦	11.209	11.252	11.263	10.889	12.012		11.133	10.497	12.157	13.102	13.152	13.425	13.008
♥	13.273	13.329	13.339	12.651		12.214	13.833		13.966	14.308	14.531	14.439	13.24
♠	10.937	10.977	10.986	10.639	11.949	11.45	11.02	10.673	12.13	12.924	12.955	13.285	12.843

The A♣ is again best for him, as he enjoys both an equity and nuts advantage. The 7♥ is nearly as good, because although the equities are close, he is more likely to hold flushes, full houses, and quads; Opal check-raised many of her draws to these hands on the flop.

Though Ivan's equity is lower on the 2♦ than on the 8♠, his EV is a bit better. Whereas the 8 introduces many nutty hands into Opal's range, she is largely condensed on the 2, enabling Ivan to treat his overpairs as near-nut hands and exert leverage accordingly.

3. On which of these cards will Ivan have the highest betting frequency? The lowest? Why?

This chart shows Ivan's betting strategy on each possible turn card. The white portion of each box represents his checking frequency, the gray portion his 75% pot betting frequency, and the black his 200% pot betting frequency. Don't worry if you can't read the exact frequencies; our concern is only with the overall pattern.

♦ Play Optimal Poker 2♠

Ivan's Turn Barreling Strategy on 9♥ 7♦ 6♦

	2	3	4	5	6	7	8	9	T	J	Q	K	A	
	942 310 CHECK 2.00% 44.70% 25.70%	942 310 CHECK 11.03% 28.84% 59.32%	942 310 CHECK 11.64% 28.69% 59.47%	942 310 CHECK 0.26% 21.45% 58.29%	942 310 CHECK 0.03% 21.79% 58.18%	942 310 CHECK 0.42% 21.12% 57.91%	942 310 CHECK 0.82% 20.39% 57.65%	942 310 CHECK 7.21% 26.39% 57.65%	942 310 CHECK 0.47% 24.68% 58.81%	942 310 CHECK 0.23% 24.21% 59.53%	942 310 CHECK 0.49% 24.21% 59.30%	942 310 CHECK 0.47% 24.21% 59.30%	942 310 CHECK 19.84% 28.28% 51.87%	942 310 CHECK 24.92% 10.25% 64.81%
	942 310 CHECK 8.48% 38.20% 53.32%	942 310 CHECK 14.13% 27.18% 58.69%	942 310 CHECK 14.13% 27.18% 58.69%	942 310 CHECK 0.24% 21.07% 58.70%	942 310 CHECK 0.24% 21.07% 58.70%	942 310 CHECK 0.24% 21.07% 58.70%	942 310 CHECK 0.24% 21.07% 58.70%	942 310 CHECK 7.88% 24.94% 67.17%	942 310 CHECK 0.20% 24.94% 68.32%	942 310 CHECK 0.23% 24.94% 68.32%	942 310 CHECK 0.49% 24.94% 68.32%	942 310 CHECK 0.49% 24.94% 68.32%	942 310 CHECK 24.6% 24.39% 51.1%	942 310 CHECK 26.11% 11.78% 62.11%
	942 310 CHECK 1.61% 37.75% 58.46%	942 310 CHECK 1.61% 37.75% 58.46%	942 310 CHECK 1.61% 37.75% 58.46%	942 310 CHECK 0.75% 38.07% 59.18%	942 310 CHECK 0.75% 38.07% 59.18%	942 310 CHECK 0.75% 38.07% 59.18%	942 310 CHECK 0.75% 38.07% 59.18%	942 310 CHECK 38.74% 48.05% 48.17%	942 310 CHECK 0.42% 48.17% 51.51%	942 310 CHECK 0.42% 48.17% 51.51%	942 310 CHECK 0.42% 48.17% 51.51%	942 310 CHECK 0.42% 48.17% 51.51%	942 310 CHECK 19.6% 38.46% 48.94%	942 310 CHECK 1.61% 38.46% 48.94%
	942 310 CHECK 2.00% 44.70% 25.70%	942 310 CHECK 11.03% 28.84% 59.32%	942 310 CHECK 11.64% 28.69% 59.47%	942 310 CHECK 0.26% 21.45% 58.29%	942 310 CHECK 0.03% 21.79% 58.18%	942 310 CHECK 0.42% 21.12% 57.91%	942 310 CHECK 0.82% 20.39% 57.65%	942 310 CHECK 7.21% 26.39% 57.65%	942 310 CHECK 0.47% 24.68% 58.81%	942 310 CHECK 0.23% 24.21% 59.53%	942 310 CHECK 0.49% 24.21% 59.30%	942 310 CHECK 0.47% 24.21% 59.30%	942 310 CHECK 19.84% 28.28% 51.87%	942 310 CHECK 24.92% 10.25% 64.81%

Ivan bets most frequently on cards like the 7♥ that complete the flush draw or open-ended straight draw. While Opal has some of these draws in her calling range, she had a lot of incentive to raise them on the flop. Ivan had a lot of incentive to bet strong draws on the flop and therefore has more of them in his range on these turns.

Ivan bets less often on the cards that are worst for his equity, which are mostly small non-hearts like the 2♦. He bets even less on the 8♠ because, as discussed above, it uncaps Opal's range in a way the 2 does not.

Ivan's betting frequency is also low on the A♣, even though it is one of the best turns for his equity and EV. This is because he has many strong but marginal hands on this turn, including big pocket pairs and pairs of Aces, that do not benefit terribly much from fold equity and also do not want to face a check-raise or play a large pot. When he does bet, he does so with a mostly polarized range; he plays all his TT through KK and most of his Ax as pure checks.

4. On which of these will Ivan have a substantial overbetting range? What will it look like?

The only cards on which Ivan does substantial overbetting are non-heart As and Ks and the 8♥. These ranges are polarized, as big bets always are.

On the A♣, he overbets mostly sets (he benefits from having AA in his range while Opal does not), flush draws, pair-plus-draws like 98, and unpaired hands with no draw. As discussed above, he never bets medium-strength hands like KK.

The 8♥ is a special turn, which is why it is the only heart on which Ivan overbets. Hearts in general are good turns for Ivan because he makes more flushes than Opal. On most heart turns his bets target her one-pair hands, for which a small bet is sufficient. On the 8♥, though, Opal makes a lot of straights, and Ivan can make her indifferent to continuing with them by overbetting. His range is mostly flushes, sets, and overcards with one big heart which functions as both a draw and a blocker.

SCENARIO: BARRELING THE 7♥

Ivan raises to \$6 in first position before the flop and Opal calls from the big blind. She checks and calls a \$4 bet on a 9♥ 7♦ 6♥ flop, then checks again on the 7♥ turn. At future opportunities, players may check, bet 75% of the pot, or bet 200% of the pot. Raises of 50% of the pot are permitted, and if Opal calls the turn, she will have the option to donk bet the river for 50% of the pot.

We have already established that, although Ivan has the nuttier range, he does not overbet on this turn card. So, we will look at how he constructs his ranges for checking and for betting \$16.

Questions

1. Does this card make the board more or less static? Why?
2. Which strong hands will Ivan bet for value at 100% frequency? Why are these hands such appealing bets?
3. Which weak hands will Ivan bluff most frequently? Why are these such good bluffing candidates?
4. What are Ivan's pure checks? What do they have in common?
5. With most flushes, Ivan is indifferent between betting and checking. But he always bets A♥ 4♥ and A♥ 3♥, and he always checks A♥ K♥. What makes these special, and why does he play them differently from each other?

Answers & Explanation

1. Does this card make the board more or less static? Why?

It makes the board more static. The strongest possible hands—nut flushes, full houses, and quads—will continue to be the strongest possible hands on most rivers. This means protection is not a significant concern for either player. The player with the nuts advantage bets a polarized range while his opponent checks and calls a condensed range.

2. Which strong hands will Ivan bet for value at 100% frequency? Why are these hands such appealing bets?

Ivan's pure value bets are his strongest hands: quads, full houses, and nut flushes; this is not a board for slowplaying. Although Opal has the occasional straight flush, Ivan has the overall nuts advantage, so he cannot count on her to build the pot for him. Even many of her flushes will not put stacks in voluntarily. He must bet to build a pot against her marginal hands.

Ivan also has some marginal hands that he bets often for protection and equity denial. These are hands like QQ and KK that benefit from folds but have decent equity when called. Because of his nuts advantage, Ivan does not have much to fear from a check-raise; Opal raises just 8% at equilibrium. That means he can safely include these hands in a depolarized betting range.

♦ Play Optimal Poker 2♠

3. Which weak hands will Ivan bluff most frequently? Why are these such good bluffing candidates?

Ivan does not have any pure bluffs. He frequently bets overcards-plus-flush-draw combos like $A♥ K♦$, but he also has some incentive to check them. They have a shred of showdown value, and they provide board coverage on heart rivers.

He also bluffs total air with little or nothing to gain from checking, such as $Q♦ J♦$. Ivan has a big enough range advantage on this turn to bluff profitably with his weakest holdings.

4. What are Ivan's pure checks? What do they have in common?

Ivan's pure checks are mostly about equity preservation. They are hands with some showdown value against the weaker part of Opal's range that will not fare well against the stronger hands that would continue to a bet. This includes hands like 88 and AK without a heart; with a heart he mixes bets and checks. T9 and 98 are high-frequency checks for the same reasons. $A♥ K♥$ is a special case we will discuss below.

5. With most flushes, Ivan is indifferent between betting and checking. But he always bets $A♥ 4♥$ and $A♥ 3♥$, and he always checks $A♥ K♥$. What makes these special, and why does he play them differently from each other?

Blockers are the key to understanding why Ivan plays these differently. Naturally, he would love to build the pot when he holds the nut flush. The question is what cards Opal needs to hold in order to come along from behind in a large pot. The best-case scenario would be if she had the second-nut flush, or at least a draw to the second-nut flush. She cannot have that when Ivan holds the K♥, so he strictly prefers slowplaying A♥ K♥. He would get less value from betting it than from betting other flushes, so he gives up less by checking it.

The nut flush with a small kicker has the opposite property. Ivan is more interested in building the pot than when he holds a lower flush, and because his second heart is small, he does not block Opal's calling range. That makes these hands especially high-value bets.

SCENARIO: BARRELING THE 2♦

The 2♦ is one of the worst cards for Ivan, but that does not mean Opal has any interest in betting out when it comes. She still has the more condensed range and checks 100% at equilibrium, as she does on all blank turn cards.

Ivan does not have an equity advantage, though, which means he cannot bet anywhere near his entire range. He must construct betting and checking ranges with board coverage in mind.

Ivan raises to \$6 in first position before the flop and Opal calls from the big blind. She checks and calls a \$4 bet on a 9♥ 7♦ 6♥ flop, then checks again on the 2♦ turn. At future opportunities, players may check, bet 75% of the pot, or bet 200% of the pot. Raises of 50% of the pot are permitted, and if Opal calls the turn, she will have the option to donk bet the river for 50% pot.

Ivan has an overbetting range of about 6% at equilibrium, but we will focus on how he splits his range between checking and betting \$16.

Questions

1. Does this turn card make the board more static or more dynamic? Why?
2. Ivan always bets 99 and 77, his nuttiest hands. Why does he not ever slowplay these in order to keep nutty hands in his checking range?

3. Ivan always bets $Q♥ Q♦$ and $K♥ K♦$. He mixes other combinations, with $Q♠ Q♣$ and $K♠ K♣$ being the lowest-frequency bets. He follows a similar pattern with AA, with $A♠ A♣$ being a pure check. Why does a single card of a flush draw suit make these pairs more appealing bets?

4. To have board coverage on as many rivers as possible, Ivan includes straight draws, heart draws, and diamond draws in both his betting and checking ranges. How does he choose which draws to bet and which to check?

Answers & Explanation

1. Does this turn card make the board more static or more dynamic? Why?

The 2♦ makes the board more dynamic. It introduces a second flush draw and leaves open the possibility of many overcards to the current top pair coming on the river. Virtually every river card will change the value of large portions of both players' ranges, which means board coverage will play an important role in Ivan's range construction process. It also means that, despite having a nuts advantage, he will bet a depolarized range that includes many semi-bluffs and protection bets. His nuts advantage protects these hands from aggressive check-raising.

2. Ivan always bets 99 and 77, his nuttiest hands. Why does he not ever slowplay these in order to keep nutty hands in his checking range?

Slowplaying is generally incorrect on dynamic boards. Ivan's sets are much nuttier on the turn than they will be on many rivers, so he has considerable incentive to bet them immediately. Checking a variety of draws ensures he will make nutty hands on most rivers at much lower cost, as these hands give up less by not betting the turn.

Additionally, facing big bets is less scary on the river, because there is no leverage behind them. Even on rivers where Ivan is more capped as a result of not checking sets on the turn, he can simply suck it up and call with bluff-catchers at a frequency that makes Opal indifferent to bluffing. He does not have to worry about getting bet off his hand on future streets.

3. Ivan always bets $Q♥ Q♦$ and $K♥ K♦$. He mixes other combinations, with $Q♠ Q♣$ and $K♠ K♣$ being the lowest-frequency bets. He follows a similar pattern with AA, with $A♠ A♣$ being a pure check. Why does a single card of a flush draw suit make these pairs more appealing bets?

Holding a heart increases the value of pairs on heart rivers. When the $3♥$ comes, for instance, Ivan value bets all his AA for 75% pot. The EV of this bet is about \$47 if he holds the $A♥$ and \$42 if he does not.

Blockers are not only about bluffing. It is also more profitable to value bet when you are less likely to run into strong hands. Anticipating that extra value on the river makes betting the turn slightly more profitable.

4. To have board coverage on as many rivers as possible, Ivan includes straight draws, heart draws, and diamond draws in both his betting and checking ranges. How does he choose which draws to bet and which to check?

The main factor driving Ivan's betting decisions is the degree to which his hand benefits from folds. He never bets AK, even with a flush draw, because it has a real chance of winning unimproved. Opal occasionally folds small pairs, but mostly she folds dominated hands that would be unlikely to draw out on AK anyway.

With AQ and AJ, Ivan is slightly more interested in fold equity, as Opal often folds AK and AQ. He does not bet these hands without a flush draw, but with diamonds or hearts he is indifferent.

He always bets $A♦ T♦$ and $A♥ T♥$. These value fold equity even more highly, plus the gutshot gives them extra equity when called by Opal's stronger hands. Lower flush draws are high-frequency bets for similar reasons.

♦ Play Optimal Poker 2♠

Ivan's only open-ended straight draws are 88 and 98. With 88, he always checks. Betting 98 is more profitable because it extracts value from Opal's 88 and 87. He always bets 9♦ 8♦; other combos are a mix.

TEST YOURSELF

1. You raise to \$15 from first position at a nine-handed \$2/\$5 no-limit hold 'em table, and the big blind calls. The flop comes 9♦ 6♠ 5♠. The big blind checks, you bet \$10, and the big blind calls. She checks again on an A♦ turn. How should you play each of the following hands?

99?

Overbet. Even though the A favors your range, your opponent has plenty of Ax you can target for value. An overbet also gets you profitable calls from some draws, like Q♠ 9♠, and valuable folds from others, like J♠ T♠.

AA?

Bet. Unlike 99, which strictly prefers overbetting, AA can bet big or small. It is not a hand to slowplay, though, as it will be weaker on many rivers than it is now.

9♠ 8♠?

Overbet. Although your hand has showdown value, it still benefits a lot from folds and gains some additional value from blocking 99. A 200% pot bet makes hands as strong as AK indifferent to calling, and you have your draws as back-up if your opponent calls.

♦ Play Optimal Poker 2♠

JJ?

Check. There is a fair chance you have the best hand, but your equity is not robust. As the pot gets larger, your opponent's range gets stronger, causing your hand to lose value. A check preserves your equity by keeping the pot small and your opponent's range wide.

AQ?

Check. Yes, your hand is strong, and the board is scary. Even on blank runouts, though, your hand will not be strong enough to bet both turn and river, so you must choose one. It will be more profitable to make your value bet on the river, when the threat of leverage no longer deters your opponent from calling with marginal hands. This also protects you from getting check-raised by a polarized range on the turn.

You can make an exception for AQ of spades. The flush draw means you will more often hold a hand worth value betting on the river, which increases the value of growing the pot on the turn.

7♠ 7♦?

You can check, but this is also a good candidate for overbetting as a bluff. Blocking 87 and combo draws is a big deal, and your hand has very little showdown value on this turn. When turning a pair into a bluff, it's usually best to bet big, especially if you block the nuts.

2. What if the BB checked and called the 9♦ 6♠ 5♠ flop and the turn were the 8♣? If your opponent checked, how should you play each of the following hands?

KK?

Betting or checking are both options, though most people do not consider betting. Yes, your opponent is more likely to have a 7, but he still does not have much 7x in his range and should call with many weaker pairs and draws.

Your hand may be marginal, but it is not getting any stronger. There are quite a few rivers where you will not be happy to face a bet, so there may well be more value in betting the turn. Getting raised is unpleasant, as it reduces your hand to a \$0 EV bluff-catcher, but it does not happen all that often.

You should be a bit more likely to bet if you have the K♠, as your hand will have more value on spade rivers.

Q♠ J♠?

Bet. This hand benefits tremendously from folds while still having good equity when called. You should not overbet, because you want to preserve the value of your pair outs, but 75% pot or so is good.

Checking because you do not want to get raised is a mistake. You may not **want** to get raised, but your hand is good enough to call if you are, and you really value the folds a bet can generate. You should think of draws as bluffing hands first and foremost, rather than as made-hands-in-waiting.

♦ Play Optimal Poker 2♠

88?

Bet. You do not need the nuts to value bet here. Your hand is extremely strong against lower pairs, and it even has outs against a straight!

A♠ J♣?

Bet. Even without a draw, your hand has betting potential. Not many better hands fold the flop, but betting denies a lot of equity, blocks nut flush and straight draws, and sets you up to bluff spade rivers profitably with a great blocker. Plus, your pair outs are occasionally live.

A♠ Q♠?

Check. This looks like an obvious semi-bluffing candidate, but it has too much showdown value for that. You can win unimproved on blank rivers, and you want to have some flush draws in your checking range. It is better to bet weaker flush draws; even nut flush draws with smaller kickers are better bluffing candidates.

CONCLUSION

Even on boards where Ivan does not flop a nuts advantage, he typically has one after Opal calls his flop bet. This is because he bets many of his strongest hands on the flop, while she raises most of hers. By not raising, she essentially announces that she does not have a nutty hand. This is relatively safe for her to do, because if she constructs her calling range well, most turns will make nut hands possible for her.

That prevents Ivan from barreling the turn with abandon, but he can leverage a nuts advantage to bet strong hands, well-chosen bluffs, and even vulnerable marginal hands that would suffer if check-raised. Ivan's nuts advantage prevents Opal from check-raising all but a narrow range.

Identifying the best bluffing candidates in this situation is not trivial. The answer varies considerably with the board texture. Static turns call for a more polarized betting range, with very low equity hands serving as the best bluffs. On such turns, there are few draws; you either have it or you don't.

Dynamic turns call for a depolarized betting range comprised of a variety of semi-bluffs and thin value bets. The variety is important to maintain board coverage on as many rivers as possible, because minimizing the exploitability of both your betting and checking ranges on all rivers is such a challenge.

Key Lessons

- ♠ **The flop aggressor typically has the nuts advantage on the turn, even if the flop did not favor him.** Aggressive actions polarize ranges, while passive actions condense them. When a player declines to raise the flop, she is less likely to have nutty hands.
- ♠ **Heuristics for barreling the turn vary with the dynamism of the board.** Static boards reward a more polarized betting range, while dynamic boards require more semi-bluffing and protection/thin value betting.
- ♠ **Playing out of position is more disadvantageous on dynamic boards.** Splitting your range while maintaining board coverage is tougher on dynamic boards, because there are more meaningfully different runouts to consider. By definition, a static flop means the same hands will be strong on most turn cards, while a dynamic flop means you must prepare for straight draws, flush draws, and a variety of overcards. That requires a lot of compromises that cost you EV.

CHAPTER 9: ATTACKING A MISSED CONTINUATION BET

OVERVIEW & OBJECTIVES

There are at least two things wrong with the title of this chapter. First, referring to a check as a “missed” continuation bet implies some sort of error or lost opportunity, but we have seen that in many cases the pre-flop raiser’s optimal strategy includes at least some checking on the flop. This is, however, the name the poker community has applied to a flop check from the pre-flop raiser.

It has also become commonplace to speak of “attacking” the pre-flop raiser in this scenario. This is unfortunate because, as we shall see, a check from the pre-flop raiser is not at all a green light to bet the turn, at least not if he is a competent player. Mostly you should check to him again.

A well-constructed check back range from the pre-flop raiser may be condensed, but it will not be weak enough for a bet from any two cards to profit. As the big blind caller, you are at a positional disadvantage and likely an equity disadvantage as well. You can pressure your opponent’s marginal hands with leveraged bets from a polarized range, but you cannot shovel money into the pot willy-nilly.

In this chapter, we will look at how Opal constructs her betting and checking ranges on various turns if Ivan checks back the flop. By the end of this chapter, you should be able to:

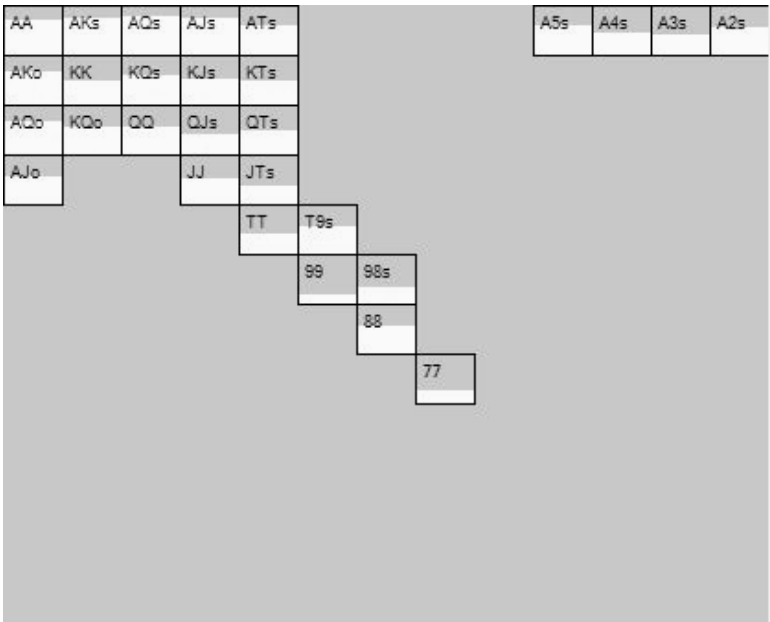
- ♠ Construct a turn betting range that effectively denies equity to the pre-flop raiser’s marginal hands.
- ♠ Weigh the merits of betting versus check-raising.
- ♠ Construct a balanced turn checking range.
- ♠ Exploit an imbalanced check from the pre-flop raiser.

SCENARIO: EVALUATING THE TURN

Assume Ivan raised to \$6 in first position and Opal called from the big blind. They both checked a 9♥ 7♦ 6♥ flop. Opal may now check, bet \$10, or bet \$26 on the following possible turn cards: 7♥, A♣, 8♠, 2♦.

In the previous chapter, we investigated how Ivan's flop betting range stacked up against Opal's calling range. Now we will investigate how his checking range stacks up against her starting range. The grid below shows Ivan's flop checking range, with boxes highlighted in proportion to how often Ivan checks those hands. Opal's starting range is the default one from page 12, as she checked her entire range on the flop.

Ivan's Checking Range on 9♥ 7♦ 6♦



♦ Play Optimal Poker 2♠

Questions

1. Which player has the equity advantage before the turn card is revealed?
2. Which player has the nuts advantage before the turn card is revealed?
3. On which of these turns does Opal have the most equity? On which does she have the least?
4. On which is Opal's EV highest? On which is it lowest?
5. On which of these cards will Opal have the highest betting frequency? The lowest? Why?
6. On which of these will she have a substantial overbetting range? What will it look like?
7. On which of these turns will Opal have the highest check-raising frequency against a \$10 bet? Why?

Answers & Explanation

Assume Ivan raised to \$6 in first position and Opal called from the big blind. They both checked a 9♥ 7♦ 6♥ flop. Opal may now check, bet \$10, or bet \$26 on the following possible turn cards: 7♥, A♣, 8♠, 2♦.

1. Which player has the equity advantage before the turn card is revealed?

Opal has 52.5% equity, a bigger advantage than the 50.5% she had on the flop. Ivan weakens his range to some degree by checking.

2. Which player has the nuts advantage before the turn card is revealed?

Opal again. She had the nuts advantage on the flop, and Ivan's checking range should be more condensed than his betting range. The turn card could change this dynamic, but in general Opal has a significant nuts advantage relative to Ivan's flop checking range.

We can confirm this by calculating her equity realization. Her equilibrium EV after Ivan checks is \$6.86, which is 52.8% of the \$13 pot. Despite being out of position, she slightly over-realizes her equity of 52.5%, which means she must benefit from a nuts advantage.

♦ Play Optimal Poker 2♠

3. On which of these turns does Opal have the most equity? On which does she have the least?

Opal's Turn Equity on 9♥ 7♦ 6♦

	2	3	4	5	6	7	8	9	T	J	Q	K	A
♣	53.284	53.306	53.243	53.242	51.374	51.62	55.514	52.154	55.009	55.269	50.733	52.695	44.281
♦	52.904	52.935	52.877	52.883	51.262		55.143	51.685	54.372	54.679	50.068	52.046	44.339
♥	53.623	53.702	53.648	53.634		52.561	54.658		53.943	53.865	50.13	52.089	46.176
♠	53.284	53.306	53.243	53.242	51.374	51.62	55.514	52.154	55.009	55.269	50.733	52.695	44.281

Opal's best turn cards are Js, Ts, and 8s, followed by the small cards that mostly don't change the board texture. Aces are much worse for her than any other turn.

This is somewhat different from the result when we compared her flop calling range to Ivan's betting range. In that case, the small cards were her best cards, and while Aces were the worst, the difference was not quite so dramatic.

Ivan's incentives on the flop explain this difference. He bets hands like JT and QT disproportionately often because they are good bluffing candidates. Even though checking them at a higher frequency would reduce his vulnerability on certain turns, it is not worth the tradeoffs. Likewise, his Ax hands are good checking candidates even though they do not have especially good implied odds when they improve to a pair of Aces because Opal can predict that Ivan will be strong on A turns.

4. On which is Opal's EV highest? On which is it lowest?

Opal's Turn EV on 9♥ 7♦ 6♦

	2	3	4	5	6	7	8	9	T	J	Q	K	A
♣	7.271	7.3178	7.303	7.3826	6.6765	6.8791	7.4123	7.2915	7.0749	7.0595	6.5341	6.5837	5.6976
♦	7.0782	7.1025	7.0937	7.165	6.7193		7.2444	7.1533	6.8929	6.9087	6.4079	6.4616	5.7892
♥	6.7647	6.798	6.7921	6.9154		6.9996	6.7133		6.5207	6.3079	6.0091	6.1809	6.178
♠	7.271	7.3178	7.303	7.3826	6.6765	6.8791	7.4123	7.2915	7.0749	7.0595	6.5341	6.5837	5.6976

Small and medium cards tend to be best for Opal's EV, with bigger cards being less good and Aces being the worst. There are some exceptions, though. She will have a harder time denying equity on heart turns. Even diamonds, which put up a backdoor flush draw, make it easier for Ivan to find calls with his marginal hands.

These results would look different against an opponent who does not think in terms of board coverage. Many human players in Ivan's shoes construct their ranges in ways that unbalance them on certain runouts. For example, it is common to see players continuation bet 100% of the time that they have a flush draw on boards like this one. Such players will have less equity and EV on flush card turns than Ivan's well-constructed range does in this example.

5. On which of these cards will Opal have the highest betting frequency? The lowest? Why?

The chart below shows Opal's strategy on each possible turn card. The white portion of each box represents her checking frequency, the gray portion her 75% pot betting frequency, and the black her 200% pot betting frequency:

♦ Play Optimal Poker 2♦

Opal's Turn Betting Strategy on 9♥ 7♦ 6♦

	2	3	4	5	6	7	8	9	T	J	Q	K	A	
♣	28.87% CHECK	10.81% CHECK	6.31% CHECK	5.58% CHECK	19.50% CHECK	3.55% CHECK	7.82% CHECK	0.188% CHECK	6.74% CHECK	3.37% CHECK	12.95% CHECK	17.52% CHECK	16.3% CHECK	11.84% CHECK
♦	25.49% CHECK	9.84% CHECK	28.24% CHECK	10.14% CHECK	0.28% CHECK	9.27% CHECK	0.22% CHECK	16.91% CHECK	0.347% CHECK	19.68% CHECK	19.55% CHECK	19.35% CHECK	18.32% CHECK	18.32% CHECK
♥	18.58% CHECK	0.37% CHECK	0.334% CHECK	0.302% CHECK	0.31% CHECK	0.29% CHECK	15.96% CHECK	0.442% CHECK	0.193% CHECK	0.232% CHECK	0.339% CHECK	0.38% CHECK	0.48% CHECK	6.49% CHECK
♠	29.52% CHECK	19.81% CHECK	6.31% CHECK	5.58% CHECK	19.50% CHECK	3.55% CHECK	7.82% CHECK	0.188% CHECK	6.74% CHECK	3.37% CHECK	12.95% CHECK	17.52% CHECK	16.3% CHECK	11.84% CHECK

Opal's betting frequency correlates more strongly with her EV than with her equity. That she can bet often on, say, the 5♣ is why her EV is so high. The 5♥ is better for her equity, but she bets much less often because Ivan has an easier time defending his equity when so much of it is wrapped up in flushes and flush draws.

6. On which of these will she have a substantial overbetting range? What will it look like?

Opal overbets most often on non-heart face cards. These turns are the worst for her equity and EV, but that is precisely why she overbets them. Her marginal hands cannot bet small for thin value and protection on cards that improve so much of Ivan's range. As only Opal's strongest and weakest hands profit from betting, her range is polarized and she prefers a larger bet size.

7. On which of these turns will Opal have the highest check-raising frequency against a \$10 bet? Why?

The chart below shows Opal's strategy facing a \$10 bet. White represents folds, gray represents calls, and black represents raises to \$26.

Opal's Strategy Facing a Turn Bet on 9♥ 7♦ 6♦

	2	3	4	5	6	7	8	9	T	J	Q	K	A	
♣	R:26 3.815% CALL 52.51% FOLD 45.57%	R:26 3.976% CALL 49.19% FOLD 46.84%	R:26 3.951% CALL 49.34% FOLD 46.7%	R:26 3.873% CALL 52.34% FOLD 45.73%	R:26 3.907% CALL 49.64% FOLD 46.4%	R:26 3.907% CALL 46.19% FOLD 46.55%	R:26 3.907% CALL 46.19% FOLD 46.55%	R:26 3.907% CALL 46.19% FOLD 46.55%	R:26 2.197% CALL 52.05% FOLD 45.61%	R:26 3.972% CALL 50.81% FOLD 49.42%	R:26 3.844% CALL 46.42% FOLD 43.73%	R:26 3.097% CALL 41.53% FOLD 50.37%	R:26 3.785% CALL 47.4% FOLD 46.94%	R:26 3.952% CALL 55.9% FOLD 50.15%
♦	R:26 3.883% CALL 47.59% FOLD 46.42%	R:26 3.973% CALL 45.64% FOLD 46.33%	R:26 3.922% CALL 46.8% FOLD 46.38%	R:26 3.801% CALL 49.25% FOLD 46.95%	R:26 3.957% CALL 44.48% FOLD 45.07%			R:26 3.916% CALL 53.2% FOLD 5.09%	R:26 3.838% CALL 48.98% FOLD 45.38%	R:26 3.834% CALL 46.9% FOLD 45.9%	R:26 3.845% CALL 46.4% FOLD 44.63%	R:26 3.222% CALL 39.77% FOLD 51.01%	R:26 7.03% CALL 45.72% FOLD 47.25%	R:26 4.428% CALL 55.44% FOLD 50.14%
♥	R:26 3.521% CALL 53.22% FOLD 46.25%	R:26 3.479% CALL 53.29% FOLD 46.21%	R:26 3.656% CALL 53.02% FOLD 46.33%	R:26 3.711% CALL 51.33% FOLD 47.4%		R:26 3.16% CALL 42.3% FOLD 49.1%	R:26 3.179% CALL 43.3% FOLD 46.04%		R:26 7.03% CALL 52.8% FOLD 45.9%	R:26 3.451% CALL 39.17% FOLD 43.38%	R:26 3.437% CALL 44.8% FOLD 49.81%	R:26 3.691% CALL 46.01% FOLD 46.09%	R:26 4.072% CALL 56.89% FOLD 59.44%	
♠	R:26 3.818% CALL 50.81% FOLD 45.57%	R:26 3.976% CALL 48.19% FOLD 46.84%	R:26 3.951% CALL 49.34% FOLD 46.7%	R:26 3.873% CALL 52.34% FOLD 45.73%	R:26 3.907% CALL 49.64% FOLD 46.4%	R:26 3.907% CALL 46.19% FOLD 46.55%	R:26 3.907% CALL 46.19% FOLD 46.55%	R:26 3.907% CALL 46.19% FOLD 46.55%	R:26 2.197% CALL 52.05% FOLD 45.61%	R:26 3.972% CALL 50.81% FOLD 49.42%	R:26 3.844% CALL 46.42% FOLD 43.73%	R:26 3.097% CALL 41.53% FOLD 50.37%	R:26 3.785% CALL 47.4% FOLD 46.94%	R:26 3.952% CALL 55.9% FOLD 50.15%

She check-raises most often on the J♣ and the J♠ (strategically, these two cards are interchangeable), where her frequency is just over 9%. These cards are at a sweet spot where they improve enough of Ivan's range that he has incentive to bet reasonably often when checked to, yet they do not upend Opal's nuts advantage.

On many turns, Ivan simply does not bet often when checked to, giving Opal little incentive to check her strongest hands. On A and K turns, Ivan bets more often, but because he has KK and AA in his range while Opal does not, it is hard for her to raise a polarized range.

The takeaway here is that Opal does not do much check-raising after the flop checks through. She mostly bets her strong hands and checks a weaker, condensed range. Because Ivan weakened and condensed his own range by checking back the flop, there is not much he can do to take advantage of Opal's weakened checking range.

♦ Play Optimal Poker 2♠

SCENARIO: ATTACKING THE 7♥

Ivan raises to \$6 in first position before the flop and Opal calls from the big blind. They both check the 9♥ 7♦ 6♥ flop, and the turn is the 7♥. Players may check, bet 75% of the pot, or bet 200% of the pot. Raises of 50% of the pot are permitted, and if Opal checks and calls the turn, she will have the option to donk bet the river for 50% pot.

Envision Starting Ranges

1. Which player has the equity advantage on the 7♥ turn?
2. Which player has the nuts advantage on the 7♥ turn?

Determine Needed Ranges

3. Will Opal mostly bet or mostly check? Why?
4. After checking, will Opal mostly fold, call, or raise if faced with a \$10 bet?
5. When Opal does bet, will she prefer to bet \$10 (75% of the pot) or \$26 (200% of the pot)?

Identify Pure Strategies

6. Which hands will be pure bets for Opal? Why?
7. Which hands will be pure checks? Why?

Resolve Mixed Strategies

8. Which of Opal's strongest holdings will be best to mix into her checking range?
9. Which weak hands will Opal mix into her betting range? What makes these good bluffing candidates?

Answers & Explanation

1. Which player has the equity advantage on the 7♥ turn?

Opal does, with 52.6% equity. She had 52.5% before the turn card was revealed, so this is merely an average turn for her equity.

2. Which player has the nuts advantage on the 7♥ turn?

Opal does. Not only is she the only player with T♥ 8♥, but Ivan had a lot of incentive to bet his sets on the flop. That means Opal is far more likely than he to make a full house on this turn.

3. Will Opal mostly bet or mostly check? Why?

She mostly checks, with more than 80% of her range. That might be surprising, given her equity and nuts advantage, but she still has a positional disadvantage. Many of her marginal hands will be tough to play on the river if Ivan calls her turn bet, so she does not have much incentive to bet them.

Ivan's flop checking range may be capped, but it still contains many strong hands, especially overpairs. Your real-life opponents may have much weaker flop checking ranges, in which case you can safely bet hands like Q9 on this turn. At equilibrium, however, Opal cannot simply assume she has the best hand when she holds top pair.

4. After checking, will Opal mostly fold, call, or raise if faced with a \$10 bet?

Opal raises less than 2%, a range you should round to 0% for simplicity's sake. She splits the rest 50/50 between calling and folding in a manner that's quite intuitive: she is indifferent with 65, always calls with stronger hands, and always folds weaker hands unless she has a heart, in which case she always calls. She strictly folds 55 and AQ without a heart but strictly calls such hands when they have a flush draw. Even AT for two overcards and a gutshot is not strong enough to call without a heart, in no small part because a straight will not be an especially nutty hand on the river.

5. When Opal does bet, will she prefer to bet \$10 (75% of the pot) or \$26 (200% of the pot)?

She bets \$26 about 16% of the time and \$10 about 3% of the time. For practical purposes, you can ignore the small bet range and simply split your range between overbetting and checking.

Why does Opal prefer the overbet? As discussed above, her marginal hands are not strong enough to bet for value/protection anyway, so she is betting a polarized range, and polarized ranges prefer large bets. Given the opportunity, she would prefer to bet even more than 200% of the pot!

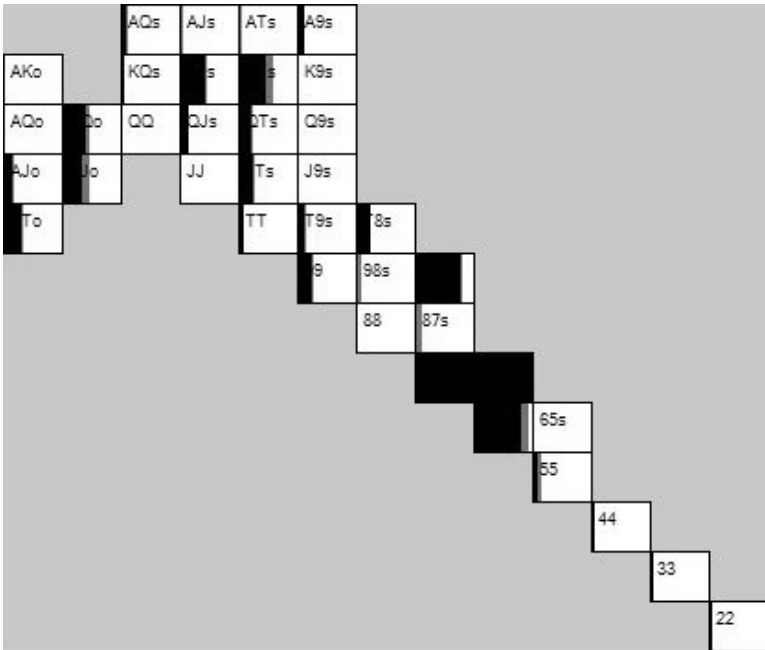
She would also, given the opportunity, prefer to bet less than \$10 with much of her range. For a sufficiently small bet—\$4, for instance—she could profitably push equity and protect her one-pair hands. Her low betting frequency in this scenario is in part a function of the bet sizes she is allowed to use.

♦ Play Optimal Poker 2♠

6. Which hands will be pure bets for Opal? Why?

The following chart shows Opal's betting strategy. White represents checks, gray represents \$10 bets, and black represents \$26 bets.

Opal's Betting Strategy on 9♥ 7♦ 6♥ 7♥



All of Opal's pure bets are full houses or stronger. She can treat even the weaker ones as the nuts, so she wants to build big pots with them. Because Ivan's range is condensed, she cannot count on him betting when she checks, so she mostly does not try to check-raise. Instead, she bets as big as she can and relies on the threat of bluffs to give Ivan incentive to call.

7. Which hands will be pure checks? Why?

Opal's pure checks are marginal hands with some chance of winning in a checked-down pot but not enough strength to bet for value. This includes her pairs, her best unpaired hands, and even most flushes! Opal is indifferent to betting A♥ Q♥, but her other flushes are pure checks.

This is a testament to how strong Ivan's range for continuing to a 200% pot bet will be. Non-nut flushes must worry about running into nut flushes, and when Opal has the nut flush, she blocks a lot of the second-best hands that would otherwise pay her off, specifically lower flushes. It's not that she doesn't win often when she bets flushes, it's that she doesn't win often enough **when her bets are called**.

This is also a function of the board being static. If the turn checks through, Opal will value bet flushes on most rivers. If she bets 200% pot with a flush on the turn, though, she strengthens Ivan's range to the point where she cannot bet again for value on the river. That means her real choice is between betting turn and checking river or betting river and checking turn. Because her flushes are not at great risk from free cards, she would rather bet the river. Ivan can call the river with a wider range because he will not have to fear the leverage of additional bets.

♦ Play Optimal Poker 2♠

8. Which of Opal's strongest holdings will be best to mix into her checking range?

Opal sometimes checks 99 and 97 but always bets 77 because it does not block T9s and 98s, which Ivan never folds. Those hands are only 3% of his calling range, but there is otherwise little difference between Opal's full houses. It does not matter terribly much which she puts into her checking range, but it is slightly better not to block Ivan's 9s and not to lose to his 77, as 66 would.

The other strong hand Opal occasionally checks is T♥8♥. There are some blocker effects here, but this hand also unblocks second-best hands in Ivan's range. The best-case scenario when Opal has a straight flush is for Ivan to have a full house, and if he does, she loses nothing by checking because he will make sure the money will go in anyway.

9. Which weak hands will Opal mix into her betting range? What makes these good bluffing candidates?

Opal's primary criterion for bluffing candidates is that they have little to no showdown value in a checked-down pot. A heart blocker/draw is not a requirement. In fact, she wants to bet some hands that do not contain hearts so that she can bluff again on heart rivers.

The strongest hand she turns into a bluff is AJ with a heart. When she does not have a heart, she prefers betting hands with even less showdown value, such as QJ. Gutshots bluff at a higher frequency than other unpaired hands.

SCENARIO: ATTACKING THE 2♦

Ivan raises to \$6 in first position before the flop and Opal calls from the big blind. Both players check the 9♥ 7♦ 6♥ flop, and the turn is the 2♦. Players may check, bet 75% of the pot, or bet 200% of the pot. Raises of 50% of the pot are permitted, and if Opal checks and calls the turn, she will have the option to donk bet the river for 50% pot.

Envision Starting Ranges

1. Which player has the equity advantage on the 2♦ turn?
2. Which player has the nuts advantage on the 2♦ turn?

Determine Needed Ranges

3. Will Opal mostly bet or mostly check? Why?
4. After checking, will Opal mostly fold, call, or raise if faced with a \$10 bet?
5. When Opal does bet, will she prefer to bet \$10 (75% of the pot) or \$26 (200% of the pot)?

Identify Pure Strategies

6. Which hands will be pure bets for Opal? Why?
7. Which hands will be pure checks? Why?

Resolve Mixed Strategies

8. Which of Opal's strongest holdings will be best to mix into her checking range?
9. Which weak hands will Opal mix into her betting range? What makes these good bluffing candidates?

Answers & Explanation

1. Which player has the equity advantage on the 2♦ turn?

Opal does, with 52.9% equity.

2. Which player has the nuts advantage on the 2♦ turn?

Opal does. We saw in Chapter 6 that Ivan does not often check strong hands on the flop, as many turns will promote his weaker holdings. This is not such a turn card. On blank turns like this one, Ivan's range is even weaker and more capped than it would be on an average turn. As a result, Opal's EV outperforms her equity even though she is out of position on a dynamic board.

3. Will Opal mostly bet or mostly check? Why?

Despite the favorable turn card, Opal still mostly checks. She only has so many hands that are strong enough to bet for value, and she needs to keep a fair number of them in her checking range. That limits her ability to bluff, resulting in a relatively low betting frequency of about 33%.

As in the previous scenario, giving Opal the option to bet smaller increases her betting frequency, but it still only gets up to about 50%. Betting top pair is a lot more appealing when she can do so for just \$4.

4. After checking, will Opal mostly fold, call, or raise if faced with a \$10 bet?

She raises less than 6% of her range. She splits the rest about evenly between calling and folding.

♦ Play Optimal Poker 2♠

5. When Opal does bet, will she prefer to bet \$10 (75% of the pot) or \$26 (200% of the pot)?

Both sizes play an important role in Opal's equilibrium strategy, though she bets \$10 more commonly. She bets \$10 with about 20% of her range and \$26 with about 13%.

Identify Pure Strategies

6. Which hands will be pure bets for Opal? Why?

She does not have any hands that are quite pure bets, but her highest-frequency bets follow a familiar pattern. She mostly bets her strongest hands, straights and sets in this case, and is more likely to check 99 because it blocks Ivan's calling range. These hands mostly raise after checking, so if you are not going to have a check-raising range, you should just bet them at 100% frequency.

Opal's highest-frequency bluffs are combo draws like KT with a flush draw or A♥T♦, which, despite its lack of a draw to the nuts, contains two valuable blockers.

7. Which hands will be pure checks? Why?

Opal's pure checks are marginal hands too strong to turn into bluffs but too weak to bet for thin value and protection. This includes AK, AQ, small pocket pairs, and even J9.

Resolve Mixed Strategies

8. Which of Opal's strongest holdings will be best to mix into her checking range?

As mentioned above, she is more likely to check 99 than other sets because of its blocker effect.

Many people panic when holding a set on such a draw-heavy board. Betting at 100% frequency would not be a huge mistake, but checking can yield big returns precisely because it is risky and unexpected. If your opponent assumes you would never check a strong hand and bets at an overly high frequency as a result, then check-raising becomes very profitable for you.

9. Which weak hands will Opal mix into her betting range? What makes these good bluffing candidates?

Opal's best bluffs are strong draws and hands with poor showdown value but good blockers. For instance, she mixes bluffing and checking with all combos of KJ that contain either a heart or a diamond but never bluffs without either. As always, she mixes both flush draws in her betting and checking ranges. For open-ended straight draws, she mostly checks 88 and 87, preferring to bet 98 because it has better equity when called.

It is also worth looking at how she mixes her betting hands across her two bet sizes. As you might expect, her range for betting 200% pot is more polarized than her range for betting 75% pot.

When Opal bets \$10, she mostly has strong one-pair hands, non-nut draws, or weak overcards with a blocker. If those were the only hands with which she bet \$10, though, Ivan could exploit her by raising. So, she also bets small with some sets and straights that will profit from those raises. She prefers 99 when "trapping" in this way because its blockers make it less appealing as an overbet.

♦ Play Optimal Poker 2♠

Ivan's range for continuing to a \$26 bet is quite strong, which means Opal constructs her betting range with an eye toward nuttiness. The smaller sets, 66 and 22, are great overbetting hands because they do not block Ivan's bluff catchers. Even her bluffs are mostly nut flush draws, though she does need to semi-bluff occasionally with K- and Q-high draws in case the river is the A♥ or A♦.

When bluffing \$26 without a flush draw, Opal prefers to block the A♥ or A♦. AT is an especially good candidate because of the gutshot draw.

When Opal bluffs with Ace-high, she almost always uses the larger bet size. This is because Ivan does not fold many better hands to a \$10 bet. If you are going to turn a hand with showdown value into a bluff, you should go big, as that is the only way you can make better hands fold. Weaker hands can bluff with small bets because they profit even when your opponents fold only their weakest hands.

EXPLOITING A CAPPED CHECKING RANGE

Although Ivan's range for checking back a 9♥ 7♦ 6♥ flop should be condensed, he goes to great lengths to ensure he will have strong hands in his range no matter what the turn card. This is a tricky balancing act, and many real-world players are led astray by bad intuition. They believe, for instance, that they must bet overpairs because they "don't want to see another card." They also tend to bet too often with draws because they see the obvious value in bluffing them but not the value in checking them.

The result of this flawed range construction is an excessively strong betting range and a checking range that will be excessively weak on almost any turn card. Opal's equilibrium strategy profits decently well from these mistakes even if she does not adapt to them, but she can really put the screws to Ivan with the right exploits. Let's use the Four-Step Exploitative Process to see how.

The following PioSolver grid shows a hypothetical continuation betting strategy for Ivan. It's an extreme example where he always bets with a pair or better, a flush draw, or JT, and always checks weaker hands. A real player's errors might not be quite so blatant, but as always, our goal is not to solve this exact situation; it is to build intuition for what kinds of exploits to consider should you encounter similar situations at the table.

♦ Play Optimal Poker 2♠

Ivan's Exploitable Betting Strategy on 9♥ 7♦ 6♥

AA	AKs	AQs	AJs	ATs	A5s	A4s	A3s	A2s
AKo	KK	KQs	KJs	KTs				
AQo	KQo	QO	QJs	QTs				
AJo		JJ	JTs					
			TT	T9s				
				99	98s			
					88			
						77		

Envision the Equilibrium

Ivan checks many overpairs and a variety of draws to ensure he will have strong hands on most turn cards. This prevents Opal from overbetting a wide, polarized range on all but the worst turns.

Make a Read

Ivan's betting range is far too strong, consisting only of strong made hands and high-equity semi-bluffs. His checking range contains no flush draws or open-ended straight draws.

Identify the Exploits

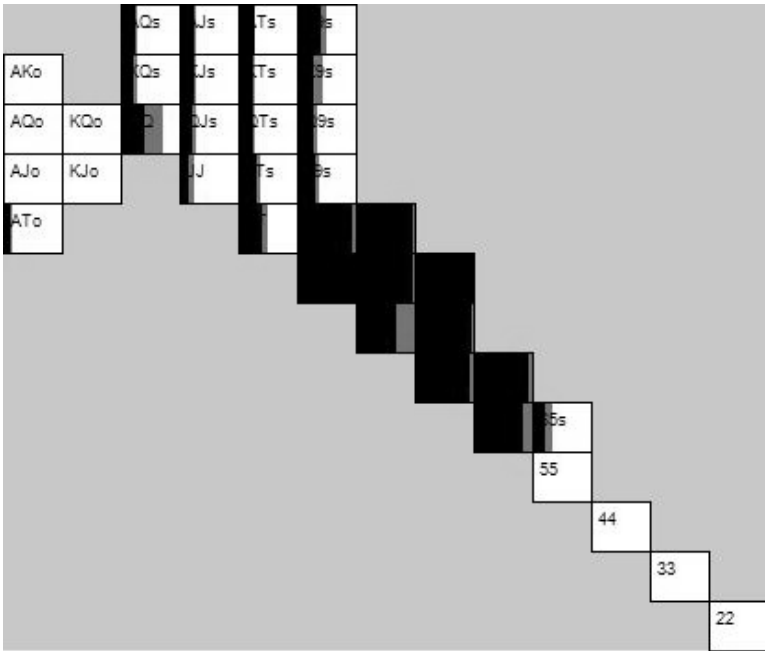
Poor range construction leads to exploitability in both Ivan's betting and checking ranges. His betting range is extremely strong, so Opal's main exploit when he bets will be to fold often. His checking range is extremely weak, which Opal will exploit by betting—often overbetting—a wide, polarized range on most turns.

Determine the Degree of Deviation

Huge. Ivan's mistakes are exaggerated in this hypothetical, so Opal's exploits are as well. Even a less extreme version of Opal's exploitative strategy would still include some dramatic deviations, though.

Here is Opal's reaction to Ivan's \$4 bet into a \$13 pot. White represents folds, gray represents calls, and black represents raises to \$14.

Opal's Exploitative Response on 9♥ 7♦ 6♥



She folds hands as strong as QQ!

Why does Opal so rarely call? Because Ivan's betting range is not polarized. Opal's incentive to call comes mostly from low-equity bluffs, and Ivan's range contains no real bluffs. The weakest hands he bets are flush draws with overcards.

Opal's incentive to raise comes from equity denial. Draws and marginal made hands comprise the majority of Ivan's betting range. These hands have good equity when called but suffer when raised, which is why Opal raises a polarized range and folds most everything else.

♥ Attacking a Missed Continuation Bet ♣

Now let's talk about Opal's response to a check. First, have a look at the EV of her maximally exploitative strategy across all possible turns:

Turn EV of Opal's Maximally Exploitative Strategy

	2	3	4	5	6	7	8	9	T	J	Q	K	A
♣	13.01	13.011	13.012	13.011	13.014	13.014	10.298	13.014	12.952	11.395	9.6673	9.3693	8.2303
♦	13.012	12.929	12.865	12.937	13.015		9.6928	13.015	12.591	10.75	9.1288	8.9169	8.0138
♥	13.01	13.011	13.011	13.012		13.015	10.466		13.005	11.196	9.8645	9.6841	8.7201
♠	13.01	13.011	13.012	13.011	13.014	13.014	10.298	13.014	12.952	11.395	9.6673	9.3693	8.2303

Notice that on many turns, her EV is \$13 or close to it. That's the entire pot! Ivan's checking range is so weak that unless the turn improves him, he just gives up. Even on turns where he can make strong hands, he still loses very often. Only on Ace turns, which improve a huge chunk of his checking range, does Opal get substantially less than \$10 out of a \$13 pot.

We see the same pattern in her betting strategy in the chart below. White represents checks, gray represents 75% pot bets, and black represents 200% pot bets:

Opal's Exploitative Turn Betting Strategy

	2	3	4	5	6	7	8	9	T	J	Q	K	A
♣	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check
♦	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check
♥	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check
♠	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check	Check

♦ Play Optimal Poker 2♠

On most turns, she just overbets her full range and claims the pot. Ivan does have some Tx and 5x in his checking range, so on 8 turns she prefers to target the weaker portion of his range with a smaller bet. Big cards are best for Ivan's checking range, so Opal is a bit more cautious on Qs, Ks, and A. She still overbets, but with a more carefully chosen, polarized range.

Again, you may wish to use less dramatic exploits against real opponents, but the principles are the same. Many players are too strong when they bet this flop and poorly balanced when they check. You exploit the bets with tight folds, and you exploit the checks with big bets on the turn.

TEST YOURSELF

You call an early position raise from the big blind, and you and your opponent both check a T♥ 8♥ 3♥ flop. The turn is the 2♦. Consider how you would play each of the following hands with an SPR of 15: 3♣ 3♠, A♥ J♥, 9♦ 7♦, 9♥ 7♥, J♣ J♠, A♦ Q♦, A♥ K♦, 6♦ 5♦.

1. 3♣ 3♠?

This is a high-frequency bet for a smallish size, up to 75% of the pot. Your overall betting frequency in this situation should be low, as we have seen, but this is one of your best betting candidates. It is well ahead of your opponent's marginal hands and even has outs against his flushes.

Contrary to popular opinion, the reason to bet here is **not** to protect against flush draws. Villain never folds a heart to a small bet, nor should you want him to fold, as you are a big favorite against something like K♥ Q♦.

A big bet is a big mistake, as it strengthens your opponent's range to the point where you are no longer a big favorite. Your objective is to target marginal hands and draws. Big bets encourage those hands to fold and set you up to lose a big pot to a flush or a bigger set.

2. A♥ J♥?

This is another high-frequency bet, and because it's the nuts, you can overbet. It's fine—optimal, actually—to split your betting range across multiple bet sizes. You have plenty of weak hands with which to balance several different bet sizes that target different parts of your opponent's range.

♦ Play Optimal Poker 2♠

3. 9♦ 7♦?

This is a great bluffing candidate, but not for a large size. The bigger you bet, the less likely you are to have the best hand if you river a straight. A small bet gets valuable folds from hands like Q♣ J♣ while preserving the equity of your draw.

4. 9♥ 7♥?

Bet small or check. You want to have some flushes in your checking range, and this is a good candidate because it is among your weakest flushes. It is also less vulnerable to free cards because two of the rivers that would be disastrous for other small flushes make this hand a straight flush.

5. J♣ J♠?

Bet small or check. It may be tempting to try to “take it down now”, but you must balance this desire against the risk of building a pot you are not likely to win. Your hand is not terribly strong, and it will be weaker still on most rivers. While a \$4 bet gets some valuable folds from overcards and some valuable calls from worse pairs, checking with the intention of value betting safe rivers is an equally good plan.

Checking is even more appealing when you hold a heart because it preserves the equity of your draw. If your opponent calls a turn bet, your flush is not strong enough to value bet on a heart river, nor to call a big bet after checking.

6. A♦ Q♦?

Check. You have too much showdown value to bluff but not enough to bet for protection. Plus, you lack any sort of draw or blocker. Checking gives you a shot at winning unimproved and preserves the equity of your top pair outs.

7. A♥ K♦?

Mostly check. This may look like a good bluffing candidate, but you have decent showdown value and would like to preserve the equity of your pair outs. You want to be capable of showing up with the A♥ after checking the turn, and this is a good hand to do it with. With weaker Ax, you have more incentive to bluff, and with your made nut flushes, you mostly want to value bet. If you're ever going to check the A♥ on this flop, this is the hand to do it with.

8. 6♦ 5♦?

Bet small. Your opponent should not continue often enough to make you indifferent to bluffing the very bottom of your range, plus you have a gutshot. Weak hands are good candidates for small bets because they profit even from the weakest hands your opponent folds. A small bet also preserves the equity of your draw, making it more likely you will win if you river a straight.

CONCLUSION

Opal's equilibrium strategy after Ivan checks behind the flop differs significantly from how many real-world players handle this situation. Even on favorable turn cards, his flop check is not a green light for her to bet with abandon. She frequently checks even "obvious" betting candidates like top pair.

This does not necessarily mean those real-world players are making a big mistake. Their opponents are likely less balanced than Ivan when checking the flop, which makes betting the turn much safer.

Some of those bets likely **are** mistakes even against an unbalanced opponent, however, and many of them will be mistakes against a tough player. It is important to distinguish between what works for exploitative reasons and what is fundamentally sound play so that you do not end up making mistakes against more balanced opponents.

The big blind's main advantage in this scenario is a less capped range. That means her turn bets should mostly be big and polarized, though on some turns she can develop a smaller, less polarized betting range consisting of thin value/protection bets, semi-bluffs, and a few traps.

Key Lessons

- ♣ **A flop check from the pre-flop raiser is not a green light to bluff the turn.** Not at equilibrium, anyway. In the absence of a read, you should bet carefully-chosen bluffs plus hands that are effectively the nuts relative to your opponent's checking range.
- ♣ **Bombing the turn is an exploit against a specific flop strategy.** Some players are scared to check vulnerable hands on coordinated flops and bluff too often with draws. Against these players, on these flops, you **can** bet most turns with abandon after they check the flop. You should recognize, however, that such a high betting frequency is an exploit of a specific tendency, not an ironclad law of poker.
- ♣ **Don't slowplay.** There are a few exceptions based on blockers, but once your opponent checks the flop, you should expect he will often check the turn as well. His range is condensed, so the impetus for building a big pot must come from you.
- ♣ **When bluffing with showdown value, go big or don't bother.** When your hand has a chance of winning unimproved, it is probably not a good bluffing candidate in the first place. If you do bluff, you should bet big, as that is the only way to make better hands fold. Weak hands make small bluffs; marginal hands mostly check but occasionally make big bluffs.
- ♣ **The bigger the bet, the better the draw.** Bluffs follow a similar pattern to value bets: weaker draws can semi-bluff for a small size but are wasted on large bets. Large bets get called only by strong hands and strong draws against which weaker draws may not be live. Blocking nutty hands is also more important when betting bigger.

**CHAPTER 10:
CONTINUATION BETTING
FROM OUT OF POSITION**

OVERVIEW & OBJECTIVES

So far, our hold 'em scenarios have more closely resembled the Clairvoyance Game, where one player enjoys a significant range advantage, than the Reciprocal Ranges Game, where ranges are more similar. This is because a single pre-flop raiser versus a big blind caller is the case where the disparity between ranges is greatest. It's also the most common way for a hold 'em hand to go heads up to the flop.

In this chapter, we consider a case where an early position raiser is called by a player in position. When a good player calls a raise in position, his range should be much closer in strength to that of the raiser than a big blind caller's would be.

Perhaps because of the prevalence of pre-flop raiser versus big blind confrontations, much of what is considered "standard" poker strategy seems to derive from these cases. We will find, in investigating a scenario where starting ranges are more similar, that the equilibrium strategies can differ significantly from the former case, and that extrapolating from one to the other is unwise.

The usual caveat applies: the results of this simulation depend heavily on the starting ranges we input. If your typical opponents have much looser calling ranges, then the correct flop strategy will look quite different. Still, it is good to understand that what you may think of as "standard" is in fact an exploitative strategy that works only against excessively loose pre-flop callers.

By the end of this chapter, you should be able to:

- ♣ Appreciate why a cold caller should have a strong range.
- ♣ Identify boards that are more or less favorable for the in-position caller.
- ♣ Balance your betting and checking ranges as the pre-flop raiser out of position on the flop.
- ♣ Exploit loose opponents with wide pre-flop calling ranges.

♦ Play Optimal Poker 2♠

SCENARIO: OUT OF POSITION ON A DYNAMIC BOARD

Opal raises to \$6 first to act before the flop at a nine-handed table, and Ivan calls on the button. The flop comes J♠ 8♦ 6♣. Effective stacks are roughly \$200.

On the flop, either player may bet 33% of the pot, bet 66% of the pot, or check. On the turn and river, they may bet 75% or 200% of the pot or check. Donk bets and raises of 50% of the pot are allowed. Players start with the ranges shown below:

Opal's UTG Opening Range

AA 1	AKs 1	AQs 1	AJs 1	ATs 1	A9s 0	A8s 0	A7s 0	A6s 0	A5s 1	A4s 1	A3s 1	A2s 1
AKo 1	KK 1	KQs 1	KJs 1	KTs 1	K9s 0	K8s 0	K7s 0	K6s 0	K5s 0	K4s 0	K3s 0	K2s 0
AQo 1	KQo 1	QQ 1	QJs 1	QTs 1	Q9s 0	Q8s 0	Q7s 0	Q6s 0	Q5s 0	Q4s 0	Q3s 0	Q2s 0
AJo 1	KJo 0	QJo 0	JJ 1	JTs 1	J9s 0	J8s 0	J7s 0	J6s 0	J5s 0	J4s 0	J3s 0	J2s 0
ATo 0	KTo 0	QTo 0	JTo 0	TT 1	T9s 1	T8s 0	T7s 0	T6s 0	T5s 0	T4s 0	T3s 0	T2s 0
A9o 0	K9o 0	Q9o 0	J9o 0	T9o 0	99 1	98s 1	97s 0	96s 0	95s 0	94s 0	93s 0	92s 0
A8o 0	K8o 0	Q8o 0	J8o 0	T8o 0	98o 0	88 1	87s 0	86s 0	85s 0	84s 0	83s 0	82s 0
A7o 0	K7o 0	Q7o 0	J7o 0	T7o 0	97o 0	87o 0	77 1	76s 0	75s 0	74s 0	73s 0	72s 0
A6o 0	K6o 0	Q6o 0	J6o 0	T6o 0	96o 0	86o 0	76o 0	66 0	65s 0	64s 0	63s 0	62s 0
A5o 0	K5o 0	Q5o 0	J5o 0	T5o 0	95o 0	85o 0	75o 0	65o 0	55 0	54s 0	53s 0	52s 0
A4o 0	K4o 0	Q4o 0	J4o 0	T4o 0	94o 0	84o 0	74o 0	64o 0	54o 0	44 0	43s 0	42s 0
A3o 0	K3o 0	Q3o 0	J3o 0	T3o 0	93o 0	83o 0	73o 0	63o 0	53o 0	43o 0	33 0	32s 0
A2o 0	K2o 0	Q2o 0	J2o 0	T2o 0	92o 0	82o 0	72o 0	62o 0	52o 0	42o 0	32o 0	22 0

Ivan's Button Calling Range

AA	AKs	AQs	AJs	ATs	A9s	A8s	A7s	A6s	A5s	A4s	A3s	A2s
0	0	1	1	0	0	0	0	0	0	0	0	0
AKo	KK	KQs	KJs	KTs	K9s	K8s	K7s	K6s	K5s	K4s	K3s	K2s
0	0	1	1	1	0	0	0	0	0	0	0	0
AQo	KQo	QQ	QJs	QTs	Q9s	Q8s	Q7s	Q6s	Q5s	Q4s	Q3s	Q2s
1	0	1	1	1	0	0	0	0	0	0	0	0
AJo	KJo	QJo	JJ	JTs	J9s	J8s	J7s	J6s	J5s	J4s	J3s	J2s
0	0	0	1	1	0	0	0	0	0	0	0	0
ATo	KTo	QTo	JTo	TT	T9s	T8s	T7s	T6s	T5s	T4s	T3s	T2s
0	0	0	0	1	1	0	0	0	0	0	0	0
A9o	K9o	Q9o	J9o	T9o	99	98s	97s	96s	95s	94s	93s	92s
0	0	0	0	0	1	0	0	0	0	0	0	0
A8o	K8o	Q8o	J8o	T8o	98o	88	87s	86s	85s	84s	83s	82s
0	0	0	0	0	0	1	0	0	0	0	0	0
A7o	K7o	Q7o	J7o	T7o	97o	87o	77	76s	75s	74s	73s	72s
0	0	0	0	0	0	0	0	0	0	0	0	0
A6o	K6o	Q6o	J6o	T6o	96o	86o	76o	66	65s	64s	63s	62s
0	0	0	0	0	0	0	0	0	0	0	0	0
A5o	K5o	Q5o	J5o	T5o	95o	85o	75o	65o	55	54s	53s	52s
0	0	0	0	0	0	0	0	0	0	1	0	0
A4o	K4o	Q4o	J4o	T4o	94o	84o	74o	64o	54o	44	43s	42s
0	0	0	0	0	0	0	0	0	0	0	0	0
A3o	K3o	Q3o	J3o	T3o	93o	83o	73o	63o	53o	43o	33	32s
0	0	0	0	0	0	0	0	0	0	0	0	0
A2o	K2o	Q2o	J2o	T2o	92o	82o	72o	62o	52o	42o	32o	22
0	0	0	0	0	0	0	0	0	0	0	0	0

Opal's raising range is the same UTG raising range Ivan used in the previous scenarios. Ivan's calling range may look a bit strange, especially with the stray 54s in there. It is derived from a game theory solver's strategy, which involves a lot of mixing between calls, three-bets, and folds. For simplicity's sake, I have rounded everything to pure strategies, causing many suited connectors to fall out of Ivan's range. The 54s shows up at an especially high frequency because he otherwise has so few small cards in his range. It provides valuable board coverage on flops where he would otherwise be excessively strong or excessively weak.

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Betting Options and Game Parameters

Starting Pot: <input type="text" value="13"/>		
EffectiveStacks <input type="text" value="194"/>		<input type="button" value="clear all"/>
<input type="checkbox"/> change only betting structure when loading configuration		
Flop IP	Tum IP	River IP
Bet sizes: <input type="text" value="33,75"/> %	Bet sizes: <input type="text" value="75,200"/> %	Bet sizes: <input type="text" value="75,200"/> %
Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %
<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin
<input type="checkbox"/> Dont 3-bet	<input type="checkbox"/> Dont 3-bet	<input type="checkbox"/> Dont 3-bet
<input type="button" value="Copy from IP to OOP"/>		
Flop OOP	Tum OOP	River OOP
Bet sizes: <input type="text" value="33,75"/> %	Bet sizes: <input type="text" value="75,200"/> %	Bet sizes: <input type="text" value="75,200"/> %
Raise sizes: <input type="text" value="50"/> %	Donk sizes: <input type="text" value="50"/> %	Donk sizes: <input type="text" value="50"/> %
<input type="checkbox"/> Add allin	Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %
	<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin
all-in threshold: <input type="text" value="67"/> % of the initial effective stack.		
"Add allin" only if less than <input type="text" value="500"/> % of pot		

Envision Starting Ranges

1. Which player has the equity advantage on this J♠ 8♦ 6♦ flop?
2. Which player has the nuts advantage on this flop?
3. Which player has higher EV in this scenario? Why?

Determine Needed Ranges

4. Opal is first to act on the flop and has three options: check, bet 33% of the pot, or bet 75% of the pot. Which will she use most frequently, and why?
5. Facing a check on the J♠ 8♦ 6♦ flop, Ivan has the same three options: check, bet \$4 into a \$13 pot, or bet \$10 into a \$13 pot. Which will he use most frequently, and why?

Pure and Mixed Strategies

6. Which hands should Opal be most likely to bet? Why?
7. If Opal checks the flop, which hands will Ivan always bet? What makes them such appealing bets?
8. If Opal checks and Ivan bets \$4, which hands will Opal raise most frequently?
9. If Opal checks and Ivan bets \$4, which hands will Opal call most frequently?
10. If Opal checks and calls \$4 on the flop and then checks again on the turn, Ivan will have the option to check, bet 75% of the pot, or bet 200% of the pot. Which option will he use most frequently, and why?

Answers & Explanations

1. Which player has the equity advantage on this J♠ 8♦ 6♦ flop?

Ivan, but it's very close. He has a bit less than 52% equity, while Opal has slightly more than 48%.

2. Which player has the nuts advantage on this flop?

Probably Opal, because of her overpairs, but it's hard to say.

More importantly, nuts advantage on the flop may not be the best metric. On such a dynamic board, hand values are likely to change dramatically depending on the turn card. What really matters is not which player is more likely to have nutty hands on the flop but rather which is more likely to have nutty hands on the turn and river, when hand values will be more clearly defined.

Hand values are always static on the river. Some turn cards will make the board much more static, while others will keep it dynamic. The K♦ is a card that will make the board more static. If that card turns, then the nuts on the turn will still be the nuts on most rivers and will be a very strong hand on any river. Hands with potential on the flop could easily be drawing dead on that turn.

The 2♠, however, will keep the board dynamic. With only one card to come, hand values are less likely to change than on the flop, but still, almost any river card could improve either player's range.

Even with a strong hand on the flop, a player cannot be sure he will want to play a large pot on the river. This reduces the value of betting a polarized range on the flop, and it especially reduces the value of large bets.

3. Which player has higher EV in this scenario? Why?

Although the equities are very close, Ivan has much higher EV. He will win about \$8, more than 61% of the pot, on average.

This has more to do with position than with range advantage. Dynamic boards magnify the value of position. The player in position is better equipped to put money in on the flop with a wide range, which enables him to develop a polarized range no matter how the board runs out. He also benefits from seeing how his opponent reacts to changes in board texture before making his own decisions.

Even when starting ranges are similar, the out of position player struggles to avoid capping her range. Balance requires expensive tradeoffs. Meanwhile, the in-position player can anticipate an information advantage and often a nuts advantage on later streets, enabling him to make more profitable decisions than his opponent.

4. Opal is first to act on the flop and has three options: check, bet 33% of the pot, or bet 75% of the pot. Which will she use most frequently, and why?

Opal checks 100% of the time! This may be quite surprising, if you are accustomed to the pre-flop raiser making a "standard" continuation bet, so let's compare this situation to our previous scenarios, where an under-the-gun (UTG) raiser was heads up against the big blind (BB).

When UTG enjoys a large range advantage on the flop, she typically bets to deny equity and EV to her opponent. A BB calling range contains many hands that are weaker than UTG's betting range but that have a substantial

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chance of winning if they get to showdown. Betting presents BB with a choice between two unappealing options: either he puts more money into the pot with weak hands, or he folds away whatever chance of winning those hands have.

A button calling range will not necessarily face the same dilemma. In this case, Ivan has a slight equity advantage, so Opal cannot push equity as she could against a BB caller. If anything, it is she who will be stuck holding hands with a small enough chance of winning that they do not want to put more money in the pot but a large enough chance of winning that it is not quite trivial to fold them.

Even if Opal is not going to bet her entire range on this flop, there still might seem to be a case for betting strong but vulnerable hands such as AA or AJ. Many players bet big when they see a board with so many draws, because they know such hands will be difficult to play on later streets and would prefer to "take it down now".

There are a few problems with this logic. First and most importantly, it is not up to you whether you "take it down now." That requires your opponent's cooperation, which you should never expect to get. The kinds of hands you would most like to fold out when you have AA are strong draws such as T9 or K♦ Q♦, but those are not going to fold. Even if Opal bet 200% of the pot, Ivan never folds such strong draws at equilibrium. They are behind AA, but they are not very far behind, they will benefit from playing in position on later streets, and they are ahead of bluffs.

This brings us to the other problem of making large bets with strong hands on this board, which is that it is difficult to balance. You cannot really justify a big bet with a hand like A♥ K♥, so at best your range for a large

bet would have to consist of strong pairs and strong draws. An opponent who stubbornly called with Q9 might make a mistake against this range, but in general he will play quite well. The large bet enables him to correctly fold weak pairs and makes it easy for him to win big pots with his strong hands. His folds will not be the hands that Opal wants him to fold; they will be the hands that are drawing slim or dead against her strong pairs.

The fundamental problem is that, even though AA is a strong hand on the flop, it will not be strong on many turns. Contrary to popular belief, there is no prize for having the best hand on the flop. Thus, Opal prefers to keep the pot small and avoid revealing information about her hand until she sees the turn. At that point, she will have much better information about whether the final board is likely to favor her and thus whether she wants to play a large pot. On a blank card such as the 2♣, she can feel very good about growing the pot, much better than she could on the flop.

If the turn is the Q♠, she can continue to proceed with caution, grateful that she did not put a big bet in on the flop. There is a tendency to think that betting the flop might have prevented this turn from coming, but that would be true only in cases where Ivan held a hand that would not actually be helped by this card. With a flush draw or T9 or QJ, he was not folding the flop anyway. Opal should be glad she does not have a lot invested in a pot she was always likely to lose given this turn card.

The lesson here is that continuation betting should not be automatic. Simply being the pre-flop raiser does not entitle or obligate you to a flop bet, and most people bet too often in this situation.

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That said, there are still many cases where continuation betting is profitable. Against button callers with overly loose pre-flop ranges, UTG will enjoy the kind of equity advantage that makes continuation betting profitable. Even against a stronger calling range like this one, some flops are more conducive to continuation betting.

Still, it is striking that in a case where many players believe it is correct to bet usually or always, the equilibrium strategy is to check 100% of your range.

5. Facing a check on the J♠ 8♦ 6♦ flop, Ivan has the same three options: check, bet \$4 into a \$13 pot, or bet \$10 into a \$13 pot. Which will he use most frequently, and why?

Ivan bets \$4 with about 69% of his range, and he bets \$10 with less than 4%. Although this bet is not a "continuation" of anything, it functions very much like a continuation bet.

Ivan has a slight range advantage, but more importantly, he can expect his position to be valuable on future streets. A small bet presents difficult decisions to hands like A♥ Q♥. Sometimes AQ is ahead, often it is live, yet it will be difficult for Opal to take to showdown even if she calls the flop bet. The small bet pushes equity, forcing her either to put money into a pot she is unlikely to win or fold away her equity.

We see large bets most commonly when a player has a nuts advantage, which Ivan does not have on the flop. He may have a nuts advantage on future streets, and there are some turns he will overbet if Opal calls a small flop bet, but on the flop he is not any better equipped to bet a polarized range than she is. He is betting the value of his position more than the value of his range.

This bet has nothing to do with Opal "showing weakness" by checking. After all, she checks her entire range, so she is not showing anything. Ivan value bets plenty of hands that could easily be behind. Opal's range is uncapped, but it does contain some weak hands Ivan can target with a small bet.

6. Which hands should Opal be most likely to bet? Why?

She should not bet any hands at all.

7. If Opal checks the flop, which hands will Ivan always bet? What makes these hands such appealing bets?

Every hand in Ivan's range is indifferent between betting \$4 and checking behind, but the hand he bets most often is 88, followed by JJ. These are the hands that most want to build the pot on the flop because they are the only hands that will remain strong on all turns. Some turns are worse than others, but even on the Q♦, Ivan never folds a set. Unless he runs 88 into exactly JJ, he always has outs to a full house, not to mention all the hands he can beat unimproved at showdown.

He has plenty of other hands that do not mind gearing up to play large pots—T9 and A♦ Q♦ bet at high frequencies—but these hands also benefit to some degree from checking. They are not strong hands yet, and on many turns they will be much weaker than they are now. When they bet the flop, it is partially to grow the pot in case they want to value bet later but also to start representing a strong hand in case they want to bluff later.

Hands that bet least often are those with little chance of improving to the nuts, such as A♣ Q♣ or A♥ Q♥.

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Although they are unlikely to check all the way to showdown and win unimproved, these hands play best in small pots. In a large pot, even improving to a pair of Aces or Queens is unlikely to win. If the flop checks through, then Ivan's chance of holding a winner when an A or Q turns is much higher.

8. If Opal checks and Ivan bets \$4, which hands will Opal raise most frequently?

Opal has a robust check-raising range of about 13%. Her most frequent check-raises are also Ivan's most frequent bets, hands like JJ and 88 that are already nutty plus hands like T9 and diamond draws that could easily improve to the nuts. She check-raises AQ only when she has either a diamond draw or a diamond blocker. As we have previously discussed, there is some value in check-raising A♦ Q♣ in order to represent a flush on diamond turns.

9. If Opal checks and Ivan bets \$4, which hands will Opal call most frequently?

Opal's weakest check-calls are KQ with a diamond and K♠ T♠, which are indifferent between calling, raising, and folding. These all have some potential to back into strong hands, and they may have value as bluffs on later streets, especially if they turn draws. Because Opal frequently check-calls strong hands that will value bet the river if the turn checks through, she can profitably call with some weak hands, planning to bluff on runouts where her range is otherwise strong. Although these hands will probably lose, they do not have to win very often to call such a small bet.

Another interesting weak hand in Opal's calling range is 77. She is much more likely to call with 77 when she has a diamond than when she does not. Like $K\heartsuit T\spadesuit$, this hand is more valuable for its backdoor draws than for its unimproved showdown value. Backing into a flush with a 7 will hardly give Opal the nuts, but it will give her appreciable showdown value.

10. If Opal checks and calls \$4 on the flop and then checks again on the turn, Ivan will have the option to check, bet 75% of the pot, or bet 200% of the pot. Which will he use most frequently, and why?

This depends on the turn card, but Ivan's average checking frequency across all possible turns is about 55%, and the lowest it ever gets is around 33%.

A common concern about check-calling TT or AK in Opal's shoes is that you will just end up folding to a turn bet anyway, in which case you would have been better off folding the flop. If you and your opponent are playing well, however, it should not be anywhere near a guarantee that you will face a bet on the turn after checking and calling the flop.

Nor, from Ivan's perspective, should it be clear whether Opal intends to call, fold, or raise if he bets again on the turn. Some portion of his range will have incentive to bluff, because Opal may fold hands like TT or AK, but these should not be the only hands in her check-calling range. No matter the turn card, she should hold plenty of hands that will not fold if Ivan bets again.

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This is how she makes him indifferent to bluffing the turn. If she only checks and calls the flop with hands that will continue to a bet on most turns, then she gives him no incentive to bluff the turn. If she only checks and calls hands that will fold to a turn bet, then she gives him no incentive to check behind. Just as when she was in the big blind, Opal's check-calling range here is designed to give Ivan difficult decisions with his bluffs and thin value bets on the turn.

SCENARIO: EXPLOITING LOOSE CALLERS

Opal raises to \$6 first to act before the flop at a nine-handed table, and Ivan calls on the button. Opal knows Ivan to be excessively loose with his pre-flop calls but does not have a strong read on his post-flop play.

The flop comes J♠ 8♦ 6♦. Effective stacks are roughly \$200. Opal has the same range as before, but Ivan's is now wider:

Ivan's Loose Pre-Flop Range

AA	AKs	AQs	AJs	ATs	A9s	A8s	A7s	A6s	A5s	A4s	A3s	A2s
0	0	1	1	1	1	1	1	1	1	1	1	1
AKo	KK	KQs	KJs	KTs	K9s	K8s	K7s	K6s	K5s	K4s	K3s	K2s
0	0	1	1	1	1	1	0	0	0	0	0	0
AQo	KQo	QQ	QJs	QTs	Q9s	Q8s	Q7s	Q6s	Q5s	Q4s	Q3s	Q2s
1	1	1	1	1	1	1	0	0	0	0	0	0
AJo	KJo	QJo	JJ	JTs	J9s	J8s	J7s	J6s	J5s	J4s	J3s	J2s
1	1	1	1	1	1	1	0	0	0	0	0	0
ATo	KTo	QTo	JTo	TT	T9s	T8s	T7s	T6s	T5s	T4s	T3s	T2s
1	1	1	1	1	1	1	1	1	0	0	0	0
A9o	K9o	Q9o	J9o	T9o	99	98s	97s	96s	95s	94s	93s	92s
1	1	1	1	1	1	1	1	1	0	0	0	0
A8o	K8o	Q8o	J8o	T8o	98o	88	87s	86s	85s	84s	83s	82s
0	0	0	0	0	1	1	1	1	0	0	0	0
A7o	K7o	Q7o	J7o	T7o	97o	87o	77	76s	75s	74s	73s	72s
0	0	0	0	0	0	1	1	1	1	0	0	0
A6o	K6o	Q6o	J6o	T6o	96o	86o	76o	66	65s	64s	63s	62s
0	0	0	0	0	0	0	0	1	1	1	0	0
A5o	K5o	Q5o	J5o	T5o	95o	85o	75o	65o	55	54s	53s	52s
0	0	0	0	0	0	0	0	0	1	1	1	0
A4o	K4o	Q4o	J4o	T4o	94o	84o	74o	64o	54o	44	43s	42s
0	0	0	0	0	0	0	0	0	0	1	1	0
A3o	K3o	Q3o	J3o	T3o	93o	83o	73o	63o	53o	43o	33	32s
0	0	0	0	0	0	0	0	0	0	0	1	0
A2o	K2o	Q2o	J2o	T2o	92o	82o	72o	62o	52o	42o	32o	22
0	0	0	0	0	0	0	0	0	0	0	0	1

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The questions below are the same as in the previous scenario. However, the answers may be quite different because of Ivan's looser calling range. Think about whether and how the equilibrium will change when Ivan starts with a much wider pre-flop range.

Envision Starting Ranges

1. Which player has the equity advantage on this flop?
2. Which player has the nuts advantage on this flop?
3. Which player has higher EV in this scenario? Why?

Determine Needed Ranges

4. Opal is first to act on the $J♠ 8♦ 6♦$ flop and has three options: check, bet 33% of the pot, or bet 75% of the pot. Which will she use most frequently, and why?
5. Facing a check, Ivan has the same three options: check, bet 33% of the pot, or bet 75% of the pot. Which will he use most frequently, and why?

Pure and Mixed Strategies

6. Which hands should Opal be most likely to bet? Why?
7. If Opal checks the $J♠ 8♦ 6♦$ flop, which hands will Ivan always bet? What makes these hands appealing bets?
8. If Opal checks and Ivan bets \$4, which hands will Opal raise most frequently?

9. If Opal checks and Ivan bets \$4, which hands will Opal call most frequently?

10. If Opal checks and calls \$4 on the flop and then checks again on the turn, Ivan will have the option to check, bet 75% of the pot, or bet 200% of the pot. Which will he use most frequently, and why?

Answers & Explanations

Opal raises to \$6 first to act before the flop at a nine-handed table, and Ivan calls on the button. Opal knows Ivan to be excessively loose with his pre-flop calls but does not have a strong read on his post-flop play. The flop comes J♠ 8♦ 6♦. Effective stacks are roughly \$200.

1. Which player has the equity advantage on this flop?

Opal now has more than 55% equity.

Many players mistakenly worry that coordinated flops are disproportionately likely to hit loose opponents. In fact, the opposite is true: the looser a player's starting range, the more likely he is to miss any given flop.

It's the old Garbage In, Garbage Out principle. Most flops miss most hands, so the more weak hands a player holds pre-flop, the more weak hands he will hold on the flop, no matter its texture. For every combination of K5s that flopped a flush draw, for instance, Ivan will have three combinations that whiffed.

2. Which player has the nuts advantage on this flop?

Ivan does. His looser pre-flop range gives him more combinations of two pair. Importantly, though, it also gives him more combinations of weak one-pair hands and many more combinations of total airballs.

3. Which player has higher EV in this scenario? Why?

Opal's EV is \$7.18, more than half the pot and much more than the \$5 she had against Ivan's tighter range. It's easy to fall into worst-case scenario thinking about what could

go wrong against a loose player: he might have flopped two-pair, he might turn a flush or straight, etc. Loose players may be less predictable than their conservative counterparts, but they are also less profitable.

4. Opal is first to act on the J♠ 8♦ 6♦ flop and has three options: check, bet 33% of the pot, or bet 75% of the pot. Which will she use most frequently, and why?

Opal bets 62.5% of her range, which is a big change from her pure checking strategy in the previous scenario. Although she uses both bet sizes at equilibrium, she uses the 75% bet more than twice as often. This reflects the dynamic nature of the board. Because Ivan will have an advantage on future streets, Opal must use larger bets to make him indifferent to calling with weak draws like K♠ Q♠.

Even though Ivan technically has the nuts advantage, his range is so thick with marginal hands that Opal can play overpairs strongly. Ivan's range is so wide that he must call with many weak hands to make her indifferent to bluffing. That enables her to get more value from her strongest hands, even though she cannot be sure they are ahead.

5. Facing a check, Ivan has the same three options: check, bet \$4, or bet \$10. Which will he use most frequently, and why?

Ivan bets \$4 with about 47% of his range, down from 69% in the previous scenario, and he bets \$10 with roughly 4% of hands. His higher checking frequency reflects the weakness of his loose range.

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6. Which hands should Opal be most likely to bet? Why?

Opal's most frequent bets are sets, nutty draws such as QT, diamonds, backdoor spades, and strong but vulnerable one-pair hands such as QQ and AJ. These are the hands that most benefit from aggression, but she must reserve some of them for check-raising as well.

She does not bet much that could be described as a pure bluff. Even against Ivan's loose pre-flop range, she must expect him to call or raise often enough that betting any two cards is not profitable.

She bets one-pair hands more commonly than the pre-flop raiser did when in position against the big blind on a similarly coordinated flop. This is because pot control is not really an option when out of position. Checking does not guarantee a free turn card the way it would if she were in position. What it really does is give control to her opponent, who can take a free card when he wants one and make the pot larger when it benefits him to do so. When out of position on early streets, your betting range should be less polarized than it would be if you were in position in a similar situation.

7. If Opal checks the J♠ 8♦ 6♦ flop, which hands will Ivan always bet? What makes these hands appealing bets?

Sets and 86 are now pure bets for Ivan, and J8 is very close to a pure bet. With so many weak hands in his range, he has more bluffing candidates and so bets more aggressively for value.

On such a dynamic board, he does not worry about strengthening his checking range by slowplaying. Most turn cards will improve some portion of his checking range so that it is not completely capped.

8. If Opal checks and Ivan bets \$4, which hands will Opal raise most frequently?

Though Opal bets many of her strongest hands, she also check-raises more than when Ivan had a tighter pre-flop range. Again, she simply is not building her strategy around the outside chance he holds a miracle two pair. Most of his range is marginal or weak, and she profits by pressuring him with both bets and check-raises. Her check-raising candidates are much the same as in the previous scenario: nutty hands and draws to nutty hands.

9. If Opal checks and Ivan bets \$4, which hands will Opal call most frequently?

Against the tighter Ivan, Opal's weakest check-calls were KQ with a diamond and K♠ T♠, which were indifferent between calling, raising, and folding. Against a looser opponent, she never folds either. Nor does she fold 77. Her weakest calls now are big unpaired cards like AT, KQ, and AQ without a backdoor flush draw.

10. If Opal checks and calls \$4 on the flop and then checks again on the turn, Ivan will have the option to check, bet 75% of the pot, or bet 200% of the pot. Which will he use most frequently, and why?

As in the previous scenario, Ivan's checking frequency is around 50% on most turns. His nuts advantage enables him to bet a polarized range, but his weak hands so outnumber the strong ones that he must check often to keep his betting range balanced.

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When he does bet, he uses the smaller size more commonly on most turns. He is most likely to bet large on turns that complete straights, which are more in his range than Opal's.

Ivan almost never uses the larger bet on cards that complete flushes. Opal can easily make a flush on such turns, which makes it easy for her to defend against an overbet. She just continues if she has a flush, a set, or a strong draw and folds otherwise, rarely facing a tough decision. Overbets are most effective on turns where her range is more capped, as they force her to defend with more marginal hands.

TEST YOURSELF

1. Suppose you open raise pre-flop and are called by only the Button. All things equal, should you be more likely to continuation bet if you raised from first position before the flop or if you were in the cut-off (one seat off the button)?

You should be more likely to bet if you were in first position, because your range is stronger. The button's range should be somewhat stronger as well when he calls an early position raise, but the difference is less dramatic, and many of your opponents may not make this adjustment anyway.

2. You are in first position before the flop and raise to \$6 with A♥ T♥. A good player calls on the Button, and the flop comes A♠ 8♦ 6♦. What's your play?

A small continuation bet of \$4 is a fine play, but don't overlook checking—it's a mix at equilibrium.

This is a more favorable flop for you than J♠ 8♦ 6♦, and you can bet about 70% of your range. You still have incentive to develop a checking range, however, mostly because unimproved pocket pairs do not play well as bets. Developing a checking range here is worth about 4 big blinds per hundred hands at equilibrium.

If you only checked pairs 99 through KK, your opponent would have a lot of incentive to bet a wide, polarized range. That, in turn, gives you incentive to check some Aces in order to profit from those bets.

The weaker your kicker, the better your hand plays as a bluff-catcher. AT beats bluffs about as well as AK does, but it gives up less by checking. When you bet, AK will be

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further ahead of your opponent's calling range than AT, so checking it is a more expensive tradeoff than checking AT.

3. You are in first position before the flop and raise to \$6 with A♥ A♦. A good player calls on the Button, and the flop comes Q♠ 6♦ 4♦. What's your play?

Technically this is a mix between betting, check-calling, and check-raising, but there is a good chance that check-raising is the best option against your real-life opponents.

You check about 74% of your range at equilibrium, including many weak hands, so your opponent has a lot of incentive to bet. He only bets half his range at equilibrium, but in practice many people bet more aggressively than this, especially with the hands you most want them to bet, which are good pairs like Qx. When your opponent checks back, it will often be with no-pair, no-draw hands that are drawing nearly dead against your Aces, so there is little risk in letting him take a free card.

This flop is less coordinated than J♠ 8♦ 6♦, and because the small cards are smaller, the straight draws are less of a threat. Other than diamonds, your opponent should have few nutty hands or draws on this board. That means Aces are very close to the nuts, and with the A♦ in your hand, you won't regret having built a large pot even on diamond turns.

4. With which other hands should you balance this line?

The most obvious semi-bluffing candidates for check-raising are diamond draws, but we know those cannot be your only bluffs. Overcards with one big diamond are also good candidates, as are backdoor draws such as A♠ 5♠ and 77.

Sets, other overpairs, and AQ are also good check-raising candidates. Strictly speaking, though, they are not balancing AA. The point of balance is to give your opponent conflicting incentives and tough decisions. Check-raising AA gives him incentive to fold his marginal hands, so it is balanced by hands like A♠ 5♠ that give him incentive to call or raise.

CONCLUSION

Playing heads up on the flop against a single caller is dramatically different when that caller has position on you than when he is in the big blind. His starting range should be much stronger than that of a big blind caller, and being out of position further disadvantages you.

Consequently, you should not attempt to extrapolate strategy for this situation based on how you would play against the big blind. Among other things, continuation betting is not automatic. It may not be part of your equilibrium strategy at all!

If your opponent is too loose pre-flop, his range starts to resemble that of a big blind caller, and you can adjust your strategy accordingly. Even though this wider range presents the risk of him hitting a miracle flop, you must build your strategy around the far more likely cases where your loose opponent holds a weak hand. That means more value betting, more bluffing, and more bluff-catching than you would do against a tighter range.

Key Lessons

- ♦ **An in-position caller should have a much stronger pre-flop range than a big blind caller.** He is getting worse odds and is taking the additional risk of a player behind him calling or re-raising, so he needs a much stronger hand to call than he would if he were in the big blind.
- ♦ **Your continuation betting frequency against an in-position caller should be much lower, perhaps even 0%.** With neither an equity nor a positional advantage, you are less likely to win the pot and so less interested in making it larger.

- ♣ **Out of position betting ranges should be more linear.** Checking from out of position does not control the size of pot as effectively as checking in position does, because your opponent can still bet after you check. Consequently, you have less incentive to check draws and vulnerable medium-strength hands.
- ♣ **Continuation bet more aggressively to exploit loose opponents. Bad hands before the flop turn into bad hands on the flop.** The wider your opponent's pre-flop calling range, the more thinly you can value bet, and the wider your bluffing range can be.

CHAPTER 11: ADAPTING TO TOURNAMENT PLAY

OVERVIEW & OBJECTIVES

Our examples so far have mostly assumed games without antes and effective stacks of roughly 100 big blinds. While such conditions may occur in a tournament, they arise more commonly in cash game play.

The heuristics and principles we learned from these examples still apply in tournament play. For the most part, poker is poker. Principles like equity preservation, polarized vs condensed ranges, and board coverage apply to cash game play, to tournament play, and even to games other than hold 'em.

From a theoretical perspective, the defining feature of tournaments is that chips have non-linear value. That is because survival has value; the last of your chips is worth the most, and each subsequent chip added to your stack is worth somewhat less. If you have 100 chips and you double up to 200, you do not double your EV in the tournament. This does not cause the concept of equilibrium to fly out the window, but it does change the way it is calculated.

Practically speaking, tournament hands tend to involve wider pre-flop ranges and lower stack-to-pot ratios than cash game hands. Chapter 5, which covers playing with shallow stacks, will be of particular interest to tournament players.

In this chapter, we will consider how to think about equilibrium when chips you win are worth less than chips you lose. We will also revisit a familiar scenario with wider ranges and a lower stack-to-pot ratio to better approximate common tournament situations.

By the end of this chapter, you should be able to:

- ♣ Understand when and how the value of tournament chips changes.
- ♣ Appropriately value your tournament life at various stages of the event.
- ♣ Reassess a hand's value when players have wide starting ranges.
- ♣ Incorporate tournament considerations into equilibrium analysis.

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SCENARIO: PLAYING WITH ANTES

Ivan is first to act before the flop in a tournament. Blinds are 100/200 with a 200 big blind ante. Effective stacks are roughly 20,000. He raises to 600, and Opal calls from the big blind. The flop comes 9♥ 7♦ 6♥.

On the flop, either player may bet 33% of the pot, bet 66% of the pot, or check. On the turn and river, they may bet 75% or 200% of the pot or check. Donk bets and raises of 50% of the pot are allowed. Starting ranges and other game parameters are as shown below.

Ivan's UTG Opening Range

AA	AKs	AQs	AJs	ATs	A9s	A8s	A7s	A6s	A5s	A4s	A3s	A2s
1	1	1	1	1	1	1	1	1	1	1	1	0
AKo	KK	KQs	KJs	KTs	K9s	K8s	K7s	K6s	K5s	K4s	K3s	K2s
1	1	1	1	1	1	0	0	0	0	0	0	0
AQo	KQo	QQ	QJs	QTs	Q9s	Q8s	Q7s	Q6s	Q5s	Q4s	Q3s	Q2s
1	1	1	1	1	1	0	0	0	0	0	0	0
AJo	KJo	QJo	JJ	JTs	J9s	J8s	J7s	J6s	J5s	J4s	J3s	J2s
1	0	0	1	1	1	0	0	0	0	0	0	0
ATo	KTo	QTo	JTo	TT	T9s	T8s	T7s	T6s	T5s	T4s	T3s	T2s
0	0	0	0	1	1	0	0	0	0	0	0	0
A9o	K9o	Q9o	J9o	T9o	99	98s	97s	96s	95s	94s	93s	92s
0	0	0	0	0	0	1	0	0	0	0	0	0
A8o	K8o	Q8o	J8o	T8o	98o	88	87s	86s	85s	84s	83s	82s
0	0	0	0	0	0	1	1	0	0	0	0	0
A7o	K7o	Q7o	J7o	T7o	97o	87o	77	76s	75s	74s	73s	72s
0	0	0	0	0	0	0	1	1	0	0	0	0
A6o	K6o	Q6o	J6o	T6o	96o	86o	76o	66	65s	64s	63s	62s
0	0	0	0	0	0	0	0	1	0	0	0	0
A5o	K5o	Q5o	J5o	T5o	95o	85o	75o	65o	55	54s	53s	52s
0	0	0	0	0	0	0	0	0	1	0	0	0
A4o	K4o	Q4o	J4o	T4o	94o	84o	74o	64o	54o	44	43s	42s
0	0	0	0	0	0	0	0	0	0	1	0	0
A3o	K3o	Q3o	J3o	T3o	93o	83o	73o	63o	53o	43o	33	32s
0	0	0	0	0	0	0	0	0	0	0	0	0
A2o	K2o	Q2o	J2o	T2o	92o	82o	72o	62o	52o	42o	32o	22
0	0	0	0	0	0	0	0	0	0	0	0	0

Opal's BB Calling Range

AA 0	AKs 0	AQs 1	AJs 1	ATs 1	A9s 1	A8s 1	A7s 1	A6s 1	A5s 1	A4s 1	A3s 1	A2s 1
AKo 0	KK 0	KQs 1	KJs 1	KTs 1	K9s 1	K8s 1	K7s 1	K6s 1	K5s 1	K4s 1	K3s 0	K2s 0
AQo 1	KQo 1	QQ 0	QJs 1	QTs 1	Q9s 1	Q8s 1	Q7s 1	Q6s 1	Q5s 1	Q4s 0	Q3s 0	Q2s 0
AJo 1	KJo 1	QJo 1	JJ 1	JTs 1	J9s 1	J8s 1	J7s 1	J6s 1	J5s 0	J4s 0	J3s 0	J2s 0
ATo 1	KTo 1	QTo 1	JTo 1	TT 1	T9s 1	T8s 1	T7s 1	T6s 1	T5s 0	T4s 0	T3s 0	T2s 0
A9o 1	K9o 1	Q9o 1	J9o 1	T9o 1	99 1	98s 1	97s 1	96s 1	95s 0	94s 0	93s 0	92s 0
A8o 1	K8o 0	Q8o 0	J8o 0	T8o 0	98o 1	88 1	87s 1	86s 1	85s 0	84s 0	83s 0	82s 0
A7o 0	K7o 0	Q7o 0	J7o 0	T7o 0	97o 0	87o 1	77 1	76s 1	75s 1	74s 0	73s 0	72s 0
A6o 0	K6o 0	Q6o 0	J6o 0	T6o 0	96o 0	86o 0	76o 0	66 1	65s 1	64s 0	63s 0	62s 0
A5o 1	K5o 0	Q5o 0	J5o 0	T5o 0	95o 0	85o 0	75o 0	65o 0	55 1	54s 1	53s 0	52s 0
A4o 0	K4o 0	Q4o 0	J4o 0	T4o 0	94o 0	84o 0	74o 0	64o 0	54o 0	44 1	43s 1	42s 0
A3o 0	K3o 0	Q3o 0	J3o 0	T3o 0	93o 0	83o 0	73o 0	63o 0	53o 0	43o 0	33 1	32s 0
A2o 0	K2o 0	Q2o 0	J2o 0	T2o 0	92o 0	82o 0	72o 0	62o 0	52o 0	42o 0	32o 0	22 1

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Betting Options and Game Parameters

Board	<input type="text" value="9h 7d 6h"/>	<input type="button" value="select"/>
Starting Pot:	<input type="text" value="15"/>	
EffectiveStacks	<input type="text" value="197"/>	<input type="button" value="clear all"/>
<input type="checkbox"/> change only betting structure when loading configuration		
Flop IP	Turn IP	River IP
Bet sizes: <input type="text" value="33,66"/> %	Bet sizes: <input type="text" value="75,200"/> %	Bet sizes: <input type="text" value="75,200"/> %
Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %
<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin
<input type="checkbox"/> Don't 3-bet	<input type="checkbox"/> Don't 3-bet	<input type="checkbox"/> Don't 3-bet
<input type="button" value="Copy from IP to OOP"/>		
Flop OOP	Turn OOP	River OOP
Bet sizes: <input type="text" value="33,66"/> %	Bet sizes: <input type="text" value="75,200"/> %	Bet sizes: <input type="text" value="75,200"/> %
Raise sizes: <input type="text" value="50"/> %	Donk sizes: <input type="text" value="50"/> %	Donk sizes: <input type="text" value="50"/> %
<input type="checkbox"/> Add allin	Raise sizes: <input type="text" value="50"/> %	Raise sizes: <input type="text" value="50"/> %
	<input type="checkbox"/> Add allin	<input type="checkbox"/> Add allin
all-in threshold: <input type="text" value="67"/> % of the initial effective stack.		
"Add allin" only if less than <input type="text" value="500"/> % of pot		
minimum bet size (in chips): <input type="text" value="0"/>		

Questions

1. The ante gives both players incentive to play more hands than they would from the same positions in a game without an ante. But the change in Opal's BB calling range is more dramatic than the change in Ivan's UTG raising range. Why does she add more hands to her range than he does?
2. Which player has the equity advantage on this flop? Why?
3. Which player has the nuts advantage on this flop? Why?
4. Which player will capture more of the EV on this flop? Why?
5. Should Ivan develop a checking range? Why or why not?
6. If Ivan were to choose a single size for his bets, should it be small (500) or large (1000)? Why?
7. Which should be larger, Ivan's betting range or his checking range?
8. Consider some of the new hands Ivan added to his pre-flop range because of the antes: A9s, A8s, A7s, A6s, K9s, Q9s, J9s, 55, and 44. Which of these will be frequent bets on the flop, and which will be frequent checks?

Answers & Explanation

Ivan is first to act before the flop in a tournament. Blinds are 100/200 with a 200 big blind ante. Effective stacks are roughly 20,000. He raises to 600, and Opal calls from the big blind. The flop comes $9♥ 7♦ 6♥$.

On the flop, either player may bet 33% of the pot, bet 66% of the pot, or check. On the turn and river, they may bet 75% or 200% of the pot or check. Donk bets and raises of 50% of the pot are allowed.

1. The ante gives both players incentive to play more hands than they would from the same positions in a game without an ante. But the change in Opal's BB calling range is more dramatic than the change in Ivan's UTG raising range. Why does she add more hands to her range than he does?

Two factors influence the profitability of Ivan's UTG raises: the size of the pot and the players behind him. In a game without an ante, his raise risks \$6 to win \$3. In this game, because of the BB ante, his raise risks 600 to win 500. As a result, hands that were slightly unprofitable without an ante, such as 44 and A6s, become slightly profitable.

He is still constrained by the players behind him, though. That is a constant across both games, and with eight players sitting behind him with potentially strong hands, he cannot open overly weak hands. The ante gives those players more incentive to call or re-raise, which further reduces the value of opening weaker hands.

Opal, however, closes the action with her call. Pot odds are the only factor determining how strong of a hand she needs, and the ante improves those odds. Without the

ante, she needed to call \$4 into a \$13 pot, requiring her to realize more than 30% pot equity while playing deep-stacked out of position against an UTG opener.

Calling 400 into 1500 requires her to realize less than 27% equity. Because Ivan's opening range is weaker, her equity and equity realization should be a bit higher.

2. Which player has the equity advantage on this flop? Why?

Ivan has 53% equity, compared to 49.5% in the game without an ante. This is the result of the difference in ranges discussed above. Both ranges contain more weak hands because of the ante, but Opal's range is weakened more than Ivan's.

3. Which player has the nuts advantage on this flop? Why?

Opal does. She has added T8o to her range, giving her many more straights than she had when we previously looked at this flop.

However, she has also added many hands to her range that hit this flop weakly or not at all. Her nut hands are diluted by all these weak holdings, making it overall more difficult for her to defend her equity.

The wider ranges and lower SPR mean Ivan's overpairs are more valuable than in the same scenario without antes. Opal must defend her expanded range by calling down more marginal hands, so on a dry runout like 2♣ 3♦, Ivan can treat all overpairs as the nuts by overbetting the turn and river for value. Similarly, if Opal check-raises the flop, Ivan can profitably three-bet and get all-in with KK (he is indifferent with QQ).

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4. Which player will capture more of the EV on this flop? Why?

Ivan gets 900 chips or 60% of the pot in EV, to Opal's 600. This is even better than he did in the game without an ante, where he got \$7.13 or 55% of the \$13 pot.

5. Should Ivan develop a checking range? Why or why not?

Yes. Even with a range advantage, Ivan does not maximize his profit by betting his entire range. As before, he uses his position to get closer to showdown with marginal hands and take free cards with weak hands.

6. If Ivan were to choose a single size for his bets, should it be small (500) or large (1000)? Why?

It should be large. This is the first time we have seen a pre-flop raiser prefer a large continuation bet sizing. The reason for it is Opal's expanded range. She has a lot more 7x and 6x in her pre-flop range, which means she makes more marginal hands on this flop.

Ivan wants to target these marginal hands for value with his overpairs, and his expanded range means he has plenty of bluffs with which to balance thinner value bets. Opal can comfortably call a bet of 500 with K7 or Q6. Facing a bet of 1000, she is indifferent. In other words, the larger bet gives her a tough decision, while the smaller bet gives her a trivial one.

At equilibrium, Ivan bets 1000 with 45% of his range and 500 with 16%. The smaller bet targets the many hands in Opal's range that missed the flop entirely. Ivan uses it mostly to protect marginal hands like A6 and 88.

7. Ivan never re-raised a check-raise when playing this scenario without an ante. Will the ante change that?

Yes. With a larger pot and wider ranges for both players, we should expect higher levels of aggression across the board. Ivan has incentive to continuation bet a wider range, which gives Opal incentive to check-raise a wider range, which gives Ivan incentive to develop a re-raising range.

He raises most often with 99. He sometimes raises 77, but 66 is a pure call. Sets are a big part of Opal's check-raising range, so as more bets go into the pot, size starts to matter. Getting 99 all-in against another set is about as profitable a spot as you can find. Getting 66 all-in against another set is a disaster.

Another frequent raise is TT, which blocks the nuts, values fold equity, and has six outs against sets. Ivan is hoping for a fold when he re-raises TT, but he is ready to call all-in if it comes to that.

Interestingly, Ivan frequently re-raises A♥ 5♥ but never A♥ 8♥. While the latter is surely strong enough to get all-in on the flop, that does not make doing so the best play. A lot of Opal's check-raising range consists of big draws like K♥ 8♥ and Q♥ 8♥. A♥ 5♥ profits by getting all-in against these dominated draws, while A♥ 8♥ blocks them. The A5 also values fold equity against hands like T♣ 7♣ more than A8 does.

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8. Consider some of the new hands Ivan added to his pre-flop range because of the antes: A9s, A8s, A7s, A6s, K9s, Q9s, J9s, 55, and 44. Which of these will be frequent bets on the flop, and which will be frequent checks?

The more frequent bets are A9s, K9s, and A8s. These may seem like different hands—two are top pair, one is a draw—but they have in common a feature that makes betting appealing: they value folds but also have good equity when called.

Because Opal also has many different combinations of 9x in her range, Ivan's kicker matters. A9 is a more appealing bet than J9, which is a frequent check. The next one down, T9, is a frequent bet not because of the strength of its kicker but because the T provides blocker value and straight potential.

We see the opposite with the small pairs: 44 bets more frequently than 55. This is because the low end of the straight draw is not robust, and checking better preserves its equity. Betting risks getting raised off the hand (Ivan is indifferent to calling a check-raise with 55) and building a pot against a range thick in Tx, against which turning a straight has less value.

A7 and A6 also check often to preserve equity. Like A9, they are vulnerable to free cards, but unlike A9, they do not have good equity when called.

THE INDEPENDENT CHIP MODEL (ICM) PUTS A PRICE ON TOURNAMENT STACKS

Game theory does not go out the window when you enter a tournament. Starting ranges and stack-to-pot ratio determine your strategy just as they would in a cash game, and at most stages of the tournament, they are all you need to think about.

Considerations such as how many chips you will have left if a bluff fails or how big your stack would be if you doubled up should rarely factor into your decisions. They may make a difference at the margins, but they are more likely to lead you astray than to guide you toward the best play.

Unless you are at a final table or near another significant pay increase, you should mostly just make the plays that you believe will maximize your EV as measured in tournament chips. Win or lose, you take the next situation as it comes and play whatever strategy is appropriate to the stack you end up with.

Tournaments Are Won One Decision at a Time

Many players get too wrapped up in the big picture when playing a tournament. They make arbitrary decisions to bluff because, “I needed to win some chips” or not to bluff because “it’s too early”.

You win a tournament one decision at a time. By taking the most +EV option at each opportunity, you give yourself the best chance of winning the tournament. You cannot manufacture a +EV opportunity because you wish you had more chips, nor should you pass on one just because you are satisfied with your current stack. You

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should always be looking for the most +EV play, not seeking to maintain a stack of a certain size. Game theory can help you find the best play in a tournament just as it can in a cash game.

Often, the most +EV play is folding. That can be frustrating when the blinds are rising, everyone else has more chips than you, and it feels like you are getting nothing but bad cards. But you do not improve your prospects by investing in bad cards. All you can do is fold and hope the next two are better.

The good news is that the shorter your stack, the easier it is to find +EV opportunities. As you blind down, it becomes more likely that the next hand you are dealt will be good enough to risk the last of your chips. By folding hands that are not good enough, you conserve your resources so you will have more to invest when you do find a good spot.

The Value of Tournament Chips is Not Linear

Our scenarios so far have treated chip values as linear, with winning 100 chips being exactly as good as losing 100 chips is bad. That's how it works in a cash game: money won is just good as money not lost.

Chip values are never quite linear in a tournament, but treating them as such is often a reasonable approximation if they are not the last of your chips. Maybe when a decision is close you err on the side of the lower variance line, but mostly you should focus on making plays that maximize your EV as measured in chips, just as you would in a cash game.

When you are on the bubble or at the final table, however, the value of chips can be highly non-linear. Losing 100 chips can be much, much worse than winning 100 chips is good.

Suppose 901 players remain in a tournament and 900 will make the money. The average stack is 5000 chips, and you have only 100 chips remaining. Winning 100 chips in this situation does virtually nothing for you. Whether you make the money with 100 chips or 200 chips, you will almost certainly come away with a min-cash.

Losing those last 100 chips, however, would be a disaster. It would be the difference between folding into a min-cash versus winning nothing. Even if you were dealt Aces in this spot, you should fold them.

That's an extreme example to illustrate the point. Most commonly, it will be correct to take some risk in the interest of winning more chips, but you will need to put a premium on your continued survival in the tournament. The objective is still to make the most +EV choice; the complication is that you need to measure your EV by the cash value of your stack (sometimes called **\$EV**) rather than by chips won or lost (sometimes called **cEV**). In other words, the question you are ultimately asking is, "Which of my options in this situation will maximize the expected cash value of my stack?"

ICM Explained

To answer this question, you must determine what your stack is currently worth and how that value will change if you win or lose chips. The most popular method for translating tournament chips into cash values for the purpose of calculating EV is the **Independent Chip Model**, or **ICM**. The ICM model calculates your likelihood of finishing in each position (1st, 2nd, 3rd, etc.) based on your stack size then multiplies by the prize for that position.

Suppose three players remain in a tournament that pays \$500 to 1st place, \$300 to 2nd place, and \$200 to 3rd place. Player A has 300 chips, and Players B and C have 100 chips each.

Player A has 300/500 chips in play, so we assume he has a 3/5 chance of finishing in 1st place (yes, that is a big assumption—ICM is an imperfect model). The other two players have 100/500 chips each, so we assume they will each finish 1st 1/5 of the time.

How often will Player A finish in 2nd place? That's more complicated. To start, we assume Player B gets 1st place. We take him and his stack out of the equation. Now Player A has 300/400 chips remaining, so we assume he finishes in 2nd place 3/4 of the time. We multiply 3/4 times 1/5 (the odds of Player B coming in 1st) to get 3/20.

But Player A could also finish 2nd behind Player C. Since B and C have the same stack, the odds of this are also 3/20. Altogether, there is a 6/20 or 3/10 chance of Player A finishing 2nd.

If Player A comes in 1st 3/5 or 6/10 of the time and he comes in 2nd 3/10 of the time, he must finish 3rd 1/10 of the time. To get the value of his stack, we multiply these odds by the value of each position: $3/5 * \$500 + 3/10 * \$300 + 1/10 * \$200 = \410 .

We could repeat this process for each of the other players, but because they have the same number of chips, we can just divide the remaining prize pool between them. The prize pool is \$1000 total. We subtract Player A's \$410 then divide the remaining \$590 by 2 to get \$295 as the value of the other two stacks.

Though Player A has 60% of the chips, the ICM EV of his stack is barely 40% of the prize pool. That is because if he wins all the chips, he will only win half the prize pool. Consequently, adding more chips to his stack is worth less than holding on to chips he already has.

If you have ever made a deal at a final table, this is likely how it was calculated. When the players decide to stop playing and divide the remaining prize pool amongst themselves, they typically use ICM to determine the current value of each player's stack.

Sometimes, a player will argue he should get more than the ICM value of his stack. Perhaps he believes he is a better player than his remaining opponents and so will outperform his ICM expectation. Perhaps he has a big stack and expects to steal more than his share of blinds.

Ultimately, ICM is only a model. It has flaws and limitations and is far from a perfect measure of a stack's value. Its many advantages and disadvantages are beyond the scope of this book, but David Sklansky's *Tournament Poker for Advanced Players* is a good resource for those wanting more discussion of tournament-specific poker theory.

For our purposes, you just need a rough understanding of what ICM is, because we will use it in our final scenario.

SCENARIO: CLAIRVOYANCE AT THE FINAL TABLE

Three players remain in a tournament: Opal, Ivan, and Nia. 1st place pays \$500, 2nd place pays \$300, and 3rd place pays \$200. Nia has already folded, leaving Ivan and Opal to contest a pot containing 200 chips. All three have 100 chips remaining in their stacks.

Opal is always dealt a K, while Ivan is randomly dealt either an A or a Q. Each knows the other's range. Opal always checks. Ivan may bet 100 or check. If the hand goes to showdown, the highest card wins.

We solved the original Clairvoyance Game in *Play Optimal Poker*, proving that Ivan should bluff with 1/3 of his Qs in order to make Opal indifferent to calling with a K, and Opal should call with 2/3 of her Ks in order to make Ivan indifferent to bluffing with a Q.

In the final table situation described here, both players' incentives are different than in the original game. They both care disproportionately about not losing the last of their chips. With that in mind, answer the following questions to the best of your ability, then read on for the explanations.

Questions

1. Would you expect Ivan to bluff more or less than in the original Clairvoyance Game? Why?
2. Would you expect Opal to call more or less in this scenario than she did in the original Clairvoyance Game? Why?
3. Suppose Ivan never bluffed. Could that plausibly be an equilibrium? Why or why not?
4. Suppose Opal never called. Could that plausibly be an equilibrium? Why or why not?
5. Exactly how often should Opal call?
6. Exactly how often should Ivan bluff?
7. Suppose Ivan goes all-in and Opal calls. He has not turned his hand over yet, so we know his betting range but not his hand. Who has the highest EV?

Answers & Explanation

1. Would you expect Opal to call more or less often in this scenario than she did in the original Clairvoyance Game? Why?

She calls less often. Her objective is still to make Ivan indifferent to bluffing, but his payoffs in this scenario are different than in the original Clairvoyance Game. Winning the pot is less good for him, and getting caught in a bluff is much worse. Consequently, Opal does not need to call as often to make him indifferent to bluffing.

2. Would you expect Ivan to bluff more or less than in the original Clairvoyance Game? Why?

He will bluff more, for the same reasons that Opal calls less. Her risk is greater, and her reward for winning the pot is reduced. She must anticipate winning more often or else she would strictly prefer folding. Ivan must therefore bluff more often to keep her indifferent.

To be clear, Opal is **not** calling less often because her risk is greater. Nor is Ivan bluffing more often because he anticipates more folds from Opal. At equilibrium, the EV of bluffing and bluff-catching in this scenario is still \$0. Just as in the original Clairvoyance Game, each player's strategy derives from his or her opponent's incentives, with the objective of making the opponent indifferent.

3. Suppose Ivan never bluffed. Could that plausibly be an equilibrium? Why or why not?

No. If Ivan never bluffed, Opal would never call. But if Opal never called, then Ivan should bluff. He does not want to risk the last of his chips, but there is no risk if Opal literally never calls. Thus, there can be no equilibrium where Ivan never bluffs.

4. Suppose Opal never called. Could that plausibly be an equilibrium? Why or why not?

Yes. If Opal never called, Ivan should always bluff, in which case she could expect to win the pot half the time by calling. Depending on just how much she values the last of her chips, though, that may not be enough incentive for her to call.

Calling could have a positive expectation measured in chips but not when measured by the ICM value of her stack. The chips she stands to win could be worth that much less than the chips she stands to lose. Whether or not this actually is the equilibrium will depend on the details of the remaining players' stack sizes and payouts. We will delve deeper into those details now.

5. Exactly how often should Opal call?

Opal's goal, as always, is to make Ivan indifferent to bluffing with a Q. That means finding a calling frequency that makes his EV for bluffing equal his EV for checking.

This is more complicated than in the original Clairvoyance Game, because the EV of bluffing successfully is not just the size of pot. Rather, it is the

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value that a successful bluff would add to the ICM value of Ivan's stack.

If Ivan checks and loses the pot, he will have 100 chips, Opal will have 300 chips, and Nia will have 100 chips. We know from our example above that Ivan's stack of 100 chips would have an ICM value of \$295.

If Ivan wins the pot with a bluff, he would be the player with a stack of 300 chips worth \$410. That means bluffing and winning the pot adds $\$410 - \$295 = \$115$ to the ICM value of his stack.

If Opal calls his bluff, Ivan is eliminated in 3rd place and is awarded \$200. That means a failed bluff costs him $\$295 - \$200 = \$95$ in ICM EV.

Now we can use the familiar indifference equation: $\$0 = (1 - \%Call) * \$110 - (\%Call * \$95)$. Solving for %Call gives us 13.6%.

In the original Clairvoyance Game, Opal had to call 2/3 or 66.7% of the time to make Ivan indifferent to bluffing, because winning the pot was twice as good for Ivan as losing a bluff was bad for him. At the final table, even though he wins twice as many chips with a successful bluff as he loses with an unsuccessful one, the ICM value of winning the pot is not much higher than the ICM value lost on a failed bluff. Thus, Opal must call just 13.3% of the time to make him indifferent.

That exact number is specific to this scenario and not important. What is important is the process by which we derived it and the general point that Opal calls less often, despite getting the same pot odds, when she considers the ICM implications of the final table.

6. Exactly how often should Ivan bluff?

To write an indifference equation, we must determine the value of calling and winning for Opal. If she calls and catches Ivan in a bluff, he will be eliminated in 3rd place. That will leave Opal with 400 chips to play heads up against Nia, who will have 100 chips. The ICM model will expect Opal to win the \$500 prize 4/5 of the time and the \$300 prize 1/5 of the time, for an overall EV of \$460.

If Opal folds, Ivan will have 300 chips, and she and Nia will have 100 chips each, which we know gives her an ICM EV of \$295. So, calling and winning adds $\$460 - \$295 = \$165$ to the ICM value of Opal's stack.

Calling and losing to a value bet would mean Opal finishes in 3rd place for \$200, a loss of \$95 in ICM EV relative to folding.

Now we can use the indifference equation $\$0 = (\%Bluff * \$165) - ((1-\%Bluff) * \$95)$. Solving for %Bluff gives us 36.5%. That does not mean Ivan bluffs with 36.5% of his Qs; it means 36.5% of his bets should be bluffs. He will always value bet with an A, so he must bet 57.5% of the time he has a Q in order to achieve an overall bluffing frequency of 36.5%.

Don't worry if you don't understand where the 57.5% came from. It's algebra, and it's not the important part. The important takeaway is that even though the risk-reward ratio of bluffing is worse for Ivan at the final table than it would be in a cash game, he bluffs at a higher frequency here (in the original Clairvoyance Game, he bluffed 33% of his Qs to achieve an overall bluffing frequency of 25%).

Why? Because the risk-reward ratio is also worse for Opal. She has little incentive to call, so even though getting called is very bad for Ivan, he bluffs more often.

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7. Suppose Ivan goes all-in and Opal calls. He has not turned his hand over yet, so we know his betting range but not his hand. Who has the highest EV?

We know Opal's EV is \$0, because Ivan's betting strategy makes her indifferent.

As for Ivan, Aces are 63.5% of his betting range. They are worth \$460 when Opal calls compared to \$410 if she folds. So, 63.5% of the time he gains \$50 in ICM EV. The other 36.5% of the time, he gets caught bluffing and finishes in 3rd place for \$200, losing \$210 compared to his ICM EV if she had folded. When Opal calls, Ivan's EV = $.635 * \$50 - .365 * \$210 = -\$45$.

By calling a bet from Ivan's equilibrium betting range, Opal breaks even and causes Ivan to lose \$45. How is that possible? Isn't poker a zero-sum game? Where did that \$45 go?

It went to Nia. When Opal and Ivan get all-in against each other, it's win-win for Nia. No matter what, she will lock up 2nd place money. Sure, she will be a 4:1 dog to win 1st place, but at least she won't finish 3rd.

Need proof? If Opal folds, she and Nia will have 100 chips and Ivan will have 300, making Nia's stack worth \$295. When Opal calls, Nia is guaranteed to be heads up against someone, with 100 chips to her opponent's 400. We already determined the player with 400 chips would have ICM EV of \$460, so the remaining \$340 of the \$800 prize pool must go to Nia. That means Opal's call improves Nia's EV by \$45.

When you're at the final table, it's good to be NIA—Not In Action. Variance and risk are your enemies. You make money just by folding and letting your opponents take risks while you sit on the sidelines.

TEST YOURSELF

For the tournament examples below, assume the payouts are as follows: \$1835 for 1st, \$1310 for 2nd, \$990 for 3rd, and \$745 for 4th.

1. It is early in a tournament. Blinds are 500/1000 with a 1000 big blind ante. You have 60,000 chips, and your opponents cover you. The cutoff—the player one seat off the button—raises to 2200, and it folds to you in the BB with K3o. What's your play?

Call. This is a bad, easily dominated hand that will be tough to play from out of position with relatively deep stacks. However, you are simply getting too good of a price to pass up. You need to realize only about 20% equity to call.

Without the ante, this would be a fold. The ante means both that you are getting a better price to call and that your opponent should be opening a wider range against which your hand will realize more equity. You are not a favorite to win, and most likely you will end up just checking and folding to a continuation bet. Getting such a great price, though, that's better than folding pre-flop.

2. What if this raise came from UTG instead of the cutoff? Should you still call?

No. Although UTG should be opening wider because of the antes, the difference should not be nearly as dramatic as for the cutoff. You should still expect him to have a reasonably good hand, which will make it hard for you to realize equity with a hand as weak as K3o.

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3. You are playing a \$5/\$10 no-limit hold 'em cash game. The button has \$400 and you cover. He opens to \$20, and you call with J♥ T♥. The flop comes J♦ 7♥ 3♣. You check, and your opponent bets \$20. What's your play?

Raise. Technically this is a mix at equilibrium, but it is a high frequency raise, whereas most human players default to calling.

Why are we talking about a cash game hand in a chapter called Adapting to Tournament Play? A key aspect of adapting to tournament play is valuing hands appropriately when starting ranges are wider and stacks are shallower. Antes are one incentive for both players to have wider starting ranges, but even in cash game play, both players should see the flop with many hands in a button vs big blind confrontation.

Against an early position raiser, this hand would not be strong enough to raise. The risk of domination would be too great. A button raiser will have many more unpaired hands to which you would like to deny equity with a raise. And because he has so many weak hands he will fold, he should be more willing to call a raise with weaker pairs, which improves JT's equity when called.

With wide starting ranges, this hand is strong enough to play for stacks on the flop or on a dry runout. The key is recognizing that both you and your opponent are less likely to hold very strong hands when you start with wide ranges and to adjust your assessment of hand strength accordingly.

4. Four players remain at the final table of a tournament. You are in 4th place with a stack of 100K after posting your ante. The chipleader has 300K, and the other two players have 200K and 150K. Blinds are 5K/10K with a

10K big blind ante. The chipleader is first to act and moves all-in. The other two fold, and you are in the big blind with A8o. What's your play?

This is a call at equilibrium, but it is very close. First, we'll talk about why it's a call, then we'll talk about why it's close and might not be a call.

As much as you do not want to be eliminated in 4th place, that is the direction things are heading even if you fold. As the short stack, you do not have as much room as your opponents to fold and hope to outlast other players. The two medium stacks are mostly waiting for you to bust out or double up; they should not take many risks until that happens. The chipleader can continue taking advantage of everyone's incentive to survive by stealing lots of blinds, and there is nothing anyone can do to exploit that. If everyone else is playing well, then you should go with a hand as strong as A8o when you are the short stack in the big blind.

That said, this is a barely profitable call at equilibrium, and everyone else playing well is a big "if". If the chipleader is not shoving as wide as the situation merits, which would include hands as weak as T8o and J3s, your hand will not have as much equity when you call. More importantly, if the other two players are taking more risks than they should, then your chances of folding into 3rd place improve. Given that this is a close decision at equilibrium, it would not take much of a read to swing it to a fold. With a hand as strong as, say, 88, you should never fold here unless you knew the chipleader to be a huge nit who would be shoving much, much tighter than his equilibrium strategy.

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5. Four players remain at the final table of a tournament. You are in 2nd place with a stack of 300K. The chipleader has 600K, and the other two players have 200K and 170K. Blinds are 10K/20K with a 20K big blind ante. Action folds to you in the small blind with AKo. The big blind is the chipleader, the only player who covers you. What's your play?

Raise all-in. Although you value survival and do not **want** to get all-in against the only player who covers you, that does not override all other considerations. Winning chips is still valuable, and this is not an especially risky shove. The BB is extremely unlikely to call—he, too, should prefer to avoid a confrontation, though not quite as strongly as you do—and even if he does, you will be ahead of his range.

Don't try to "play it safe" by limping or raising small. These plays only increase your likelihood of losing \$EV and/or the pot. For one thing, they give your opponent the opportunity to shove on you. Even if you call and are ahead, this greatly increases your risk of elimination and so is less good for you than just winning the blinds and antes.

A limp or small raise also gives your opponent the opportunity to see a flop and realize equity with weaker hands against which AK is not a big favorite. You have a great hand pre-flop, but playing out of position against the chipleader is going to be tough on most flops. Going all-in pre-flop is the safest thing you can do.

6. Four players remain at the final table of a tournament. You are in 2nd place with a stack of 300K after posting your ante. The chipleader has 600K, and the other two players have 50K and 40K. Blinds are 5K/10K with a 10K big blind ante. The chipleader is first to act and moves all-in. The other two fold, and you are in the big blind with AKo. What's your play?

Fold. The risk of elimination in 4th place is too great. The two short stacks will be forced all in by the blinds in the next two orbits, so there is a good chance you can lock up 2nd place money just by folding.

The major difference between this spot and the previous one, even more important than the pot odds, is that here you would be the one calling all-in rather than the one moving all-in. Moving all-in is not terribly risky, because the most likely outcome will be the big blind folding and you collecting the blinds and antes without a showdown. Calling all-in guarantees you will go to showdown against a player who covers you, risking elimination in 4th place.

You should not fold quite 100% of hands in this spot, but you need a much stronger hand than AK to call. The problem with AK is that even when it is ahead, it is rarely a big favorite, and losing the last of your chips right now is much, much, much worse than doubling up is good. Your incentive to survive is so strong that you need a pair of Jacks or better to call.

♦ Play Optimal Poker 2♠

7. Suppose you were the chipleader in the above situation. What's your range for moving all-in?

At equilibrium, this is a shove with 86% of the deck. The best hands you fold are 94o and T3o.

You are probably accustomed to raising such a wide range only as an exploit against opponents who fold too often. Here, though, it is unexploitable because the distribution of stacks at the final table means your opponents have incentive to fold very often even if they know how wide you are shoving.

The BB is the only player who can put a hurting on you, but he needs an extremely strong hand to call. The short stacks can call wider, but they still want to outlast each other. Even when they do call, it does not cost you much.

This is an equilibrium because no player can unilaterally increase his EV by expanding his calling range. Any player can, however, **reduce** his own EV by calling with weaker hands than he should. And in the process, he can take you down with him.

Many players in BB's shoes will not understand ICM and final table dynamics. They will see Ace-King and call happily. In so doing, they light both their own EV and yours on fire to the delight of the short stacks, who suddenly have a real chance of finishing in 2nd place.

If you anticipate your opponents not calling as tightly as their own incentives dictate, the exploitative play is to raise a tighter range and fold your weakest hands. It is frustrating when your opponents' mistakes cost you money, but you must remember that in the long run you benefit from them. Sometimes you are the short stack who ekes out a 3rd or even 2nd place finish because the BB makes a bad call.

CONCLUSION

Tournament play is not as dramatically different from cash game play as people assume. In fact, the biggest differences are often the antes and shallower effective stacks rather than the “last player standing” aspect. The best play in a typical tournament situation would be the best play in a cash game situation with comparable effective stacks and antes.

The exception is during stages of a tournament, most notably the bubble and the final table, where survival is at a premium and chips have decidedly non-linear value. Game theory concepts still apply in such situations, but the equilibrium shifts toward more conservative play. Calculating EV is more complicated in such situations, because even when the pot is heads up, other players in the tournament still have a stake in the outcome.

The ICM model makes more accurate EV calculations possible by putting a cash value on a chipstack depending on the size of that stack relative to those of the remaining players and the tournament’s payout structure. This model enables us to apply equilibrium analysis to tournament situations where chips won or lost is not a good measure of EV. It even enables us to solve multi-player equilibria for simple pre-flop scenarios.

Key Lessons

- ♦ **Tournaments are won one decision at a time.** You should approach a tournament just as you would a cash game, seeking to make the most +EV decision at every opportunity. Excessive concern with survival or maintenance of a particular stack size will not serve you well.
- ♦ **When starting ranges are wider, hands change value.** The wider a player's starting range, the more weak hands he will hold. That means his opponent has more incentive to bluff and bet for thin value, giving the player more incentive to call or raise weaker hands than he would if he started with a stronger range. Both players will have top pair less often, making top pair more valuable.
- ♦ **ICM is only a rough approximation of a stack's value.** It does not account for factors such as skill relative to the field, potential for future +EV situations, and where you are relative to the blinds.
- ♦ **Game theory concepts like equilibrium still apply in tournaments.** When survival is at a premium, the equilibrium may shift toward more conservative play, but with the help of ICM we can still find an equilibrium.
- ♦ **Risk aversion influences the caller more than the bettor.** Making a big bet, especially an all-in bet, is not nearly as risky as calling such a bet. When you make a big bet, there is typically a good chance your opponent will fold, which is a low variance outcome. When you call a big bet, you guarantee a high variance outcome.
- ♦ **Medium stacks value survival the most.** The chipleader is less concerned with survival because no

one can eliminate her in a single hand. The short stack is less concerned with survival because he is not a favorite to outlast other players by folding. Medium stacks have the most to lose by getting all-in against a player who covers them.

- ♣ **Opponents who deviate from equilibrium can cost you money.** Players who are not involved in the pot at a final table still have an interest in its outcome, so your opponent's mistakes can cost both of you money, to the benefit of those other players. As a result, exploitative play in tournaments is not always about taking advantage of an opponent's mistakes so much as accounting for them.

CONCLUSION

Learning to construct ranges is one of the largest quantum leaps you can make in your development as a poker player. Thinking in terms of ranges instead of playing hands in a vacuum is the key to concealing your objectives from your opponents and presenting them with genuinely tough decisions.

The details matter, but the first step is simply learning to think in terms of ranges. Actually constructing them, getting the details right and seeing every opportunity, is the work of a lifetime. You will refine these skills for the rest of your poker career.

Fortunately, all this work is subject to the Pareto principle: 80% of the results come from 20% of the effort. The first steps—recognizing when you should have a raising range, roughly how large it should be, what kinds of hands should populate it, and what your plan on various turns should be—are the most important.

These are the steps this book has prepared you to take. You should not expect to take them all at once—that will lead to tripping and stumbling—but you should have a better idea of the questions to ask as well as the tools to answer them.

Much of this work is best done away from the tables. You delve deeply into hands when you have the time to do so that your instincts will be honed when you are in the heat of battle.

At the table, you will have only a fraction of the time you would need to explore a decision in the depth of our scenarios. You are now equipped to focus on what is most important and to avoid common dead-ends. Start with the interplay between ranges and the broad outlines of your strategy: How dynamic is the board? Who has the

equity advantage? Should you be driving the betting or mostly checking and calling? Faced with a bet, how strong must your hand be to continue? How strong must your hand be to commit your stack? Which turn and river cards will be especially good or bad for you, and how can you construct your ranges to provide coverage on those runouts?

If you consistently ask these questions and endeavor to answer them ever more precisely, the process will come more easily to you. You will find yourself in fewer situations where you are not sure how best to proceed, and you will more often put your opponents in such situations. You will be closer to playing optimal poker.

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Andrew Brokos's professional poker career began in 2004, when he graduated from the University of Chicago with a B.A. in philosophy. He initially played small-stakes online games to make ends meet while searching for jobs at education-oriented non-profit organizations but quickly saw that taking poker seriously could produce enough income to start his own non-profit.

Later that year, Andrew founded the Boston Debate League and served as volunteer executive director until 2008, when the organization was large enough to hire a full-time director.

Since then, Andrew has dedicated himself full-time to teaching and playing poker. He currently makes instructional videos for Tournament Poker Edge and writes a monthly column for Two Plus Two Magazine.

In 2012, Andrew Brokos and Nate Meyvis launched the Thinking Poker Podcast, a weekly show that quickly became one of the most popular poker podcasts on the internet. You can find the podcast archives and more information about private coaching at www.thinkingpoker.net.