THE LOGIC OF SPORTS BETTING

ED MILLER
MATTHEW DAVIDOW

The Logic Of Sports Betting

Ed Miller
Matthew Davidow

Ed Miller
10624 South Eastern Avenue
Suite A-995
Henderson, NV 89052
United States of America.

TheLogicOfSportsBetting.com
ISBN-13: 978-1-0968-0572-4
ISBN-10: 1-0968-0572-3

For Elliott and Matias

Contents

Introduction

"If you can't spot the sucker in your first half hour at the table, then you are the sucker."

In a movie full of great lines, that one was the best. The best because *Rounders* was a poker movie, and no sentence has ever hit at the core of poker better than that one.

But also, the best because the idea so clearly transcends poker. It's a dark truism about our culture and the world we live in.

And—in a much more trivial but no less profound way—about betting on sports.

Most casino games are single-player games. Some games like slot machines and video poker are obviously so. You sit by yourself at a machine and press buttons.

Table games like blackjack may not appear to be single player at first. There's always at least a dealer at the table, and there are usually other players too.

But the dealers are just there to turn cards over and pay bets—they have no decision-making authority. Their jobs could easily be done by a machine—machine dealers are a trend in modern casinos.

The other players at the table aren't part of your game either. They're playing their own games. Next to you. What they do has no effect on your game, and vice versa. If they're suckers, it does you no good. The only thing that matters in blackjack is how well your strategy exploits the static rules of the game.

People often think of these casino games as "you versus the house." But the house isn't playing. You're the only one playing. Against a fixed ruleset designed to make you lose. The house is just there to run the game and collect your losses.

Poker is different, of course. It's different because the house's role as a non-player is more obvious. You sit at a table with eight other people, and you are really playing against them. If you've got a sucker at the table, then it's likely to be a good day. Again, the house's role is simply to run the game and collect a fee for doing so.

Sports betting is unique because it's the only game where you are, in fact, playing against the house. The house is an active participant. It's your main, direct adversary.

It's also a zero-sum game. Either you will win, and the house will lose the same amount. Or the house will win, and you will lose.

It's a little unfair, because unlike in poker where you can stare your opponents down across the table, in sports betting you usually don't get to look your competition in the eye. But every time you make a bet at a sportsbook, you are playing in a game against other people. People who work for the sportsbook. Other bettors. People who are trying to beat you. Because if they don't beat you, then by the definition of a zero-sum game, you will beat them. And if you do enough of that they'll be out of a job.

This is a core truth about sports betting. You're playing a game against other people who are actively trying to beat you.

And it's not just a two-player game—you against the house. It's a multiplayer game where you are playing indirectly against other bettors. In blackjack if the best blackjack player in the world is sitting next to you, it has no effect on your hand or results.

In sports betting if the best player in the world is betting in your market, it costs you money and makes it harder for you to win.

So, while Mike McDermott was talking about poker when he said you need to be able to spot the sucker, it's even more true in sports betting. If you can't spot the sucker, you are the sucker. This book teaches you how to spot the sucker and to keep from being the sucker yourself. And maybe even how to make a few bucks along the way.

The book is divided into three parts. The first part is an in-depth examination of your main counterpart, the sportsbook. It's a nuts-and-bolts look at how bets work, and then an explanation of how the sports betting industry is put together, its strengths, its weaknesses, and what tricks you can expect from the folks who work for the house as they try (hopefully in vain) to win your money.

The second part of the book covers the logic of sports betting. These are the main concepts you need to navigate markets, avoid pitfalls, and build a winning strategy.

The third part is a practical guide to looking at a sports betting menu and consistently finding bets that will win over time.

My goal with all of it is to give you a pretty good look behind the curtain of the sports betting industry, so you see where sportsbooks are strong and where they're barely holding things together. (The barely holding things together parts should be your focus when betting.) Then to outline the logic of how to find good bets while still allowing you to take the final step on your own to put the ideas into practice.

Finally, a caveat. This book is about the logic of sports betting. It's not a guide to becoming a professional bettor, and in particular, there is one key area of professional betting I don't cover—data analytics and modeling. It's possible to win a little at

sports if you don't do much data work, but it's impossible to win a lot without diving deeply into the data.

What I cover in this book is all required knowledge to bet professionally, but it is not enough on its own. If your goal is to become a highly educated recreational bettor, this book might be all you need to have fun with betting and stick it to the sportsbooks. If you want to turn your betting into a business, however, you need a lot more knowledge than just what I cover here.

Alright let's get to it.

PART I: BETS AND BOOKS

Sports Betting Is A Multiplayer Game

I doubt most people would really think about it this way, but in my experience, many sports bettors treat the activity like it's a game of solitaire. Or like it's a puzzle book like Sudoku or something.

They open a sports betting app or website—or pick up a sheet if they're really old-school—and start looking at the lines one-by-one. They're looking for lines that are "off." They make their estimate of what the line should be, they look at what's on the app or sheet, and if they're sufficiently different, they make a bet.

I guess the theory goes that there are bad lines out there, and if you find enough of them through this process, you'll win.

Sports betting as solitaire is a terrible way to think about the game, though. I don't know of anyone who wins who takes this approach.

There are two sides to every bet. When you type your bet into the app and hit go, you're just accepting an offer to bet with someone on the other end. Someone who works for the sportsbook.

Someone who wants to beat you, not just on behalf of the company they work for, but often out of a personal sense of

competition as well. Someone who has a whole lot of built in advantages over you.

There's a counterparty to your bet. An equal party. If it's a Yankees-Red Sox game, and you bet the Yankees for $100 to win $100, then someone somewhere offered to bet the Red Sox against you for $100 to win $100. If you bet $100 to win $10,000 on the Cleveland Browns to win the Super Bowl, then someone else has agreed to bet $10,000 to win your $100 that they won't.

That counterparty isn't a machine or an algorithm or a table game dealer bound by static rules. It's an actual person with latitude to play the game how they see fit. That person made the two-sided offer and agreed to take the other side because they thought they had the right side of it.

They think you're gonna lose.

But really sports betting isn't a two-player game either. It's a multiplayer game.

Because at the very same time you opened your app and started looking at prices, so did hundreds of other people. Some people who bet for a living look at those prices all day long every day.

And they're trying to do the same thing you are. They're looking for the lines that are "off" and they're betting them.

Think about how Black Friday works. Every year some big retailer announces that their Black Friday sale will start at exactly 6am. And a huge crowd forms outside, and then when they open the doors, the mob rushes into the store and someone films it and it gets on the news and all of us above-it-alls shake our heads and wonder why anyone could be so selfish and foolish and materialistic that they'd trample their fellow humans to try to buy cheap stuff on Black Friday.

But why are people doing that? Are they just nuts? Why don't they just wait a few hours until the mob is gone and do their shopping in relative peace?

They brave the mob because they know that the retailer uses artificial scarcity on the very best deals. Yes, you can—as advertised—buy a 65-inch TV for $99. But there are only three dozen of them in stock. And when they're gone, they're gone, and when the TVs get restocked the price is going back to normal.

This is almost always true. The real deals rarely last. By the time you hit the store even a few hours later, you're basically looking at run-of-the-mill sale prices and possibly nothing even worth driving to the store for.

Sports betting is very similar. Sportsbooks tend to have a predictable schedule for when they list their markets. For the NBA, for example, a market making sportsbook might post the next day's NBA games at roughly the same time every evening. A "mob" collects, waiting for these markets to post. (The mob is online obviously. And we'll talk more about market makers later in the book, but for now a market maker is just a sportsbook that posts opening lines for games, takes bets, and moves their line based on the action. If you thought every sportsbook did this, well, keep on reading.)

As soon as the markets post, people scan the lines as quickly as they can looking for the best deals. As soon as they spot a deal, they jam in a full-limit bet. And as soon as someone makes a bet, the sportsbook moves the price.

If the price is still a "deal" after a single price move, either someone else bets it, or the original bettor bets again.

This process goes quickly, with one or another of the mob smashing in their bets on all the obvious good prices. By the time things quiet down, almost by definition there are no obvious good deals left. Everything's been picked through.

At this point, the sportsbooks that don't act as market makers (that's most all of them), open their markets. They use the lines that got hashed out by the feeding frenzy. They want nothing to do with the mob or the $99 TVs. They're selling only the TVs that are still left after all the $99 ones are gone.

That's the trouble with looking at sports betting as you versus the sportsbook. Whatever price you're seeing—whatever line you think is "off" or has "value"—has been seen by dozens or hundreds of other like-minded people. And they all looked at that price and didn't see what you think you see. They looked at it and said, "Meh, bad bet."

That does not mean necessarily that you are wrong and they are right. Obviously if they were always right, it would be essentially impossible to win at sports betting if you aren't interested in being part of a mob.

But you should never underestimate the power of this "picked over" effect either. It's very strong. It's strongest in the markets that get the most attention.

For example, consider the major NFL markets—game point spread, moneyline, total, and first half point spread and total.

By Sunday night, the earliest market makers will post lines for the next week's NFL games for the major markets. The feeding frenzy process will take place. Then on Monday a few more places will post lines and another minor feeding frenzy will happen.

Let's say your favorite sportsbook then opens their NFL markets for the week on Tuesday morning. One way or the other, they will be duplicating the current lines posted at the early bird places—the lines arrived at after the feeding frenzies stopped because those involved couldn't find anything worth betting anymore.

If your process is just to look at these lines on Tuesday morning, see which ones look "off," and bet them, chances are very strong that your process is a losing one.

Why? Because the sportsbook's hold[1] forces you to be "right" the vast majority of the time. If one of your theories turns out to be mostly BS, every bet you make using that theory costs you two or three "good" bets worth of value.

When you bet on Tuesday you're saying, "I know hundreds of people who are trying to win already picked through all these numbers, but I can find the seven ones they all missed, and I'm almost never wrong about it."

Again, this is not impossible. I'm just hoping when I put it this way that you understand what a high bar it really requires to try to beat these major markets.

Furthermore, there's a substantial difference between trying to bet NFL on Tuesday and betting on Saturday or Sunday morning. On Tuesday, the market making books that set the lines typically still have restricted limits on NFL and college football. This limits who wants to participate in the market on Tuesday—the football bettors with the largest bankrolls (a mixture of the strongest bettors and the not-as-strong-but-with-enormous-egos bettors) often sit things out until the limits increase.

Sunday night and Monday NFL bettors are the sports betting equivalent of Black Friday retail shoppers trampling and clawing each other over a pile of half-off Nintendos. Tuesday and Wednesday bettors are the folks who spend all day on eBay sniping mispriced auctions and reselling the goods at profit.

---

[1] The vig. The juice. The take. The house cut. We'll call it the hold throughout the book and explain how to calculate it in future chapters.

Saturday and Sunday NFL bettors are big swinging dick Wall Street traders (sometimes literally).

Okay that was a ridiculous analogy, but you get the idea. As the week goes on, the inventory (the major NFL side and totals markets) get picked over by increasingly sophisticated bettors.

If you're betting an NFL point spread, moneyline, or total on Sunday morning at a major market making book (or at a retail book with the same price as the market makers), it will prove very difficult to win. You will need a truly unique insight into how these bets should be priced that an entire country of 300 million people doesn't comprehend.

All this explanation leads up to one central idea. In the rest of the book I will teach you how to go about looking for bets that win. Perhaps the most key idea toward that end is this.

Avoid betting into major markets that have been picked over by others. Look for virgin lines, scarcely examined bets, and those that serious bettors tend to ignore.

Look for markets at one sportsbook that aren't even offered at other sportsbooks—this cuts down the number of eyeballs who might see the bets and snipe the good ones before you.

Look for markets that are only up for a few minutes (second half and in-play markets).

If you go into this thinking you're the smartest person in the world and that you can go head-to-head with the entire betting market, you will almost certainly fail.

So don't do that. Treat sports betting like an Easter egg hunt. When all the other kids run one direction, you run the other. Look for the eggs a little less out in the open. It's more fun anyway.

Break-even Percentages

Just like most poker books start by explaining pot odds, if you want to bet sports well you have to understand how the odds work. There's one key idea, and if you get used to it you'll be ahead of the game to start.

Convert everything to break-even percentages.

A break-even percentage (alternatively called implied odds) is the percentage of time a bet must win for you to neither win nor lose money making the bet over time. If someone offers you an even money bet that a coin flip will land heads, the break-even percentage is 50%. Not because those are the true odds of winning, but because that's how often you have to win to exactly break-even on an even money bet.

In other words, break-even percentage is based on how much the bet pays, not how often it wins.

If someone offers you 5-to-1 odds that a six-sided die will land one, you have a 16.7% break-even percentage—and that also happens to be how often the bet will win. That makes it a break-even bet.

If they offer you 4-to-1 odds, that's a 20% break-even percentage. Because the bet will win less than the break-even percentage, it's a losing bet (for you).

If they offer you 7-to-1 odds, that's a 12.5% break-even percentage. Because the bet will win more than the break-even percentage, it's a winning bet (for you).

Because these bets are all zero-sum, like sports bets, if it's a losing bet for you, it's a winning bet for your counterparty. And vice versa.

That's the main idea. I'll back up a little bit though.

HOW ODDS ARE LISTED

The first time someone who's never bet sports before walks into a sports book and sees the board, they are inevitably overwhelmed. "What do all these numbers mean? Sixty-seven-point-five? Minus-one-fifty-five? What the heck?"

In the United States, the most popular way of conveying odds is by using what's called American odds. (Surprise.) American odds are represented by either a positive number or a negative number, and the number is always at least 100. So, for example, -165 or +215 or -310 are all valid in American odds notation.

The minus sign denotes that the bet is on a favorite. The plus sign denotes an underdog. When the bet is plus (i.e., an underdog) the number after the plus sign means how much money you would win if you bet $100 on that market. So if you make a bet at +350 odds, it means you will win $350 for every $100 you bet. If you bet $10, you win $35. If you bet $200, you win $700. And so on.

When the bet is minus (i.e., a favorite) the number after the minus sign means how much money you would have to bet to win $100 on that market. So if it's -110 that means you have to bet $110 if you want to win $100. Or $22 to win $20. Or $99 to win $90. And so on.

What matters for all these numbers is the break-even percentage. If you make a bet at -155, how often does it have to win (as a percentage) for the bet to break-even?

The math for that is simple. If it's a plus number, you take 100 and divide it by 100 plus the listed number. So the break-even percentage for +120 is

BE% = 100 / (100 + 120) = 45.5%

The break-even percentage for +390 is

BE% = 100 / (100 + 390) = 20.4%

If it's a minus number, you take the listed number and divide it by 100 plus the listed number. So the break-even percentage for -110 is

BE% = 110 / (100 + 110) = 52.4%

The break-even percentage for -260 is

BE% = 260 / (100 + 260) = 72.2%

If it's a plus number, the break-even percentage will always be below 50%. If it's a minus number, it will always be above 50%. And either way, it's always determined as

Break-even percentage = Risk / (Risk + Win)

If the break-even number is exactly 50%, the bet will pay even money. For every $100 you bet, you stand to win $100. Those

odds can be listed as -100, +100, EV, or maybe something else some sportsbook thinks is cute.

Note I'm not talking at all about point spreads here. I'll have plenty to say about those later in the book. But for now it's just the odds—how much your bet pays.

I really can't overemphasize how important it is to get in the habit as soon as possible of converting all these numbers in your head directly to break-even percentages. Do not use the American odds numbers directly in your thought process. Convert everything to break-even percentages and work with those.

Here's why. The goal of all this is to make bets that win more often than the break-even percentage. Given that, which is the better bet? A -110 bet if the fair price is -130? Or a -340 bet if the fair price is -380?

I know you may not fully follow that question yet, which is fine. People who learn to think in American odds often talk about "cents" of value on a bet. If a bet "should" be priced -130 but they find it for -110, they say they have "20 cents" of value. A bet that should be priced -380 that they find for -340 is "40 cents" of value.

Naturally, 40 cents is better than 20, right? It's, like, twice as much.

You probably know where this is headed. In this example, the -110 bet is better, even though it only has "20 cents" of value. Look at the break-even percentages.

The break-even percentage of -110 is 52.4% like I calculated above. The break-even for -130 is 130 / 230 = 56.5%. So you're making a bet that breaks even if it wins 52.4% of the time, but it will actually win 56.5% of the time. Pretty good.

The break-even percentage of -340 is 340 / 440 = 77.3%. The break-even percentage of -380 is 79.2%. Still a good bet, but 56.5% vs 52.4% is much better than 79.2% vs 77.3%. People who

think in American odds rather than converting to break-even percentages are prone to making many errors due to this effect of the ever-changing value of "cents."

CALCULATE THE HOLD

Sportsbooks make money via the hold. The hold is the spread between what they will buy a bet for and what they'll sell it for. Say you could buy something for $52 and sell it for $56. You'd make money, right?

That's what sportsbooks do. They buy teams/bets at one price and sell them at a higher price. Say there's a Giants-Dodgers baseball game tonight. The listed prices are Giants +130 and Dodgers -150.

That means you can bet on the Giants at a break-even win percentage of 100 / 230 = 43.5%. Or you can bet on the Dodgers at a break-even win percentage of 150 / 250 = 60.0%.

If you buy the Giants at 43.5%, from the sportsbooks' perspective, they've bought the Dodgers at 56.5%. That is, if you bet $100 to win $130 on the Giants, then the sportsbook just bet you $130 to win $100 (-130 in American odds) on the Dodgers. The break-even percentage for -130 is 130 / 230 = 56.5%.

The sportsbook buys the Dodgers at 56.5% and sells them at 60%. If they can manage to buy and sell exactly the same amount of this market, they will simply pocket the difference with zero risk. Just like if you bought a bunch of apples for $56.50 and then sold them for $60, you'd pocket the $3.50 difference.

Of course the book almost never has the same amount of each side, so they always have some risk at play as well.

The hold percentage of a market is the percentage of all bets a sportsbook would win if they had zero risk in the market. Let's figure out the hold percentage of the Giants +130/Dodgers -150 market.

Say someone bet $150 to win $100 on the Dodgers to win. And someone else bet $108.69 to win $141.30 (stay with me here, I picked these numbers for a reason) on the Giants to win.

The total amount bet is $150 + $108.69 = $258.69

If the Dodgers win, the sportsbook pays out $100, but collects the $108.69 bet for an $8.69 profit.

If the Giants win, the sportsbook pays out $141.30, but collects the $150 bet for an $8.70 profit.

Therefore, they have a risk-free position (yes, I see that penny), winning $8.70 no matter who wins the game. Since they win $8.70 on a total of $258.69 bet, the hold percentage is about 3.4%.

The hold percentage is defined by the betting options and their break-even percentages. Even if no one bet on the Giants, the market would still have a 3.4% hold. This is just how the term is defined.[2]

This is a key point. All sportsbook markets have a positive hold (except for promotional markets). But putting a hold on a market does not guarantee that the sportsbook will win money booking the market. They could lose because they took a preponderance of bets one way or the other, and the game result went wrong for them.

Or, more importantly to you as a bettor, they could lose because one side of the bet is clearly good for the bettor, one side

[2] Confusingly, the word "hold" is also sometimes used in reference to actual money won by sportsbooks. This is more of an industry term, and as a bettor, it's not a usage you really have to be familiar with.

is very bad, and their customers were smart enough to bet only the good side.

DECIMAL AND FRACTIONAL ODDS

We Americans like to be different. We like our inches and pounds and pints and Fahrenheit. The rest of the world thinks we're a bit nuts.

It shouldn't come as a surprise that the rest of the world thinks we're a bit nuts about how we do sports betting as well. Instead of the American odds system, they tend to use two other systems called decimal and fractional odds. You may see these formats in the US as well, so it's worth a few paragraphs to become familiar with them.

Decimal odds are quoted as a single number, such as 1.9 or 2.5 or 6. What that number means is it's the amount that you'll collect from a winning $1 bet—including the amount of your bet. So if you bet $1 at 2.5, you will receive $2.50 from a winning bet—your original $1 plus $1.50 in winnings.

Therefore, 2 represents an even money bet. Numbers between 1 and 2 represent favorites. And numbers over 2 represent underdogs. The "standard" -110 in American is 1.91 in decimal. And +230 would be 3.3.

A nice feature of decimal odds is that to find the break-even percentage you just take the reciprocal. The break-even percentage of 1.91 is 1 / 1.91 = 52.4%. The break-even percentage of 3.3 is 1 / 3.3 = 30%. And so on. You don't have to mess with different formulas for plus and minus numbers.

You're probably already familiar with fractional odds. If you see something like 7/4 odds, it means if you bet 4 (the denominator) you stand to win 7 (the numerator). In American, 7/4 is +175. In decimal it's 2.75. You would represent -110 as 10/11 in fractional odds.

Below is a quick-reference chart that converts all these odds formats to their equivalent break-even percentages for a few select numbers. We have a more extensive chart in Appendix A.

Decimal Odds	Fractional Odds	American Odds	Break-even Percentage
100	99/1	+9900	1%
4	3/1	+300	25%
2.5	3/2	+150	40%
1.91	10/11	-110	52.4%
1.67	2/3	-150	60%
1.33	1/3	-300	75%
1.1	1/10	-1000	91%

MORE ON HOLD

The book makes money via the hold—a spread between what they will buy a bet for and what they sell it for.

If you're like most sports bettors and don't really have any ability to find the good bets among the sea of bad bets on offer, then it's easy to estimate how much you expect to lose on each bet by looking at the size of this spread.

The first thing to note is that at almost all sportsbooks, this hold can at first appear shockingly large when compared to other gambling games like blackjack, video poker, craps, and even a

relatively player-unfriendly game like roulette. Let's take the "standard" hold where either side of a roughly 50-50 bet is priced at -110.

The break-even percentage of -110 is 110/210 = 52.4%.

Going through the hold percentage math again, let's say a book took two $110 bets on either side of this market. No matter which side won, they'd pay out $100 to the winner and collect $110 from the loser for a net of $10 profit on $220 of total bets. Thus, the hold on this "standard" market is 10 / 220 = 4.5%.

For reference, the hold percentages (when calculated in a similar way) for games like blackjack, craps, baccarat, and video poker when played in a reasonably skillful way are in the 1-3% range. Of course one hand of blackjack lasts thirty seconds, while one sports bet can keep you in action for a whole game. So there's a little bit of apples and oranges comparing these types of gambling I admit.

But what this means is that if you throw darts at sports bets, it's not a great gambling game. You're going to lose at a pretty healthy clip. The saving grace—and it's a big one—is that sports betting is a multiplayer game, and if you play much better than everyone else (including the sportsbook employees), it's possible to nullify this hold and get the edge on your side.

There's also another wrinkle to sports betting hold. The math above assumes you never push your bet. Since sportsbooks return the full bet on a push, the sportsbook hold drops as push frequency increases.

Compare a bet at -3.5 on an NFL game to one at -3. The -3.5 bet never pushes, so it's priced at -110, and the hold is 4.5%.

The -3 bet will push, however. For the sake of argument let's say it pushes 10 percent of the time. If you bet $110 with no advantage at -110 on -3, then 45 percent of the time you lose $110, 45 percent you win $100, and 10 percent of the time you

get your money back for a $0 win. The average outcome for your $110 then is

$$EV = 0.45 \times -\$110 + 0.45 \times \$100 + 0.1 \times \$0 = -\$4.50$$

which is an average loss of 4.5/110 = 4.1% of your bet.

The chance to push the bet on 3 points dropped the hold from 4.5% to 4.1%. If you're making random bets into a sportsbook, the chance to push helps you. If you have an edge, it hurts you. Either way, you should be aware of it.

Finally, most American books hang different holds on different markets—and often will have different holds from game to game even in the same sport on the same day.

One reason this happens is thanks to the quirks of that old American odds system. Books often calculate their hold in terms of "cents" of American odds. In NHL, for example, you might get "20 cent lines."

If the two teams are evenly matched, they might each get priced at -110, and the hold would be the 4.5% I calculated above.

But if one team is a favorite, they might get priced at -150 and the underdog at "20 cents worse" or +130. I calculated the hold on that market already as 3.4%. Big difference between 4.5% and 3.4%.

Books know all about this effect, obviously, so they will only give you a break like this to a point. After a while they will switch to "30 cent" lines such as -200 and +170. And then they will add more and more cents like -300 and +250 as one side becomes a bigger and bigger favorite.

Again, working in cents is imprecise, and if you want to get serious about betting sports, you should calculate hold percentages in all these markets for yourself until they become

second nature. If you want to win, the difference between a 3% and a 5% hold is very significant.

As an exercise, try to calculate the hold in the -200/+170 and -300/+250 markets using the method I outlined.

Once you get into this, you'll see the huge disparity in hold percentages. You might see a -160/+150 market in MLB (a 1.5% hold) or a -120/-120 market on a prop (an 8.3% hold). Figuring out the hold in every market is the first step in finding good bet.

Multiway Markets

All the markets I've discussed so far have been simple two-way markets. Bet on this team or that team. Bet over or under. Sportsbooks also offer multiway markets.

In theory nothing is special about a multiway market. There's nothing fundamentally different about betting on one of three outcomes or one of five outcomes or one of 100 outcomes versus one of two outcomes.

Be careful with multiway markets, however. They sometimes obscure a very high hold.

The annoying math in the last chapter notwithstanding, it's not too hard to look at a two-way market and eyeball the hold. If it's -125/+105, it's a "standard" hold (in the 4-something percent range). If you see -120/-105 then it's a little higher (5-something percent). If it's -120/-110 it's higher still (6-something percent).

Okay in two seconds estimate the hold on this five-way market:

+140 / +245 / +375 / +725 / +1325

Buzz. Time's up.

Once you get used to it, estimating the hold for any two-way market gets to be second nature. I don't know anyone who can just look at a multiway market like the one above and make a

quick and accurate estimate of the hold. (The hold in the example is about 9.8%.)

This fact makes it more difficult to bet intelligently into multiway markets, since the size of the hold in a market is one of the most important factors in whether you will find good bets in the market.

Some markets are multiway by nature. Futures markets like "pick the league champion" or "who will win the home run crown" bets obviously lend themselves to multiway markets.

But it's become an unfortunate trend these days to take natural two-way markets and convert them to multiway markets. I call these artificial multiway markets.

For example, one of the most popular ways to bet golf is to bet a matchup between two paired golfers. Who will score better in the tournament, Jordan Spieth or Justin Rose? Maybe you can bet Spieth at -130 or Rose at +110. And if they score the same, the bet pushes.

The book would hold about 4% in this market if there were no pushes. Because pushes return the full bet to bettors on either side, the chance of a push drops the hold percentage below 4.

Some books don't like low hold percentages and don't like pushes. So they've "solved" this "problem" by converting the natural two-way market (Spieth or Rose, who do you like?) to a three-way market.

You can now bet Spieth, Rose, or… Tie?

This is not a natural market. Who wants to bet on a tie between two golfers?

"Yeah, man, Spieth's putting has been next level. But Rose has put a couple good tournaments together. I think I want to bet that they will have exactly the same score after four rounds."

Let's be real. The main purpose for presenting the matchup this way is to convert the pushes into wins for the book on both golfers.

And superficially they can make it look like the hold is minimal. They could price the market Spieth -125, Rose +115, Tie +1800 for example. If you ignore the tie and just look at the two golfers, it looks like you're getting a deal.

If the tie pushed like a normal market, -125/+115 would be a pretty good deal with about a 2% hold. But add in the separate tie bet, and the hold balloons to about 7%.

I'll have a lot more to say about multiway markets later in the book—including their inherent weaknesses that often allow you to beat them despite the high holds. But right off the bat I wanted to make two points:

- Multiway markets almost always have higher holds than two-way markets, so tread carefully.
- Don't be fooled by artificial multiway markets where the push has been pulled out into a tie bet. This is almost always done to create much larger holds for the sportsbook.

Parlays

Parlays have been a popular sports betting product for a while now. People like them because they give you a lot of leeway to manipulate the risk profile of bets. If you want to bet a small amount and have a shot for a big score, you can do that with a parlay. If you want to bet big favorites but don't want to lay a lot to win peanuts, you can do that with a parlay. If you want to have a chance to be in action all weekend with just one or two bets, you can do that as well.

Let's be clear on what a parlay is. A parlay is just a bet where your winnings on one bet get rolled over into a bet on something else. Say you bet $100 at even money on a morning MLB game and then you plan, if you win that bet, to bet it all (i.e., $200) on an evening MLB game at -200.

If you win the second bet, you have $300 at the end. You have the $100 you started with, the $100 you won on the first game, and the $100 you won (at -200 odds) on the second game.

A parlay bet is a convenient way of wrapping up this plan to roll over winnings onto the next game. So instead of making two bets (one conditional on winning the first bet), you could have placed a two-team parlay in the morning for $100 and it would have paid +200. Win both games, end with $300. Otherwise lose your $100.

Teasers are parlays based on an alternative point spread. Teasers are particularly popular in football, and they let you bet a more generous point spread at commensurately worse odds.

Sportsbooks don't treat all parlay bets alike. It's important to understand the house rules surrounding parlays, because they are always different between sportsbooks. In general, however, here's what you should look for.

First, there are off the board, true odds parlays. Let's say you want to bet on who will win four different NHL hockey games. Instead of betting each game separately, you either want a huge payoff if all four win, or you want nothing. The teams you want to bet on have the following prices:

-170, -220, +110, and +135

How do you figure out how much this parlay should pay on a $100 bet?

Well, one way is to pretend like you are rolling your winnings over from each bet and find out how much you have at the end.

So you bet $100 at -170 and if you win you collect $158.82 (your original $100 plus $58.82 in winnings).

Then you bet $158.82 at -220 and if you win you collect $231.01.

Then you bet $231.01 at +110 and if you win you collect $485.12.

Finally you bet $485.12 at +135 and if you win you collect $1140.04.

Whew. You're betting $100 to collect $1140.04. Or $100 to win $1040.04. So the price of the parlay should be +1040.

There's a somewhat easier way to get the same answer. First, you convert all the bets to their break-even percentages. Then you just multiply the percentages together and convert back to odds.

That's 0.630 × 0.688 × 0.476 × 0.426 = 0.0879

Convert to decimal odds by taking the reciprocal (which is 11.38) and then back to American odds if you like which would be +1038. (The difference between the two answers is a rounding error.)

Also, if you use decimal odds (like they do in Europe), you can just multiply all the decimal odds together to get the parlay payout. Pretty handy.

The key idea here is that the off the board, true odds parlay pays the break-even percentages of all the bets multiplied together. Below is a chart that summarizes the parlay math on various numbers of legs of 50-50 bets.

No. of Legs	Break-even Percent at +100	Payout at +100	Break-even Percent at -110	Payout at -110	Avg. Vol. Mult.
2	25%	+300	27.4%	+264	1.96×
3	12.5%	+700	14.4%	+596	2.87×
4	6.3%	+1500	7.5%	+1228	3.74×
5	3.1%	+3100	3.9%	+2436	4.57×
6	1.6%	+6300	2.1%	+4741	5.36×
7	0.78%	+12700	1.1%	+9142	6.12×
8	0.39%	+25500	0.57%	+17545	6.85×
9	0.20%	+51100	0.30%	+33585	7.54×
10	0.098%	1023/1	0.16%	+64208	8.20×
11	0.049%	2047/1	0.081%	1227/1	8.83×
12	0.024%	4095/1	0.043%	2343/1	9.43×
13	0.012%	8191/1	0.022%	4474/1	10.0×
14	0.006%	16383/1	0.012%	8541/1	10.6×
15	0.003%	32767/1	0.006%	16307/1	11.1×

"Never bet parlays. They're for suckers."

Honestly, I couldn't tell you how often I've heard that advice. It's not good advice.

Because while it's certainly true that "suckers" (just people who bet sports recreationally) love to bet parlays, it doesn't at all follow logically that it somehow makes them bad bets.

A lot of people think parlays are bad because they hold a lot for sportsbooks. And that's sort of true—the average three-leg $10 parlay might hold $1.25 on average for the book, or 12.5%.

But the reason the parlay "holds 12.5%" isn't because parlaying bets together somehow takes good bets and turns them into terrible bets. All a parlay does is blow up the betting volume.

Let's take a simplified example of a three-leg parlay. The "standard" payout on a three-leg parlay of 50-50 bets is +600.

Assuming you have no ability to pick good bets, and your bets are all independent of one another, your chance of winning each 50-50 bet is about 50%. That gives the chance that you win all three bets as

$$0.5 \times 0.5 \times 0.5 = 0.125 \text{ or } 12.5\%$$

Therefore, if you were to bet this for $10 eight times, on average you would win $60 once and lose $10 seven times for a net loss of $10 on the $80 in action. That makes a "hold" of 12.5% on the parlay.

"Hey," you might say, "a 12.5% hold sounds pretty bad. After all we've been talking about 4% holds. And you warned me about markets with a 6% or 7% hold. And now we're at 12.5% and you're going to say something different?"

To understand what's going on, let's break the parlay down into its constituent parts. Let's say you bet a three-leg parlay on

NFL Sunday. You bet one morning game, one afternoon game, and the Sunday Night game. All the individual bets are -110 off the board, and your three-leg parlay pays +600.

You can win or lose each of the bets (let's ignore pushes for now), so there are eight possible ways the bets could resolve

L-L-L
L-L-W
L-W-L
L-W-W
W-L-L
W-L-W
W-W-L
W-W-W

The parlay pays out only if the last one happens—all the others end up losers. But the path to losing is different for each of the parlays.

In the first four cases, the first bet loses, so your total betting volume is $10.

In the next two cases, the first bet wins, so after that game you theoretically have $19.09—the original $10 plus the $9.09 won on the first game. The parlay then demands you bet that entire $19.09 on the next game, which loses, so you get zero.

But in these two cases, your total betting volume is actually $10 + $19.09 = $29.09

In the final two cases, you win the first two bets, so you have even more betting volume. Your $19.09 bet on the second game wins $17.35, so you then bet $19.09 + $17.35 = $36.44 on the final game.

And your total betting volume for these cases is $10 + $19.09 + $36.44 = $65.53

Therefore, your average betting volume for the $10 parlay isn't really $10. It's

Volume = 0.5 × $10 + 0.25 × 29.09 + 0.25 × 65.53
= $5 + $7.27 + $16.38
= $28.65

Over the course of the eight bets, you haven't bet just $80. You've actually bet $229.24. And of that $229.24 total bet, you lose $10. Which works out to a 4.4% hold.

Which is roughly the same old hold we're always looking at on straight bets.

Parlays don't hold more. They make you bet more money.

Okay before I move on there's an exception to this concept big enough that I have to mention it. What I said is true for off the board parlays, where the sportsbook calculates the payout exactly as if you simply rolled all your winnings on the previous bet over to the next bet.

But sportsbooks often like to short pay parlays, particularly when you parlay more than three legs of 50-50 bets. They might pay +600 on three-legs, but only +1100 on four-legs and +2000 on five-legs. Paying these legs fairly at -110 for each leg would make the payouts +596, +1229, and +2436 respectively. So yeah, if you're betting into a short pay parlay like the four- and five-leg examples here, then the parlay does hold more. But not because it's a parlay. Because the book is short paying you.

Other parlay type bets that often have short pay scales are teasers and parlay cards.

Sportsbooks these days are offering more alternative point spreads as straight bets, and therefore instead of betting a short-pay teaser, you may be better off parlaying the alternative spread bets to get the off the board pricing.

Parlay cards are kind of their own animal (and a very beatable one at that) so we'll discuss those more in the final part of the book.

But if you avoid getting short paid, parlays are not in any way sucker bets. They're just a way to increase betting volume. And if you have some winning bets you'd like make, a sneaky way to increase volume can be very handy.

Market Making

Okay we're done for now with the nuts and bolts math stuff. There will be a little more of it later, but let's talk about something a little more fun for now.

Sportsbooks these days have lines for everything. If you live in a state with legal mobile sports betting like Nevada or New Jersey, you can sign up for an account, download a phone app, and find markets on literally hundreds of sporting events each day. You can bet on the American sports like NFL, college football, NBA, college basketball, WNBA, MLB, NHL, and PGA. On a college basketball Saturday, they'll have lines on a hundred different games from Duke-Kentucky to Xavier-Creighton.

On top of all that, you can bet European sports also. Major European soccer leagues, Russian hockey, rugby, cricket.

For each of these games, they'll usually have at least three markets. Point spread (or run line for MLB/puck line for NHL), moneyline, and total.

For major sports they'll have first halves. Second halves during the game. Sometimes in-play throughout the game.

Then there's alternate spreads and totals, and for marquee games, props as well.

On any given day in Las Vegas, there are probably the better part of a thousand different bets you can make on sporting events happening that day.

And then they do it all over again the next day.

On one hand, this is amazing. Because every one of these bets has to be priced. Someone, somewhere has to say, "Yeah, Xavier should be -2.5 against Creighton."

Where does that number come from? And why is that the number? Why not -3? Why not -13?

If you ask this question on Twitter, someone will no doubt tell you, "Sportsbooks just set the line that will get equal action on both sides."

How the heck do they know in advance what will get equal action?

Someone else will chime in, "Vegas makes the lines."

I hope Vegas gets paid overtime because that sounds like a lot of work for one guy.

Another popular theory is that every sportsbook has an army of math nerds crunching numbers all day long, accounting for every variable to come up with the perfect answer for exactly what every line on every market should be.

If you think about it, that would be quite the quantitative feat. There are hundreds of markets every single day, and every angle from weather to injuries to recent form to evaluating rookies to how tight referees are calling games and more is neatly analyzed, modeled, and correctly weighed by the team of supernerds in the back room 365 days a year including Christmas.

And there's a dozen give-or-take independent sportsbooks just in Nevada, so that means twelve teams of…

Okay I'll stop. This is not a thing. There aren't thousands of supernerds living in an underground bunker in Las Vegas crunching numbers day and night to make the lines.

But there's a line. There's always a line. Where the heck does it come from? And why is it what it is?

Sportsbooks copy their lines from other sportsbooks.

That's the answer.

Okay it's not quite that simple.

There are three ways lines get made, and every sportsbook makes their lines using a blend of the three.

1. A small army of supernerds
2. Copying from other sportsbooks
3. Price discovery

So yes, there are some supernerds on line-making duty. But not armies of them in a bunker. Just a few here and there. Of the three ways, the supernerds play the smallest role in the process. This is for a couple of reasons. For one, supernerd salaries are expensive.

For two, supernerds don't make the best lines.

This is due to an information deficit. Supernerds can be good at turning the information they have in front of them into a line—but the problem is they never have all the relevant information. They may know that Ohio State's offense has gotten 6.2 yards per play so far this year, but they didn't watch the Buckeyes quarterback limp around after a hit in practice. They may be able to project the Orioles hitters well, but they don't know that a thunderstorm system just sprung up in Baltimore and the wind is going haywire.

The "quantitative analyst" (let's be polite) doesn't know all of that—one person (or a small team) simply can't know everything.

But someone out there does. The crowd—the betting public—always has more information than any analyst can. That's why even the best nerd makes not-so-great lines compared what you get through price discovery.

The main thing the nerds do is they make the opening line—the first line any sportsbook publishes for a given market. (After

all, if sportsbooks are going to copy from each other, someone has to post a number first for everyone to copy.)

Once the supernerds are out of the way, copying and price discovery takes over. I'll explain price discovery in detail in just a moment.

My purpose for describing the industry workflow here is that it is in my opinion critical for you to understand (in quite a bit of detail in fact) exactly where all these prices and lines come from if you want to try to beat them. To win long-term at sports betting you need a working understanding of what I will describe here.

Okay, back to the explanation. Download a random sports betting app in a state that permits legal sports betting and there are lines on hundreds of games from NFL to college basketball. From Swedish hockey to Mexican soccer to badminton, most of those lines were copied from a market maker.

What's a market maker?

A market maker sportsbook is one that does more price discovery and less copying than most other sportsbooks.

A market maker in general is someone who does very frequent, liquid business in a market, buying and selling, day after day. A gold market maker, for example, does nothing but buy and sell gold all day long. If you want to buy gold, they'll quote you a price. If you want to sell them gold, they'll quote you a (lower) price.

If this sounds like what a sportsbook does, only with gold bars instead of sports bets, you're right.

Let's say you have ten ounces of gold that you want to sell to your friend. You both have to agree on a price. What price would you use?

Chances are you'd do something like Google "price of gold" and Google would say something like $1,304.72 per ounce, and you'd say to your friend, "How about thirteen thousand and

forty-seven dollars for the ten ounces," and your friend would either agree to that or some bargaining would ensue.

The price you got from Google would certainly be the anchor for whatever deal you made.

Where did Google get that price from? It's the price as discovered that day by market makers operating on a major commodities exchange. The people who buy and sell gold all day think $1,304.72 is a good price at this moment to get some customers to buy and some customers to sell.

Where did you get the price from? You copied it from the market maker.

Now let's say just as your friend is about to buy the gold, he realizes that he left his wallet with the thirteen thousand dollars in it at home and says, "Let's meet again tomorrow and make this deal and I promise not to forget my wallet this time."

So the next day you bring your gold and he brings his cash, but he says, "Hey, let's check the price of gold today." And he Googles "price of gold" and it says $1,273.99. And he says, "Hey I don't want to buy it for thirteen thousand and forty-seven dollars anymore I now want to buy it for twelve thousand seven hundred and thirty-nine dollars and ninety cents."

And you, annoyed, say, "Why? Yesterday you thought thirteen thousand was fair?" And he shrugs and points to Google. "Price went down," he says.

What's changed between yesterday and today? If neither you nor your friend are in the gold market making business, likely nothing.

Which is the right price? Is $1,304.72 the right price? Or is $1,273.99? Which is fairer?

There's no such thing as the right price. Yesterday's price was arbitrary—copied from the price some market maker in Chicago

published. Same with today's price. You liked yesterday's price better. Your friend likes today's price.

What's gold worth? Who knows. It's a hunk of yellow metal.

At the same time, if you're like most people, you're probably thinking that today the price went down, so if you're going to do the deal today, unless you had a firm commitment like a contract signed yesterday, the "fairest" price is probably whatever Google happens to say right at this moment.

In the end, you copy the new price from the market maker and finalize the deal with your friend. Twelve thousand seven hundred and thirty-nine dollars and ninety cents it is.

Sportsbooks price most of their markets in just this way. If they want to know what to price a bet, they look at the screen, find a price at another sportsbook (usually one with a reputation as a market maker), and use that. If the market maker's price changes, they change their price.

PRICE DISCOVERY

If most sportsbooks copy their lines from market makers, who are the market makers? And where do they get the lines from?

Market makers are sportsbooks that operate under a different business model than most.

Let's say I'm a sportsbook and I want to make markets for college football. I'm not going to copy lines from anywhere. I'm going to discover a price through the market making process.

First thing I will do is post all this week's college football games to the betting menu and seed each game with an initial line. Let's assume that, unfortunately for me, I don't know the first

thing about college football. Is this Alabama team good? Impossible to say.

I'm also way too cheap to hire any nerds.

So I just post every game with the same line—PK (*PK*, which stands for pick 'em, just means a point spread of zero). I put each game up -110 on each side and start taking bets with a posted limit of $100.

Customers start betting. What do you know, the first guy wants to bet on Alabama for the maximum, $100.

I accept that bet, Alabama PK -110, and then move the line to Alabama -1 -110.

The next guy also wants to bet on Alabama. I warn him that I've moved the line to -1, but he seems undeterred. So I write him an Alabama -1 -110 ticket for $100 and then move the line to -2.

And so on.

Eventually once Alabama's line gets to -38.5, my customers no longer seem so eager to bet on Alabama. I might even take a bet on the other side +38.5.

I do the same for the entire menu of games—take bets and move the line on the action. After a while, the lines start to settle in, and the action slows down. That's when I raise the limits. Now you can bet $1,000 at a time.

There's another little flurry of action at this point. Customers who can't be bothered for a $100 bet now jump in and pick off the lines they like. The process is the same. Take a bet, move the line. Keep doing that until the action slows down.

Raise the limits again, take a bet, move the line.

By Saturday morning, the action will have knocked all the lines pretty well into place. I raise my limits to the maximum I'm willing to take and continue to move on action all the way until each game kicks off.

That's how market making works. When the market is mature, I will have a pretty good line for each game, and by placing a hold on the market, I ensure that I will end up keeping a percentage of all the bets made into the mature market. Not only that, but once the market has settled in, I don't really have to have a decision on the game that's more than a few limit-sized bets either way. If someone bets one side, I move the price until someone else bets the other side. (The corollary to this is that if you hear a sportsbook employee report that they have "heavy action" on one side or a "big decision," then you know that to some extent they were not using price discovery. They were taking bets and not moving the line.)

I know absolutely nothing whatsoever about college football, yet by Saturday morning I have prices good enough on every game to put relatively little more at risk, and still expect to win on each new bet against my customers.

But I had to pay up to get to that point—I wrote a whole lot of really bad $100 bets. That guy who got Alabama PK -110 was basically stealing. Same with the -1 guy.

I can limit that expense if I put a little bit of effort into making openers. I won't open every game PK. I'll use some method to try to get each game in the ballpark before I put it up. There are many methods to do this.

This is where the nerds come in. Or I could save some money, not hire anyone, and just use my experience watching markets all day long to guess and get close enough.

It would be ideal to put a "perfect" opening number up for every game, but the reality is it's cost prohibitive. And you'd never get perfect anyway.

That's about it for how openers work. If you follow sports betting media like articles, podcasts, and the like, you'll often hear

breathless reporting about how far a market has moved from the opener.

"The game opened -6 but now it's all the way down to -3.5 as sharp money is absolutely pounding the game."

Not necessarily. The opener may have been -6 because that's what whoever did thirty seconds of math and opened the market threw up. It may have moved because a handful of guys with spreadsheets mashing the refresh button bet $100 to $300 at a time to move it there. That "sharp money pounding the game" could be less than a few thousand dollars in total volume.

THE INFORMATION GAME

Setting intelligent openers is the first refinement market making books make to the "take a bet, move the line" process of price discovery to keep the cost of writing bad bets under control.

The next refinement revolves around using information intelligently.

Information is one of the greatest assets a market making sportsbook has. For every single bet placed at the market maker book, the market maker knows who made the bet, when, at what price, for how much, and also the entire betting history of that player at their book.

Any sportsbook hoping to copy the market maker's lines knows none of this—they only know the published line.

Player profiling is the first way market makers leverage this information. They go through all their customers' betting histories—literally every customer—and try to draw conclusions about the player. The nature of the conclusions can vary, obviously, but for the most part it boils down to, "How sharp is this person?"

Let's presume a market maker develops a very simple system where they grade every customer's account with a number one through five. One is for recreational customers who make no real attempt to try to win. Five is for their sharpest customers who will probably be winners going forward.

After a few bets, every customer gets a number. That number is updated periodically as more betting behavior information comes in.

How should a market maker use these player profile categories?

Let's say you have a market for the Knicks-Bucks game tonight, and your total is currently sitting at 221 (-110 on either side). Two full limit bets come in on this game at almost the same time.

The first bet comes from a category two customer whom you know to be a wealthy corporate attorney. She bet over.

The second bet comes from a category five customer whom you know to be a professional sports bettor and who is active daily in the NBA totals markets—and who has a winning history in those markets over a period of years. He bet under.

You took two bets of equal size on 221. One over, one under. Your job is to take a bet and move the line. But here the bets cancel out. Do you move the number? And if so, in which direction?

Of course you move it—you move it lower. Why? Because the sharp guy who wins in this market bet under.

Take a bet, move the line. But move the line faster and harder when someone you know wins wants to bet you. Because the sharp guy bet you, there's a very good chance that under 221 will win more than the break-even percentage of 52.4%.

That means the corporate attorney just made a really bad over bet—not only did she pay -110 for it, but she will probably win less than 47.6% of the time.

But that's what category two customers do. They make bad bets. They make good bets too. But it's random—they have no ability to tell the bad from the good and so it's a crapshoot whether they picked good this time or not.

The book should be happy they took the cancelling action but should also use the information and move the line lower. That way they won't get hit by any more sharp bets on under 221.

The idea is take a bet, move the line. But move more when a known sharp bettor bets, because that bet carries with it more and better information about what a better line would be.

FINAL THOUGHTS

When you see a sportsbook's menu with multiple markets per game on a hundred or more games each day, most of those lines were created predominantly through price discovery. A sportsbook somewhere in the world put up an opening line and took bets and moved the line until it got to where it currently is. Then all the other sportsbooks copied that line. (And copied from each other. And did a little price discovery of their own. And then copied again.)

Different sportsbooks might serve as the primary market maker for different sports. The book that makes the markets for college football will likely be a different one than the one that makes the markets for Australian rules football. To make a market, you need active customers betting into the market every day. Not many books have that kind of customer base for every single sport.

Most of the other books then follow the prices at the market making book. If a line moves there, the other books move their lines as well.

This structure creates fragility in the system. Often, one sportsbook moves a market based on a bet, and then a large number of sportsbooks will copy that move even though none of their customers made a bet. This behavior means the real market is often much smaller and less liquid than it appears. It also allows savvy bettors to manipulate the market. Worse, it makes game integrity problems harder to spot. The best weapon in defense of game integrity is a large liquid market, where nonsensical movements stick out like a sore thumb.

Sportsbook Business Models

This book is not about the nuances of the industry side of sports betting, so this chapter will be brief and somewhat oversimplified. But just as you must understand how market making works if you want to bet intelligently, you also must understand a bit about the business models of various sportsbooks. It's not possible to be a long-term substantial winner at sports betting without a working knowledge of these topics.

There are dozens of independent sportsbook operators, and obviously they all have slightly different business models because they occupy different niches in the industry. This chapter isn't intended to describe any single operator. Instead we'll talk more about concepts, and in being aware of these concepts you will be able to understand a bit more about how the sportsbooks you use operate and make decisions.

No single book will ever operate at either extreme described below. They will fall on a spectrum between the extremes. Also, subsets or divisions of the sportsbook's business can operate under different business models—i.e., a book that operates as a market maker for hockey could operate more as a retail book for soccer.

MARKET MAKERS

Market making books need betting volume. Lots of it. They tend to operate with low margins and rely on very high volume to generate revenue. (In the gambling industry world, revenue means how much the business wins betting against their customers. This is not profit, as all operating expenses including rent, salaries, vendor payments, and so on must be paid out of revenue.)

Because they need volume, they try to place as few restrictions on betting as possible. They make their betting limits high. They let all customers bet, even those that they think will win over time.

They also try to keep their hold percentages on the low end of the spectrum. Low holds mean that recreational bettors who tend to lose at the rate of the hold percentage (or sometimes even more) will be more likely to stay in action longer—and therefore will generate more betting volume.

Market making has a few benefits. First, you don't have to pay a vendor for your lines—you make them yourself.

Second, you often don't have to spend much on marketing. Because you take all comers and offer high limits, you can cultivate a loyal customer base that will bet with you for years and years. Many of these customers are trying to win. (Though even if they win overall, it doesn't mean they win against you, which is a critical distinction. They can and often do lose to the market maker book but win it back and more against other sportsbooks.) But many of them are just recreational customers who appreciate the high limits and no-nonsense approach of the market making book.

Third, market making allows you to manage risk effectively.

There are some major downsides to market making, however. First among them is that market making is hard.

In today's global sports betting markets with diverse and sophisticated bettors, market making is a highly skilled job that requires heavy investment in talent and infrastructure. If you want to be a market maker, hiring a sportsbook manager for low six figures and a few traders for $60,000 a year ain't gonna cut it. It's way too big and too difficult a job for that. Any book that's going to even think about becoming a market maker has to make a major investment up front to do so.

Second, that investment may well not pan out. If your market making operation isn't good enough, it's very easy for a sportsbook that takes all comers and has high limits to win at tiny margins or even to lose over time.

"The house always wins," just isn't true in sports betting. As I described in the market making chapter, writing a certain number of bad (for the sportsbook) bets is just part of the market making process. Those bets cost the book money. And if the book doesn't make the markets intelligently enough (i.e., profiles customers poorly, moves too much on action, moves too little on action, moves too much on the wrong action, makes too many plain old mistakes, sets limits poorly, and so on) the market making book will offer too many soft bets to their customers at limits that are too high, and they will get beat.

The hold percentage that the sportsbook puts on their markets gives them a margin for error. It does not guarantee that they win. Only customers choosing bets at random (or without any skill at all) can expect to lose their money at the rate of the hold percentage. Any customers who are choosier with their bets will lose at a lower rate or—with enough skill—will win over time.

If the market maker does its job well, it will win a very small percentage overall on a very large volume of bets. If the market

maker does its job poorly, it will win nearly zero or even lose on a very large volume of bets—which as you might imagine is bad for business.

Third, market makers are extremely sensitive to how sports betting is taxed. Because it's a high volume, low margin model, any tax on volume (rather than revenue) will hit them extremely hard. In the United States, there is a 0.25% Federal excise tax on betting volume. Any licensed operator must pay this tax, and it's a Federal tax. Yet more taxes and fees get tacked onto operators at the state level.

A 0.25% tax might not sound like a lot. But it's 0.25% on total volume, which is the key point.

A well-run market making book will run on margins as low as 1%. If you're only winning 1% of volume, and then you have to pay a 0.25% tax on volume, that Federal excise tax takes 25% of the sportsbook's total revenue. Off the top.

Then the sportsbook has to pay all its taxes and fees to the state, which are generally assessed either as flat fees or as a percentage of revenue (sometimes at very high percentages up to 50% of revenue).

Then the sportsbook has to pay all its operating costs like paying the smart people who work day and night to make the markets.

Then maybe there's some profit leftover. But realistically there may not be.

When the Supreme Court decision came down in 2018 that removed restrictions on US sports betting, the sports leagues sprang into action immediately calling for a 1% tax on volume to be paid to them as an "integrity fee."

1%.

On volume.

Given how much the 0.25% Federal excise tax costs a market making book, think about what a 1% fee paid to the leagues would do.

The market making business model would be completely and totally unfeasible. Which is fine—except someone has to be the market maker. Those hundreds and thousands of lines on events daily don't just come from thin air. Someone must do the hard work of being the market maker.

Ironically, in the past when integrity problems have been uncovered, market making sportsbooks have often been the first to sound the alarm. They're the ones with all the market information, after all. They see all the bets. Their business is to know their customers. And they are victimized directly when games get fixed. The leagues managed to propose a "solution" to integrity problems that would make the entities that have been most effective at combating integrity problems unviable.

What happens if you do that is that the market making books set up offshore and deal to customers in an unlicensed, untaxed way with no oversight. Then all the licensed operators are beholden to a few gray market making sportsbooks. Everyone needs to know what lines to use, and the heavy onshore taxation makes it impossible for someone to fill that role in the regulated market.

This situation is—fragile.

In summary, the market making business model works on a low margin and very high volume. These books take on all comers and offer high limits. But it's hard to do a good job of it, and if a sportsbook tries to do it but fails, it will be out of business in short order.

RETAIL SPORTSBOOKS

Most sportsbooks don't want the type of systematic risk that market making books take. They don't want to have to be the figurative smartest guys in the room or risk losing to their customers and going out of business.

They want to sell sports bets like Barnes & Noble sells books and count on making a profit on each bet sold.

They can then focus on more traditional retail problems—marketing, sales, product development, inventory, and so on.

This is the retail sportsbook business model. Retail sportsbooks care about their margins—they want bigger ones. Naturally they want to drive volume as well, so they are essentially always trying to answer the question, "How can I get our customers to bet more without sacrificing our margins?"

Here's roughly how they operate. Since they don't make the markets, they have to source their lines from a third party. They may copy them. They may license a data feed that provides lines—this is how most in-play lines are delivered to retail sportsbooks.

These lines are a bit of a black box. Because the retail sportsbook isn't provided all the backstory about how the line was created (this information stays with the market maker), they don't really know how strong the lines are, which side may offer a good bet, and so on.

Because they're in the dark about all this, they're vulnerable to any bettor who may have more information about their markets than they do.

This is not inside information about players or coaches involved in the sporting event. It's market information like who bet what, when, and why into the market making sportsbook.

This sort of information leaks widely among serious bettors but is less accessible to the operators of retail sportsbooks.

Therefore, retail sportsbooks must balance two competing concerns. They want to drive as much volume as they can while still maintaining their margins. But they are in perpetual fear that they are getting the wrong kind of volume—the volume from bettors who know more about their markets than they do.

Retail books typically walk this line by taking protective measures. They use relatively low betting limits—doubly so for bets taken on an app or website rather than in person over the counter. They increase the hold in their markets as much as they feel like they can while still driving volume. And, most controversially, they curate their customer pool—sometimes with a very heavy hand.

In other words, if they think you're beating them, they might restrict your betting to nominal amounts (e.g., $20) or close your betting account entirely.

While market making books heavily profile customers so they know how best to move their lines in response to action, retail books heavily profile customers so that they can determine which ones they don't want.

"Low limits?" you might ask. "But I just saw a report of a six-figure bet placed on a college football game. That doesn't seem low to me!"

Large bets like these are considered on a case-by-case basis by a retail sportsbook. They will accept the action if they are fairly sure the customer isn't trying to exploit vulnerabilities in the lines (i.e., they're fairly sure the customer will lose if they keep betting). Or if the sportsbook is connected to a casino, they'll accept the bet if the person is a known big player at slots or table games essentially as part of that player's amenity package. Finally, accepting bets like these sometimes is good for marketing. (If they

lose a big bet at least they can get a photo op handing the winner an oversized check.)

But if you were to open a mobile betting account at the same operator and try to place the same bet that you just saw well-publicized, there's a good chance you would run into a betting limit like $2,000 or possibly even lower.

One thing you will notice about retail sportsbooks is that they often do not move their lines on action. If you make a limit bet into a market maker, they will usually move the line immediately. (How much they move depends on how they have profiled you as a customer.)

If you make a limit bet at a retail book, however, they will often not move the line. This is because they are committed to shadowing the market maker's lines rather than making their own market.

Think about it this way. Say there was a store in your neighborhood that bought and sold people's scrap gold. Bullion, jewelry, and so on, in small amounts like people would have in their homes.

The shopkeeper's business model would probably be to Google "price of gold" every five minutes and then subtract some dollars when buying and add some dollars when selling.

But let's say this shopkeeper also wanted to use the "take a bet, move the line" model of the market maker. Someone walks into his shop with a bunch of heirloom jewelry and wants to sell the gold. This is a lot of gold—about the limit of what he would normally see in a transaction.

He quotes his price of market-maker-price-minus-some-dollars, and the person agrees to sell.

Should he now "move the line"? For the next customer who walks in, should he quote a price that's lower than what Google says just because his last customer made a big sale?

Intuitively it doesn't make much sense, right?

And what if you found a shopkeeper who did that? Every time they bought gold, they lowered their price for the next customer. And every time they sold gold, they raised their price for the next customer? You could make money just by sitting outside this fellow's shop, and every time his price went far enough above or below the market maker's price, you could just buy (at a low price) or sell (at a high price) to take advantage of it.

If you ever ended up with more gold than you wanted, you'd just sell it to the market maker at the market price. And if you ever ended up with not enough gold so you could take advantage of a selling opportunity, you'd just buy a working supply from the market maker.

You wouldn't have to know anything interesting about gold, nor would you have to be able to predict price movement at the market maker whatsoever. All you'd have to do is Google "price of gold" and every time this guy was selling for less, buy it. And every time he's buying for more, sell it.

This simple strategy is called arbitrage, and it's a tried and true way to make money. When applied to sports betting it's called either scalping (when buying and selling the same bet—like a moneyline bet), or middling (when buying and selling slightly different bets like point spread bets pegged to different numbers of points).

If a retail sportsbook made a habit of moving on action, sometimes a line would be far enough from the price of the market making book that someone could buy the bet from the retail book, sell it back to the market maker, and guarantee a profit.

As a rule, retail sportsbooks are keenly aware of this practice, and they absolutely hate it. For the most part, they know exactly where their lines are compared to the relevant market makers. If

you make a habit of taking only those bets where they offer a much better price than the market maker, they will tell you to get lost.

And, for the most part, retail sportsbooks try not to offer arbitrage opportunities in the first place.

Most sportsbooks rely mostly on the retail model. Certainly, if you see them actively advertising, offering promotions, and so on, it's likely you're looking at a retail book.

The upsides to the retail model are that you don't have to do the heavy lifting of making the market yourself. You kick out customers who can beat you, and you're left mostly just with customers who will lose over time because they can't identify the good bets from the bad.

If you increase the hold, you increase your margins. Then the trick is just to try to get more customers and get your current customers to bet more and more.

The downside to the retail model is that there's a whole lot of competition, as this is what most books are trying to do. Everyone wants the reliable customer who will click in bets and has no real chance to win. This one will offer a deposit bonus. That one will advertise on TV. The other one will offer a loss rebate. A fourth one will promote odds boosted markets where the hold is reduced or removed. A fifth one, not to be outdone, will offer a deposit bonus, advertise on TV, offer loss rebates, promote boosted markets, and make it rain two-dollar bills outside their main offices every Tuesday.

You get the idea.

Obviously this is an oversimplification of the sports betting industry, but in broad strokes this is what you need to know about how sportsbooks operate to identify good bets. Because it's one thing to find lines that look "off" to you. It's another thing to be consistently right about those lines being "off." If you find "off"

lines at one type of sportsbook, there's a good chance they're actually very accurate, and you'll lose the hold. Whereas if you find "off" lines somewhere else, it's possible you've found the candy store. Use this insight into how books run their businesses and find the candy stores.

Public Money

Sports betting media is obsessed with the concept of public money. "The public is all over the Patriots," says the guy writing an article for a sports betting blog.

"The public loves favorites and overs," says the fast-talking tout on a podcast.

"Look at this detailed chart of where all the public money is according to Sportsbook Manager Jon Johnson," it says in the Tweet, along with a screenshot of a detailed spreadsheet of dozens of numbers and percentages.

The converse of the "public money" discussion is where all the "sharp money" is. "The sharps are all over Iona," says the host on the sports betting TV show.

"This is a classic Pros-versus-Joes game."

Okay, you get the idea. If you've seen it, you know what I'm talking about.

Usually this information is presented as-is without much interpretation. Public money is here. Sharp money is there.

Okay, great. Sounds good.

Sometimes the provider of said information offers some thoughts about how to use the information. Ideas like, "Follow the sharp action," or "Fade the public action," or "You want to be on the same side as the sportsbooks."

Occasionally the tips will get more detailed. "Right now you can bet the Patriots because that's where the sharp money is. But

then if you wait until game time, the public is going to move the line to minus-11, and you can bet the other side and lock in a nice middle."

For the most part, none of this information is useful in any meaningful way to find good bets.

That's the bottom line.

If you followed the discussion in the market making and retail book explainers before, you have enough knowledge to understand why.

The vast majority of lines get set through price discovery at a small handful of market making books. The retail books then use these lines to price their markets. Even if public action on one side or another of these markets is lopsided, the retail books stay firm with their prices so as not to offer arbitrage opportunities with market makers. They end up just gambling on the outcome.

(Limited exceptions to this general rule can happen in markets where there is massive public interest—NFL playoff games, World Cup games, and the like. These are markets where the public action can be large enough and one-sided enough that a retail book can't fade the risk of losing their side and they're forced to move their line at least somewhat on public action.)

Most sportsbooks use the retail book business model, and most of the public action is booked by retail books.

In summary, lines for the entire market are set predominantly at a handful of market making books. Most of the public action happens at retail books, which don't tend to move their lines much based on public action.

Therefore, the huge weight of public action has relatively little overall impact on where lines sit. This is the fatal flaw in the "fade the public" concept. Okay, the public is all over the Dodgers tonight. Great. But that public money had almost no impact on

how the Dodgers line is set, since it's set by different entities than the ones booking all the public money.

To be clear, it's not that public money has zero effect on where the lines are. It does matter a little. For one, market making books get plenty of public action as well. They just also get a lot of so-called "sharp" action, and they tend to move the lines far more in response to the sharp action than the public action. But let's say in a very high-profile game, the big public bettors all happen to like the same side for some reason. In that specific case, you'd expect the public money to influence the line, and fading the public might give you a free bet.

The Floyd Mayweather-Conor McGregor fight on August 26, 2017 was a recent example of a market like this. It was enormously high-profile, and public money absolutely poured in on McGregor. Besides the fact that most bettors simply liked McGregor more, it wasn't so easy to bet on Mayweather even if you tried to be objective about the fighters' chances. Mayweather was clearly a big favorite. (The only question being how big a favorite he should be.) That meant to bet on him, you had to lay a big price like -500 or more. It's not fun to bet $500 to win $100—not nearly as much as it is to bet $100 to win $350 like you could on McGregor.

Every sharp sports bettor I knew had placed a very large bet on Mayweather for that fight. But that just wasn't enough money to stem the tide of public money on McGregor.

For that event, you didn't have to know a thing about boxing. All you had to know to find the good bet on Mayweather was that the public money was on McGregor and the sharp money was on Mayweather.

But that event was a huge outlier. It's not even close to how the markets function on a day-to-day basis.

In most markets for most games most days, a few books take bets from all comers, and they move their lines on action. Once the line settles in, almost by definition it means that there is no longer a sharp side. Because if there were still a sharp side, sharps would bet it, and the line would move.

It does you no good to be told that a few sharp bettors bet UTEP +9 if the only bets available now are UTEP +7.5. Maybe UTEP +9 was a "sharp side", but that is meaningless regarding what's currently available.

It also does you no good to know that the public is "all over" New Mexico State -7.5. That public action has little effect on what the market maker will make their line, and retail books will try to shadow the market maker's line regardless of how their customers are splitting their action.

Also never forget that there's a sizable hold on every market. Even when the public money influences the line, it would have to push the line at least roughly 3% on the break-even percentage (e.g., from 50% to 53%) until you could even consider using this public money as a betting angle.

In 99% of cases, all this public money sharp money stuff, while maybe interesting, will not help you in any way to find good bets. The exceptions come when there is a very high-profile event where for whatever reason most people are strongly inclined to bet one way and not the other. In these cases, you can likely bet the other way blindly and consider it a good bet. But that's about it for the whole pros versus Joes thing.

In-Play Betting

So far, the betting markets I've talked about are pregame markets. The main three markets—spread, moneyline, and total—and the derivative markets—first half spread, moneyline, and total—they are all offered before the game starts. Once the game begins, the markets close.

In-play markets open once the game begins. Most sportsbooks these days offer at least some form of in-play betting. The menus at some books can be as simple as continuations of the main three pregame markets. Or at other books the menus can be extremely extensive with hundreds of betting options available at all (or at least most) times.

Say you're watching an MLB baseball game and open your favorite sportsbook's app. They have a couple dozen markets available on the game—moneyline, run line, total for the game, the same bets but for the first five innings only, the first seven innings only, alternative run lines and totals, maybe a few prop bets.

Each of these markets have prices that update in real-time as the game goes on.

If you've been following the theme of the book so far, one specific question may come to mind when you see these markets.

Where the heck do all these prices come from?

Most often, sportsbooks receive these odds as a data feed from a third-party vendor. There are a few established vendors

who sell up-to-the-second pricing on in-play betting markets as a service. (As a matter of disclosure, at the time of this writing, I am in the process of launching one of these vendor companies. So this is a topic that I know a fair bit about, but also where I may have some personal biases that come through in the discussion.)

The way it works, roughly, is a sportsbook operator decides they would like to offer in-play betting markets to their customers. They contract with a third-party vendor who provides a data feed with markets and suggested prices. The sportsbook then adds a hold to the markets—how much they add is up to them—and they offer the bets to their customers.

Some sportsbooks contract with multiple vendors and combine the individual feeds with perhaps a twist of their own into a proprietary, aggregate feed which they then use to price the markets they offer to their customers.

Okay, so the operators buy a feed of pricing. But how do the vendor companies price all these markets in real time as the game is in progress?

Exactly how any vendor does this is going to be proprietary, and they all do it a little differently. But the basic idea is that each vendor will have some sort of model, algorithm, or other process that takes in information about the teams, as well as game state information, and transforms that into prices for the markets.

Here's a simplified example. Let's say it's the top of the seventh inning in an MLB game, and the home team is ahead 4-3. The pregame betting markets closed (at market maker books) with the home team as a 62% favorite to win the game, and the total closed at 9.5 with the over at a 52% break-even percentage.

You want to make an in-play moneyline for the game. You look in your database for games that closed with similar lines (say with the home team as between a 59% and 65% favorite and totals between 8.5 and 10.5) where the home team was ahead by

one run in the top of the seventh. Then you just count what percentage of those games the home team ended up winning, and there's your line.

You wouldn't want people to have to run these calculations during the game, so this process is automated—either by using fast database queries or by precomputing the answers.

What I just described is a simplified version of how one could make an in-play line. I don't know how accurately this process describes what happens at the various vendors, and this sort of analysis is only one piece of the puzzle when I make a line.

But the basic idea is there. You take information about the strength of the teams (pregame closing lines), information about the game state (the score, the inning and/or how much time is remaining, and any other relevant information like who has the ball, position on the field, and so on), and combine them intelligently to come up with a line.

There are two major problems with this, and you may already have thought of them both.

The first problem is that there is an enormous amount of information available once the game starts that wasn't reflected in the pregame lines.

Maybe a player or two got injured during the game.

Maybe the teams are playing different strategies than the market expected before the game started.

Maybe the teams are playing faster or slower.

Maybe they're fouling more or less.

Maybe the weather took an unexpected turn.

Maybe one key player is playing at a much higher (or lower) level than their usual standard.

Much of this is information that is readily available to anyone with a web browser and a TV. It's also information that is—as you might imagine once I described how the lines get made—

extremely difficult (in some cases) or nearly impossible (in others) to account for correctly, in real time, second-by-second, in an in-play line feed.

And sportsbooks aren't content these days with offering just a spread and total in-play. They want to offer dozens of markets. All updated by the second. All priced in an instant.

I call this wide range of betting options that sportsbooks offer without fully understanding them "attack surface," a concept I'm borrowing from computer security that I think also describes sports betting well. I'll explain the analogy a little later in the book.

The second major problem from the sportsbook's perspective with offering in-play is that they rely on correct, up-to-the-second game state information. Since the game state is a key part of the equation to price the markets, if the game state data is either slow or error-prone, the lines priced using it will also be slow or error-prone.

In the UK where in-play betting is a more mature product, sportsbooks complain about "courtsiders," which is a very English term for bettors who are trying to take advantage of slow data feeds by watching events in person and getting key information several seconds faster than the sportsbook receives it (via their third party odds vendor which gets it via a data feed).

Even if the data feed is fast, sportsbooks are potentially vulnerable to every glitch or mistake in the data feed. "The ball is at the Rams 35-yard line." Five seconds later. "Whoops. That was the Patriots 35-yard line. Sorry about that."

That's five seconds the markets may have been priced for the wrong yard line—and obviously in a sport like the NFL that sort of error can make a massive difference in how markets should be priced.

Nevertheless, despite these two big problems, sportsbook operators know their customers want to bet during games, and so they offer a variety of markets priced in just this way.

There's one other big divide with how sportsbooks offer in-play betting. I'm not sure there are industry-approved terms for these variants, so I call them "timeout" betting and "running down the field" betting.

Timeout in-play betting is a style that focuses on offering bets to customers only during stoppages in play—timeouts and commercial breaks. While the game is in progress, the bets are unavailable. Then once play stops, the markets go up for a couple minutes until the game starts back up again.

Running down the field in-play betting is a style that always attempts to offer bets, even while the game is in progress.

In-play betting is most popular so far in Europe, and soccer is the most popular sport to bet in Europe. Therefore, as you might imagine, running down the field betting is very popular there. Soccer has few timeouts, so if you waited for one to offer in-play betting, you'd be waiting a very long time. And in soccer there are many periods of time during a game where the ball is being passed back and forth in the defensive half, and it's unlikely a goal will be scored in the next thirty seconds or so. As a result, running down the field betting is a pretty good choice for soccer betting.

American sports are different, though. Things happen faster. In the NBA, the average possession is now just a little over ten seconds. In football, a team could break a big play for a touchdown basically at any time. Even in relatively slow-paced baseball, any given pitch could turn into a game-changing home run. There's no "downtime" in these games where nothing is likely to happen.

Not to mention hockey. Hockey is nuts.

Anyway, TV feeds are also delayed substantially. By the time you see Steph Curry bury that three on TV, likely 10-to-20 seconds have passed since he did it in real life, and the other team has probably already completed an entire possession in the meantime. The sportsbook knows (via their third-party vendor feed) what happened on that possession. You don't. That's a problem.

American sports also all happen to have plenty of timeouts. The timeout model is a great fit for American sports, while the running down the field model is fraught with problems. I've seen some sportsbooks try to use the running down the field model on American sports, but to me that's a square peg in a round hole. I suspect as the industry evolves that we will see the timeout model take root as the predominant form of in-play betting in the USA.

Bets and Books

Before I move on to the next part, where I break down where to look to find good sports bets, I wanted to summarize the information so far. Hopefully you found the inside-the-industry information here interesting, but beyond that it's critical to know a bit about how it all works if you want to succeed at finding good bets.

There are two main business models for sportsbooks. The market maker model and the retail model. The market maker model is to accept bets from all bettors, profile your customers, and move your market prices on action. This is a difficult model to run profitably. You have to make hard decisions about exactly how to move the prices on your markets, and also if and how much to move related markets when a single market gets bet into. You also can't make many mistakes, as your sharp customer base will pounce on them immediately.

The retail model is to accept bets only from recreational customers. If you determine that someone is likely beating you, you limit their bet sizes, or you close their account entirely. You often don't move your prices on action—instead you try to mark your market prices to those at the market maker books.

It's much easier to win a good hold percentage from your customers when you run your business this way—after all you are actively limiting or kicking out any customer who you think might be able to beat you. But because it's easier to run a book this way,

there is plenty of competition, and marketing costs can become difficult to keep up with.

Many operators run a business model that is a bit of a hybrid between these two extremes. Some market makers will only make markets for a few core sports and will behave more like retail books for the other sports. Some retail books attempt to limit or refuse as few customers as possible. They know that the broader a range of customers they can serve (profitably), the more money they stand to make.

And accepting customers other sportsbooks refuse is great marketing that you don't have to pay for.

The way lines get made is that market maker books post opening lines with low limits and begin to accept bets. They do the best job they can to make opening lines that are reasonable, but in the end it's not resource-efficient to spend too much time making any one line, and so inevitably whatever system they use to make openers will be flawed, and there will be some great bets available to the early birds.

This is why market makers keep the limits low early—the early birds get in a few pecks, but they can't gorge themselves.

Market makers move these early lines quickly on action. They use all the information available, including any profiles they may have of the accounts making the bets. While moving lines in response to action is a core practice of all market making books, there's a real art to this sort of trading. How much to move. How much to move related markets. Which markets in fact are related—and how strongly related. Which specific bettors play which specific angles. And so on.

Sportsbooks with the best talent will get to a good line much faster (and therefore less expensively) than books with mediocre talent running the show. This is so true that market making books

with mediocre talent tend not to survive. It's not so easy to be the house in the world of sports betting.

Once the market makers' lines have begun to stabilize for an event, retail books will post the same markets, opening with the lines the market makers have discovered. They may shade the lines one way or another in anticipation of action from their customer base. For example, if they know their customers love to bet the Lakers, they might make any bets on the Lakers more expensive by a few percent. But rarely will they take this idea too far—typically they will anchor even their skewed markets to the lines at the market makers.

Retail books will then peg their lines to those at the market makers until the market closes. If a market maker moves a line, retail books will make the same move. This is such an entrenched strategy these days for retail books that there are third party companies whose entire business is to sell this line service to retail books—they will notify retail books in real time of any movement in any monitored market at the market maker books. Some will even automate the entire line movement process for a retail book.

This is true for the major markets—point spread (or run line in MLB/puck line in NHL), moneyline, and total. This is less true for any derivative markets. First half markets have become fairly major markets as well, so it's common for retail books to peg their first half lines to those at market makers as well.

But the more exotic a derivative, the less likely the retail book will be to peg their lines to those at another book. These days books like to offer as many derivatives on major events as they possibly can. So you may see things like second half lines dealt pregame, first quarter lines, second quarter lines, first inning lines, alternative spreads, alternative totals, parlayed alternative spreads with alternative totals.

And then there are proposition bets (props). Player props (e.g., points scored by a player, touchdowns scored, runs scored, hits plus runs plus RBIs, yards, completed passes, you name it). Team props (team totals, corner kicks, faceoffs won, team field goals kicked, team totals by half). Game props (first team to score, first to reach a certain score, first to score a touchdown, total touchdowns scored, scoring by time in the game, and more).

Retail books love derivatives and props because their customers love derivatives and props. But retail books don't have a great way to price several dozen derivatives and props for each game, nor do they typically maintain sophisticated trading rooms—at least not ones large enough that could reliably trade every single event they offer all these markets for.

Retail books will often open these derivative and prop markets by copying similar markets at a market maker. But as often as not, they will just use the opening lines and most importantly will not peg their lines to those at another book as the market develops.

Or they may not copy the markets and lines at all and just put up a quick and dirty opening line themselves.

Their approaches to trading these markets can vary widely from specific retail book to book. I've seen some that will move their lines on a market 6% (e.g., the entire amount of the hold) from a single limit bet (and limits on these markets are often as low as $300 or lower). I've seen others that seem never to move these lines at all to a limit bet. In no case have I seen any retail book attempt to propagate any line move on one of these markets to any related markets.

As a simple example, say I see a prop on the number of touchdowns scored by both teams combined in a game. The line is 6.5 -110 on either side. I bet the limit on the over.

Related markets to this bet would be total touchdowns by team, total points for the game, total points by half, total points

by the quarter, any in-game totals they may deal in the future, even total field goal bets, and other props like total yards of offense, defensive touchdowns scored, and more.

(Make sure you understand how each of these markets is related to an over bet on combined touchdowns scored.)

I've never seen any retail book (and if I'm honest, for the example given no market maker book either) make any real attempt to propagate a line move in this market appropriately through to any related markets.

I've just said to the sportsbook (by betting) that I think the teams will score lots of touchdowns. And the sportsbook will maybe move that one market—maybe they'll move it a lot—but they won't touch the pricing on any other market where scoring lots of touchdowns would also matter.

Here's the bottom line. These derivative and prop markets simply aren't priced well. They aren't opened well. They aren't updated well. And they aren't priced well with respect to one another.

Everything I just said about derivative and prop markets I can say about in-play markets, but even more so. Trading in-play markets is a legitimately hard and complex problem. Books want to offer all the same props and derivatives in-play as they do in their pregame markets. So right off the bat these in-play derivative and prop markets will suffer from the same vulnerabilities that the pregame ones do. But layer on top of that all the extra information available to you if you are following the game closely.

Sportsbooks often deal a dozen or more different games (in several different sports) simultaneously. They deal dozens of derivative and prop markets in each of these games. That amounts to hundreds of in-play markets available at any given moment to customers.

Think about how hard it is to get all that right!

Your job as a bettor is just to find the flaws. Their job is to make sure there aren't any flaws in the first place. You can imagine which job is (much) easier.

My business and interest in this industry is to solve this problem once and for all for sportsbooks. I can assure you it's a hard problem. Until a lot of smart people put in a lot of work to get all this right, you can be sure that in-play betting will be extremely vulnerable.

You don't have to be a "courtsider," trying to front run the information feed that sportsbooks use to price their markets. (In fact, I think any attempt to do this systematically should be considered cheating the sportsbook and potentially a crime.)

In-play betting is a game, a fun game, where you can use your knowledge of the sport, what you see with your eyes, in-game statistics, and more to try to outwit the sportsbook. And at least for now it isn't particularly difficult to outwit the sportsbook and to do so honestly.

PART II: THE LOGIC OF SPORTS BETTING

Betting The Best Price

If you want to make a bet, you should look at the prices at all the sportsbooks available to you and choose to bet the best price. If one book has Broncos +6 -110 and another has Broncos +6 -105 you should bet the -105 because it has a lower break-even percentage.

Duh.

This is the traditional line-shopping advice, and obviously it's good. Buy your bets at the lowest available price.

But I have a question. Why do I want to bet Broncos +6 in the first place?

A good answer to this frequently has relatively little to do with the Broncos (or their opponents). After all, what we're talking about here is one of the majorest of major markets—an NFL point spread. By the time this line gets to you, tens of thousands of people, a few of whom may also be smart, have looked at this same Broncos +6 bet you're looking at. Every sportsbook employee operating in the US has looked at this bet. They've looked at the lines at every one of their competitors on this game.

It is very unlikely that you know something special about the Broncos that the entire sports betting universe that's bet this line to +6 doesn't know.

Nevertheless, you might want to bet that Broncos -105 after all. Why?

Well it has not as much to do with the Broncos and more to do with what prices are available in the marketplace.

GETTING THE HOLD TO ZERO

Let's imagine a world, for a moment, where sportsbooks didn't put hold on their markets. You could bet Broncos +6 +100, or you could bet Chiefs -6 +100. That's a 0% hold. What would be the implications for bettors?

First, there would be no penalty for dart-throwing. You could bet completely at random, and you would not lose over time. That's a pretty big deal.

The only way to be a losing sports bettor in this alternate world would be to have a skill or gift for picking bad bets. This is a lot harder than it sounds—because if you have the persistent ability to pick bad bets then theoretically you can just bet the opposite (if there's 0% hold) and turn that into the ability to pick good bets. As long as you're trying to win (and not just picking the side you want to root for), you will win into 0% hold.

On the other hand, any twinge of insight you might have into any bet would very easily be profitable. Weather starting to look bad in Cleveland? Bet under. Think you figured out an NHL trend this year leading to higher scoring? Bet every over.

There's no penalty to it. If you're wrong, it's break-even. If you're right, the bets make money. You're almost guaranteed to be profitable over time doing this—again as long as the way you choose your bets isn't "let's bet the most popular teams where I live."

Of course, this is a fantasy world. Sportsbooks put holds on their markets, and the holds tend to be big enough that your

twinges of insight aren't valuable enough to turn into profitable bets.

But it's not entirely fantasy. Because while any single sportsbook won't offer a 0% hold market, you can frequently synthesize a 0% hold market by using prices at two different sportsbooks.

Here's the simplest example. You're looking at today's Diamondbacks-Rockies game. Sportsbook A has the game priced Diamondbacks +130/Rockies -140. Sportsbook B has the game Diamondbacks +140/Rockies -150.

Each book has their "standard" MLB moneyline hold on these markets. But between them, you can see the prices Diamondbacks +140 (at Sportsbook B)/Rockies -140 (at Sportsbook A).

Guess what. That's a 0% hold synthetic market ("synthetic" because it's synthesized from two different markets). Everything I just said above about 0% hold markets applies to this game. Heard a rumor that the Diamondbacks closer has the flu? Bet Rockies -140. Do you think the Rockies bullpen has been getting lucky lately? Bet Diamondbacks +140.

You're probably wrong about most of that stuff—or at least mostly wrong—but when the hold is 0%, there's essentially no penalty for being wrong. Only upside for being right.

Much more frequently than 0% hold synthetic markets, you can find microhold synthetic markets. Say the best you can find is Diamondbacks +138/Rockies -140 between two sportsbooks. That's a 0.35% hold. If you bet randomly into this market, you will lose—but very slowly. And if you have any real insight at all when making your bets, you'll overcome a hold that small.

Occasionally, the synthetic market hold goes negative. Like say you found Diamondbacks +142/Rockies -140. This is a -0.35% hold for the market, meaning you could lock in a profit for

yourself. You could bet $140 on the Rockies at -140, and $99.17 on the Diamondbacks at +142, and no matter who won, you'd pocket 83 cents.

When you find a synthetic market with a negative hold like this, it's called a scalp. There are hundreds of people as you read this running computer scripts that scrape worldwide sportsbook lines all day long looking for scalp situations and then automatically betting them when found. Because it's risk-free profit that even a computer can identify easily.

If you aren't a computer, however, it's usually better to treat these scalps as you would a 0% hold market. You choose a side you like better for one reason or another and bet only that side. If you're essentially throwing darts when you pick, that's okay. You'll still probably make that 0.35% return on your bets—only thing you give up is the risk-free part when you pick one side instead of betting both.

The key idea here is that it's relatively hard to find winning bets when you're betting into a 4.5% hold. If every sportsbook has the exact same price on a market, that's bad for you as a bettor.

When sportsbook prices start to diverge, and you can create synthetic markets between them with 0% hold, it's almost trivial to be a winning bettor if you bet consistently only into those 0% markets. And whether the market has a 0.35% hold or a -0.35% or a true 0% hold really doesn't matter much. Mathematically there's not too much difference between the three—unless you're trying to live the good life 83 cents at a time with an always-running computer script that is.

This is perhaps the most core winning sports betting concept of all.

USING RELATED MARKETS TO GET THE HOLD TO ZERO

Okay let's switch sports to NFL. Say there's a Dolphins-Bills game on Sunday. Both Sportsbook A and B have the point spread at -5.5, but A has it as -110/-110, and B has it at +100/-120. So the best price on the Dolphins is +5.5 +100 and on the Bills is -5.5 -110. That's a 2.3% synthetic hold, which is a lot better than 4.5%, but is also nowhere near zero.

But let's say the Bills are starting their backup quarterback for the first time this week due to an injury in the fourth quarter of last week's game, and you have a strong opinion that this quarterback is much better than people seem to be giving him credit for.

On the other hand, you know full well that you aren't the only person with an opinion about the Bills quarterback, and that because NFL football sides are a huge market, it's more likely than not that you're missing something important.

Missing something important is a huge potential problem for you when you bet into a hold (even a 2.3% hold). It's much less important if you can get the hold to zero. Because, again, once the hold is zero, you can throw darts and break-even. So if your opinion has any real merit at all, your Bills bet will be worth making.

You turn to the moneyline markets. Sportsbook A has the moneyline on the game as +170/-210. Sportsbook B has it +190/-230.

Teams that are 5.5-point favorites in the NFL tend to win the game about 68% of the time. There are various ways to know this—you can just look at a database of games and choose point spreads around 5.5 and see how often the favorite wins. Or you

can build a model. For something this simple, you can also theoretically just look at how the market makers tend to price these games over a period of time.

Anyway, one way or another you need to be able to convert that -5.5 point spread to a 68% break-even percentage moneyline.

The -210 price on the Bills converts to a 67.7% break-even percentage.

So now you have a pair of bets—at Sportsbook B there's Dolphins +5.5 +100 and at Sportsbook A there's Bills -210 on the moneyline—that create a new synthetic market with a slightly negative hold.

Let me go through that one more time.

I want a market with zero hold. We've got Dolphins +5.5 +100. So ideally, I want Bills -5.5 +100 somewhere as well. But I can't find that price anywhere, the best I can find is Bills -5.5 -110, which isn't good enough.

But if I were to convert Bills -5.5 +100 to an equivalent moneyline, we'd get 68% break-even percentage or about -213. Not only is -213 on the moneyline available, but -210 which is ever so slightly better is listed at Sportsbook A.

I now have our zero-hold market, and I can bet our Bills quarterback hunch by taking the -210 moneyline price.

This same idea can be used with other pairs of related markets as well. Game spreads to first half spreads. First half spreads to first half moneylines. Game point spreads and totals to team totals. And so on. As long as you have a fairly reliable way to convert one market to the appropriate price in the related market, and you can find a zero hold market across that conversion, you can use the "feel free to bet your ideas into zero hold markets because if you're wrong it's free" concept.

The one slight caveat here is that you can convert incorrectly. I said that a -5.5 spread converts to a 68% moneyline. That comes

from my model. My model can be wrong. It can be wrong because I built it badly. It can be wrong because it has some inherent error in it. It can also be wrong because the game is changing and for whatever reason NFL teams are now materially more or less likely than in the past to win by between 1 and 5 points.

Fortunately, it doesn't have to be dead-on to make money with this idea. If I think the hold is -0.35%, but it's actually 0.35%, that's not great, but it's still probably fine to bet my Bills backup quarterback idea into.

Of course if my conversions are so bad that they can be 3% off the "right" answer, then it's not going to work out. I need to develop ways to convert between related markets that are very good but not necessarily perfect. Once I have that, then my chance of finding zero hold pairs of bets on any given game will get much, much better.

Incidentally, this is all people are doing when you hear that they're "middling" a game. They've found a pair of related bets (at different point spreads) that create a negative hold synthetic market. Like I said with scalping above, it's often better once you've identified such a pair to bet just one of the two bets—the one you happen to like better for whatever reason. Betting both of them cuts your risk profile way down, but it also tends to cut your long-term profit as well. The more real insight you have into the sport and the game you're looking at, the truer this is.

CHASING STEAM

Let's say you're watching the college football full game markets, and you see almost every sportsbook has Oklahoma a 14-point favorite against Kansas State.

Then you see the main college football market maker go to 14.5, then straight to 16. Who is betting the Sooners? Who knows. Who cares. Whoever it is, the market maker sure thinks they know their stuff in college football, and that's good enough.

Other sportsbooks start following the price move, but there's one you see that hasn't touched their line.

You log in real fast and bet Oklahoma -14 before they can move their line.

That's chasing steam. You're basically watching the market for any significant price movement, and then looking for sportsbooks who are slow to move their lines so you can pick off the old number before they get around to changing it.

This is just a subcase of the more general idea from above—betting into zero or negative hold markets. For a brief period, you have found a pair of bets, Oklahoma -14 and Kansas State +16, that have a whopping -1.2% hold synthetic market. (I estimated the hold by using my college football push rate chart. You can find charts like these online if you do some searching.)

The sportsbooks have—for just a moment—decided to offer you the hold instead of keeping it for themselves.

This is a perfect example of a situation where you could middle the market by betting both sides and lock in a profit—but you probably shouldn't. Why not? Because you aren't flipping a coin to decide which of these bets is the good one and which is the bad one. The bad bet is the Kansas State +16 bet. Why? Because that's the price that the preeminent market maker is offering—a price they got to through the price discovery process, likely because a few people who follow college football very closely suddenly decided to unload on the Sooners for whatever reason.

The -14 price, on the other hand, is only on offer because a retail book who normally copies the market maker's moves happened to be asleep at the wheel for the past couple minutes.

Steam chasing wins. It wins because you're betting into a zero-hold market with an informational advantage. You may not know a thing about either the Sooners or the Wildcats. But you know you can bet on either one with zero hold (in this case negative hold). And you also know which sportsbook is likely to have the sharper line, because you know how each sportsbook makes their lines.

And that's all you need to know to make a little money.

Sportsbooks, as a rule, hate steam chasers. You can see why. Think about how you'd feel if you ran a sportsbook and every time you took a bathroom break, some guy would jam in only the bets that had moved while you were gone.

You'd probably get sick of that pretty fast.

Steam chasing wins. It's also probably the fastest way to get yourself banned.

FINAL THOUGHTS

You've probably heard of line shopping. "Figure out what you want to bet and then go find the sportsbook that has the best price."

But, honestly, that advice is really kind of backwards. Better advice in most cases would look like, "Find games where you can create zero hold synthetic markets between sportsbooks and using related markets. Once you find games like that, figure out which side you like better and bet that at the best price."

This is not how most people think about sports betting. For most people, the hunch about the game comes first, and the price shopping comes second. Most people don't think, "Well let me go look at every sportsbook's lines and try to find the ones where the world is cutting me a break and focus on betting just those."

Most people also lose.

Beating The Odds

I mentioned the term "attack surface" before and said that I would explain my analogy to computer security. Here's the first part of that analogy.

It would be very hard to write a book to teach you to break into computer systems—at least the way most people would think about it.

"Hey. Teach me to hack the Pentagon."

"Sure thing, reader. Go to this URL and you download this script and then you run the script and it executes Pentagon Hacking Exploit Number 492 and then…"

That's not how it works, right? Because in some crazy world where you could go to a URL and download a script that actually hacks the Pentagon, the moment I wrote it down in a book and anyone at the Pentagon read it, they would patch the system.

The directions in the book would be obsolete long before they released me from my detention in a featureless interrogation room.

Long before.

Anyway, it's much the same with sports betting. The more specific the directions I try to give you in the book about how to win, the quicker those tactics will become obsolete. Sportsbook employees will no doubt read this book too, and if I say, "Hey in the NBA bet under in the first half when the wind is blowing,"

they'll start opening those lines lower, and the angle will be obsolete.

My approach here won't be to give you specific recipes. I'm going to help you develop a process for finding good bets.

The core principle in that process is this. Attack sportsbooks where they are vulnerable. Avoid betting into their strengths.

Simple and intuitive. Avoid strength. Attack weakness.

In many ways, besides the entertainment value, the entire point of the first part of the book was to help you understand where sportsbooks are strong and where they are weak. Of the zillions of lines that sportsbooks offer every day, some of those lines are made through a very robust process where a market maker books millions of dollars of action on both sides.

And some are pulled directly out of someone's ass.

You want the ass bets.

It's worth going over a list of advantages and disadvantages that sportsbooks have over bettors (and bettors over sportsbooks). Most of this list comes directly out of the first part of the book, so it shouldn't be surprising. But lists are good.

ADVANTAGES SPORTSBOOKS HAVE

Sportsbooks have several major advantages over the bettor, and if you want to win you have to keep these in mind and minimize their impact wherever possible.

Advantage #1. Many traders, risk managers, and other employees monitoring prices.

Sportsbooks hire employees called "traders." Exactly what these folks do on a minute by minute basis depends on the business model of the sportsbook, but their job is to make sure that all the lines offered by the book are where they are supposed to be. They watch the market—what lines other sportsbooks have. They monitor incoming bets. They move lines. They may decide whether to accept or reject bets on a customer-by-customer basis.

The bigger the sportsbook, the more of these people they will have on staff. The largest sportsbooks in the world have hundreds of these employees. Their entire job is to use everything at their disposal to make sure you never get a good bet.

Small sportsbooks employ relatively few traders, but often they still have to monitor between them hundreds of markets. This naturally means that things will slip through the cracks, and you will be more likely to find good bets and even flat-out mistakes.

Small books are also acutely aware of this shortcoming, and so will usually have defensive policies in place. They'll place strict limits on how much you can bet on any one market (particularly when you're betting online). If it's permitted by regulations, they may be quick to cancel bets if they feel you've taken advantage of an error. And if they see you as a customer who tries to nail them on every mistake they make, they'll probably show you the door.

Large books will have many more traders, and so will make fewer mistakes. But this capacity at times can make them complacent. They may be less restrictive on their customers. They may not notice as quickly a customer who picks them off.

Many vulnerabilities can't be fixed no matter how many traders a sportsbook hires.

Nevertheless, sportsbooks have a team of people trying to beat you, and you are but one person. Has to count as an advantage in their column.

Advantage #2: Mathematical models to make derivative and in-game prices.

In general, derivative and in-game bets will be more vulnerable than the main side and total markets. One reason is that derivative and in-play markets aren't forged in the fires of a liquid betting market like the major pregame markets are. Popular derivatives like first halves are exposed to market making, but more exotic ones like quarters, single innings, props, and so on typically aren't.

But that doesn't mean that all these prices are completely random. They're made by mathematical models (often supplied by third party vendors to the sportsbooks). The math can be of varying quality, but sometimes it's pretty good.

Take in-play betting on an NFL game, for instance. This is a very beatable market as of the writing of this book. But just because it's beatable doesn't mean any old thought you have will turn into a good bet.

Say the Pats are 10-point favorites pregame, and then they open the game scoring two touchdowns in the first quarter. You see a Pats -20 -115 bet and think, "Many they're rolling and they're the Pats and all they have to do is win the rest of the game by less than a touchdown? Gimme that!"

Well, be very careful with that. The lines you were offered by the book were made by a mathematical model, while you're using basically seat of the pants intuition.

The math that goes into the in-play lines is far from perfect. But it's there and it's improving year-by-year. Even if your intuition is good enough to beat their math today (and, honestly, it's likely not), it won't be in two or three years.

If you want to beat this stuff, at some point you'll have to fight math with math.

Advantage #3: Betting Information.

Theoretically, the information advantage that sportsbooks have should make it nearly impossible to beat them.

I say theoretically, because information is only as good as the person or software trying to use it. If the sportsbook employee or software doesn't make good use of this information, it's no advantage. But if that person really gets into it and tries to beat every customer—particularly the high volume, high stakes customers—the information at their disposal can be too much to overcome.

If you play poker, think about if you were playing heads-up no-limit hold 'em online. Your opponent gets a heads-up display (HUD) with up to the second summaries of your betting history, including dozens of relevant statistics and an AI analysis of your strengths and weaknesses as a player. You get no HUD, and you see an anonymized screenname and a cartoon avatar of a smiling tortoise chewing some leaves.

Even if you're a pretty good poker player it's going to be hard for you to beat a competent and motivated opponent with this information imbalance.

Or think about how NFL games would play out if one team could do all the analytics, the advance scouting, and watch all the film they liked, while the other team was prohibited from doing any of it.

This is theoretically a huge advantage. Sportsbooks have information about every bet every one of their customers has ever made. They know what markets they win and lose on. They know who they win and lose to. They know what those people bet. They know how they bet.

They know every bet you've ever made, how you've done on it, and so on.

They also (at least currently in the United States—perhaps these regulations should change) have the power to accept or reject any bet at any time for any reason.

Take this to its logical extreme. They've trained AIs now to beat humans in darn near every game we've ever invented. How hard do you think it would be to train an AI to beat any human bettor in the "I have the entire company's betting history and your entire betting history and I get to accept or reject any bet as I please and—oh yeah—I have a 5% hold on every market too" game.

The only reason you can win at all is because the current software sucks and humans run the show.

In practice a few sportsbooks are fairly good at using the information at their disposal and many of them are pretty bad at it. You'll get to know which is which as you bet with them and see their behavior. (The same way you can tell who is good at poker and who is not by playing with them for a while.)

When you're betting at a book that's good with information and is also willing to use every other tool at it its disposal to beat you, watch out.

Advantage #4: The hold.

This is the most obvious advantage, of course. It's also enormous. And it's insidious.

One good way to think about how the hold kills you is that it destroys your margin for error. If I define being "right" as correctly assessing the percentage chance a bet will win, and being "wrong" as missing a key factor that adds noise to your estimate and renders it little better than a random choice—if I define right and wrong this way then the bigger the hold, the more often you

must be right versus wrong if you hope to do better than break-even.

Here's what I mean. Say you make five bets, and you think all five of the bets should win about 53% of the time. Since they win more than the 52.4% break-even percentage on a -110 bet, you make all five bets.

And you handicapped these bets perfectly—except for one game where there was a key injury affecting the line that you didn't realize until after you'd made your bet. When information you fail to account for ends up being more significant than your handicapping, your bets perform as if you'd chosen them randomly. So we can expect about a 50% win rate on the "wrong" bet.

Your average win if you bet $110 on each of these five bets—the four good ones and the one mistake—would then be

$$\begin{aligned} EV &= 100 \times (0.53 \times 4 + 0.5) - 110 \times (0.47 \times 4 + 0.5) \\ &= 262 - 261.8 \\ &= \$0.20 \end{aligned}$$

That's 20 cents. Basically break-even. You made four good bets and one bad one, and the one mistake completely wiped out all your good work.

This is why limiting or eliminating the hold by creating synthetic markets across sportsbooks is a fundamental skill. Because without doing that, you have to basically be perfect at this if you want to win even a little bit.

DISADVANTAGES SPORTSBOOKS HAVE

Disadvantage #1: Attack surface.

There's a computer security concept called attack surface. *Attack surface* represents all the possible ways into a computer—legitimate ways in like accessing a website or receiving email. The more attack surface you have, the more chance there is you made a mistake locking things down. And the more chance that your computer will get hacked.

Let's say your job is to administer a single server. That server's job is to relay emails from one network to another network. That's it. It doesn't run a website. It doesn't host Minecraft games. It doesn't mine cryptocurrency. It relays emails from one network to another.

The security principle states that you should remove as much software (and hardware) functionality as possible from this server that is not essential for it to perform its task. If the operating system automatically installs a web server, uninstall it. Remove Minecraft. Remove the ASIC Bitcoin mining hardware. Strip the thing down so that it's running only exactly what it needs to perform its task and nothing more.

Why?

Because if you leave that web server installed but you don't use it, you will neglect it. And then six months later a bug is discovered in the web server that you aren't paying attention to, and a hacker exploits that bug to take control of the system. All because something you didn't use and didn't need anyway was sitting there neglected.

For a sportsbook, derivative markets are attack surface. Every additional alternative or related market a sportsbook wants to

post is a potential vulnerability. Every one of them is sitting there waiting for someone clever to correctly price the relationship between the derivative and main markets and pick off the mispriced markets.

Not only that, but sportsbooks are addicted to these derivative markets. They want more, more, more options for their customers. But what they're really offering is opportunity.

Disadvantage #2: They must post their price and take bets on either side at any time.

If you've ever tried to sell stuff (and not get ripped off by the vultures) you know that choosing the right price can be very tricky. Price things too high, and your customers walk on by. Price things too low, and you get hit.

Haggling—while annoying to many Americans—is a solution to this problem. The seller can throw out a price that's too high. But instead of walking away, the customer understands the game. Then the parties can converge on a "fairer" price through haggling.

Well there's no haggling in sports betting. Prices are posted on hundreds of markets simultaneously, and the sportsbook's promise (not always upheld, mind you) is that you can bet any available market at any time at the posted price.

And most markets are two-way, which means there's no safety in posting a too-high price. The customer can effectively sell to you at that price (minus the hold) by betting the other side.

This is a pretty major disadvantage—particularly so if the sportsbook likes to post zillions of markets including exotic derivatives, alternate lines, and props. And obviously if the sportsbook honors the implied promise and actually lets you bet at the posted prices.

The good faith promise of a sportsbook is that customers can come and bet any posted line within the posted betting limits and get the bet. To compensate the sportsbook for this admittedly generous offer, they get to set a hold on every market—and they can basically set the hold to whatever they choose. The hold is clearly declared on the betting menu, and the customer can calculate it easily using the method I described earlier in the book.

Disadvantage #3: Talent is expensive.

For now, until the sportsbook-run-by-AI dystopia comes to fruition, there's a human on the other side of your sports bets. That human is an employee of the sportsbook. That employee is hired from a relatively small talent pool.

As of the time of this writing, the best sports bettors can still make seven figures per year as bettors. A good handful more can make six figures per year. This is some of the best part of the talent pool sportsbooks could hire from—but at least for now they aren't willing to offer six or seven figure compensation packages to be competitive.

Many of the people who are the best at this therefore tend not to work for operators. They instead are the "adversaries." It's a small talent pool to begin with, and then operators aren't willing to pay to compete for any of the best part of it.

There are plenty of smart people working for sportsbooks, of course, but maintaining a major sportsbook 24/7 is also a huge job requiring the collaborative effort of many people, all with very specialized skillsets.

It's just plain hard to fill all these roles with qualified candidates. As a result, sportsbooks tend not to use all their built-in advantages to the maximum as some of the employees charged with using those advantages don't know how to leverage them properly.

This problem for the books is likely to get worse in the short term (first few years of expansion in the US) before it gets better.

BET DELAYS

Sportsbooks are keenly aware of these disadvantages, and they take a few countermeasures against their customers to mitigate these disadvantages. Most of these countermeasures are obvious—you can't miss it if you're being "countermeasured."

However, there is a large countermeasure that many sportsbooks take that I don't believe is well understood, so I'm going to go in depth on its repercussions here.

The main deal that sportsbooks make is they put up both sides of every bet, all the time. In exchange for this, they add a hold so that they earn a profit as they buy and sell. However, sportsbooks also sometimes add something else—a fixed time delay—to your bets that really tilts the bargain in their favor.

Most sportsbooks are set up to let bets of trivial size—maybe $10 or $20—go through immediately without review. But any bets above a certain dollar threshold (this threshold often varies depending on how the sportsbook has profiled you as a bettor—the more of a threat they think you are, the lower the number) get delayed.

The delay is often just a fixed amount of time, like five or eight seconds. That delay is there for a reason—and it's not because it's customer-friendly

It's a period where the sportsbook can gather market information that you didn't have when you submitted your request for a bet. If it's not clear how this helps the sportsbook

in a way that's potentially unfair to the bettor, consider the stock market.

Say it was your job to trade stocks for a living. But every time you wanted to buy or sell a stock, you had to submit your offer—and it was locked in for fifteen seconds. You couldn't withdraw it during that time. You couldn't change the price. You just had to call your shot and then sit there for fifteen seconds to see if someone wanted it. And if anyone took you up on your offer within that fifteen seconds, you were committed.

How do you think that would go for you? "I want to buy Amazon for $1500 a share," you'd say. Tick, tick, tick. The price goes up to $1505. Tick, tick, tick. The price goes up to $1508. Beep. Times up.

No one sold you any stock. Try again.

"I want to buy Amazon for $1500 a share," you say again. Tick, tick, tick. The price drops to $1503. Tick, tick, tick. The price drops to $1493. Ding! Sold!

You just bought Amazon at $1500 when the prevailing price was $1493. Congratulations.

Hard to win with those rules, right?

The stock market is obviously much bigger, faster, and more liquid than any sports betting market, and that difference makes a delay like that one absolutely crippling in stock markets whereas it's often merely bad for you in a sports market.

But the principle is the same. How badly the delay hurts you depends on how aggressively your counterparty (i.e., the sportsbook) rejects bets when the information that comes through during that delay period is bad for them.

As a simple example, say halftime in an NBA game has just started, and the Pistons open at -3.5 for the second half. You think that's a great line, so you get your bet in as soon as possible.

Tick, tick, tick.

Tick, tick, tick.

Apparently, you weren't the only one who liked Pistons -3.5 because it's already moved to -4 at several other sportsbooks.

"REJECTED. Line has moved. Would you like to make the bet at -4?" pops up on your sports betting app.

You are annoyed, but you still like it at -4, so you say yes.

Tick, tick, tick.

Tick, tick, tick.

Oh no. Just as the delay ends, you see the line jump to -4.5 at another sportsbook.

"REJECTED. Line has moved. Would you like to make the bet at -4.5?"

You can see how this is a problem. This is incredibly frustrating when it happens.

What makes this a subtle but insidious problem for the bettor is that this isn't what usually happens when you bet into a delay/approval. Most of the time, the clock ticks, the delay ends, and your bet gets approved.

If you just randomly had 5% of your bets rejected, it wouldn't be a problem. The problem is, the bets that get rejected aren't randomly selected.

They're almost all going to be among your very best bets. That's the entire point of this delay/approval process—it's designed to stop you from getting good bets. The more bets the sportsbook rejects, the harder it will be for you to win, even if you're still getting most of your bets in.

Any time you bet into a sportsbook with a delay/approval mechanic in place, it costs you money. The smarter they are, and the more aggressive they are, the more it hurts you. At some point if they're smart and aggressive enough about rejecting bets, you just plain can't win.

It becomes a carnival game. It looks like you can win, but it's rigged in just the right way to make sure you can't.

Try to avoid betting into sportsbooks with delay/approval processes. Unfortunately, the books that are soft in other ways (big attack surface, weak pricing, and so on) also tend to use this delay/approval process as well to try to paper over some of their weaknesses. So it's probably not the right idea to refuse outright to bet into a delay/approval process.

But don't get lulled into a false sense of security about it either. If they reject your bets on any regular basis, your edge at that sportsbook is not what it may seem. And if they're sharp and ruthless about it, you don't have a fighting chance.

ADVANTAGES BETTORS HAVE

Sportsbooks have a lot of advantages over the bettor, but the bettor has a few potential advantages also.

Advantage #1: Specialization.

Books put out markets in every major sport (and many minor ones) and try to put out many markets including derivatives, props, and in-play markets. Many sportsbooks run like the cartoon character sticking a finger in the dike to plug a leak only to have another one spring up and squirt them in the face.

Bettors can specialize by sport. They can also specialize by market—looking mostly at first halves, second halves, quarters, props, in-game, and so on. Many of the biggest sports betting success stories I've heard revolve around someone specializing in a particular derivative market in a particular sport—second half college basketball totals, for example.

Every single successful bettor I know uses this specialization advantage to some extent or another. Many use it to an almost extreme extent.

Advantage #2: Modeling.

I listed this as advantage #2 that sportsbooks have, but bettors can turn the tables and turn it into an advantage for themselves.

You can gain major edges through math.

I want to be clear. Most mathematical models people build to predict sports are utterly worthless for beating sports markets. This is even more likely to be true if the creator of the model publishes it on the internet.

They may be worthless because they're just plain junk top to bottom. But even if they're not, and the model has real predictive value, it may still be worthless for beating sports markets due to noise and the hold.

Every model makes decisions about what to include and attempt to account for and what to ignore. Beyond this, there's always uncertainty in exactly how to account for each factor—or even in how much a factor applies to a particular game.

Take weather in baseball, for example. The hotter it is, the thinner the air, and the more the ball carries. But when you try to account for this in a model, you encounter complications. Temperature isn't the only relevant weather factor in baseball. Wind, pressure, humidity, you name it—they all matter as well. And since each ballpark is unique in MLB, how each of these weather factors interacts with the specific park adds another layer of complexity.

Your model will do the best job it can of accounting for this, but at some point you have to call it a day. What's left after you call it a day is the noise in your model. It's what you're missing. It's what you don't understand.

Beyond this, when you're modeling weather for a baseball game, you're really in the weather prediction business—in the morning the weather information you are plugging into your baseball model is probably whatever the National Weather Service says. It's a prediction of what the weather will be many hours later in the evening. We all know there's plenty of noise in those predictions.

And remember that the hold makes it so you have to be "right" far more often than you're "wrong" if you want to do better than break-even. The more noise there is in your model, the harder it is to hit that high percentage of "rights" you need to win. Even if it's a pretty darn good model. The random noise can kill you.

The holy grail is to identify a phenomenon that affects the pricing of a betting market, is predictable with relatively little noise in it, but that isn't well accounted for in the lines books use.

Here are a few rapid fire examples of this sort of thing.

- **NBA fourth quarters.** Books used to make the fourth quarter line by taking the second half line and chopping it in half. But that doesn't work when one team is a big favorite, because when the game is nearly put away, the winning team tends to take it easy.
- **NFL halftime bets.** You used to be able to bet on the road team any time they received the second half kickoff. There were two effects working together. First, home field advantage is much stronger in the first half than the second, but the second half lines were priced as if it were consistent throughout the game. Second, the team receiving the kickoff has a chance to have an extra possession.
- **College football halftime totals in 2006.** This was a one year only thing, but something similar could happen again at any

time. They changed the clock rules that year, and the clock would start after a change of possession play (i.e., after a punt). This caused the teams with the lead to play more conservatively because they could run more time off the clock than they could before the rule change. Teams that were behind didn't adjust correctly to become more aggressive. As a result, you could blindly bet all second half unders that year. (They changed the rule back the next year.)

Instead of just building a generalized mathematical model, you build it with a focus on the particular phenomenon or angle you hope to exploit to find winning bets.

Sometimes the angle is so strong you don't even need a model to find the good bets. Other times when it's a smaller effect, you need to do a little math to sort the good bets out from the not-so-good ones.

A model like this one will give you a real, lasting advantage you can leverage for profit—potentially for years and years.

Advantage #3. Schedule.

Modern sportsbooks try to be available for betting for as many hours in the day as possible. A closed sportsbook does no business.

If a sportsbook wants to be available around the clock, however, obviously it must staff the book in shifts. Naturally, the most talented and most senior employees will tend to get the prime shifts with the most action. The graveyard shift will be staffed with more junior employees.

If you have flexibility in your own schedule, you may be able to create an advantage for yourself by lining up your prime hours with the graveyard hours at the book. It's easier to win if you're playing against the B team.

FINAL THOUGHTS

Beating sportsbooks is hard. They have a lot of advantages, including a team of trained employees, software and mathematical modeling, information about all their customers' betting patterns in real time, and most of all, the hold.

They have some disadvantages as well, though. They are spread very thin offering hundreds of markets in a dozen sports that they will book either side of at any time. And their operating budget often isn't enough to ensure super talented people are always manning the trading desk.

Sportsbooks use a set of countermeasures to mitigate these disadvantages. Hopefully as sports betting expands in the US, state regulators will identify the most customer-unfriendly of these practices and place restrictions on their use. Betting delay/approval, in particular, is a tactic to watch out for and not to take lightly.

Finally, sports bettors have some advantages of their own. They can specialize by sport and market. They can build mathematical models designed to exploit specific, consistent, identifiable flaws in market pricing. And they can choose the hours they work to align with times the sportsbooks have their less experienced shifts at the helm.

If you want to win at this, you absolutely must design your approach to leverage your advantages against the sportsbook's disadvantages. If you just try to take the books head-on and blast away, you will lose. Almost everyone loses.

The more specific and well-developed you can make your strengths, and the more you can point these strengths with a laser focus at the sportsbooks' weaknesses, the better a shot you got.

Market Agreement and Resistance

Before I get into the weeds there's one more core market concept you have to understand. I started the book making a big deal about how sports betting isn't a one- or two-player game, but rather a competitive, multiplayer game. While you are betting directly against a sportsbook, and they are your most important adversary in this game, you are indirectly also competing against hundreds of other serious bettors trying to do the same thing you are—find good bets. This mob of other bettors will have a consistent and predictable effect on the lines you see—they bet the good ones (and move the lines) and leave the bad ones.

The mob effect doesn't stop after you make a bet. It keeps going, over time slowly squeezing more and more value out of available markets.

If you do bet a major market—an MLB moneyline or college football point spread or NBA total—you can expect the line to keep moving after your bet. (I say "if" you bet a major market because, again, the core of the strategy in this book will be to avoid these major markets and try to find bets in related, derivative and prop markets with less picked-through prices.)

This line movement after you bet isn't random. It reflects something of a consensus of all the serious bettors in the same market.

Let's say it's a Tuesday evening in June, and a market maker sportsbook has just posted moneyline markets for tomorrow's MLB games. Because you don't value either your time or sanity, you have been madly clicking refresh trying to get the very first bets in on the virgin markets.

You find a bet you like—Reds +138—and slam in your $100 before anyone else can grab it. The market maker moves the line to +132, and you don't like that bet as much, so you close your laptop to go binge watch Gilmore Girls.

The next morning, you grab ten of your smartest friends and tell them about your bet. For simplicity, let's say one of two things can happen. First, is all ten of them can tell you what a great bet you made. Second, they can all tell you it's a terrible bet and that you should be ashamed of yourself.

Guess what. With just this information, I can already give you a pretty good guess at whether your bet was good—i.e., that you will tend to win on average over time if you make other bets that are just as good. I don't know anything about the Reds, don't even know who they're playing, don't know who is pitching, none of it.

The bet where your ten friends said you were a genius is a good bet. The bet where they all said you're an idiot is not.

How is this good enough? How is it enough for me just to know what ten of your friends think without knowing anything else about the bet?

You're betting into a hold. The presumption with no other information has to be that all bets are bad right? How does ten friends liking the bet overcome that?

Well, it's important in this story that you're betting into a virgin line. That is, the only person whose opinion is in the price you bet is whoever made the opening line. Those opinions are

often—not the best. Despite the hold, it's not at all rare to find good bets into the opening line like this.

There's no strong bias from the picked over effect built into the bet like there would be if you waited until a few minutes before game time to bet. It's entirely plausible you found a good bet.

Because it's entirely plausible you found a good bet, I'm willing to trust the unanimous opinion of ten independent smart people. That's basically it. You think you found something good. You found it in a situation where finding something good isn't particularly hard to do. Ten people agreed. It's probably good.

Likewise, if your ten friends think you messed up, you probably did.

It's much less clear-cut if I consider situations where say six friends like the bet and four don't. So let's not.

This is the basic idea behind the extremely important concepts of market agreement and market resistance.

In sports betting markets, the people giving you feedback about your bet aren't your friends. They're other serious bettors looking for bets in the same market.

The easiest gauge of market agreement and resistance is what happens to the line at market maker books after you make your bet. The morning after your Reds +138 bet you wake up with that Gilmore Girls glow and open your laptop back up to check current prices on your bet. Let's say you see prices between Reds +115 and Reds +120 as the widely available numbers.

Remember we're supposed to immediately convert these to break-even percentages, so let's do that. Your bet +138 is 42% break-even. The +120 is 45.5% and +115 is 46.5%.

After you "bought" your bet at 42, the price went up overnight to between 45.5 and 46.5. A very good sign.

This means that your "friends," the other folks out there who bet MLB seriously, tended to agree more than disagree with your bet. They predominantly made similar bets and moved the price on the Reds substantially higher. The only bad news here is that your choice to pass on betting again at Reds +132 may have been a mistake.

No doubt you know what's coming next, but I have to say it anyway.

Now let's say instead of seeing the price at Reds +120 or Reds +115, you open your laptop and see prices between Reds +163 and Reds +170 out there. Those are break-even prices of 38% and 37%. You bought your bet at 42 and now it's going for between 37 and 38.

Bad news.

Your friends, the other MLB bettors, think you laid a fat one on this bet and that you should be ashamed of yourself.

Some people look at this turn of events as an opportunity. "Well, if I liked Reds at 42, I should really, really like it at the current price of 37 or 38." And then they go load up on "cheap" Reds.

No. No. No.

NO. NO. NO. NO. NO.

NONONONONONONONONONO.

When the price moves lower on a bet you've made, that is market resistance. That's smart people telling you that you made a mistake.

Listen to them.

If you don't listen to them, what will happen is you will consistently build up your largest positions on your worst bets. You don't get 17 cracks at the good bets. You only get that on your stinkers.

It's not a sign that the world has temporarily gone insane. It is absolutely not a sign that Christmas is coming early this year.

It means that whatever process you used to decide that Reds +138 was a good bet was wrong. Maybe it's a good process in 90% of games, but in this particular game something special is going on that makes the process bad. Or maybe it's just a total garbage process that produces bad bets right and left.

Either way market resistance is a massive red flag that you're missing something, and the best thing you can do is stop betting into the resistance and instead try to figure out what you may have gotten wrong.

Usually you don't want to start doing the post-mortem on your bad bets until the market closes. It's possible that the line will move back toward your way of looking at things in the run up to game time. There are many reasons a line can move one way at first and then move the other way later.

A common way to judge whether in general you are finding good bets in major markets is by looking at your closing line value (CLV). You are looking at the price you got on your bet and comparing it to the price available at market maker books when the market closed and the game started.

If in general you are getting a substantially better price on your bets than what's available at closing, that's good. It means that you are usually getting market agreement.

If it's a mixed bag, that's a bad sign. It means that you are probably not "right" with your bets often enough to overcome the sportsbook's hold.

For most people, getting substantial, good average CLV on bets over a period (at least hundreds of bets) is a strong indicator that those bets (and the process behind them) will win over time. Failing to get substantial, good average CLV on bets is a strong indicator that your bets will lose over time.

What your "smart friends," the other serious bettors, think of your bets is indeed a very strong predictor of long-term success.

There are some exceptions to this rule about CLV, most of which involve being an end boss of one sort or another in a market. For most people reading this book, however, the following will be true.

You want to see market agreement on most of the bets you make into any major market (point spread, moneyline, total, first half markets). The more market agreement, the better. Any time you get substantial market resistance, that's a big red flag. Stop betting. Look further into the situation and try to figure out why other smart people think you're nuts.

If you look at all the bets you've made, and you have an average closing line value of at least half the hold, you're probably on the right track. For example, if you've bet into a market with a 4% hold, and you bet it at 42% break-even and it closed at 45% break-even, then it moved 3% in your favor, which is more than half the hold.

That's good. One bet isn't remotely enough sample to draw a conclusion though. Once you've made hundreds of bets, and you average the CLV for all your bets and you get more than half the hold, that's promising.

Finally, this concept of market agreement and resistance, while extremely important, applies only when there's a true, liquid market. That is, when there's a market maker who is actively taking bets on both sides.

If you make an NFL point spread bet on Tuesday, and the market on that bet closes on Sunday exactly where you bet it, that's a bad sign for you. But that's a bad sign only because NFL point spreads are an extremely liquid market made by market maker books. Between Tuesday and Sunday, thousands of smart

and often well-bankrolled people looked at your bet and shrugged their shoulders.

If you make a bet on total rushing attempts by the backup running back on the Jets at retail book XYZ on Friday, and it closes on Sunday with the line unchanged, that means little to nothing. It's possible not a single other serious bettor even looked at that bet you made. It's also possible a few others did see it, found the same bet you did, blasted it like you did, but XYZ has a policy not to move their lines on action. (Yes, this is a policy some retail sportsbooks have.)

Market agreement and resistance is the difference between winning and losing. But only on bets where there's actually a market.

Strong Markets vs Weak Markets

Now let's talk about finding bets without a market that uses price discovery, because that's where the real soft spots live.

To win at sports betting, attack weak markets. You attack a market either by having more information than whoever made the market, or by using widely available information better. You have to learn to tell the difference between strong and weak markets, both overall and at a particular book. Different sports have different markets, and there are often both strong and weak markets within a sport.

What makes a market strong?

Many market making books

Sports books that use price discovery, market making books, make markets stronger. Again, these are the sportsbooks that do relatively little copying from other books and instead make their lines by taking lots of bets and moving on action. If there's only one main sportsbook that makes a market in a sport, the market

is weaker because there's more chance that the action that one book has seen happens to be lopsided for one reason or another (one particularly big-betting recreational player for instance).

Once you add a second, third, and fourth sportsbook making lines the old-fashioned way, the market gets strong quickly. Now lopsided action at one book won't skew a market because there are other options to copy from. Also, when there are multiple market makers they can't get too far off one another or arbitrage bettors will step in and bet the lines back into alignment.

English Premier League soccer is an example of a sport with multiple market makers.

Smaller and US-only sports will tend to have only a single market maker—though you can't take that for granted. You need to dig a little and figure out which books are making markets for which sports.

Large overall limits

The bigger the betting limits in a market, the more cheese there is at the end of the maze for any bettors who want to put in the time and effort to build models, monitor markets, and so on. All other things equal, the bigger the limits in a market, the stronger it will be, and the more it will attract top talent to compete in the market. Also, the more games there are in a season, the greater the payoff for putting in the work.

Sports with large limits include NBA and some major soccer leagues.

Widely available information

The easier it is to come by reliable information on the market, the stronger it will be on average. Compare injury information in the NFL to that in college football.

Lower hold at market making books

Market making books like to attract lots of betting volume, and one way they do that is to offer lower hold on some markets. But typically they have different holds on different markets. The lower the hold on a market, again all things equal, the stronger it will be. NFL sides (point spreads and moneylines) tend to have lower hold markets at market makers than totals do. The lower hold increases betting volume and makes the price discovery more accurate.

MLB moneylines are another market (versus totals and first five inning markets) with generally low holds.

WHAT MAKES A MARKET WEAK?

One or ideally no market making books

Any markets with only one or especially those that are unlisted at market making books tend to be weaker. NBA player props are an example. Another example market that seems to be catching on is minor league baseball here in the US.

Small overall limits

Many markets have limits that are too small for most sports bettors with a track record of success to bother with. These can be derivative and prop markets on major sports or all markets on small sports. An example might be whatever new professional football league someone has decided to start this year to try to compete with the NFL.

Little available data

When professional bettors attack a new market, they'll often look to build a predictive model based on the available data for the sport. Sports with little or no available data will make building a model like that difficult, and therefore the entire sport will tend to draw somewhat less interest from the usual suspects. Combine that with low overall limits, and you'll likely have yourself a weak market. Fighting sports might be an example of this.

Very large public interest

So far hopefully these things that make markets strong or weak are relatively intuitive. Popular markets served by multiple market maker books and big limits and low holds tend to be strong. Weird, niche, exotic markets, or those with little available information and data tend to be weaker. This one is the only sort of logical inconsistency with that basic idea. When markets attract

an enormous amount of public interest, sometimes the weight of public money can weaken the market somewhat.

Super Bowls and World Cups—despite otherwise meeting the criteria for very strong markets—get hit by the public money factor to a major degree and therefore aren't nearly as strong markets as they otherwise would be.

To a lesser extent, major soccer leagues and NFL also get the public money weakening effect even during the regular season.

To be specific, the effect here is that for a normal, run of the mill game, if the weight of public money begins to skew a line at a market maker, sharp bettors have plenty enough in reserve to blast that line back to where they think it should be. But if there is enormous public interest, eventually the weight of the public money will overwhelm all the sharp bettors—no one is about to risk their entire bankroll because they think a World Cup line is off by a few percent. At that point the mechanisms that keep strong markets strong begin to break down, and the market weakens.

STRONG VERSUS WEAK MARKETS WITHIN ONE SPORTSBOOK

There are some hints you can pick up on to see if a market at a particular sportsbook is strong or weak. You can look at the hold and limits. In general, sportsbooks will place higher hold and lower limits on weaker markets and vice versa on stronger markets. They know what's most vulnerable at their sportsbook, and you can see how they feel about their lines by looking at hold and limits.

You can look at how frequently the lines move. In general, frequent line moves correlate with stronger markets. Every movement is a price adjustment—the adjustments will tend toward efficiency over time. Fewer line movements mean less efficiency.

Sometimes sportsbooks will behave as market makers and rely on price discovery for one or two markets but not for the rest. Nevada sportsbooks, for example, take a whole lot of action on the UFC and tend to act as market makers for these fights more than they might for something like Mexican soccer.

FINAL THOUGHTS

These are just rules of thumb, of course. NBA sides are typically a very tough, strong market. But theoretically you could find a sportsbook that updates their lines only once an hour or so. Or maybe you might expect Russian hockey to be a weak market at your sportsbook, but the employee they've put in charge of that market happens to be a huge fan of the league, follows the news very closely, handicaps all the games himself, and bets it profitably on the side.

You never know for sure what kind of market you're looking at until you follow it for a while, bet into it a few times, and see how it behaves. Strong markets can frustrate you at every turn, and weak markets can feel like you're stealing every time you get a bet accepted.

If you take one thing from this chapter, however, take this. Arrogance and strong markets are a deadly combination. If you come into one blasting away, it's unlikely to go well. Strong markets deserve your respect.

Related Markets

For most American sports, sportsbooks deal three major markets for each game. They deal one total market and two sides. The total represents a median outcome of the game. Bets on either side are priced at close to 50% break-even percentage (with hold added from there).

In football and basketball, the sides are a moneyline and a point spread. The point spread also represents the median outcome of the game.

In baseball and hockey, the sides are a moneyline and a run or puck line, where the run or puck line are fixed at 1.5 and do not represent a median outcome.

Mathematically, there's nothing special about these three markets. These markets are chosen because they're interesting to bettors. "Who will win the game" is the core bet on any sport, so moneylines are always interesting. But when one team is a huge favorite over the other, you get into that situation where you have to lay a big price to bet the favorite, which isn't fun for most people.

Both the point spread and the run and puck lines are designed to offer an alternative, interesting bet when the moneyline break-even percentage on a favorite is say 60% or higher. That's all they do. There's nothing magic about them.

Whenever the game is equally matched to begin with—say the moneyline break-even percentage is around 54% on the

favorite—there isn't much purpose for the point spread or run and puck line markets. At least not for most bettors. It's easy to bet either side of the moneyline, and the second line is sort of redundant. Sportsbooks offer the markets anyway on these games because why not, and people do still bet them.

One thing that makes multiple markets on the same game interesting is that the prices are related. Prices between any two different side bets will always be strongly related to one another. (The pricing on side and total bets is also related, though the strength of the relationship can vary from extremely strong to barely at all depending on the sport and teams involved.)

Think about an NFL game where the point spread is currently the home team -1. Books are offering either side of this bet at -110.

What should the moneyline market look like?

A moneyline bet on the favorite and a -1 bet on the favorite grade the same way in all game outcomes except for two: the favorite wins by exactly one point or the game ends in a tie.

If the favorite wins by 1, the spread bet pushes, but the moneyline bet wins. If the game ties, then then spread bet loses and the moneyline bet pushes.

Because the bets are so similar, it's obvious they should have very similar break-even percentages. The moneyline bet on the favorite wins slightly more often than the -1 bet. So the moneyline bet should have a higher break-even percentage than the -1 bet—but by how much?

It depends on the relevant push rates. A push rate is the percentage of time a given bet will push—that is how often the game lands on either zero (a tie, pushing the moneyline) or one (pushing the spread bet).

There are various methods for bettors to estimate push rates. A simple one would be to look at all the NFL games with similar

lines from the past and see how often these games tie or land on the favorite winning by 1.

For this, you need data. If you want to win at sports, you need at least some access to data. I don't think it's realistic to have no data at all at your disposal and expect to find any edges consistently. The type of data you need (and the difficulty in obtaining it) varies based on the type of edges you are looking for. There are many free and small fee websites that can aid in cutting the data gap.

But the most basic dataset you will need is a database of game scores (by quarter, half, inning, or period) and closing lines. For this NFL example above, say you have a dataset of NFL games. For each game over the last ten years, you have each team's scoring broken down by quarter, and you have the closing point spread and total for each game. (You would choose from the lines at books known for making the NFL markets when choosing what spreads and totals you used.)

How to acquire a dataset like this is a bit beyond the scope of what I want to talk about here. But no doubt you can find simple datasets like the one I described available—and searchable—either for free or pay on websites.

Once you have your data, you look at games that closed around PK—maybe games where the home team closed somewhere between +2 and -2. Then you look at what percentage of the time those games ended in a tie or with the home team winning by exactly 1 point. (Actually, if you do this, you'll find that you want to use a much wider range of spreads than just +2 to -2 to get a larger sample of data. It so happens that the push rates don't change much even as the lines get substantially higher. This is something you can only learn by playing with the data.)

For the sake of argument, let's say 0.5 percent of those games ended in a tie, and 2.5 percent of those games ended in a home

team win by 1 point. (Here's a place where changes in the game can change the answers over time. Recently the NFL made changes to the overtime rules that made tie games more likely. If you used data from years prior to this change in your dataset, you'd have to account for the effect of this rule change in some way.)

Let's say you think a 50% break-even moneyline is a fair price. That is, you think the game is an absolute toss-up. What should the break-even price on the home team -1 be?

If the moneyline is dead even and the game ties 0.5 percent of the time, that implies that the road team wins 49.75% and the home team wins 49.75% (and a moneyline bet pushes 0.5%).

If I assume that the home team will win by exactly 1 about 2.5% of the time, then I have our estimates of the four relevant outcomes as follows:

Road team wins 49.75%
Tie 0.5%
Home team wins by 1 point 2.5%
Home team wins by more than 1 point 47.25%

A bet on home team -1 would win 47.25% and lose 50.25% while pushing 2.5%. The break-even percentage is therefore

BE% = 47.25 / (47.25 + 50.25) = 48.5%

or about +106 in American odds. If the moneyline is even (+100) then the home team -1 should be about +106.

Working the other direction, say you know that -1 has a fair break-even percentage of 50%. What is a fair moneyline?

In this case, the four outcomes break down this way:

Road team wins 48.25%
Tie 0.5%
Home team wins by 1 point 2.5%
Home team wins by more than 1 point 48.75%

The home team will win the game 51.25%, lose 48.25%, and tie 0.5%. Therefore the moneyline break-even percentage is

BE% = 51.25 / (51.25 + 48.25) = 51.5%

or about -106 in American odds.

FINAL THOUGHTS

The key concept is that the point spread and moneyline are related markets. It would make no sense for an NFL home team to be -1 -110 on the spread, but -135 on the moneyline. There's a strong relationship between these prices that's determined mostly by the rules of an NFL game.

Similar relationships can be established between arbitrary point spreads, like for instance between an NFL underdog that's +3.5 and the same team on a teaser +9.5. You can estimate how often the game will land on a number from 4 through 9 and from that estimate work back what the fair pricing relationship should be between these two bets.

First half lines and full game lines have similar relationships, and generally the pricing between these markets is strongly linked.

The idea that you can reliably price related markets like these against one another using historical data (or some other model) is at the core of the idea of creating zero hold synthetic markets.

For the most part, these relationships are remarkably consistent from game to game. If you consume sports betting media, you'll often hear people say things like, "I think the Blazers will win outright, but I think LeBron and the Lakers will keep it close enough that I'm going to bet the middle—favorite on the moneyline but dog on the spread."

For the most part, this sort of logic is nonsense. The Lakers, with or without LeBron, are likely to be exactly no better or worse at "keeping it close" than any other similarly sized NBA underdog. The relationship between the moneyline and spread is determined almost entirely by the rules of the NBA and the relative uniformity of talent and professionalism in the league.

I say almost entirely, because every so often there's a legitimate, predictable, quantifiable exception to this rule. If you can figure out this exception when others don't, it's potentially worth a whole lot.

But in this case, the exception proves the rule. Learn to price related markets against one another. It's a fundamental tool of the successful sports bettor's toolkit.

The Betting Menu

The betting menu is exactly what it sounds like—the list of bets a sportsbook offers and the current prices of these bets. What is implied when a sportsbook lists a bet is that anyone can choose any bet on the menu and bet it at the listed price for any amount up to the posted betting limit for that bet. In exchange for this generous offer, the sportsbook gets to place a hold (of the size of their choosing) on every market.

I've already mentioned that sportsbooks don't always hold up their end of the deal on this, so I won't beat that dead horse here.

In the old days, which really wasn't too long ago, the menu consisted of a relatively small handful of bets on each game. A moneyline. Maybe a point spread, puck line, or run line (depending on the sport). Maybe a total. Maybe a first half point spread, moneyline, total. For key, televised games, a second half point spread and total.

For very high-profile games, maybe a prop or two, or first quarter point spread and total.

This has changed, however. Modern betting menus have absolutely exploded with options since those days. The reason boils down to an essential business problem that sportsbooks have.

Let's set aside books that run the market making business model for now, since they have a different set of business problems.

Say you're a sportsbook that runs the retail business model. And say you operate in a state that doesn't artificially limit competition by restricting the available licenses to just one or two.

Your problem, in business terms, is that you have no moat. Your product is the bets you offer to your customers. The moment you are successful, a competitor will pop up trying to steal your market share. Anyone can put up the same markets with the same prices you do, the same way you do it.

There's nothing special about how you line your bets. The lines come from the market maker books just like everyone else's. There's not much you can do different there without exposing yourself to being easily beaten.

You theoretically could reduce your hold to compete on price, but that's a risky strategy. Doing this simultaneously cuts your profit margin on all the bets you take while also preferentially makes your sportsbook attractive to the smartest bettors. If you don't have superior talent behind the counter, you could easily discount yourself right out of business.

You could build better software than your competitors. That's a real potential competitive advantage. If your app or your web client is slick looking, easy to use, engaging, customers may prefer your sportsbook to the competitors even if your actual bets and prices are basically the same. But good software engineers are expensive, and again this route is very risky. If you invest in this potential advantage and whiff—building some very expensive software that in the end turns out to be not really any better than the competitors'—there's a good chance you spend yourself out of business.

You could spend on marketing to build a brand that attracts and keeps customers even though your product is basically the same as the next person's. This is the main route many retail sportsbooks take. In markets where it's legal to do so,

sportsbooks often spend a whole lot on TV, online, and other advertising. They also often run promotions, most of which boil down to giving away money to anyone willing to be their customer even for a brief period of time.

But again, anyone can spend on marketing. If a new sportsbook that's overfat on venture capital investment decides they're going to give $1,000 to anyone willing to become a new customer—well, it's going to be expensive to retain your existing customers in the face of a competing deal like that. What tends to happen is there is often a marketing arms race, with several retail sportsbooks attempting to one-up each other to build the value of their brands and poach customers from competitors. (These marketing arms races can be quite lucrative to a smart customer—more on this later.)

One relatively less risky, less expensive way to try to differentiate your retail sportsbook from the competitors is to expand your betting menu. "Okay, so our lines aren't better, our hold isn't less, our software is kinda average, and we won't make it rain just because you walked in the door. But our sportsbook is more fun, because we give you more options to bet on. Want to bet pregame? You can bet on a zillion derivative and prop markets. You can even make up your own bet and pitch it to us, and we'll give you a line you can bet. You can bet in-play. And not just on the boring old side and total. You can bet derivatives and props in game also. We've got this quasi-fantasy football betting game you can play too."

This expanded menu idea offers two tantalizing benefits to folks that run these sportsbooks. First, as I mentioned, it offers the promise of "differentiation," where customers might choose their sportsbook simply to bet on interesting things they can't find at a competitor. Second, the theory is that this will increase each customer's betting volume. Instead of making just one or two

bets on any given game, a customer might make four or five or ten or sit there eyes glazed throughout the entire game clicking ball or strike bets in on every pitch of an MLB game. (Can you tell I'm skeptical of that one?)

The theoretical profit a sportsbook makes from their customers is equal to their edge times their volume. Their edge will vary based on how "sharp" the customer is, but it ranges from about the full amount of the hold (or a little more for some particularly hopeless customers) to a negative number (that's you—hopefully) for the sportsbook.

Messing with the hold can have serious unintended consequences for a sportsbook, but if they can somehow encourage their customers to bet a higher volume, they will theoretically win more per customer.

So more volume it is. And therefore, expanded menus. A goal of modern retail sportsbooks is always to offer as many bets as possible to all their customers.

There's a huge, largely unrealized risk with this drive to offer more, more, more different bets to customers. Attack surface.

To offer a bet to a customer, the sportsbook must price the bet. This is no problem at all for the major markets. To offer NFL point spread bets to their customers on Sunday morning, a retail book merely has to use the price from a market maker book, and they can be sure (for the reasons I explained in the preceding chapters) that these prices are robust and extremely difficult for any of their customers to beat.

But what if a retail book wants to offer a bet that no market maker offers a market on? Say Notre Dame is a seven-point favorite, but the sportsbook wants to let you bet Notre Dame -21 (at a big plus number). What should the plus number be?

What if they want you to be able to bet that the Notre Dame quarterback will throw more than 2.5 touchdowns? What if they

want you to be able to bet that both the Notre Dame quarterback will throw more than 2.5 touchdowns and that Notre Dame will win by 21 or more?

What if they want you to be able to bet 150 different things just like this?

What if they want you to be able to bet half of these in-game as well?

What if they want you to be able to bet all 150 of these on any of 20 high-profile games on a college football Saturday?

For some of these extra markets that other sportsbooks offer, they can anchor to the lines at other books. But part of the whole point of this exercise is to differentiate—to have something no one else has. How do they line those?

They can either contract with a third-party company to price the markets, or they can try to do it in-house.

Either way, there are hundreds or thousands of potential bets to line, and not much time for each one. In most cases, when it comes down to it, all these lines are made one of two ways. An "expert" basically guesses at a reasonable price. Or maybe they do a little back of the envelope math using the market spread and total as input variables.

So that's how they make the lines for all these bets in the first place. Then they have an equally hard problem every time the market moves. Say Notre Dame moves from -7 to -9.5 at a market maker, and the total moves from 63.5 to 65.5. How much should the -21 price change? How about those quarterback touchdown bets?

Clearly if Notre Dame is a bigger favorite and the total also goes up, it implies Notre Dame scores more points. Scoring more points implies scoring more touchdowns. It also implies that they cover 21 more often.

But by how much?

That's a hard problem, and for most sportsbooks, an unsolved one.

This problem is magnified when the book wants to offer multiway markets. Say they want to let you bet on the exact number of touchdowns the Notre Dame quarterback will throw. You have seven different choices from exactly 0 touchdowns to 6+ touchdowns, and each one has a price. When the underlying point spread moves from -7 to -9.5, that entire distribution of touchdowns also should move.

But how much does exactly 5 touchdowns move? Exactly 1 touchdown?

Now say the line moves from -7 to -9.5 and then a customer wants to put a max bet on 6+ touchdowns. Do you move the line? How much? What do you do to the other lines like 0 or 1 or 2 touchdowns based on that limit bet on 6+ touchdowns?

Sportsbooks put bigger holds on these multiway markets to protect themselves to some extent from the inherent difficulty in getting this entire distribution of possibilities priced correctly. But that hold is only somewhat protective. This is just a fundamentally difficult problem, and modern sportsbooks simply don't invest in getting this kind of math correct in all the hundreds of markets they want to offer.

This is your main advantage as a bettor. These prices are all logically related to one another. Obviously if Notre Dame goes from -7 to -9.5 and the total goes from 63.5 to 65.5, that implies more touchdowns. How many more you can estimate with a little back of the envelope math. You find a sportsbook that doesn't accurately reprice every one of these derivative markets (hint: none do), and you've found an opportunity.

That basically sums up the strategy we'll use to beat retail sportsbooks. We are looking for logical inconsistencies between related lines. We'll identify the lines that are strongest. In most

cases these will be the lines on the full game point spread, moneyline, and total markets set through price discovery at market making books. Then we'll bet into the weak prop and derivative lines that are logically inconsistent with the strong lines.

PART III: WINNING

Okay. You understand odds. You know how sportsbooks make their lines—the good, the bad, and the ugly. You know some important market concepts like zero hold synthetic markets, market agreement and resistance, market strength and weakness, and pricing related markets. Now you're saying, "Okay, it's time to win!"

I'll do my best.

I have to walk a fine line. I want to be as specific as I can, because vague advice sucks. But if I'm too specific, I'll kill every opportunity I write about. I think I split that difference pretty well in this part. I think the advice is specific enough to easily inspire you to find your own opportunities. But it's just vague enough that your inspiration will probably be a little different from another reader's inspiration. That's the sweet spot.

Well, that's what I went for at least. Hope this part helps you win a little money betting sports.

Should You Try To Win 60% Or 54%?

Before I get to some ways to try to beat this game, let's think about what your goal should be. Should you try to win 60% of your 50-50 bets? Or 54%? Or less? Seems like a stupid question. Who doesn't want to win more often?

But which percentage wins you more overall money?

When I was in grade school, I dreamed of making money betting sports. I'd sit in class and calculate how many bets it would take me to get rich depending on the chances to win each bet. "Okay, if I win 55% of my bets and make 100 bets of $100 each (all at -110 of course), I'll win $550. But wait, what if I win 2 out of every 3 bets? How hard could that be anyway? I'll be rich in no time!"

I had a lot to learn. But it wasn't just that winning 67% of bets was unobtainable. An even more important concept is that winning 67% of your bets is undesirable. How can that be?

The short answer is that if you can identify bets that win 67%, you can also identify bets that win 60% and 55% and 53%. And there will be many, many more of the lower edge ones. Who wants to pass on a 55% bet? No one trying to make money.

Do you want to bet five 67% bets, or five 67% bets plus fifty 55% bets? Including the 55% bets clearly makes you more money, but it also lowers your overall winning percentage.

So what percentage should you go for? Make every bet that you think will show a profit. Every bet that you're fairly confident has an edge. Whatever your winning percentage is at that point, it's the right one. As for the guy on the internet claiming he wins 60% of his bets, ask him why he doesn't bet the 55% winners.

Derivatives

Earlier I discussed what makes two betting markets related, and I went through an example of how to price one market versus the other.

The same logic from that chapter can be used to price any point spread versus any other spread (or a moneyline, which is the same as a point spread bet with a line of zero). Pricing -1 versus the moneyline is simple, because you only care about how often the game will tie or land on 1. But you could use the same process to derive the price relationship between the moneyline and a line of -2.5 or -7.5 or even -28.

If you wanted to do -28, for example, you'd try to estimate five percentages. The chance the dog wins the game, the chance the game ends in a tie, the chance the favorite wins by less than 28, the chance the favorite wins by exactly 28, and the chance the favorite wins by more than 28. If you can come up with good estimates for those five percentage chances, you can estimate how those two bets should be priced relative to one another.

Nowadays, books want to offer more than just three markets on each game. They want you to be able to bet on just the first half. Or just the second half. Or just the first quarter. Or just the first inning.

Or they want you to be able to bet on alternative spreads and totals. Say you want to bet a favorite, but you don't want to lay a big minus on the moneyline, and you also don't want to

bet -7.5 -110. You want to lay even more points than that—say -13.5—but get a plus money payoff on your bet. That's an alternative spread.

The same logic applies to totals.

It should be obvious that all of these are related markets. If a team is a favorite for the game, they'll usually also be a favorite in the first half, first quarter, or the first inning as well. If you wanted to bet which team will score first, the game favorite will usually be a favorite there as well.

If -7.5 is the current market spread on a game set by a market maker, then the price for -10.5 can reasonably be estimated using the method I described previously.

And so on. All these markets that sportsbooks offer that are clearly related to the big three markets are called derivatives. The idea being that the pricing for these markets can be derived from the pricing for the main markets.

The key words in that last paragraph are "can be." How books price these derivatives varies, but you can be fairly certain that nobody at your favorite retail sportsbook is making the numbers for every game, every day with a database and a push rate chart.

In fairness, pricing these derivative markets is a very difficult job even for the market maker books. The market makers work by taking bets and moving lines. But what happens if they take a bet on one market, but they don't take an equivalent bet on a clearly related market?

Say they have an NFL spread at -5.5 and a moneyline at 68.5% (-217 in American odds). Then they take a few limit bets on the favorite at -5.5, but no bets on the moneyline. What should they do?

Well obviously they should move the line on the favorite to make it more expensive, either by increasing the break-even

percentage by moving to say -5.5 -120 or by moving the spread to -6. But what about the moneyline?

Should they leave it where it is because it took no action?

Should they move it an equivalent amount as the spread even though it took no action?

Should they move it some in-between amount?

It's a tricky question to answer. On one hand, the relationship between the two markets is obvious. On the other hand, there may be a good reason the sharp bettors took the point spread bets but not the moneyline bets.

Remember, our method for determining the relationship between these two bets. It was very simple. I just looked at games over the last ten years and figured out how many landed on the key numbers.

But what if that method isn't good enough? What if there was a recent rule change that made the chance of landing between 0 and 5.5 smaller? Or what if there was some other reason specific to this game (as opposed to just looking at an average of all NFL games) for the difference?

There's no clear correct answer here—and this is one of many, many reasons that it's actually very hard to be a good sportsbook.

Derivatives like first inning bets, first period bets, first quarter bets, and the like are often weak because their prices are not tied tightly to the major markets.

The openers are often not particularly strong, made using years-old charts or rules of thumb. Sports change year-over-year, sometimes by a lot, and often these changes affect what percentage of the entire game's scoring happens in any particular

quarter or period. But these changes aren't reflected in how the derivative's opening lines are set.

Maybe you know a basketball team intentionally loses the opening tipoff every game for some strategic reason. (The Minnesota Lynx in the WNBA have used this strategy.)

Some NBA teams win tipoffs more often than others—some much more often. Winning the tipoff makes a team a bigger favorite to win a first quarter bet, and who wins that first tipoff also determines the team that starts with the ball in each subsequent quarter.

Or in a football game, you know one team is likely to elect to receive the kickoff if they win the coinflip, but the other is likely to defer (thus ensuring that one team is almost certain to start with the ball).

If you want to attack derivatives, it pays to build a simple model to price them. If you want to bet NFL first quarters, for instance, you should look at games with a similar game point spread and total and then look at the first quarter results for those games when evaluating bets. Keeping in mind, of course, that the game changes over time, and that, for example, a total of 48 points today might mean relatively more second and fourth quarter scoring and less first quarter scoring than a total of 48 points from ten years ago.

Be aware some derivatives—particularly first half markets in major sports like NFL and NBA—are priced almost as sharply as the major markets. Market makers take action and move the line, and retail books follow. If a first half line looks "off" to you, it's entirely possible there's a good reason for it that you just don't know. Tread carefully.

Similarly, be much more willing to bet any derivative that seems "off" at a soft book than at a sharper retail book. If a book

normally prices their derivatives well, but you find one that seems out of line, it might be there for a good reason.

A Derivative Example

Sportsbooks have started to offer a first inning bet on MLB games. "Will there be a score in the first inning?" is the most common bet offered. The price might look like Yes +140/No -160.

Say it's Tuesday, and there are 15 games this evening. It's 11am, and the book is putting this market up for every game. Here's one way they might do it. They may have a chart that maps the game total into an opening price for this derivative. If the total is 7.5 -105 to the over, the opening price is this. If the total is 9.5 -120 to the over, the opening price is that.

They look at the total in each game at 11am, throw up an opener, and they're in business.

Fast-forward to 6pm. Lineups have come out for most of the games. The weather report has shifted in one or two cities. Some totals have moved.

You look at the Rays-Yankees game. The Rays are using an "opener"—a starting pitcher who is scheduled to pitch only one or two innings. This opener pitcher isn't particularly good—he'd be near the back of the Rays bullpen if they used him normally.

The Rays plan to put in one of their better "starters" in the second or third inning and then let him pitch for five innings or so.

Because everyone betting the main market at the market maker knows the good starter is likely to pitch most of the early innings, the total isn't too high—sitting around 8.5 -110.

The opener (who is pitching the first inning) is a right-hander, and the Yankees stacked the top of their lineup with power-hitting lefties to try to take advantage of the platoon advantage and the short porch in right field at Yankee Stadium.

Meanwhile, the book hasn't moved the line on the "Will there be a score in the first inning?" derivative bet since they posted it at 11am.

Clearly the method used to set this line is no good in this case. The chart they used to make the line was probably made six years ago, and they haven't touched it since. Six years ago, no one had ever heard of using an "opener," and half the teams still batted the .220 hitting no power shortstop in the two-hole.

Now most of the teams bat their best hitter second, and almost always their best four hitters 1-2-3-4.

There are two effects going on. In general, because the game has changed, but the sportsbook hasn't kept up, their entire chart is wrong—teams will be scoring in the first inning now more often than before because the best hitters almost always come up in the first inning these days.

Second, this particular Rays-Yankees game is an outlier—the chart assumes the good "starter" will pitch the first inning, but the Rays are pitching a worse pitcher for the first inning only. The chart assumes that the platoon advantage for the hitters in the first inning will be typical for most games, but in this game the Yankees have stacked the top of their lineup with righty-mashing lefty hitters.

Everything about the way the sportsbook turned the (strong market) game total of 8.5 -110 into a (weak market) line for the

first inning is wrong for this game. Everything points in the same direction—more chance of a run than what they are estimating.

Logic says that betting on the yes is likely to be a good bet.

But before you pull the trigger, consider two factors.

First, the hold. Let's say for a moment you were offered this bet in a no-hold market—maybe a bet with your friend. Will there be a run in the first inning, Yes +150/No -150.

Betting yes is a slam dunk in that case. Several arrows point in the same direction and given that you would break-even if you chose which side to bet by flipping a coin, it's clearly more likely than not that you would have a good bet going with the arrows.[3]

As you add hold to the market, however, it becomes less certain yes is a good bet. There's now a chance that neither side is a good bet. And I haven't made any attempt to quantify how much more often the Yankees in Yankee Stadium with the platoon advantage against a weak opener on the Rays will score in a game with a total of 8.5 -110.

Maybe it's only a couple percent more often?

You can do some quick baseball math to come up with an estimate, but absent the math, you really don't know.

In the example, the market was priced Yes +140/No -160 so the hold is only about 3%. That gives the book roughly 1.5% leeway each side to get their price correct. If it's a reasonable guess that the factors you are accounting for move the needle by at least

[3] I'm going to ignore the possibility that whoever offered you the market took all the above into consideration and then intentionally chose a break-even percentage that makes yes bad knowing that you'll choose it anyway. That's a little next level for this book—though to some extent sportsbooks do shade lines intentionally in some markets if they expect a deluge of action on one side or another. A first inning market on just-another-MLB-game however is unlikely to be that sort of situation.

1.5% (preferably 2% at least), then you can probably feel pretty safe betting yes into this hold and your bet is probably good.

Books know that they are vulnerable in these sorts of derivative markets, however, so one tactic they often use to protect themselves is to jack up the hold. They might try to price the market Yes +130/No -170, which is closer to a 6% hold.

There's no way I would bet this into a 6% hold without doing some real math to try to figure out my estimate for what the right price should be. It's just way too easy for me to have gotten the logic of the bet completely correct, but for the effects I identified not to matter enough to overcome that 6% hold.

Second, make sure you know where the line you're looking at came from.

Here's the best-case scenario for you. Let's say the sportsbook you're looking at has been expanding their menu options rapidly as they try to compete with more established outfits. They just hired a guy named Spencer out of college, and he's in charge of putting up the derivative markets for MLB. They gave him a few charts that one of the traders had saved on a hard drive from an old job at another sportsbook.

Spencer is a football guy and actually has never watched a baseball game in his life. He's never heard of opener pitchers, platoon advantages, short porches, or anything else.

On top of that, this sportsbook has a "true price" approach to trading their markets. That is, they don't move their lines when you bet them. They aren't afraid of a little risk, and they definitely don't want to give back any of their advantage to the next person who bets the "good" side after they've moved off their number.

On top of that they keep the hold on these derivative markets to a reasonable 4 or 5%.

If this is the scenario, you can pick the whole offering apart using your baseball logic. You know where the line comes from.

You know it won't move. You know the guy making the line really can't do anything to make it sharper. You know the hold is low enough that when multiple factors point in one direction, the factors will move the needle enough to make the bet good.

Here's how that best-case scenario can break down.

The book can update their method for making the lines with new data, or contract out to a third-party specializing in pricing derivative and prop markets.

The book can start moving the line on action. That won't make the opening line any better, but it will give the market that "picked through" effect. If you get there first, great. If you don't, you miss out. If you aren't sure if you got there first or not—even worse, because now you don't know if you are still betting into a good number or one that's already been hit and moved.

Spencer can be smart and motivated. Just because he didn't know anything about baseball on April 1st two months after being hired doesn't mean he still won't know anything by August. Maybe he's a sharp dude and throws himself into the job. He watches you beating his market and tries to reverse engineer your strategy. He starts reading Fangraphs and learns about the factors in baseball that affect scoring. Halfway through the season he's two steps ahead of you and baiting you to bet bad numbers against him.

How do you tell what's going on? Is it freshly hired Spencer putting up garbage every day? Or is it out-for-blood Spencer laughing at you as you keep betting your same tired angles into his market?

You have to pay attention. You have to watch the market day after day, every day. You have to reverse engineer what the sportsbook is doing to make those numbers.

Figure out what time of day they post derivatives for that evening's games. Look at the openers for every game. Is there a

clear pattern for how they make the lines that stays consistent day after day? What is that pattern?

Do they ever alter the pattern? If so, can you figure out what triggered it?

What happens when you bet into the market? Do they move the lines? How much? Can you tell if other bettors are in the same market by looking at which lines move and by how much from the openers? If there are other bettors playing this market, are they betting the same games you would bet, or different ones? Is there some logic to what they're betting, or are they just betting the Dodgers every game? (Or is there logic to betting the Dodgers every game?)

Okay, so let's distill all this into a process for finding good bets in derivatives.

1. **Find a derivative market offered by a retail sportsbook.** These can be markets like quarter markets, period markets in hockey, first inning markets in baseball. Or alternative spread and total markets like a -14.5 market on a game where the main market 50-50 point spread is at -5.
2. **Watch the market for a while.** Does the book offer the market on all games or just a few high-profile games? What time of day does the book post the derivative markets? (It's common for books to post the main markets for a game and then wait a while before posting derivative markets.) How does the book price the openers for the derivative? Ideally, you want the market posted for every game, at a consistent time every day, and either with the same opener every time or with a very simple system for determining the opener (e.g., varies predictably with the market total).
3. **Determine how picked-over the market is.** Is this market available at lots of different books, or is it a

"differentiator" market that's only offered by one or a few books? Fewer books is better, because then the book can't use prices at other books to anchor theirs. Does the book move the price if you bet it? If not, great. If so, watch the market over time to see how often it moves. This will give you an idea of how many other bettors are "picking through" this market to find the good prices. Obviously, the less pick-through, the better.

4. **Look at the hold.** You will find many more good bets in a market with a 4% hold than one with a 6% hold. A higher hold cuts substantially into the profitability of all your bets, and it also dramatically reduces your margin for error. "I think this is good," might be good enough if you're betting into a soft 4% market. But at 6% or higher, you really must be sure that the book is making bad lines and that they aren't getting hit by other smart bettors before you.

5. **Identify outlier situations.** These are the situations where whatever method the book uses to prices the market will fail. In the above example, several factors acted together to increase first inning scoring versus the average game. Other possible outlier factors can include weather (particularly an atypical weather pattern affecting one part of the game more than others), travel, coaching tendencies, and more.

6. **Track your bets.** Do more research. Once you think you've found something good, go ahead and bet it. If you're wrong, you're wrong, and you'll lose. Unless you completely screwed up, however, even your ideas that don't work won't lose the full hold—you might lose 0.5% or 1% instead of the 4% or 6% hold because your bets will be consistently in the right direction. Just not by quite enough to overcome the hold. Keep a record of your bets. Refine your strategy with research. Look at similar situations in the past and see how things worked out.

This process is designed to find low-hanging fruit in overlooked markets. You're looking for stuff the book puts up as an afterthought. Stuff the book uses to "fill out its menu." Stuff the book puts up only so they can brag about having more markets on every game than the next guy. Stuff the book spends two minutes pricing and then moves on.

If people on ESPN are talking about these bets or this market, or if you can tell it gets a lot of action because the lines move all day long, it's not what you're looking for. Those markets can be beaten also, but the more attention a market gets, the harder it is to beat. (Though the bigger the reward if you do figure out how to beat it.)

If you live in a state like New Jersey with a dozen competing sportsbooks, and you apply this process vigilantly, you should be able to find hundreds of truly good bets.

Props

Props create a massive attack surface for a sportsbook. Instead of keeping just two or three markets on a game that they can easily peg to a market maker, they're keeping two dozen (or more) markets on the game, and they can't easily peg these lines to a broader market.

Props are great because the openers are often (mis)priced based on a market line and total when the prop is made—and then they're never updated. If there's an injury or a change in weather or some other relevant information that hits about a game, the main markets will move, but often the props will just stay put.

Props also create opportunities for sportsbooks to make major mistakes. They can copy the pricing on a prop from another sportsbook, for instance, but accidentally word it differently. Something like

"Will Aaron Rodgers throw two or more touchdowns?"

versus

"Will Aaron Rodgers throw more than two touchdowns?"

Obviously, these are two very different bets, but a sloppy sportsbook could copy a price but transpose the words and give bettors a major opportunity.

Furthermore, with player props, information and breaking news that barely registers in the main market prices can drastically affect the value of a prop—and likely no one at the sportsbook will notice until they start getting bet.

For example, say two high-strikeout power hitters who were expected to be in the lineup at 11am end up on the bench and replaced with two high-contact, low-strikeout hitters. And you can still bet under on the opposing starting pitcher's strikeout prop at the same price from the morning.

Or a cornerback who was expected to shadow a specific receiver is suddenly announced out with an injury from Thursday practice. And you can still bet that receiver's yard and reception totals at the early week price.

Given enough props on the menu, darn near every news item can have a material effect on at least one of them. That's just way too much for any sportsbook to keep up with. If you can stay on top of the news and learn to apply logic to the related bets, you can easily find edges.

Having said all that, while player props have been very beatable up until now, I expect them to get a lot of attention in the coming years. Already there are fantasy sports analysts who have pivoted to analyzing player prop bets. It's likely that the number of people betting these seriously will explode. Explosion means more availability and higher limits—but it also means more market efficiency. Market maker books will likely start making more markets for these. More betting volume means books will pay more attention to these markets at competitors, and the price discovery plus copying process will take hold.

So go to town on them now, but be quick to recognize if those player prop markets start to get stronger over time.

Game props are team- or game-level bets. Will there be a defensive touchdown in the game? Which team will be first to score 30 points? Will there be a goal in the first 10 minutes of the game?

These props, like player props, are likely to proliferate in coming years. But I don't think they will generate quite the increased attention from bettors that player props will, and as such, there's a good chance they remain juicy targets for a while.

The great thing about these bets is that you can often deduce logically when these bets are good.

Typically, the pricing of game props is (or at least should be) directly related to the main spread and total of the game. Some props vary more with the spread and total than others.

A common game prop that doesn't vary much is this NFL prop

"Will the final score of the game be odd or even?"

At first thought, you might assume this bet should be roughly 50-50. But it's not—it's slightly skewed toward odd being the favorite. The main reason is that a tie is an even score, and ties are uncommon.

"Ah. If the lack of tie games represents the biggest reason odd is a favorite over even, then odd should be a bigger favorite in games with low spreads and a smaller favorite in games with large spreads."

This is correct, and it's a perfect example of the type of logic you can use to beat these sorts of props.

Unfortunately, in this case, this effect doesn't move the needle much. Games just don't end tied in regulation that often—and of

those, a good portion end with one team scoring a touchdown for 6 points and an even final score.

This proposition varies from about 54% games ending odd at a PK spread to about 52% games ending odd if the home team is a 17-point favorite. This 2% swing is less than the hold on the bet. I can count on one hand the number of times I've found a good pregame odd/even NFL bet.

One popular NFL game prop that does vary enough to create good bets is

"Will one team score three consecutive times at any point in the game?"

If you aren't familiar with this prop, it's a widely cited example of a bet that's counterintuitive to casual bettors. It sounds like scoring three times in a row is hard—but the reality is that when you have all game long to do it once, it ends up being a good favorite to happen.

But exactly how much a favorite depends on both the point spread and the total of the game. Logic suggests that this prop is more likely to win when one team will have trouble scoring. And that's exactly the effect—in games where one team is a big favorite, this happens more often. And of those games with a nice-sized favorite, it happens more often when the game has a lower total.

Basically, when one team has a particularly low expected team total is when the fair value on this prop really starts to move.

The chart below shows what I make the break-even percentages on this prop using my NFL model. The columns represent different possible point spreads—it doesn't matter whether the home or road team is the favorite. The rows represent possible totals.

	0	3	7	10	14	17
37	62%	62%	65%	68%	73%	*
41	62%	62%	65%	68%	73%	76%
45	62%	62%	65%	68%	73%	76%
49	62%	62%	65%	68%	72%	75%
53	62%	62%	65%	68%	72%	75%
57	62%	62%	65%	67%	71%	73%
61	61%	62%	65%	67%	70%	72%

You can see that the fair value on this prop can range from as little as 61% when the teams are evenly matched to about 76% when you've got an excellent team likely to beat up on a team with a hopeless offense. Because the fair value of the yes can move potentially up to about 15%, but the hold on this prop is usually only 4 or 5%, it's very possible to find good bets. I've personally bet this prop many times.

Other NFL game and team props with fair values that vary enough with the spread and total to find good bets are

"Total field goals"
"Total touchdowns"
"Will the team that scores first win the game?"
"Will the game ever be tied after 0-0?"
"Will the first score be a TD or FG/SAF?"
"Will there be a score in the last two minutes of the first half?"

And so on. Each of these props has a fair price that varies considerably with the pregame point spread and total. And for the most part, sportsbooks don't do a great job of capturing this relationship when they open these prop markets.

Props are a great way to get started finding winning sports bets. They're often weakly priced and not tied to a larger market. If you want a process for attacking these bets, try this one.

1. Find a prop where it seems the fair value price should change considerably in games with different spreads and totals.
2. Watch the prop for different games as it's priced over time and try to reverse engineer the pricing.
3. If the prop is offered at multiple books, compare this pricing at several different places.
4. Watch it to see if others are betting the prop and determine how the book moves the pricing when you bet the prop.
5. Once you understand what is in the price and what isn't, bet the prop whenever the price doesn't seem to account correctly for the spread and total.

Taking Advantage of Parlays

Okay. Last time I mentioned parlays I was explaining how they aren't really sucker bets and how the main thing they do is not increase the hold, but instead blow up betting volume. Now I'll talk about how you can use parlays to your advantage.

Betting more money is a double-edged sword. If you don't have an edge on the bets you choose, then betting more money causes you to lose more money. "See, sucker bet," says the guy with all the helpful advice.

If you do have an edge on the bets you choose, then betting more causes you to win more money. Remarkably, many people seem confused about this aspect of parlays. Possibly because so few bettors win. For the bettors who do win though, parlays can be a devastating weapon.

There are three main use cases winning bettors have for parlays.

Circumvent Betting Limits

Let's say you found a sportsbook that lets you bet totals on the Korean baseball league. The book offers this market so they can

say, "I let you bet on more stuff than that other sportsbook!" in their advertising. You're the only one of their customers crazy enough to actually bet it.

The sportsbook grabs the opening lines each day from Asia and never gives them a second look because no one bets them.

You've figured out that when the weather is hot, it's easy to hit home runs, and when the weather is cold, it's hard to hit them. You just look at the weather report each day in Korea, and when it's hot you bet over and cold you bet under.

To protect themselves from getting beaten on these totals that they aren't paying attention to, the sportsbook limits you to $50 bets.

But they also let you bet them as three-leg parlays again with a $50 limit.

Say there are four games, and you want to bet over in all four games. Without parlays, you'd get $200 down, the $50 limit on each game.

But say they let you bet the four games as a round robin by threes, which just means you're betting separate three game parlays for every combination of three games of the four. That gives you four, three-game parlays: 1-2-3, 1-2-4, 1-3-4, and 2-3-4. You bet $50 on each parlay, for a total of $200 again.

Same, same, right? No, of course not. Because hidden within the parlays is a lot of extra betting volume. A three-leg parlay of 50-50 bets will nearly triple your actual betting volume. By parlaying the games instead of straight-betting them, you end up getting nearly $600 of volume, or nearly $150 down per game—into a market with an ostensible straight betting limit of $50.

Now imagine instead of four Korean baseball games, you have an angle on college basketball games, and you've found a couple dozen good bets on a college basketball Saturday. Books know that they're vulnerable on college basketball—too many teams to

keep track of and not a particularly liquid market at the market making books (so the price discovery process is incomplete)—so they often set limits low.

But what if they let you round robin your games, and they don't realize they need to slash the betting limit on those parlays?

LOWER BALANCES IN BETTING ACCOUNTS

If you start betting seriously, you'll find that managing your sportsbook account balances can turn into a major headache. The big problem is that money sitting in a sportsbook account isn't as good as money outside the account. There's only one thing you can do with money in a sportsbook account—bet it. And only at that one sportsbook.

Say you had a really good run at one book, and a bad run at another. Happens all the time. Combine the two and you're doing fine, you're just imbalanced.

Then you see some great bets you want to make. Only problem is that they're at the book you lost all your money at.

"No problem," you say, "I'll just withdraw from the first book and deposit at the second."

Logistically there's usually a lot more to this than just that. The withdrawal can take an hour or more of your time to coordinate or even a couple business days or more to go through.

It's almost always easier to deposit than withdraw (go figure). As a general operating principle, then, you want to keep balances as small as is feasible at every sportsbook you have an account at. (You can probably think of a few more reasons you might want to do this as well.)

Parlays let you bet higher volume for the same money deposited. Or they let you deposit less to bet the same amount of volume.

That's it. But it can be a powerful concept if you have accounts at a dozen different sportsbooks and you want to keep them all funded and available to bet without raiding your 401k to do so. (Public service announcement. Don't raid your 401k to bet. Just say no.)

CORRELATED PARLAYS

This is where a lot of the black art of parlays lives. A key assumption of the parlay payout structure is that each leg of the parlay is independent. That is, if leg one wins, that result has zero influence on whether leg two wins as well.

Any time you make two bets on the same event, that assumption of independence to one extent or another is violated.

No sportsbook will allow you to do this but think about what would happen if you bet on the Raptors to win the first half, and you parlayed that with the Raptors to win the game. For the sake of simplicity, let's say both lines are +100, so the parlay pays +300.

Assume you bet $10 on this parlay. At the end of the first half, say the Raptors are behind. You've lost the bet. Oh well, it happens.

Now say the Raptors are leading at the end of the first half. You've won your $10 bet, so now you have $20, and you automatically bet it at +100 that the Raptors will win the game. But is +100 still the fair line?

Of course not. The Raptors are leading. They're now a favorite to win. If they're ahead by 6 or 8 points, they might be a big

favorite to win. Your $20 bet (at twice your original stake, no less) is now a fantastic bet.

That's how correlated parlays work. You're betting on two related events, and if one leg wins, the other leg is more likely to win as well. But you're still getting paid by the same parlay math that assumes one doesn't affect the other.

All sportsbooks know about this phenomenon. All sportsbooks have some rules about what bets on the same event you can and can't parlay. But some sportsbooks have looser rules than others.

At one end of the spectrum are the paranoid books. They prohibit all parlays where two of the legs involve the same event. So no Bills and over parlay on Sunday morning.

At the other end of the spectrum are the fast and loose books. Some of these let you get away with very strongly correlated parlays. A well-known example of an extremely correlated parlay that some books have let people bet is the big favorite college football parlay.

Every season the big college football teams schedule at least one game with a much weaker opponent. In these games, the lines might look something like

Clemson -42, total 45

Obviously taken together, these lines predict a game where Clemson scores around six touchdowns and the other team may or may not score.

But really both bets are a bet on the same thing—how many touchdowns does Clemson score? If they score seven, then both Clemson and over are likely to win. If they score five, then both are likely to lose.

You bet two parlays. Clemson and the over, and then the dog and the under. Let's say you bet $100 on each, and you get +260 on your two-leg parlay. If either bet wins, you'll finish with $360, so you're effectively betting $200 to win $160 or -125 on the combined bets.

The break-even percentage for a -125 bet is 55.6%. But your combined bets will win far more often than that due to how closely correlated the side and total are in a game like this one.

Another well-known—but much weaker—correlation comes up in baseball. If the home team wins a baseball game, they usually don't play the bottom of the ninth, so you only get 17 half innings. If the road team wins, though, then they play all 18 half innings. Fewer half innings mean less scoring.

Therefore, the road team winning is correlated with the over, while the home team winning is correlated with the under.

This correlation exists for nearly every baseball game, but it's not strong enough to bet it blindly and expect to win. (If someone lets you bet that college football one, bet it until you burn it out. That correlation is so strong you don't have to know a thing about the game or teams to win on it.)

But let's say for some reason you wanted to bet the road team and the over anyway, on their own merit. Parlaying them would give you an even better bet, because you could also benefit from the correlation.

Good correlation situations that sportsbooks will accept are worth a lot, so I'm not just going to list every correlation I know about here. All that would do is create a checklist for sportsbook operators to go through and make sure they reject everything on the list. Plus, it's kind of fun to think of these.

Remember, any two bets on the same event will have some correlation. Even when you're betting on different golfers in a PGA event. (That's a hint.) Your job is to figure out if there's

enough correlation to make a dent in the hold on the bets. If there is, then it's worth looking around testing the rules at various sportsbooks to see which ones permit the parlay.

A FEW MORE POINTS IN NO PARTICULAR ORDER

Earlier in the book I mentioned something called a parlay card. Parlay cards are kind of a hybrid promotional tool/profit center for sportsbooks. Sportsbooks produce parlay cards for several sports, but they're easiest to describe using football as an example.

Say it's Week 3 of the college football season. On Sunday, the market maker books posted the early lines on the games for this coming week, and the crazy button mashers hammered on those lines for a bit. On Monday, a retail sportsbook copied all those hashed out lines and printed them on a card—yes with actual ink on cardstock. Maybe they're printed overnight Monday and ready to put out for customers Tuesday morning in the sportsbook.

At any point from Tuesday until Saturday morning, you can bet one of these parlay cards. In most ways it works like a normal parlay. You pick as few or as many teams as you like on the point spread (usually there's a minimum of at least maybe three picks and a maximum of perhaps 15 or so). If all your point spread bets win, you get paid at the odds listed on the back of the card.

There are two massive drawbacks to parlay cards versus betting off the board parlays. The first is that all parlay cards short pay the parlay odds—often by a lot. The second is that there are often extra rules that tilt in the house's favor. A common one is "ties lose." In a normal parlay, if you bet a team -3 and they win

by exactly 3, that game pushes, and the parlay bet is simply treated as whatever it would be if you hadn't bet that game.

On a ties-lose parlay card, your whole bet loses when that happens. Listing all the little rules wrinkles that sportsbooks put on parlay cards is beyond the scope of this book—just realize that there's usually at least one gotcha rule on a parlay card that you won't like.

"Okay, great," you say, "bad odds and bad rules. Sounds awesome." Yes, if you bet these things more or less randomly like most people do, they're brutal.

Ahh, but I haven't gotten to the saving grace. The cards are printed on Tuesday, but you can bet them all the way through Saturday morning. That means you can bet into Tuesday's lines on Saturday morning with Saturday's market information.

The cards are easy to beat. You just look at the games with lines that have moved the most between Tuesday and Saturday. Say you find Army +9.5 on a parlay card (listed as +10 on the card, but joke's on you, ties lose), and they're +4 at current market maker prices. You do some related market push rate analysis to figure out what a fair break-even percentage for +9.5 is if +4 is fair at 50%. You compare this to the break-even percentage given then odds listed on the parlay card. (Which will unfortunately be more than 52.4% because the card short pays you.)

If you think +9.5 wins more often than the break-even percentage of the card, then Army +9.5 goes on your parlay card.

You go down the list of every game on the card that's moved substantially and do this analysis. Then you have a list of maybe six-or-so bets on the card that are good. You then bet them in as many combinations as you can for the maximum limit on the parlay card.

I know of people who bet parlay cards like this for a substantial portion of their income. It's not glamorous, but it does work.

Prop parlay cards are becoming increasingly popular. This is the same idea as the parlay card I just described, except instead of point spreads for fifty-odd college football games, the cards list a prop menu for a few selected high-profile games. Maybe the parlay card lists an array of props that pertain to this week's NFL Sunday and Monday Night Football games.

Same caveats apply—these cards short pay and have some nasty rules. Same upside also applies—often the lines are stale (i.e., not updated with market or other information), and because all the options pertain to just one or two events, there's often plenty of correlation in there to boot. These things are very beatable.

Finally, while the traditional parlay card requires you to walk into a sportsbook and bubble in your selections on an actual card with a #2 pencil, I've seen this product get a digital makeover at some sportsbooks—you can bet the exact same thing on your phone app.

Just as legs of a parlay can be correlated, they can also be anti-correlated. Winning one leg makes it less likely you win another leg. Unlike the correlated parlays that work in your favor, sportsbooks have no problem letting you bet anti-correlated parlays.

An anti-correlated parlay that I see people bet all the time is to bet both sides of an NFL teaser. Say the line on the Broncos-Chargers game is Chargers -7.5. With some justification like, "I think the Chargers will win, but not blow the Broncos out," they will tease the Chargers to -1.5 and also tease the Broncos to +13.5 and put both bets on the same ticket.

This may be the single worst sports bet that people actually make on a regular basis. The bets are anti-correlated. If you know that Chargers cover -1.5, that makes the Broncos covering +13.5 less likely, because you are removing all the situations from consideration where the Broncos win the game outright.

The same logic goes the other direction. I'm not saying it's impossible for the Chargers to win and the game to land between 1.5 and 13.5. Of course it's possible—it's even fairly likely. I'm just saying that getting paid only -110 (or whatever your two-leg teaser pays) on that bet is horrendous.

In a typical NFL game with a favorite of around -7.5, my model says the game should land between those numbers somewhere around 37 to 40% of the time. So you're betting on let's call it a 40% event at a break-even percentage of 52.4%. Not good.

If you think you've identified a trend in a sport that is so far uncaptured in the market, you can often exploit it more thoroughly with parlays. A few years back, home run totals began to spike in MLB games. At first it seemed like an anomaly. Then the spike kept on going. Eventually MLB acknowledged that the balls were manufactured a bit livelier during this period.

If you had been on top of this trend from the beginning, a good way to profit from it would have been to round robin the

overs until the rest of the market caught up. Because the overs would all be caused by the same phenomenon league-wide, there would be a greater than normal chance that if one of your bets was good, that they were all good. That fact, plus the naturally increased betting volume you get from betting parlays, would make the round robins the most efficient way to exploit such a trend.

There's a knock-on effect on a strategy like this one. For every extra percentage your overs win, you benefit twice—you win your bet more often and you get more average volume (because the first and second double-up bets win more often). That is, you get both more edge and more volume.

This is useful in situations like these because you often don't really know what your edge may be. Maybe the overs will win 54% until the market adjusts. Or maybe they'll win 60% until it adjusts. Or maybe you're just wrong about the whole thing and overs will win 50% like normal. You can't ever know for sure, because the whole point is there's no data supporting your angle—the data supports the market prices where they are, and it's only the brand-new trend that makes you think the market is off.

Because of the knock-on effect, every extra percentage of winning gives you disproportionately more upside when you parlay the bets—whereas if you were to just bet this angle straight, you'd get only a linear benefit from increasing win percentages.

One way or another the edge (if it exists at all) will be gone soon, so bang in the parlays and hope it's a monster.

Sportsbooks are often very restrictive about allowing you to parlay derivatives and props—and for good reason. Correlations

between full game spreads and totals are usually fairly weak (the college football example notwithstanding). You can create much stronger correlations if you are allowed to parlay things like halves and quarters bets, alternate spreads and alternate totals, game and player props, team totals, and the like.

When you open a sportsbook account, one of the most valuable things you can do first is to explore their software and see exactly which markets they will and won't allow you to parlay.

The clearest example of how parlays are primarily a method to increase betting volume rather than "hold" hits social media seemingly every week. Someone bets a mega-leg $10 parlay and now has a sweat on the final leg for $50,000 or something. Media folks start tweeting photos of the ticket and saying the guy is desperate to hedge.

Well, yeah. That's because the guy is a $10 bettor, but through the magic of parlay math, has managed to place a $25,000 bet on the outcome of a single game. A $25,000 bet he doesn't want, never wanted, and now is trying to figure out how to take mostly off the table.

Parlays blow up betting volume. If that's not what you want, don't bet them. If it is, though, then they can be an indispensable tool.

Multiway Markets And Futures

Multiway markets are those with more than two options. I'm lumping futures in here also, because futures are usually multiway markets.

There are two main features of multiway markets that pull in different directions for how attractive they are.

The first feature is that these markets are usually set to hold a substantially higher percentage than a two-way market. While a typical two-way market priced around -110 will hold 4 to 4.5%, multiway markets often hold 10% to 30%.

That's a whole lot of hold. So you should never bet into a multiway market, right? End of chapter.

No doubt you can see all the words further down the page, so obviously there's more to it. You're only really exposed to that big hold percentage if you bet in the dumbest way possible. For example, say you build a bet chooser program that randomly chooses bets from a multiway market with a frequency weighted to the odds of the bet. It chooses the 2-to-1 option about a third of the time and the 99-to-1 option about 1/100th of the time.

That would be very dumb.

If you did that, you'd lose that massive hold percentage over time. So don't do that. I know the random bet chooser thing was

your plan going in, so feel free to thank me for warning you away from that minefield.

Okay, the hold is bad. But the saving grace is that multiway markets are very hard for sportsbooks to price correctly. Also, there's usually not really a market maker for these markets that gets copied. You've got books putting out their own multiway and futures markets and then moving them on their own action.

And that's where the opportunities come in.

Let's take NCAA Football Championship futures as an example.

You're a sportsbook and you want to offer these to your customers. There are maybe a dozen teams that have a real shot to win. And then another dozen or two that, if everything goes perfect for them, can make the playoff and therefore theoretically could win.

You want to offer this market with a 30% hold, which is, you know, a lot. That gives you plenty of margin for error on these prices.

From past years you know which teams are popular with your customers, and since college allegiances basically stay the same year after year, you can probably predict reasonably well the action you're likely to get on these futures.

You start with the teams you know will get lots of action, and you make sure they're priced to give you a healthy edge on all of them. Alabama? How's +200. Ohio State? +400. Oklahoma? +600. And so on.

Okay. Now you've got the rest of the teams with a shot to win, but no particular fan base that's likely to bet them hard. You draw a little distribution curve of percentage winning chances for the remaining teams that sums to give you the hold you want for the market. Let's say for simplicity you want these percentages to add up to 100%. (Because you've already priced the big favorite and

popular teams outside of this 100%, adding all the teams' break-even percentages together at the end will give you well over 100%. This is what gives the book a hold in the market.)

You have to distribute this 100% over the remaining one hundred-something teams. Maybe you lump sixty no-hoper teams together, call them The Field, and price them at 4%. Then you draw a curve with the other 96% and distribute it to the rest of the teams. The best team out of this maybe gets 8%, then then next team 7%, then the next team 6%, and a couple 5s and a lot of 4s and 3s and 2s and 1s and add it all up and you're done.

This is simple enough. And it works for the sportsbook, because they know what teams they're going to get bet, and they've made sure they like the prices they're offering on those teams.

But lurking in there are those maybe two dozen teams with an outside shot to win, but that the book really didn't spend much effort trying to get the price correct for.

Maybe they slipped up and accidentally put a 1% on one of those teams. Or even a 0.5%. That might be worth a bet.

Or maybe one of the teams the book knows will get a lot of action is way overrated. Like say Oklahoma is a perennial betting favorite, but they're primed for a down year. You know TCU looks particularly good and is more likely to win that conference. But they got pushed into the back end of the curve and received only a 3% price.

Here is the core multiway market idea. The math of the hold makes it impossible to find lots of good bets in one of these markets. But the difficulty in pricing all those options correctly makes it quite likely you can find at least one or two good bets.

Then, as the season progresses, it is equally difficult to maintain and reprice this futures market. This is particularly true in a sport like college football where there are so few games and

a single week of results has a massive impact on the chances of every team.

Say TCU plays a key game in Week 3 of the season and wins handily. Meanwhile, Oklahoma has played easy opponents so far. Because TCU passed a key obstacle already on their path to win the conference (and therefore make the playoffs), theoretically their futures price should go up considerably. But this may escape notice because Oklahoma hasn't lost yet.

Or even if the employees at the sportsbook are savvy to TCU and give them a bump, it's very difficult for them to keep track of all hundred-plus teams and every single week accurately assess the impact of the last week of results on each team's championship chances.

And then there's the problem of what to do when someone bets and you need to move a line. Say Oklahoma starts drawing a lot of action at +600. So you move them to +500 then +400 and finally +300. The break-even percentage on them therefore has moved from 14% to 25%. That's a big move. How do you move the rest of the teams in response?

Well, one thing you can do is just not move the rest of the teams. That doesn't open any new vulnerabilities, but it increases the hold on the market. This solution is easy for the sportsbook, sucks for their customers, and degenerates into absurdity if maintained all season long. By playoff time every team would be -300.

To keep a reasonable futures market, if you want to add 11% to Oklahoma's break-even chances, you've got to take that 11% from other teams. You have to make some teams cheaper and give them better odds.

But which teams to give better odds? It's tricky to do it "right." You can't just subtract the same amount from every other team—

that's too simplistic and if you do it that way, over time you're guaranteed to start offering some very good bets.

To get it right you have to unwind the logic of it. If Oklahoma is more likely to win the championship, that means they're more likely to win the remaining games on their schedule. So the opposing teams on the schedule are obvious targets for lowering.

Other teams in the conference even if not on the schedule are also likely targets.

Another target might be a top team in a different conference that might match up poorly against Oklahoma in a theoretical playoff game. That's starting to get in the weeds, though.

The bottom line is that it is not remotely obvious exactly how to distribute these 11% among the remaining teams once you give it to Oklahoma. Sportsbooks can and do make plenty of errors when they do this.

Of course the sportsbook doesn't have to do this perfectly to make money on the futures. They just have to maintain the prices well on the teams most of their customers are betting. The market hold gives them enough cushion on the rest so they won't get burned badly on a few bad numbers.

This same logic applies to nearly every multiway and futures market. The overall hold on the market will be very high. The most popular choices will often be very bad bets. It's difficult for the sportsbook to keep the odds on all 50+ options correctly priced as the season progresses, or as new information comes in. For the most part they don't even try because they don't have to. If they get a few key teams right, they'll make their money.

That means that you can break down these markets logically to find the teams that are likely to be overlooked and underpriced. If you find one or two good (maybe even great) bets, you might be on to something. If think you've found 15 good bets, however, you've probably done something wrong.

A FEW MORE POINTS IN NO PARTICULAR ORDER

The first thing you should do when you look at multiway markets is to reframe them as a series of normal two-way markets. If Oklahoma is listed at +600, then the other side of the two-way Oklahoma market would be Anyone-But-Oklahoma at -600.

This theoretical Anyone-But bet will usually be ridiculously good. But sometimes it won't be, and those are the options to pay more attention to.

Some ambitious sportsbooks will offer the two-way market, especially on the handful of most likely options in the field. Alabama +200/Anyone-But-Alabama -280. Oklahoma +600/Anyone-But-Oklahoma -800. Doing this helps them to price the entire multiway market more accurately, because now they can get punished if they offer Anyone-But bets that are too generous.

"The Field" is a key option in many multiway markets. First, before you even think about betting into a multiway market, make sure either every possible outcome is a listed option, or there is a The Field option listed. If there are unlisted possible winners with no Field, the effective hold on the market often becomes enormous due to the chance that the book wins every single bet.

When there is a Field option, it's often either a terrible bet or an amazing bet. The tail of a distribution (i.e., the large number of low and very low probability outcomes) is notoriously difficult

to price correctly. This is true in far more liquid and efficient markets than sports like options markets and other major financial markets.

In multiway sports markets, much of the tail is often priced into one option, The Field.

Outright markets are an important part of betting golf. An outright market means betting who will win this week's tournament.

PGA tournaments will often have starting fields of over 100 golfers. An outright market will often list only 50 or sometimes as few as 40 of these runners. The rest of them will get gobbled up in The Field.

There is plenty of volatility in a few rounds of golf. Furthermore, whichever sportsbook employee authored the outright list this week could easily have overlooked a couple key golfers who may not have had the best results, but who match up well with this week's course. Or they may have overlooked a new golfer or one coming over from a different tour. A few key omissions from the listed runners can change the value of a Field bet substantially—and whoever made the market might not have noticed.

If you do make a Field bet, make sure you document in some way every single listed runner in the market at the time you bet it. Take screenshots. Take the prop sheet. Because your ticket will probably just say "The Field" and if there's a dispute about who is in it you want some documentation.

Sometimes the distribution tails won't be listed as "The Field," but you will find other options in multiway markets that serve the

same role. I remember a prop I saw a few years back about the MLB home run leader. The prop was "How many home runs will be hit this season by the player who leads the league?" The market listed every possible option from 31 to 49 separately. (All of these bets were horrendous.) Then it listed "30 or less" as an option (hasn't happened since World War II).

Then it listed "50 or more" as an option. Which happens with some frequency. The prop sheet listed it at +600 and it was +500 by the time I saw it. I think it's a strong bet at either price.

At the very least it's a clear example of a mispriced tail, as if that bet had been priced at the same hold percentage as the rest of the market, something more like +150 would have been the offer. The +600 opener was clearly just a mistake.

The bet lost that year, and when I looked for it at the same book the next year, whoever made the prop had fixed it. Oh well.

A quick method to estimate how much hold there is in a multiway market is to convert all the odds to break-even percentages and add them up. A no hold market would add up to 100%. Markets with hold in them add up to more than 100%.

You'll frequently find multiway markets that add up to 150% or more. That's a lot of hold. But, again, such a market can still be attractive despite the hold if there are many runners, because it's very difficult to price all the runners correctly (and maintain correct pricing after people bet into the market and while the market is in-progress) with respect to one another.

With the last point in mind, pay special attention to multiway markets offered in-play. An example of a market like this would be a prop bet offered during NFL and college football games.

"Will the result of the current drive be a TD, FG, punt, or turnover/downs/safety?" with individual prices on each option.

The correct pricing for this prop changes dramatically based the game situation—and it can also change substantially based on the coaching decision tendencies made by the team on offense. Anyone offering a prop like this one in-play will put a very healthy hold on it, but even so it's nearly impossible for an algorithm to price it well enough to prevent a knowledgeable NFL bettor who is watching the game from finding good bets here and there.

Futures markets are a great area to specialize in if it suits you. Let's say you wanted to attack MLB futures. I would recommend opening many different sportsbook accounts and then comparing the futures pricing on each team in each betting market (MLB Championship, AL/NL Pennant, Division winners, even player award futures like MVP, Cy Young, ROY) between sportsbooks. Find the best prices for each runner across all the sportsbooks you have access to.

Then start looking for pricing weaknesses. Did one team just win 10 games in a row? It's possible one or two sportsbooks on your list didn't update their futures markets during that run, and you'll find good bets on that team. Same for the player markets. The players who get off to hot April starts get a lot of press, but say someone goes on a real run after Memorial Day. You might find that player listed at 75-to-1 on the MVP market somewhere,

while due to the hot streak he's sitting just off the league leaders in the relevant hitting categories.

Follow trade news in July. Teams that are trading for win-now talent at the trade deadline could be underpriced.

The great thing about a sport like baseball is there's always something happening, and sometimes hot streaks fly under the radar, especially after the football hype begins. If you check those futures markets regularly throughout the season and pick off the mistakes, by the end of the season you can have a strong portfolio of futures bets that give you many ways to come out ahead.

Angles

The derivative example I introduced earlier of the first inning bet with the opener pitcher and the Murderers' Row of lefties at Yankee Stadium was our first exposure to an angle. An angle is any factor with a predictable and quantifiable effect on the outcome of a bet that is unaccounted for in the line. Let's pull out the three qualifications.

1. Predictable
2. Quantifiable
3. Unaccounted for in the line

You can make a lot of money betting angles, but the angle must meet all three qualifications. Winning angles are everywhere—but angles that you can bet month after month, year after year for profit in big, liquid markets are extremely hard to find. Most angles work for relatively small bets at retail books with un-picked-through lines.

This book focuses on those easier to find, smaller value angles. Once you build a track record finding and exploiting those, maybe start digging to find the higher valued ones that work in tougher, deeper markets.

Let's start with the last qualification and work backward. Your angle must be unaccounted for in the line.

I've invested a lot of words in this book explaining where lines come from. How they're made. Who makes them. What makes

them "strong" (a lot of smart people betting into them) or "weak" (an unmoved or un-bet line made up by a sportsbook). That's because before you can know if any bet you make is good, you need as good an idea as possible about where the line came from.

It's usually not too hard to figure out whether your angle is accounted for in a weak line. You watch the market for a while and reverse engineer how they make the lines. Usually it will be a very simple system.

The key is that the line will represent a league average prediction for the market in question. And—more importantly—it will represent a backward-looking league average prediction. That is, the league average will be built (one way or another) by looking at past years' data. If something about the game has changed and that will change things going forward, but the change isn't in the data yet, chances are it won't be reflected in these league average predictions.

Here's an example. Say you're looking at a first quarter total for an NFL game. Let's say the sportsbook you're looking at opens the quarters markets on Saturday, a day before the game starts. They probably just take the market game total at that time and plug it into a formula to make the first quarter total.

If the market game total moves after they open the first quarter market, they may or may not adjust the first quarter price. That's something to look for. Obviously it's better for you if they set it and forget it on that first quarter market. If possible, try to find a book that neglects its derivative markets after opening them.

Let's say the method they used to make the first quarter totals was to look at all NFL games from 2005-2014 and group them by similar game totals. Games where the total was 37-39 would be grouped together. And 40-42. And 43-45. And so on.

Then they looked at each grouping and just picked the first quarter total that would make each group fall roughly 50-50. So if, for example, they found for the 40-42 group that 53% of the games went under 7.5 points in the first quarter, they'd just open the first quarter total something like

7.5 o+105/u-125

for any game with a game total between 40 and 42. And so on, for every game on the schedule.

Of course you can't know exactly how they built their chart for making first quarter totals. All you can do is look at the markets as the sportsbook posts them and make note of what prices they open.

And you can look at the same market at other sportsbooks and look for pricing discrepancies. It's always a good sign when sportsbooks have substantially varying prices on the same market. It means that the market isn't efficient or well picked-through, and also that if you find a good angle, you can bet your overs at the book with the lowest number and your unders at the book with the highest number, effectively cutting the hold you are playing into.

So let's go back to the NFL. A trend in recent years—and here I mean about 2017 and beyond—is that teams are becoming better at scoring points in the second half of the game. This comes from a few things that all work in the same direction.

Offenses when down two or more scores are becoming better at passing quickly and effectively down the field. Coaches are making more aggressive decisions to go for it on fourth down than they did in the past. Teams with the lead aren't playing quite as conservatively—they open up the field more often and try more often to ice games with one more touchdown.

There are other smaller changes that affect this trend, but I don't want to go too far into the weeds on NFL scoring trends. The main idea is that the sport—any sport—is always evolving. Strategies change over time. What was average ten years ago may no longer be average.

But derivative pricing is almost always based on what was average ten years ago (metaphorically for sure, and often also literally).

Okay, let's back up. I have first quarter NFL totals at a sportsbook that appear un-picked through, and it's obvious that the opening price is just tied to the game total when they open the market. Also we've observed that NFL second half scoring is more efficient than it used to be. So what's the angle?

The angle is to bet under the first quarter totals. Why?

Five years ago, before this second half efficiency trend kicked in, scoring was more evenly distributed between first and second half. A game total of, say, 53.5 meant X scoring in the first half, and Y scoring in the second half.

Today, the same 53.5 total means more scoring in the second half, which by definition means less in the first half. Furthermore, the efficiency trend affected the second quarter more than the first, so if a sportsbook simply plugs their 53.5 game total into their chart made from 2005-2014 data, they will get back a total that reflects too much scoring in the first quarter.

This angle is predictable. It applies to essentially every NFL game.

It is quantifiable. You can quantify it by making your own charts exactly the way I describe the sportsbook making them—grab data from NFL games from 2000 through the present. Group games by the closing total. Look at what the first quarter total is for each grouping of game totals. And look at how that

first quarter total moves as you start at the old games and move to the newest games.

Sports data is always a short sample, so you have to read between the lines a little bit. But if you use the method I describe, you can estimate how much the relationship between the game total and the first quarter total has changed over time. And then you can (very carefully) project this change into the future—being quick to revise your projection if you begin to watch new games and see the trend toward more efficiency later in the game stall out or reverse.

And if you watch them put up enough lines, you can determine whether you think this trend is being accounted for in the line.

Again, having several books with the same market can help here. Let's say you find two books that post a first quarter total for an NFL game with a market game total of 54.5. At Book A, the market is

10 o-120/u+100

At Book B, the market is

10.5 o-110/u-110

Because it's common to score exactly 10 points in the first quarter, these are very different lines. Without an angle, you would know at least one of these must be a bad line, but you wouldn't have a good idea which one.

But our angle says that betting under in first quarters is likely good, so the right idea would be to bet the u10.5 -110 and leave the market at Book A alone.

I want to stress that your takeaway so far should not be, "Betting NFL first quarter unders is good!" That's not what I'm

saying at all. By the time you read this, the trend could be over. The charts used to make openers will surely be updated. (In fact, I've bet many NFL first quarter overs despite this one angle.)

Blindly betting any angle will lose.

That's really the point. Angles are great. The bread and butter of winning at sports betting. But if you want to bet the angle profitably, it has to be predictable, quantifiable, and not accounted for in the line. You can't know if it's accounted for in the line unless you spend the time to research how the lines get made, and how (or if) they get moved.

And the quantifiable size of the angle has to overcome the hold. It does you little good to recognize an angle that's worth half a percent went the market has 4% hold.

Okay, let's return to our NFL second half efficiency angle again. If the difference is really that NFL teams are more efficient now in the second half than they used to be, why are we looking at first quarter bets? Why not just bet under in the first half and over in the second half?

NFL first halves are a major market that's dealt by market making books. They take substantial limits from anyone, and they move the number on action.

By the time your retail book posts a first half number, the Black Friday frenzy over the opening line at the market making book has already happened. At least someone who participates in this scrum will tend to know about nearly any NFL angle you might think of.

Let's say the employees at the market making book have never watched an NFL game. They don't know about efficiency trends, travel schedules, circadian rhythms, altitude, or anything else that may constitute an NFL angle. They make their openers in the simplest way possible. They just have a list of power ratings for each team and open the game point spread and total by

subtracting and adding these ratings. Then they open the first half by looking the opening spread and total up on a chart they made ten years ago.

These numbers will be okay for some games. For other games, they'll be pretty far off. Either way, the vultures will descend immediately and madly jam in $250 bets. Within minutes, all the well-known angles that apply to any game will be in the lines.

The guy who likes to bet the travel schedule angle will jam in his travel bets. The guy who likes to bet injury angles will jam in his injury bets. The guy who likes to bet efficiency trend angles will jam in his first half bets.

From that point on, the angle will be accounted for in the line. This is a very efficient process for the market making book, because often the people who bet these angles don't even win on them. They overbet the angles. They try to apply them to games that don't apply. But whether the vultures win over time or not is barely relevant to you. These folks are moving the lines in the right direction to account for all these little angles.

If three days later you trot out your "efficiency trends" angle on the first half line, you are very late to the party.

The same can be said for the second half line as well. The way second halves work today is that an opener is posted at a market making book a few seconds after the first half ends. Immediately, within seconds, anyone with an applicable angle starts jamming in bets. The lines jerk back and forth to the bets. Within the first minute, the lines begin to settle.

It is only at that point that retail books open their halftime markets. Watch next time. Time how long it takes between when you see the half end on TV and the time your retail book opens their halftime market. It will usually be over a minute at least—sometimes longer. What the retail book is doing during that time

is watching the market maker and letting the frenzy play out. Once things seem settled, then they post the lines.

This doesn't mean that halftime markets don't move after retail books post—they do all the time. But it does mean that you absolutely will not make money trying to bet cheap, well-known angles into retail sportsbooks' second half markets. Your angle is accounted for in the lines.

The do's and don'ts of angle betting.

Do

- Make sure your angle is predictable, quantifiable, and not accounted for in the line
- Target the obscure and exotic markets that the retail sportsbook makes to fill out their menu
- Watch your markets over time to reverse engineer the sportsbook's process for posting the market and making the opener
- Make sure you're either betting the opener or that no one else is consistently moving your markets before you hit them
- Compare prices on your markets between sportsbooks and prefer betting into markets that have bigger price differences from book to book
- Keep records and watch out for your angle losing profitability. All angles fade over time as other bettors discover the angles and books develop better processes to make their lines.

Don't

- Bet an angle blindly. You have to know what went into making the lines you bet.

- Bet angles into major, liquid markets made by a market maker. Unless you found a unicorn, your angle is almost certainly at least partially accounted for in these lines.
- Bet into a large hold (more than about 5%, with each percent beyond that being considerably worse). Theoretically you can make money betting into 8% markets, but you need to have the quantifiable part of your angle absolutely nailed. Alternatively, you can bet into an 8% market at one sportsbook if you find lines at other books that are off by enough to bring the combined hold (betting the good price at each place) down well below 4%.

BETTING A "TREND" AS IF IT WERE AN ANGLE

This one is a little nuanced. Angles are real, and finding them is one of the best ways to make money betting sports.

What is an angle? It's a relevant, quantifiable factor that isn't priced into the market.

Because finding a great angle can be as good as gold, people are constantly sifting through the data trying to find one.

The things people find when they sift are called "trends." You've probably heard these before.

"In games coming off a non-conference loss where an SEC team is a 14-point or greater favorite, they are 22-and-9 against the spread."

That's a trend. Don't bet that. It has absolutely zero predictive value. You will lose the hold going forward if you take that trend at face value and start betting these SEC favorites.

Here's another trend.

"In games where the prevailing wind speed is 20 miles-per-hour or greater, the under is 37-and-21."

That's an angle. Bet that—until it gets priced into the market, that is.

I said this point is a bit nuanced. There's no bright line between an observation that's a garbage, non-predictive trend and a genuine, potentially valuable angle.

As I said, genuine angles are often found when sifting through all the trends. Unfortunately, I can't give you a hard-and-fast rule for telling when a trend is something that might have value. But here are the two main things to look for.

First, look for a realistic reason. Look at the first trend. Non-conference. Loss. SEC. 14-point favorite. That's four constraints.

Why?

What do any of those have to do with one another? What's special about SEC teams? Why 14 points and not 7 or 21? Why non-conference?

If you have an active imagination, you may be able to tell yourself a story about what these four things have in common and what on-the-field effect you're selecting for when you look at these teams.

But let's be real. This is a Mad Libs betting theory.

The second trend about the wind is so much more realistic. Wind makes it harder to complete passes and kick field goals. That means fewer points. Which means more unders as long as the effect isn't already priced into the market.

Obviously you have to use your judgment about what's realistic or not. Remember that athletes are humans and stuff that affects human health and performance like travel, sleep, diet, injury, illness, and so on all tend to matter and have real effects.

Weather has real effects. Coaching has real effects. Umpiring and refereeing have real effects.

You get into more dangerous territory when you try to determine how much effort a team of players will or won't put forth in a game. Teams are composed of many players who have various personalities. It's an oversimplification to claim that a 53-player NFL football team "won't be up" for a game—how the heck would you know that? And even if you're correct about some of the players, are they key players? How much is it worth?

Good angles (and therefore trends) tend to be realistic, and they also cut only one direction. No one ever played better because they flew across the country and got four hours of sleep the night before the game. No one ever kicked field goals better in 30 mile-per-hour wind.

Whereas getting beaten the week before might cause a letdown for some players but serve as extra motivation for others. In general, stay away from trends that can cut both ways like this.

The other important characteristic of a good trend is that it glides. If you expect an effect in 30 mile-per-hour wind, then you should also see it in 15 mile-per-hour wind—just less.

If you expect a team that's a 14-point favorite to behave one way, you should also see it in 17- and 10-point favorites—perhaps to a different degree.

If you expect a team that's travelled 3000 miles to suffer, then you should also expect it of a team that's travelled 2500 miles—again, perhaps just to a lesser degree.

This is an important test of your trend. If it glides, that is if you see the effect fall away slowly and in a logical way as you loosen the constraints of the trend, then there's a good chance you've found something of real value.

Otherwise—and this will be true of almost every trend you find—you're just looking at pure noise with no predictive value, and if you bet it, you will lose your money.

In-Play Betting

On the industry side, in-play betting gets an enormous amount of hype. For a sportsbook operator, it offers a tantalizing proposition. Without in-play betting, customers can maybe make a point spread bet or a total bet on a game, maybe a prop or two, and that's about it. So a max of four bets per game and usually more like one or two.

With in-play betting, customers can potentially make bets all game long. This timeout betting a moneyline. The next timeout betting a total. The next betting a couple props. Maybe ten or more bets through the whole game.

In-play betting likely gets the sports leagues excited also, because if you're betting in game, you're watching all game long, and you're much more engaged with what's happening on the field.

There's only one problem. It's a big one. And it should also be a familiar one by now.

Where do the lines come from?

Pregame lines come from price discovery at a market making book.

But in game, there's no time for price discovery. A timeout lasts maybe two minutes. In many ways, each timeout is the same as a brand-new opening line. And as different sportsbooks get these in-play opening lines from different sources, you will see a variety of lines. Some scalps, profitable to bet both sides, for sure.

And many, many instances of very small hold. You will often be able to create synthetic markets with less than 1% hold between two sportsbooks on their in-play lines.

These opening lines are difficult to make. It's hard enough when the book is just trying to put up a moneyline. Say the Browns are playing at the Patriots, and three minutes into the second quarter, the Browns are up 14 to 3. But the Pats were 10.5-point favorites pregame with a 52.5 total.

Quick, what percentage of the time will the Pats come back and win? The sportsbook has two seconds to get a line up. And it needs to be within about 2% of the "right" answer or else the line will offer customers a good bet on one side or the other.

It's not an easy problem. Fortunately for you, the bettor, it's not your problem. No one is forcing you to bet every timeout. You can sit back and just bet the mistakes.

In general, the mistakes in these in-play lines fall into one of several categories.

1. Mistaken game state
2. Failing to account for an important game-specific factor
3. Fundamental modeling error

BACKING UP

Before I go in depth on the mistakes that in-play vendors can make when they set lines, here's a brief overview of how they go about making the lines in the first place. While I don't know the internal operations at any of the vendors currently in use at American sportsbooks, this much about how they make lines can be determined simply by watching the lines move over time.

They take as an input the game state. In a football game, for example, that means the score, the time, who has the ball, the yard line, down and distance, maybe timeouts. Then they combine that game state information with information about how good each team is—likely the pregame spread and total at market close. Perhaps they use other information as well. If they have access to real-time betting information, for example, they likely fold that in as well.

Then using those inputs, they have some sort of algorithm that converts those inputs to a betting line. Or in the case of the ones who offer several dozen markets at once, many betting lines.

The betting lines then get transmitted to the sportsbook operator, who can either post the lines unchanged, or can do whatever they like to the supplied lines before they post them for customers to bet.

And, again, while I can't speak to the internal operations at any of the third-party vendors currently in use at American sportsbooks, I do know that the industry currently places an emphasis on automating this process. As much as possible, operators (and likely the vendors as well) would like to take humans out of the equation to make the process cheaper, faster, more seamless.

THE MISTAKES

Now that you understand the basic workflow of in-play betting markets and where the heck these lines come from, you can start to see where this process might go wrong.

First, the lines are utterly dependent upon having accurate, real-time game state information. If the algorithm gets told the wrong score, it's gonna make the wrong line.

This happens more than you might think. In football, for example, the model inputs tend to get the score wrong when something a little weird happens. A team misses an extra point. A team goes for two instead of kicking. A team kicks a field goal, but then it comes off the board due to a penalty. There's a safety.

After all, whatever game state information is baked into the lines ultimately comes from a person watching the game somewhere and typing it in. People make mistakes. You can put error checking at points in the chain there—and for sure there is error checking—but mistakes get through.

In football they also often get the yard lines wrong. It's common for the side of the field to get flipped, so they make the line as if the ball were at a team's own 20-yard line, but actually they're on their opponent's 20.

Or they get the yard line wrong because they make the line as if the result of the play counted, but instead there was a (significant) penalty.

In basketball, it's common for them to have the score wrong when they make a line.

These mistakes are all more likely to happen for lower profile games. You can probably figure out if the game you're watching (and betting) is likely to have a modest or high error rate on the basic game state.

Over time I expect these mistakes to become less frequent. Leagues understand that their live, real-time data could be very valuable, and they also understand that to unlock the real value of the data, they have to get their error rates down to nearly zero.

But, no matter what, it will likely always be worth looking for this kind of mistake.

The second mistake, failing to account for an important game-specific factor, however, will be much harder for leagues, vendors, and operators to purge from their lines. And, ironically, the more everyone wants to automate in-play betting, the more of these types of mistakes you are likely to see.

In baseball, it matters who is pitching. Duh.

Here's an example of how an in-play data feed treated an MLB game in 2018. On July 11, 2018, the Mets hosted the Phillies. Pregame, the Mets closed at around 58% favorites at major market makers. Their hitting was not so great, but in this game they had the eventual Cy Young winner Jacob deGrom starting, which is why they were the favorite.

The game remained 0-0 through the end of the ninth inning, with deGrom pitching eight stellar innings. At the top of the tenth, the in-play markets were up—and the Mets were still 58% favorites.

Logically, this makes no sense. The Mets were only 58% favorites pregame because they were expected to get seven or so great innings out of the likely best pitcher in baseball. Otherwise they wouldn't have been favorites at all.

Now he's out of the game, the game is tied and in extras. Obviously the Mets shouldn't still be 58% favorites. If you happened to be watching that game and caught the in-play markets at the right time, you could have easily bagged a Phillies +130 or +135 bet that was clearly good. A bet which would have lost, by the way, as the Mets ended up winning 3-0 after Brandon Nimmo hit a walk-off three-run home run in the tenth.

If you know anything about baseball, this example is obvious. And the more you know about baseball, the more of these little quirks you will find—factors like in-game weather changes, lineup changes, bullpen usage, and more that you can bet on but won't be accounted for in the line.

The same sort of things pop up in all sports. In-game injuries present opportunities like these—it's hard for a model to incorporate real-time injury information.

In-game strategy changes also. The NHL is a notoriously difficult sport to model in-game. There's not much data for a model to chew on—mostly just the score and time remaining—but there's so much more about the game that you can see with your eyes.

Leagues like the NHL are trying to bridge this gap by creating more granular, real-time player data by using wearable technologies. I think this will be something to watch going forward. But it's one thing to have a zillion data points on where every player has been over the last five minutes. It's another entirely to turn that into an estimated game win percentage that people can bet on. It's far from a sure thing the models will be able to keep up with a trained human eye in hockey any time soon.

The third mistake class is more profound and harder for sportsbooks to root out of their systems. It's basically a "the math deep inside the system is wrong" error.

Sportsbooks can compensate for the first two error types. They can do double and triple and quadruple error checking on their game state information. They can hire people who know sports and know their models and can estimate how to move lines based on injuries or pitching changes or freak weather.

But if there's broken math in the algorithm itself, there's not much anyone can do about that except to do a deep dive and figure out what's wrong.

And to do that they'd have to figure out something was wrong in the first place.

Finding Mistakes With Logic

In 2019, mistakes of all three types are common in in-play feeds for the major American sports. If the idea of watching lots of sports with your sportsbook's in-play betting menu open appeals to you, you should probably learn to identify these mistakes so you can bet them.

I have the benefit of having built in-play models for all the major American sports. Mistakes of all three types just pop out at you when you have your own model. "Oh, they gave the Eagles an extra point even though they missed the kick." "Oh, they're pricing this like deGrom Is still pitching." "The totals ride high at this point in every game, likely because they're doing this math wrong."

It's a huge investment of time and resources to build models, so I'm not suggesting to do that.

Instead, I recommend building up an intuition for pricing these games by watching carefully as the models move. You want to compare different models to each other. You want to compare a model to itself at different points in the game. And you want to compare different markets (like comparing a model's moneyline price to its point spread price). Do that, and the mistake prices will begin to pop out at you.

The easiest thing to do is to find two sportsbooks that are clearly using two different pricing feeds. (Recall that there are only a small handful of providers of these lines, so frequently two sportsbooks will be using the same feed, perhaps with minor tweaks on the operator's end.)

Watch when the prices change. Watch when they go off the board and come back. Watch what direction they move. If they're

mostly synchronized, it's likely based off the same feed. Otherwise, you may have two different feeds.

You're most interested in timeouts when the feeds have different prices. If they're different enough, theoretically you could scalp them (betting one side at one book and another at the other to lock in a profit), but given the relatively low limits at most of the books on their in-play markets, it's likely not worth the time if all you're going to do is bet both sides.

Instead, you want to try to figure out which price is "right" and which is "wrong"—the wrong one often being an out-and-out mistake.

This is where tracking over time helps. Let's say you're watching a football game, and one team has just kicked a field goal with 6 minutes left in the first quarter. The in-game total was listed at 51.5 flat (i.e., close to the same price/break-even percentage on both over and under) at both books.

On the next drive, the team makes a first down and then punts to the opposing team's 20-yard line. Three minutes come off the clock, so there's 3 minutes left in the first quarter now.

At that timeout, the two books have different totals. One has 49.5 flat and the other has 50.5 +102 on the under.

These are quite different prices. It's barely good enough to scalp (middle) it, but it's close, especially if the book has a higher hold than 4% on in-play markets, forcing you to bet -112 or -115. Scalping in this case would mean betting both o49.5 -115 and u50.5 +102, hoping the game lands exactly 50.[4]

---

[4] Let's price out this scalp for the heck of it. Say the one book has 49.5 -115. That's a break-even percentage of 53.5%. The other book has u50.5 +102 which is a break-even percentage of 49.5%. That implies that over 50.5 will hit 50.5% of the time. Subtracting 50.5 from 53.5 gives you 3%, which is the implied percentage chance between these two bets of landing on exactly 50. My model puts the chance at a similar situation of hitting a total of

But in most scalp situations—and definitely in this one—usually what's going on is that one of the bets is a losing one, and the other is a winning one that wins just a bit more than the losing one loses. You're better off if you can identify which bet is which and only make the winning bet.

You can use logic to figure out which of these two bets is likely the one you want. Both books agreed the total should be 51.5 with 6 minutes to go in the first quarter. From that point on, only "under" things happened. Three minutes ticked off the clock. And the ball went from a team's 25-yard line (after the kickoff) to a team's 20-yard line (after the punt).

We started with 51 minutes remaining in the game, and we burned 3 of them plus put ourselves in a situation less likely to generate a score than the original situation. The book that has the 49.5 total says that chain of events costs 2 points on average. The book with the 50.5 u+102 price says that chain of events costs considerably less than 1 point (due to the plus price on the under/minus price on the over).

Which one makes more sense logically? It has to be the 2 points cost. There's simply no way that burning 1/17th of the remaining game and creating a worse scoring situation to boot costs less than 1/50th of the total expected remaining scoring.

You have to be a little careful with your logic in these situations, because if you aren't careful you could do some oversimplified, bad math and assume betting under 49.5 is also good. After all I burned 1/17th of the game, but only docked 1/25th of the total expected remaining scoring as a result.

---

exactly 50 at around 3.5%, so theoretically betting both together would be slightly profitable. If you trust my model. Which I do, but the more you force any model to distinguish between 3% and 3.5%, the more trouble you can make for yourself.

But moving the total by 2 points is actually about right for this chain events, because football games feature more scoring in the second and fourth quarters than in the first, so three minutes burned in the first quarter isn't as strong to the under as, say, burning the last three minutes of the second quarter without a score would be.

Anyway, with that warning out of the way, it is safe to look at that 50.5 +102 price and realize that it can't possibly be right, especially when the other book has 49.5 flat.

Comparing prices sequentially throughout a game is the strongest tool most bettors have to find mistakes in the in-play pricing. The logic that connects the price at the last timeout to the one at this timeout is mainly "what happened between then and now, and how much should it affect the price?"

Again, this is a much stronger signal to bet when you can find two books that disagree on the new price. If both books have a similar number, but the number doesn't make logical sense to you, there's a good chance you're just missing something. Maybe you broke the logic of the situation down incorrectly. Maybe you missed a relevant factor that is accounted for in the line. Maybe the entire betting universe is piling on one side, and that's skewed the market to one direction. Trying to fade the entire betting universe (especially the smart folks in that universe) just for the sake of fading it is a good way to lose.

This isn't to say you can't be right, but I would stick primarily to betting into disagreements until you get the hang of it.

Basketball is a tough game for the in-play lines to track correctly. The pregame total (determined by the price discovery process at a market maker) depends heavily on an expectation of how fast

each team will play. Small changes in average time per possession can add up to a substantial change in the total, since there are so many possessions in a basketball game.

The observed pace of an in-progress basketball game predicts the pace for the rest of the game—that is, if the pregame total predicts a pace of X, but so far after the first quarter they are going 8% faster than X, betting the over on the in-game total will often be good.

To do this right, you really should get some data and do some math. Look at games by pregame total and then use the data to pull out the implied pace of each total. (I.e., sort all the games by total, separate them into similar-total buckets, and count possessions per game for each bucket). Then you compare that pace to the actual pace of the game you've seen so far.

As a sanity check, you'll want to make sure the in-game line is based on the pregame total and not an adjusted total. A good way to do this if you don't want to build a model is just to watch a lot of games and write down the pregame total along with the in-game totals at various fixed points in the games. (Scheduled timeouts are ideal.)

If the in-game totals are substantially different for similar pregame totals, you'll want to dig a little to figure out what factor (including potentially observed game pace) might be added to the algorithm to produce the totals you are seeing.

Key players in early foul trouble also presents an in-play betting opportunity. Foul trouble looms large in college basketball. It would be a huge undertaking for an in-play odds provider to properly evaluate how important each player is on any of 200+ teams on a college basketball Saturday. If you happen to know the teams and players and see someone important get in trouble early, you'll probably have an edge most of the game long betting against the team that lost the player.

In the NHL, a place to look for modeling errors is during the second period. Scoring rates are higher in the second period versus the first and third because in the second period the teams attack the nets on the same side as their benches. This means that line changes happen further up the ice for each team and create better attacking situations. A good model should pick this effect up, but a weak model might use a constant scoring rate for the rest of the game, without realizing the dip that comes at the end of the second period.

Also in the NHL, goalie-pulling strategy differs from team to team, and again, it's unlikely any in-play model will capture that accurately on a team-by-team basis. The algorithm will likely expect each team to pull their goalie according to a league average strategy—or worse, according to whatever was league average five years ago.

If you can track which teams are extreme with their goalie pulling—say pulling very early in most situations and also pulling reliably down two goals—then you can wait for a goalie-pulling situation to begin to materialize for any of those teams and hit the over.

Going back to basketball, there's another trend in the NBA that is breaking in-game models. In recent seasons, both the average team's pace and their scoring efficiency have increased. Those increases have pushed total scoring sky high.

In the fourth quarter, typically the leading team will move at a slower pace (trying to run out the clock), while the trailing team will start playing faster. In the past, these effects somewhat evened out, the trailing team saving about the same amount of time on each possession that the leading team was wasting.

But now that overall game pace has gotten so much faster on average, this has skewed the fourth quarter effect. Nowadays, the leading teams can slow things down (relative to the first half pace)

by a lot more, while the trailing teams can barely go faster since the entire game is already played at breakneck speed.

Therefore the effects tend not to cancel anymore, and the fourth quarter plays slower on average than the other quarters when one team is clearly in the lead and the other is clearly trailing.

The overall effect is that if a game has a total of 220, say, more of those points will be scored in the first half versus the second than in the past. This effect is mostly priced into first half markets already (thanks to liquid first half markets using price discovery), but it's not priced well into the split between third and fourth quarter totals (those are your weak markets).

It's also not priced well into some in-game models. When this situation is beginning to shape up near the end of the third quarter, you may see the in-game totals get bet down hard—and if you are on top of it you can get some very good bets in.

USING HALFTIME PRICE DISCOVERY

Halftime is a special case of in-play betting. On one hand, halftime is just another timeout—a particularly long one. On the other hand, many sportsbooks don't treat it that way at all. They turn off their in-play betting feed and instead make their own halftime market—or at least try to follow a market maker's halftime market.

The good thing about halftime is that it's long enough for the price discovery process to work. The way halftimes tend to work today in sports like pro and college football and basketball is a few seconds after the game goes to halftime, a market maker

posts an opening line. There's a frenzy of betting, and those lines get knocked into place.

About a minute later, most retail sportsbooks follow, opening the lines from the market maker that have already been subject to some price discovery.

Then, for the rest of the halftime, people are betting the line at the market maker, and it's moving in reaction. The frenzied bettors at halftime will tend to know a lot of the angles I just listed, and so if the pace has been fast or slow, they'll bet the game over or under at halftime. If a key player is in foul trouble, they'll bet the other team on the point spread, and the halftime market will move.

There are similar bread-and-butter angles in football that pro bettors know and jam in on halftimes.

Watching these halftime markets move will give you a hint about how to bet the rest of the game once the second half starts and the in-game line feed is back in control.

It's not uncommon, at least in 2019, to see a discontinuity between the lines that closed halftime and the in-play lines that open the second half. Say a basketball game has been going incredibly slowly, and during halftime the second half total got bet down two full points from where it opened. The moment the second half gets underway, you might see the in-play total pop those two points back to near where halftime opened. That would be because the algorithm used to make the in-play lines doesn't know anything about the halftime betting action.

If you see this, it's basically a free under bet—and it also suggests under bets will tend to be good throughout the rest of the game (unless you see the pace of the game change).

As a corollary to this point, the very worst time to bet during a game is from several minutes into halftime through the end of halftime. This is the one in-game market that is reliably exposed

to price discovery and the picked-through effect. If you're betting in-game, you want to be betting virgin lines fresh from the sportsbook, not lines that have been hammered into place by several minutes of bets from smart bettors. If you're not betting the market maker's halftime opener, you're likely better off waiting until the in-play feed starts back up again to get your bets in.

BET DURING TIMEOUTS ONLY

This point is so important it deserves its own section. If you are betting in-game, bet only during timeouts. Never, ever bet when the game is underway.

In the United States, as of 2019, if you're watching a game on TV, your feed will be substantially delayed from the live action. Most people underestimate how long this delay is. Typical these days is about 18 seconds. It can be delayed even longer on some TV providers or if you are streaming the game over the internet (on a stream that's not specifically designed to be low latency).

Sportsbooks, for the most part, use lines that are based on low-latency data feeds. That is, whoever is making the lines knows what's happened in the game with only perhaps a one second delay. Then it's 17 more seconds of delay until you see it on TV.

The sportsbook is a full basketball possession ahead of you. A full football play. A full baseball pitch.

Don't even think about betting into a situation like that.

In fact, it's often even worse. Sportsbooks often tack on an extra delay when you bet in-game. An eight second delay might be typical.

Here's what happens when you try to make that Spurs moneyline bet while the game is in progress. First, the line you're betting into has been made using the result of the next possession that you haven't seen yet baked into it. Then after you click "Submit" on your in-play bet, the sportsbook puts it in a queue and literally just sits on it for eight seconds (or however long they have set the delay).

Your experience as the bettor here is that you will see the little cursor spinning on your web or mobile betting app. You might otherwise think this is "network latency" or some such, but it's not. It's the sportsbook just waiting you out for eight seconds.

They're waiting to see if they get another line update from their odds provider during those eight seconds. If they get an update, but the line stays about the same, then you usually get the bet.

If they get an update, but the line moves substantially, then it depends on which way it moves what happens next. If the line moves your way (i.e., if something good for the bet you tried to make has happened in the game), then the sportsbook will either decline your bet outright or offer it to you at the new (worse) odds.

If the line moves against you (i.e., if something bad for the bet happens during those eight seconds), then the sportsbook either gives you the bet (thank you very much), or sometimes will give you the bet at the new, better price (and tell you what great folks they are for giving you a better price).

Sportsbooks claim they need these delays to protect from people sitting at the game and jamming in bets live before they can get their updated lines.

With the fast data feeds available these days for major American sports, if the operator is making their lines in a timely way, there really should be almost no time for someone even at

the game to get bets in before the line feed picks up the information.

And furthermore, there's no rule that says a sportsbook has to offer bets during a period where they could get beaten simply by someone attending the game. If you're the sportsbook, you just take the lines down during the time you would be vulnerable to that, and you put it back up during lulls in the action. Seems simple enough to me.

Anyway, these arguments notwithstanding, it's "standard practice" these days for operators to tack on four, six, eight seconds of delay after you make an in-play bet. That's eight more seconds that they're watching the game and waiting to decide if they want your bet or not.

That sound fair to you?

Most sportsbooks are not trying to be unfair with this practice. They're trying to offer a good in-play betting experience to their customers while also protecting themselves from the angle shooters out there.

The problem is, from the bettor's perspective, it doesn't really matter what the sportsbook's intent is. It's literally impossible to win at in-play betting when you're betting into 6.5% hold lines (like -115 on each side) while also subjecting yourself to the TV delay plus the added sportsbook delay.

In fact, just the added sportsbook delay is enough. You can't beat it, so don't try. It's not a fair bet.

The solution is to prefer sportsbooks that don't use a delay at all. And to bet only during timeouts where both the sportsbook and you have the same knowledge about what's happened in the game.

It's that simple. Bet during timeouts only.

BET THE MISTAKES

A common theory I hear for in-play betting is that people wait until they can bet a "better price" than they could pregame. Like say they want to bet a team that is a -300 favorite pregame. Instead of laying -300, they wait for the game to start, and they hope it starts off poorly for the favorite. Maybe the dog scores an early touchdown or goes on a quick run.

"I'll bet Duke on the first price -180 or better I see in game."

This is not a winning strategy—you're probably better off just betting the -300 pregame or betting a point spread or alternate spread to get the minus number down.

The reason it doesn't win is because the in-game algorithm prices the markets according to their (usually reasonable) estimate of how likely the bet is to win. If Duke drops from a 75% break-even to a 64%, it's usually because their actual chance of winning the game has dropped just as much.

On top of that, you usually have to play into a bigger hold if you want to bet in-game. Maybe you could grab Duke pregame at a 4% hold, but if you want to bet them in game, it's 6.5%.

The way to win at in-game betting is to spot the situations where the line feed has made an error making the line and bet those. Don't bet price targets, middles with your pregame bet, or bets with any other reasoning besides that you think the line is wrong.

Here's a little summary chart by sport of places to look for mistakes in the in-game feeds. This is by no means an exhaustive list—just a little inspiration. Recall the categories from above.

1. Mistaken game state
2. Failing to account for an important game-specific factor
3. Fundamental modeling error

Sport	Angle	Category
NHL	Goalie pulling strategy	2, 3
	Power play status	1
	More goals in 2nd period	3
	Forechecking aggressiveness	2
	Team strategies during a blowout	2
MLB	Starter vs bullpen quality	2, 3
	Who will pitch next inning?	2
	Will the pitcher get pinch hit for?	2
	Quality of remaining bench players	2
	How long will current pitcher pitch?	2
NCAAB	Players in foul trouble	2
	Pace of play	2
	End of game fouling strategy	2
	Injuries	2
	Going into timeout… Was foul a block or charge? A shooting foul? Was basket a 2 or 3?	1
	Intentional fouling strategy	2
	Pace of play	2
NBA	Key player rotations	2
	Too many points in the 4th quarter	3
	Substitutions during blowout	2
NCAAF	Quarterback injuries	2
	Correct down and distance	1
	Aggressiveness during blowouts	2
	Substitutions during blowouts	2
NFL	Not enough points in 2nd half	3
	Aggressiveness on 4th down	2
	Aggressiveness during blowouts	2

Taking Advantage of Sportsbook Marketing

A dirty secret of professional gambling is that a very substantial proportion of the win comes directly and indirectly from the casino or betting operator's marketing budget.

Back in the early 2000s, it was very easy to make a six-figure living playing poker full-time. Why? Because poker was the "hot new thing" (Buffalo Bill probably would have laughed at that one), and online poker operators were spraying around massive marketing budgets. Advertisements everywhere encouraged brand new players to deposit money and promptly lose it to the pros. Sites offered very generous deposit and reload bonuses, and professionals developed protocols to maximize these. And sites also ran affiliate marketing programs—these were designed to encourage professional marketers to use novel ways to reach new players. But this spawned "rakeback" where already established professional players would sign up for new accounts under one of these affiliates in exchange for being kicked back most of the money that was intended for the marketer.

Poker players were making money directly from the marketing budget (rakeback and bonuses) and indirectly (by enjoying a stream of fresh fish brought to them by the marketing). Once the frenzy died out and the money spigot got shut off, winning at

poker became a whole lot harder very quickly. You had to actually, like, study the game and stuff.

Daily fantasy sports followed a similar arc, though the glory days flamed out faster. But it was the same thing. The main sites had massive marketing budgets. (Remember those ads that were everywhere?) "Professional fantasy players" mostly had optimized their ability to soak up those sweet capital investment dollars while the marketing firehose was spraying away.

When the marketing budgets dried up, so did a lot of the "fantasy pros." To be expected.

The beauty of poker and daily fantasy sports is that you play against other players, so when a clueless person sees an ad and deposits, you get a direct crack at their money. In sports betting, unfortunately, you never get direct access to someone else's recreational dollars like that.

Nevertheless, as sports betting explodes across the country, so will marketing budgets (at least for a few years). You can and should funnel at least a few of these marketing dollars into your accounts.

DEPOSIT BONUSES

The main thing to look out for are deposit bonuses. The sportsbook says they will double your first deposit up to some limit—say $500. Usually these offers come with a substantial string attached. You have to bet some multiple of the bonus—maybe 10× or 20×—before you can withdraw the bonus.

Let's say you deposit $500. The sportsbook awards you a $500 bonus. You're required to bet 20× the bonus, or $10,000 in this case, before you can withdraw.

If you have the ability to find winning sportsbook bets, then great. Just make your winning bets up to the $10,000 requirement and either cash out or don't.

If you don't have that ability yet, however, you can still profit from the bonus. The key idea here is a bit counterintuitive, however. You should try to go broke.

Yes, you read that right.

You want to bet in a way that maximizes the chance you bust the account. Because if there's no bonus anymore because you lost it all, then there's no more betting requirement.

Okay, I know this sounds absurd, but this is the actual perverse math of these bonus things. Here's how it works.

Let's say all you know how to do is bet into 4% holds with no skill. So you expect to lose 4% of your total betting handle. If you have to bet $10,000, then your expected loss is $400. The entire bonus was $500, so after expected loss you're only making $100 (on average). Not great.

Now let's say you take my advice and go nuts with it. You bet the entire $1,000 on a +200 underdog. Betting the entire amount on a single event is the key idea. This is how you maximize the chance that you zero out the account. Choosing an underdog gives you a little extra chance to zero, which makes it a bit better.

Let's say this team you bet on at +200 actually has an 31% chance to win the game. Then 69% of the time when you're trying to clear the bonus, you will lose the first game, bust the account, and have bet only $1,000 and your "theoretical" loss is $70.

$$TL = -0.69 \times \$1000 + 0.31 \times \$2000 = -\$70$$

The other 31% of the time you have a $3,000 bankroll and a requirement to bet $9,000 more. So you do it again. You bet it all

on a +200 underdog. Now your theoretical loss is -$210 (because you're betting three times as much).

Say you win this one too, and now you have $9,000. You have to bet $6,000 more to fulfill the cashout requirement, so you do that at a 4% hold for an additional theoretical loss of -$240.

Your total theoretical loss therefore is

$$TL = -70 - 0.31 \times 210 - (0.31 \times 0.31) \times 240$$
$$= -70 - 65.1 - 23.06$$
$$= -\$158.16$$

By going for broke twice, you've cut your theoretical loss to the sportsbook from $400 to just $158.16. This is because those times you went broke ($0.69 + 0.31 \times 0.69 = 0.904$) you lost way less than the $400 in theoretical hold the sportsbook asked for in exchange for your $500 bonus. Only 9.6% of the time did you lose the $400 to the house.

I know this still likely seems like voodoo math, so I will break it down a different way as well.

Let's presume that the sportsbook allows you to bet through your requirement by negative scalping yourself. Like they let you bet the Ravens -160 and the Steelers +135 in the same game to lock in a roughly 4% loss with no risk.

In the first case where you didn't use my crazy strategy, you end up with about $600 every time. Your original $500, the added $500, and then the $400 loss from betting both sides of a few games until you met your requirements.

In the second case, 90.4% of the time you end up with $0. That's how often you lose either the first or second big bet. The other 9.6% of the time you end up with $8,760—the $9,000 you have after winning the longshot games minus the $240 loss from negative scalping to meet your requirement.

Your average bankroll then is 9.6% of $8760 or $840.96. (This is $1,000 minus the theoretical loss of $158.16 I calculated above, modulo a couple rounding errors.)

Do it the lame way, you come away with $600. Do it my way, you come away with $840.96 on average. You make more money on average with these bonuses if you try to bust your entire deposit.

The key observation is that they give you the $500 up front. You only have to give them the $10,000 of action (which costs you at least $400 in expected losses) if you don't lose the money first. The more often you go broke, the less often you have to give them their expected losses, and paradoxically the more you will make on average.

Obviously you have to be very willing to lose your initial $500 deposit to make this strategy attractive. If $500 is a lot of money to you, you're better off taking the sure thing than the wild gamble.

But if you can afford to burn through some $500 deposits, my strategy is much better. Not only do you make a lot more money over the long-term doing it my way, but sportsbooks will like it a lot better as well. They want you to gamble with the bonus money. They don't want to see you grind it away and cash out at a small profit. If you plow that deposit and bonus straight into a wild longshot and lose, you've got a better chance at getting another marketing offer from them soon.

Whereas if you just grind out your $100 and cash out, you may end up on the marketing blacklist.

Finally, notice that I effectively bet a parlay when I did this—but I did it by manually parlaying the two bets. Don't roll this up into a single parlay ticket, because then you will get credit only for your original $1,000 bet toward the requirement rather than $4,000.

If you want to use my go-for-broke strategy, do some wild parlaying, but ideally do it by finding longshot straight bets and parlay them manually.

ODDS BOOSTS, BAD BEAT REBATES, AND MORE

Sportsbooks are finding new and innovative ways to spray cash around as they compete for market share. For the most part the strategy on these is easy. Get in front of the hose and open wide.

If they're boosting the odds on a bet, bet the maximum allowed on it.

If they're giving you your money back if a moneyline bet loses that was leading at halftime, bet moneylines there instead of point spreads.

If they're offering a zero-hold market on a game, decide which side you like better and bet it.

That sort of thing. This is all free money. Get it while the getting is good, because it won't last.

FREE PLAY

If a sportsbook offers you free play or betting credit instead of cash in your account, then you want to bet that free play on a massive longshot. It's because the sportsbook keeps the free play credit after you bet it, and you only keep the winnings.

Say you have three options for a free $100 bet, a -200 play, an +100 play, and a +200 play. Let's say the -200 bet wins 70% of the time, the +100 bet wins 50% of the time, and the +200 pay

wins 30% of the time. That is, if this weren't free play, the -200 would be a good bet, the +100 bet would be break-even, and the +200 would be a losing bet.

If you bet the -200 bet, 70% of the time you'll end up with $50 for an average of $35

If you bet the +100 bet, 50% of the time you'll end up with $100 for an average of $50

If you bet the +200 bet, 30% of the time you'll end up with $200 for an average of $60

The "sportsbook keeps the free play credit" part of the free play means you will always make more if you bet a longshot so bet the biggest longshot they'll let you bet with it.

FROTHY ATTITUDES

This is a subtler point and not one you can directly take advantage of, but be aware of it. In 2019, sports betting in the US is the hot new thing. Investors can't wait to throw their money at the industry. Upstart sportsbook operators are madly trying to get deals to move into new states. This frothiness is temporary. It won't last.

While things are still frothy, sportsbook operators are likely to be more tolerant of winners. When the CEO of the sportsbook is worried about how to spend the $100 million in capital she just raised and how to secure entry into eight new states, she's probably not going to sweat that you're crushing her on correlated football parlays.

Eventually, reality will set in. This is a tough business. Investment dollars will dry up. Operators will consolidate. Some will go bankrupt. That's when the belt-tightening will start, and

when the mood shifts to cost-cutting, winning bettors will be prime targets.

Not much you can do about this. It's the natural course of things. Just be aware of it, realize the good times may be here now, but they won't last, and get what you can while you can.

Chopping The Hold

One of the most powerful ways I know to think about whether a sports bet is winning or not is to think about the hold. Sportsbooks win against their customers because they tack a hold onto their markets. If I can chop that hold down to zero and then turn it negative, then I'm the one who will win.

I could beat Mongolian netball markets with a negative hold.

You start with the 4% hold that the sportsbook has tacked on the market. Then you use every trick you know to try to chop away at that hold. If you can chop it below zero, you bet it.

You don't have to get it much below zero. Remember the story about the guy on the Internet claiming to hit 60% of bets. Never mind that it's a bullshit claim, you wouldn't want to hit 60% anyway. Because to hit 60% you'd have to intentionally pass on 58% and 56% and 54% bets. Why the heck would you want to pass on bets that win? There are a lot more 54% bets floating around out there than there are 60% bets.

The main reason to pass on a "marginal" bet is when if you're wrong about it, you end up eating most of the hold. An example would be if you found an obscure prop bet that is offered at only one sportsbook. They have an 8% hold on the market. You have a model, and your model says that you have a 0.5% edge on one side of the prop.

Don't bet that. Yeah, the prop likely isn't priced very well. But in the best case when you have the situation pegged exactly right,

you have a 0.5% edge. But if you've made a substantial mistake pricing the bet, then you could be betting essentially at random, which means eating the 8% hold. Those are the marginal bets to pass on.

The more market information you have, though, and the surer you are that you're at worst betting into a small hold, the more you should err on the side of betting your ideas.

The first step is to open accounts at lots of sportsbooks and compare market pricing between them. You're trying to create synthetic markets with low hold. If you compare only identical markets (like a 6.5 full game point spread only versus another 6.5 full game point spread), that's like trying to buy a vacuum cleaner but limiting your shopping search only to brick and mortar retail stores.

If you expand your comparison shopping to related markets (like comparing a 6.5 full game point spread to a 6-point spread or a moneyline), that's like adding in some major internet retailers to your search for the best priced vacuum.

If you expand further your comparison shopping to derivative markets (like comparing a full game point spread to a first half or first quarter point spread or moneyline), that's like trawling Craigslist and hitting the garage sale circuit bright and early Sunday morning trying to find bargains.

The more you expand your shopping search, the better deals you will find—though at the cost of time and effort.

If you want to be able to comparison shop properly, you'll need to be able to convert prices between different point spreads and across derivatives. If -6.5 is -110, what is the equivalent price for -6?

This sort of conversion is easy to do. You need some league data and then you need to build a push-rate chart like I described

earlier in the book. And with the same dataset you can build full game to first half and first quarter conversion charts as well.

You don't have to do this work, but if you don't, you're going to be stuck shopping the brick and mortar stores, and you'll find many fewer good bets.

So you're trying to chop that 4% hold down to nothing. For most bets you find, most of the chopping will happen in this step—finding the synthetic low-hold market. Say you get a 4% hold market down to 1% by creating a market between a first half total at a retail sportsbook and a full game total at a market maker sportsbook. The retail sportsbook has a higher price on the total, so if you're betting under, you're betting it there. If you're betting over, it will be at the market maker.

How do you get rid of the other 1% to make a good bet?

Maybe you have an angle play? What's the weather? Say it's moderately windy. Perhaps it's not windy enough that all the sports-talk folks are making a big deal about it. It's just a little windy. But you know that high winds push scoring down, so low-medium winds should also push scoring down, but by a smaller amount. Is that worth 1%?

Maybe not. It's worth something though—and if you notice something like that in a game, it should make you more inclined to bet with the angle and less inclined to bet against it.

Maybe you think it's worth about 0.25%. Okay. So now we're down to 0.75% hold if we want to bet under.

Was there any price movement at a market maker? Say the total for this game recently moved lower at the market maker you're looking at. This is a steam situation—the price moved, but the retail sportsbook hasn't adjusted or moved their first half derivative yet. That's worth something due to the agreement effect—whoever bet the market maker total lower would likely also tend to agree with your first half under bet at the retail book.

Sports betting is a multiplayer game. If other folks who are moving markets would likely be on your side of a bet, that's a good sign.

Maybe it's worth 0.5% here. Whoever bet under didn't keep betting it to move the market even lower, but there's a chance they would have bet it if they could have gotten your (better) price.

Okay, you've got the hold down to 0.25%. Still not zero, but close. Maybe you sit on the bet for a bit to see if you can find one more arrow pointing in your direction to tip the scales.

Say the market maker moves down a couple more ticks on their total. Okay, go bet.

Say some injury news breaks—one of the better offensive players who was listed questionable is announced out. Okay, go bet.

Say the weather report changes and a little more wind is now predicted. Okay, go bet.

Say you can find what is clearly a good bet on a first half side at the same retail book that has the total you almost like—and you know that the side will be mildly correlated with the under. Bet the parlay.

Or, on the flipside, the market maker moves up a couple ticks on the total. Hold off.

Some injury news breaks the other way—that good offensive player who had been listed as questionable is confirmed to play. Hold off.

And so on.

Everything is in constant flux. Lines are moving. Synthetic markets with low hold are appearing and disappearing. News is coming in. Weather reports are changing. You're looking for moments in time when the sports betting universe is cutting you a break. When it's saying, "Sure, go ahead and bet either side, and

we aren't going to charge you any hold this time." When it's saying, "Sure I see that sharp price at the market maker that's been hammered into place with millions of dollars of action, but I'm going to offer you a closely related bet that I've priced myself and it's 5% off the market maker's price. Happy Birthday."

I like this model of trying to chop the hold down to below zero on your bets because it keeps you out of trouble. You get the hold down to 0.25% and then you get a little overzealous on one of your angles and bet when you probably shouldn't have.

Okay, big deal—you're betting into a 0.25% hold market. You just can't get it very wrong when you do that.

You only get in trouble when you try to be a hero into full hold markets.

This is the fundamental process for finding good bets. If you want to dive deeper, then you can add two more powerful tools to your toolkit.

Data modeling. It's very hard to build a model that crushes major markets if you try to take them head-on. It's much easier to build a model that's useful for tipping the scales when you get close—like in the 0.25% hold example from above. Say you had a simple model using widely available data to project totals for this sport, and your model liked the under by a little bit. That by itself could be worth another maybe 0.5% to 1% on the hold, tipping it into negative territory and giving you an easy bet.

If you decide you want to take sports betting seriously, you'll have to start working with data and building some models.

Subjective handicapping. We didn't cover it yet in the book, but it's a real thing that can help you win. What did the quarterback look like last game? Does that rookie pitcher on a hot streak appear to be the real deal, or does it feel like the magic is going to disappear at any moment? Does that basketball team

seem like they're mailing in the rest of the season, or have they just had a series of tough results?

On its own, subjective handicapping isn't enough to win anymore. But in-depth knowledge of a sport moves the needle. Putting in hours watching games on replay matters. Insights you get from doing this can be worth maybe 1 or 2% on the hold if your opinion is strong and reliable enough.

So, again, you don't want to blast away into 4% hold on your pet theory about the backup quarterback who is starting the next game. But if you can get the hold down to 1% by line shopping, comparing related markets and derivatives, by using steam or other weak angles, then your opinion about the quarterback might then be enough to tip the balance.

FINAL THOUGHTS

The more pieces you can bring together, the more likely you are to have found a good bet. All the ideas in this book work together. Any one idea on its own might not be enough to unearth a good bet, but several ideas working together can do it.

Think in terms of break-even percentages. How often does your bet have to win to be profitable? (That's the basic break-even percentage calculation from the beginning of the book.)

How often does the market think your bet will win? That's a different question that requires you to draw inferences from prices you see at market maker books, recent line movement at those books, conversions between related and derivative markets, and more.

If the market thinks your bet will win in the ballpark of the break-even percentage you're being offered, is there a reason you

might know just a little bit better than the market how often this bet will win? Do you have a little extra information? Are you analyzing widely available information just a little better? Are you betting into a weak sportsbook or weak market where your information advantage will be more reliable? Or are you thinking of betting into a stronger book or market where you may not always come out on the right side of the information equation?

If the market thinks you're close, and you think you have an extra edge to put you over the top, then go ahead and bet. The worst you can be is wrong.

How Do I Know If I'm Winning?

This is the question at the heart of it all. Am I winning? Am I beating the system? Is what I'm doing good enough?

It can be fiendishly hard to figure out the answer.

If you're winning money, it's tempting to assume you're the smartest person in the world, and the good times will keep on rolling. If you're losing money, it can be intensely frustrating, especially if you're convinced what you're doing should be winning.

Throughout the book I've talked about winning and losing like it's some foregone conclusion. Do this and it will win. Do that and it will lose.

The reality is a lot messier than that. Whenever I say, "win," I mean, "win on average," or really, "will win eventually if you keep on doing it over and over again and don't give up and nothing important changes in the interim."

I didn't really talk about things like risk, variance, and bankroll in depth because it's a huge topic worthy of its own book. But the main idea is that in the long term, winning strategies will win and losing strategies will lose. In the short term, absolutely anything can happen. And the short term is a whole lot longer than most people without years of gambling experience appreciate. The long term is always longer than you think it is.

Thus, the question. How do I know if I'm winning?

First, you have to start betting. There's no such thing as figuring out if you're going to win without getting your beak wet. Sports betting is a multiplayer game, and if you're not betting, you're not playing. Tracking make-believe bets is not the same as betting.

That's step one. Get in there and bet. Start with low stakes if you like. But if you're betting real money then you're playing the game.

Step two is to keep records. Record what you bet, how much you bet, the result of the bet.

Step three is to do it for a while until you get a nice record of settled bets. Are you winning or not? At some point this record begins to speak for itself. If you're ahead after, say, a thousand bets, that's a good sign.

But even then, record is not definitive. The long run is a very long time. No doubt you will have improved your process over those thousand bets. But also, the sportsbooks you bet into will likely also have gotten smarter during that time as well.

So here's my best answer to the original question.

Sports betting is a multiplayer game. You know you're winning at sports betting the same way you know you're winning at poker. You have to evaluate your opponents. You've got to be able to spot the sucker.

Each bet you make has a break-even percentage. To be profitable, your bet has to have a higher winning percentage than that number. The market, by definition, thinks it doesn't. Why are you right and your opponents wrong? Who's the sucker?

In my experience, every winning bet fits into one of two categories. Either you're winning because you have more information than your opponents. Or you're winning because you are using available information better than your opponents. If you

can't point to which one of these applies to each bet, it's probably not a winning bet.

Do you have more information than your opponents? This is information that is not included in the line you are betting into and can range from market to weather to injury information.

Chasing steam is an example of having more market information. You know the line moved at the market makers. You notice that Sportsbook ABC hasn't moved yet. You have more information about the line than the employee at Sportsbook ABC has. That's your advantage.

In this case it's obvious you have more information—you can see the line at the market maker, you can see the line at Sportsbook ABC, and you can see that the line moved at the market maker and that five other sportsbooks followed the move and ABC just hasn't moved yet.

It can be trickier to tell if you have weather or injury information that others don't, but keep in mind you don't need to have the entire market scooped. You just need one sucker.

Say you're watching an NBA game, and you see a player writhing on the ground after a hard foul. The game goes to commercial. You rewind your DVR, and it appears to you that the player simply had the wind knocked out of him and perhaps is playing it up a little for the refs.

Sportsbooks come out with their in-play lines. Most sportsbooks have something around Warriors -7 -104. But one sportsbook has Warriors -7 -120 and Rockets +7 +100. Your experience tells you the line should be Golden State -6.5, but you suspect you're seeing higher numbers across the board due to the indelible image of the Rockets' best player rolling around on the ground.

You can create a synthetic market with 1% hold between the Warriors -7 -104 at one book and the Rockets +7 +100 at

another. It's probably a good idea to bet the Rockets +7 +100, and the reason you're betting is because you think you have more information than that one sportsbook. You watched the DVR replay. They likely didn't.

The other category of bets is when you have the same information your opponents have, but you use it better. Better analysis, better insight, better ideas. That's really all an angle is, after all. You're looking at information that's freely available to everyone. Travel schedules. Weather. Or things like tipoff or coinflip strategy. And you're putting the pieces together better than other people are. Using statistical models to bet also fits in this category.

If your perceived edge comes from using information better, make sure you can specifically point out how. What are you doing better than your opponents? Better math? Better insight? Have you sorted the data in a unique way?

If your big idea is, "I can download a bunch of data and run a regression on it better than everyone else," well, you're probably fooling yourself. Instead, if your idea is, "I know more about how travel schedules affect hockey teams than other people do," you might be right.

The "better than other people do" part of it is, of course, the key part. You need to figure out what you're good at, and then you need to get an idea for where the other players are in the same space. Say you've done some research, and you now know that a difficult travel schedule has a bigger effect on the travelling team during one specific period of a hockey game. Do the people who open the single-period derivative markets seem to know about this? You can look at the numbers they open in travel-relevant games and figure this out.

Do other bettors seem to know this angle? When the markets open, do the lines move in the way you'd expect? By watching the

line movement (or lack thereof), you may be able to get a good idea of what people do and don't seem to know. Maybe they seem to understand in general that travel matters, but they don't have one of the nuances of it figured out. So they underbet the travel angle in some games and overbet it in others.

It's like poker.[5] If you sit at the table long enough and watch the actions of your opponents, you can sometimes reverse engineer their thought processes. You can make predictions about how they will react to future situations. You can get a sense for what they know and what they don't. You know you have an edge at poker when you can clearly explain the mistakes your opponents are making, and you can formulate a counterstrategy to exploit those mistakes.

Sports betting is the same. However, you should give your opponents in this game plenty of respect. Every one of your relevant opponents is a smart, informed person with experience playing the game. They don't know everything, but they also aren't dumb. Don't pretend you are playing against the "Joes" of the world. "Oh, the public can't get enough of the huge favorites and there's value everywhere on dogs!"

No that's not how it works. There are plenty of Joes out there, but they aren't playing your game. They're betting into retail sportsbooks, and the retail sportsbook business model is designed to profit from their mistakes without sharing any of those profits with you. No easy money for you.

Your opponents are sportsbook employees and other smart bettors. They read the sports analytics websites. They look at data.

---

[5] If you want to check out Ed's poker strategy books, try *The Course: Serious Hold 'em Strategy For Smart Players.*

They do research. They follow Twitter for breaking news. It's not easy to beat them at their game.

The good news is that the more sports betting expands, the more attack surface there will be. There will be more props and derivatives and in-play bets on offer, and these bets will appear on betting menus before anyone at the sportsbooks have really nailed the math on them. Bigger menus mean more ways for a sportsbook to overlook something—perhaps allowing parlays on bets that are correlated. Bigger menus also mean more ways to turn angles or other insights into profitable bets.

Sports betting expansion will also bring bigger marketing budgets. Deposit bonuses and odds boosts and loss rebates and other promotions can be a great source of winnings on top of what you can win just by finding good bets.

One day it may be impossible to win. All-knowing AI algorithms may make precise line moves on all incoming information and then may perfectly adjust all bet menu pricing on the fly as new information comes in. Maybe one day.

But that's not today. The sports betting of today is a big frothy mess. There are some things the market does very well. Price discovery on major markets is a powerful force, and it's hard to take the biggest markets head-on and win.

But there are also many weaknesses lurking just under the surface. If you can create information advantages for yourself, and you can identify those advantages with a clear head and turn them into bets, then, if just for a little while, you'll be able to open a new account at a brand new sportsbook and say, "I found the sucker."

Acknowledgments

A big thank you to Andrej Semnic (semnitz on 99designs.com) for a fantastic cover design.

Thank you to the folks who took time out of their days to read, edit, and give feedback on the book like Rufus Peabody, Brian Wyman, Chris Fargis, Adam Zerner, Jake Williams, Rex Beyers, Harlan Redlick, Dan Singer, Steve Fenic, Steven McLoughlin, Matthew Trenhaile, Joe Brennan Jr., Matthew Flynn, Jack Andrews, Jamie Poster, Matt Brown, Brett Collson, Dave Clark, Eric Rodawig, Leo Meyers, and Robert Walker.

Finally, thank you to Diana Davidow and Elaine Vigneault who are indispensable every day and without whom this book and likely many other things would not be possible.

Appendix A

This chart converts various odds formats to break-even percentages.

Decimal Odds	Fractional Odds	American Odds	Break-even Percentage
100	99/1	+9900	1%
50	49/1	+4900	2%
33.33	97/3	+3233	3%
25	24/1	+2400	4%
20	19/1	+1900	5%
16.67	47/3	+1567	6%
14.29	13.3/1	+1329	7%
12.5	23/2	+1150	8%
11.11	10.1/1	+1011	9%
10	9/1	+900	10%
9.09	8.1/1	+809	11%
8.33	22/3	+733	12%
7.69	6.7/1	+669	13%
7.14	6.1/1	+614	14%
6.67	17/3	+567	15%
6.25	21/4	+525	16%
5.88	4.9/1	+488	17%
5.56	4.6/1	+456	18%
5.26	4.3/1	+426	19%
5	4/1	+400	20%

Decimal Odds	Fractional Odds	American Odds	Break-even Percentage
4.76	3.8/1	+376	21%
4.55	3.6/1	+355	22%
4.35	3.4/1	+335	23%
4.17	3.2/1	+317	24%
4	3/1	+300	25%
3.85	2.9/1	+285	26%
3.7	2.7/1	+270	27%
3.57	2.6/1	+257	28%
3.45	2.5/1	+245	29%
3.33	2.3/1	+233	30%
3.23	2.2/1	+223	31%
3.13	2.1/1	+213	32%
3.03	2/1	+203	33%
2.94	1.9/1	+194	34%
2.86	1.9/1	+186	35%
2.78	1.8/1	+178	36%
2.7	1.7/1	+170	37%
2.63	1.6/1	+163	38%
2.56	1.6/1	+156	39%
2.5	1.5/1	+150	40%
2.44	1.4/1	+144	41%
2.38	1.4/1	+138	42%
2.33	1.3/1	+133	43%
2.27	1.3/1	+127	44%
2.22	1.2/1	+122	45%
2.17	1.2/1	+117	46%
2.13	1.1/1	+113	47%
2.08	1.1/1	+108	48%
2.04	1/1	+104	49%
2	1/1	±100	50%

Decimal Odds	Fractional Odds	American Odds	Break-even Percentage
1.96	1/1	-104	51%
1.92	1/1.1	-108	52%
1.89	1/1.1	-113	53%
1.85	1/1.2	-117	54%
1.82	1/1.2	-122	55%
1.79	1/1.3	-127	56%
1.75	1/1.3	-133	57%
1.72	1/1.4	-138	58%
1.69	1/1.4	-144	59%
1.67	1/1.5	-150	60%
1.64	1/1.6	-156	61%
1.61	1/1.6	-163	62%
1.59	1/1.7	-170	63%
1.56	1/1.8	-178	64%
1.54	1/1.9	-186	65%
1.52	1/1.9	-194	66%
1.49	1/2	-203	67%
1.47	1/2.1	-213	68%
1.45	1/2.2	-223	69%
1.43	1/2.3	-233	70%
1.41	1/2.5	-245	71%
1.39	1/2.6	-257	72%
1.37	1/2.7	-270	73%
1.35	1/2.9	-285	74%
1.33	1/3	-300	75%
1.32	1/3.2	-317	76%
1.3	1/3.4	-335	77%
1.28	1/3.6	-355	78%
1.27	1/3.8	-376	79%
1.25	1/4	-400	80%

Decimal Odds	Fractional Odds	American Odds	Break-even Percentage
1.23	1/4.3	-426	81%
1.22	1/4.6	-456	82%
1.2	1/4.9	-488	83%
1.19	4/21	-525	84%
1.18	3/17	-567	85%
1.16	1/6.1	-614	86%
1.15	1/6.7	-669	87%
1.14	3/22	-733	88%
1.12	1/8.1	-809	89%
1.11	1/9	-900	90%
1.1	1/10.1	-1011	91%
1.09	2/23	-1150	92%
1.08	1/13.3	-1329	93%
1.06	3/47	-1567	94%
1.05	1/19	-1900	95%
1.04	1/24	-2400	96%
1.03	3/97	-3233	97%
1.02	1/49	-4900	98%
1.01	1/99	-9900	99%