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PROFESSOR: Today, we're going to be talking about something a little bit away from the game of poker, per se, and more about looking at poker as an investment. The conceit here is that, to some extent, you're either a winning poker player now, or eventually you'll get there. So this is looking at now that you have these alpha streams, these streams of positive EV that you can pick which ones you want to embrace, how do you balance out? How do you look at your future, given that this is now an option you hold?

Cash game here just means anything that's not a tournament, where tournament is a poker structure where you buy in, and with money, you receive tournament chips, and you only get money to the extent that you survive longer than someone else, where the person with all the chips in the end wins some set piece, not necessarily all their chips. Whereas a cash game is one such that each chip has a specific value, like you're actually bedding real dollars, and you can enter or leave whenever you like.

So in cash games, chips are effectively literal money, so the more chips you win, the more money you win. Whereas in tournaments, all that matters is the position you finish. When we talk about the Independent Chip model, we'll talk about when those diverge. The second point is about that, where Chip EV, like literally having more chips, in a cash game is directly related to the amount of money you make. If you're making a decision that results in you having more chips, you make more money in the long run.

Whereas in a tournament, it's a little bit more complicated. They're congruent, and they generally trend in the same direction. But in some particular cases, what's something that's positive Chip EV may be either positive or negative in terms of

Dollar EV, and we'll talk about that in a little bit. Cash games-- you can come and go whenever you want. That makes them very liquid. If you're a big cash game player, you can generally grind out your hourly win rate whenever you want, especially online. There's a little bit of overhead when you play live, but cash games are much easier to just come and go with regard to kind of executing your skill.

With tournaments. you get all your EV from winning, from lasting long, so you're generally stuck. The better you are, the longer these tournaments take, and you have to kind of be there for the long run and generally plan to last a long time. In cash games, you can buy in as many times as you want. Like if you're in a cash game with a lot of bad players and you get knocked out, you can just buy back in. It's like it never happened. With a tournament, if you're at a tournament with a lot of bad players, and you get knocked out the first hand because you get unlucky, you never get to redo that for most tournaments. You always get kind of a new field of players, and you don't have the opportunity to reenter a tournament. Your only choice is to enter at the first time or not.

Cash games have fixed blinds. The situation that you're in when you start is generally the situation you're always going to be in, so you don't need to factor in having a different size stack. Presumably, you're always going to have at least the maximum buy-in or more. Whereas in tournament situations, you're going to be short-stacked. People at your table are going to have a widely different stack size.

In cash games, you have a single table selection, which is you get to see the nine people that you're going to play against. And you can watch them, and you can see if eight people call pre-flop in a cash game, you know that probably seven of those people are bad, and you can just enter that game and play against those eight or nine people-- totally fine.

Whereas for tournaments, because you're only playing against nine other people in the tournament of a field of say, like 100, you only really get to target groups of people. You can identify an audience of people who would enter that tournament and then get an idea of what the average person you'll play against will be, but you

can enter tournament with 90 fish and 10 pros and be at a table of 10 pros to start. So that adds a little bit of variance.

It also adds some complexity in trying to get a read at your table and kind of make that jive with your read of what the average player should be for that tournament. Like the World Series of Poker is typically a tournament that has like 60% fish, 40% percent pros nowadays. But a lot of tables end up like eight pros and two fish, and that creates a much different type of situation for you than if you were at a table that was primarily new players.

As I said before, cash games have higher liquidity. The best kind of career you can make in poker is being really good at a cash game, because you can go anywhere and play those. You can play as long as you want. Like if you only have two hours and you're in Vegas, you can grind out pretty confidently like \$150 in EV, no problem. Whereas in a tournament, it's much more uncertain how long it'll take you to capture that EV and how long you might be obligated to stick around.

For what's considered normal win rates, cash games are considered lower variance. Tournaments are considered higher variance. If you're winning at cash games, you're crushing it, but it's much, much harder to win at cash games, at least at the medium high stakes. It's for this reason-- it's because anyone who's a loser at a cash game knows it immediately and drops out really quickly. Whereas in tournaments, some of the big name pros are probably losers at this point, they just don't know it yet. Because you can go years before you find out whether you're actually a winner or a loser at big tournaments.

Let's talk about the tournament life cycle. The early game is going to be everything before the bubble. So it's going to be like the first 90% of eliminations in the tournament will be in the early game, although because of how tournaments work, that ends up being like half the tournament in terms of time. But you get the idea anyway. Play during the early game is very similar to cash games. There's no ICM. There's no difference in the value of chips early on, because when you have 1,000 chips, and you need 100,000 to win the tournament, a difference of 50 chips isn't

that big of a deal.

The difference in value of chips doesn't really matter that much, which is why I'm saying that Tournament Chip EV is approximately equal to real Dollar EV, so make decisions as if it were a normal cash game. In addition, your playing style is going to be entirely influenced by your stack size. Having the same proportional stack size later in the early game, you'll make the same types of decisions. I'm defining different zones of play based on your stack size.

If your M is less than 2, I'm calling that the dead zone, Harrington called it that. 2 to 8 is the steal period. 8 to 12 is the steal re-steal period, and we'll explain what that is later. 12 to 30 is the value-betting zone, and then 30 or more is a set-mining zone. Let me talk about tempo before we get into what exactly those things are.

The most important thing about tournaments with regard to how it's different than a cash game is getting the speed right, like getting your aggression at the right level. Doyle Brunson used to say "never get caught speeding in a tournament." What that means is don't get caught being way too aggressive way too early on, and by early on, I mean when you have a big chip stack. So you need to win coin flips, like you will have to win several hands when you're behind to win a tournament.

So what you should do is make sure that when you're not in coin flips, you slowly grow your stack, and you avoid flipping when you don't have to so that when you actually do flip, you end up with more chips. Like those small differences are the things that are multiplied all throughout the tournament to make you-- instead of like 1% chance of winning a tournament, like 3% or 4%. That's where your edge really materializes.

The dead zone-- being in the dead zone is terrible. It's much worse than half of having 4M. You should only ever be in the zone because you lost the last hand, and you had slightly more chips than that guy. Because this is a really bad situation to be in, because you have no fold equity. So fold equity is where your value is going to come from, because you're not going to win a lot of showdowns in a tournament, and a lot of your EV from the tournament is going to come from fold equity. So if you

have less than 2M, you're going to bet like pre-flop, and the big blind is going to call you without even looking at his hand, which means you have no fold equity-- like you basically have to win a showdown to get back into it, and that's a really bad situation.

You want to get out of the dead zone before you have to pay a big blind, and then you're going to be stuck on whatever hand you get there. The reason is you want to be able to get your fold equity back. If you're under 1M under any circumstance-- so never, never do that. Call any two cards before you get to 1M. Why? Because if you have 1M, and then you double up, you still are in the dead zone, like you're basically at least one coin flip behind being in a terrible situation. So enter any sort of coin flip to avoid getting below 1M.

So a lot of your value is going to come from this steal period, and by steal, I mean stealing blinds. When you have between 2 and 8M, your only decision is to go all in or fold. Because every time you steal the blinds, and the blinds are really valuable to you, you increase your stack by like 20% or 30%-- like that's a big deal. That's probably more than your equity from actually going to showdown. Unless you literally have aces, that's probably better than any sort of edge you're going to have by getting called. So find out who doesn't protect their blinds and steal from them. You should've been reading people early in the tournament to find out who's a pushover-- like they're going to be your best friend, because you're going to steal blinds from them.

On the converse, pretend like you're someone who defends their blind, because if you get walked-- if everyone folds to your big blind-- you just get one additional M for free. But don't actually do it, because you don't want to see a showdown. It's a bit of a game of chicken, and I will actively pretend, like I will tell a person I will actively defend my blinds-- because it's not binding, and you can do that-- and then just think about whatever hand I have and then fold. You should still be calling at a very tight range, but to the extent that you can convince them not to push into you, it's almost as good as the stealing yourself. So avoid showdowns if at all possible.

A lot of your hands are going to be played in this period, and the most important thing you can do is find opportunities to steal. Don't get into showdowns. Don't call unless you think you're like a 70% favorite. And it's related to the Gap Theory, which is by Sklansky, which says to call a hand, to call it all in, you need a much stronger hand than to push. Why? Because when you push, when you bet, you have full equity, and when you call, you don't. And that's the difference. Like you can push with any two cards in a lot of situations, but you need to have a good hand to call.

So you're here your goal here is to keep your head above water. Don't fall below 2, and preferably get into like the 10M period, either by doubling up or by stealing. So if you steal three hands in a row, you have 11M, if you're at 8. That's the idea, here. And then once you're at 11M, you're in a much more interesting situation. So this steal, re-steal period is when everyone is trying to steal blinds, except you have the equity such that if you get re-raised, you can fold. What will happen is people bet into you, and you have to re-pop them sometimes. And then like you have to identify who's going to re-pop you and avoid them.

Here's the idea. If you steal a bet with like 2M, and if he re-raises you with 6M, you're like marginally to call any two cards. Then if you have an M of 5, for example, you fall below. If you have a 27% equity, it's a good call, meaning any two cards, because you're at least 70%-30% basically all the time. Whereas if you have an M of 12 and he pushes, you have to have a 40% chance of calling, like you can actually fold this, and that's good, it gives you more optionality.

The Value Betting Zone is where you might actually get to see a flop, and you have to plan for that. Your hand, pre-flop, is actually valuable to the extent it hits the flop, not like it is when you have lower M, where your hand's going to be valuable to the extent that you're likely to be winning pre-flop. So this play in 15M to 30M is very similar to what a cash game play is like. So you're probably going to see a bunch of flops, and we're going to plan accordingly. You still don't want to flat call pre-flop. When you play a hand, you want to be the aggressor. You want to raise when you have a good hand. You want to fold when you have a bad hand.

I'm going to call this Flop, Turn, River, Play, but I really mean it's play when you have enough chips to actually see the flop. What you should do is not play that many hands, but when you play hands, play them aggressively. So the standard bet here is going to be 3 big blinds, plus one big blind for every caller before you. So if everyone folded before you, you bet 3. If two people call before you, you bet 5, 5 times a big blind. All your bets should be big. They should be big, big portions of the pot. 2/3 is an OK number. If you think the person is particularly weak, you can bet the pot.

First, we're going to talk about pre-flop. When your M is high, your value comes from having a good hand on the flop. I still don't care about the river. If you do this right, you're probably not even going to reach the river by the time someone is all in. We're only worried about the extent that your hand is valuable on the flop.

Depending on your position, this is what I'm recommending your opening range is, where I'm saying you're opening by raising to three big blinds. So I'm saying that if you're an early position, you should really only do this with like the top 5% of hands, which is 10s or Ace-Queen, suited, or Ace-King. The difference in suitedness actually matters there.

If you're first to act, any other hand, you should fold, which is obviously the majority of hands, because you have the least amount of information now-- like you might be up against someone with another strong hand, now. And then on like every card hereafter, you're going to be in the worst position. So to win in that position, to be profitable in that position, you need to already have a really good hand. To the extent that you have the option to just not play a hand, it seems to make sense that you would prefer not playing hands when you're in a bad position. So that's why that's a really tight range.

When you get to middle position-- so maybe like four people to act after you-- you could widen up a little bit, which a lot of you might think is still very tight range-- and it is. This might be close to like 15%, where you have 8s or Ace-Jack, and maybe, King-Queen. Every other hand, you should be folding. Like that's your range for raising out of any sort of middle position. And then it makes it easy, because you

can imagine what type of flop you either hit or don't hit, here.

So if you're facing a raise, what I recommend is you just move everything up one. So if you're facing a raise in early or middle position, then you can play 10s, Ace-Queen, Ace-King, and if you're late, then you can start playing like Ace-Jack. So when it comes to a flop, by this time, you will have raised pre-flop, and you are now the aggressor in the hand. So if you were the aggressor, you should bet $\frac{2}{3}$ of the pot. That works a lot more often than you would think, even among people who know what a seed bet is. Then the break-even, based on our formula, is going to be $\frac{2}{3}$ divided by $\frac{5}{3}$, or 40%.

This is what I'm recommending in terms of tiers. This Tier 1 is a King-high flush, like I'm giving you a little bit of leeway, there, where you don't need to have literally the Ace-high flush. But if you have the King-high flush, you can go broke for 30M. In addition, the literal top straight. So if the board is 4, 5, 6, and you have 7, 8, you can consider that Tier 1. And this is only going to be relevant on an unpaired board. Why? Like, what does a paired board mean?

STUDENT: Somebody's got a flush.

STUDENT: Somebody [INAUDIBLE]

PROFESSOR: It means a full house is possible. So if a full house is possible, it basically makes your hand worse than six more hands that are possible. Like a flush or a straight on a paired board would be considered Tier 2. Like if they're betting aggressively into you, and you have an Ace-high flush, you might be ahead. But then if they're raising you, then I would be very worried about you being up against a full house. So I would bet those much less aggressively, and then I would only bet the Ace-high flush, here. Like if you have a King-high flush on that board, there are all sorts of hand that can beat you.

In addition, I'm saying if you have what-- like the fourth best flush, here, you can bet it, but you can't raise it, really. You can't raise it if they raise into you, because that just gives them too many opportunities to have a hand that would actually beat you.

So a 10-high flush isn't bad. You shouldn't fold it. And you're not really drawing, but you should understand that it doesn't have four bets of value. It only really has two bets of value, either a bet and their raise, which you'll call. Or if they bet, you can raise them, and that's generally it. And that's obviously on an unpaired board. This also counts a second straight-- so a straight where you don't have the top two cards, but you have two cards that give you a straight that are slightly lower.

In addition, bottom set-- I would put here in addition to any two pair. So two pair is crushed by a set, and then bottom set is also crushed by any set. It has the same problem. So I'm calling this Tier 2, and I'm saying that's good for like two bets. Tier 3 is an Overpair. So if you have a pair of Jacks, and the flop comes 2, 3, 4, or something that is a little bit less correlated, like 2, 3, 10. Like an Overpair is good. It's slightly better than Top-Pair Top-Kicker, because you beat Top-Pair Top-Kicker. And then Top-Pair Good-Kicker, I'm saying is also Tier 3, where you might be able to take it down. Like if you bet, and they call, you might still be ahead if they're drawing. But if you bet, and they raise, you're probably behind, and should treat it like you're drawing thereafter.

Then all these hands, which you guys might have previously thought were good hands, are not. They're just going to be called drawing hands-- so Top-Pair Bad-Kicker, Mid or Bottom Pair, or a Pocket Pair that's not an Overpair. So if you have 5s, when the board is 2, 6, 7. So by the Turn and the River, all your turns, like they're already going to be big pots. You don't need to worry about extracting additional bets on the Turn. So in general, try to figure out, based on his action, what are the possible groups of hands that he could have here. And in general, like that's it. By the time you're on the Turn, there aren't like going to be that many more bets. So usually on the Turn, it's either like go all in or fold. Then hopefully you're going to be in a situation where you played it right previously, where you're going to have a better idea of whether to do that.

Bubble play is going to be around 20% to 10% of the field left. If we're saying that 10% of the field makes money, we're saying that around 10% more is when like everyone at every table thinks that oh, like they have a pretty good chance of

making money at some point. So they change around a little bit. This is when ICM starts mattering. This is when your decisions to win more chips may not necessarily be the maximal decision with regard to winning money. And it's when players who are probably not very comfortable with the amount of stakes that they're playing for start to make really big mistakes.

Typically, the bad players around the bubble will be a little bit too tight, like if you're playing in the World Series, you'll see that like there are 250 people left, and 240 people get \$12,000, and everyone else gets zero. And they're going to say like OK, maybe I don't need to worry about increasing my chances of getting first place by half a percent if it means that I'm putting myself at risk of getting zero now. Like they weigh that little jump in money quite a bit, and as a result, they play a little bit too tight.

Then the general-- at least as of a couple years ago-- the consensus was that how you do during this bubble period basically determines how deep you're going to go during the tournament, because this is when the amateurs make the biggest mistakes. So if you're a player who likes to exploit those mistakes, this is when you're going to-- a good player can just crush it. Like he can be much more than 50% to double up during this period by just identifying weaker players who don't want to get knocked out for any reason and just bullying them around.

So there are two types of meta-game going on now, just so you know. This was a conventional belief-- "the average amateur player is way too tight." But then once everyone realized that, it became the opposite, where the average amateur player was way too aggressive. Because once the first one gets priced in, then everyone starts to be too aggressive, because everyone wants to do what good players do on the bubble. You could probably identify your table pretty quickly around this time, whether you see weaker players making really bad calls or really bad folds. That will kind of give you an idea of what situation you're in. To the extent you can bully people around, but to the extent that other people are bullying you, you don't need to necessarily push them back.

Let's talk about ICM. The Independent Chip Model is highlighting when the chip value diverges from your dollar value in the tournament. So Chip-EV, which is a C, here-- how it's different than Dollar-EV in tournaments. It's related to the chance of you ending up in certain payout spots. That's why it's particularly nonlinear. Rather, when the first place gets everything, Chip-EV goes Dollar-EV, because you eventually just have to win all the chips. And to the extent it brings you closer to winning all the chips, your expectation for the tournament is a little bit higher. But when payouts are steep, it gets a little bit more complicated, because in some situations, surviving a little bit longer has a material dollar difference and getting more chips in that situation may not be as important as surviving. And we'll go through examples.

The Dollar-EV is not symmetric. There's curvature. So there's this idea of convexity, where when you win, you always lose in this kind of situation, because when you win a lot of chips, those chips go down in value over time. And when you lose chips, those chips are really valuable. So it makes your marginal threshold for making a risky decision much higher. In addition, when you factor in actual utility of money, it's even worse, where clearly big upsides are less good than protecting against big downsides. That's kind of the idea there. Losing hurts more than winning.

Let's just go through an example of this, and hopefully this will make it intuitive. Say that we're playing in this situation. It was whatever, like a 100-person tournament that was a \$20 buy-in, and we're down to the final four people, and we have 2,500 chips each, and these are the payouts, where first gets a grand, second gets \$600, and third gets \$400. If we look at player Adam, what's his equity? Like what's his expected dollar amount in this tournament, assuming that everyone is approximately equal skill, which is the underlying assumption here?

STUDENT: [INAUDIBLE]

PROFESSOR: Yeah, it should be like just 25% of the whole pot, because he has 25% of the chips. The whole pot is \$2,000, so I expect that his EV is \$500. And it is. So everyone has a \$500 EV. But say that we're in a situation where Adam and David go into a coin

flip, and then Adam beats David. Intuitively, what do you think Adam's equity should change to? I would imagine you would think that he just gets the equity from David, because those 2,500 chips are worth \$500 in equity in the tournament. So when this happens, how does the equity change? You could run it through a poker tracker, and I'll go through the kind of rudimentary math for it.

You might think that Adam now has \$1,000 in EV, and these guys have \$500 in EV. And like really, you should think those guys shouldn't have gain from this happening, because the pot size doesn't change, and they don't even change in chip value. But in actuality, Adam only gains \$266 of equity for doubling up here, and these guys actually gain \$100 from that happening. Let me show you why that is.

Let's look at the deltas of these payouts. This is worth \$400, and then this is worth \$200, and getting to first is worth an additional \$400. So we originally have \$500 of value here, but now that one person's out, everyone's guaranteed what? Like certainly, when someone has zero chips, what's their equity in this tournament? It should be this, right? \$400-- like they already are guaranteed \$400 of chips. OK, so now that everyone has \$400, we're just allocating the remainder of this. We're deciding who gets this remaining \$600. So you can see that these guys have a 25% chance of getting that remaining \$600, which is why they have just about \$150 more than that \$400 number. So that's where it comes.

The reason this is is because the winner does not eventually get all of the equity, like the winner doesn't end up with \$2,000. He ends up with \$1,000, which is a less valuable than adding up all the equities from every player. Really, he's giving value out to the second and third place player. So that first spot is probably the worst value when it comes to your equity per chip, because if it were winner take all, then the equity would be flat, and then who would care? But the fact that he's giving money to players who didn't have all the chips in the end caused that first place to be really bad.

So since Adam is really close to first place, he's getting hurt the most. You would

think like fair value would be \$1,000, but he's not. He's well short of it. Whereas these guys are just gaining from it, because they're most likely place is second and third, and they're capturing some of that value. So a satellite is a tournament that a certain x number of people win a ticket to a bigger event. The World Series of Poker runs a lot of satellites, and I think these tournaments are great, because this is a really difficult situation for people to figure out, and it causes a lot of people to make a huge, huge, huge mistakes.

Say this is like 100-person tournament, where they all buy in for like \$90 or something, such that first through ninth gets \$10,000, and tenth place gets zero, and there are 10 people left. So their equity is just their percentage chance of winning this flat payout. Since they all have the same amount, they're splitting that \$90,000 pool even, right? So they all have approximately the same equity, here, because no one gets hurt by having more chips by the curvature.

Say they were in a situation-- blinds are \$200-\$400, and Irene, here, who's in the small blind, raises \$2,500 to Jessica, who has Kings. This is one person down until we make money. Jessica has Kings, here. So intuitively, what should we do, here? Yeah, like calling seems not that bad. What do I give you, here? Like what is Jessica's range? Jessica is pushing anything, here, right, because Jessica has an M of like 3. And she's in the small blind, so she's appropriately pushing any two cards, because as we showed earlier, you're definitely, definitely supposed to do that at least when it comes to Chip-EV.

So Jessica is 82% with the Kings, and if we look at chip equity, she is crushing it. She is 82% to win \$5,000, doubling up. She's 18% to lose. So her equity, her expected value after this is 4,100, meaning her delta is 1,600. She is expected to win 1,600 chips for this. But what about when we look at Dollar-EV? We see for Dollar-EV, she has an 82% chance of winning \$10,000 and an 18% chance of getting zero. So her expected value after this call is actually \$8,200, which is worse than her equity of this tournament. She actually loses money if she makes us call.

In fact, if you put the other person on any two cards, you should even fold aces.

Like you should only pretend to look at your cards before you fold this hand. And this is what it is for every person in this situation, unless you're more than a 90% favorite to win, which you're not, because unless you can particularly put them on a hand, which you have a Pocket-Pair that dominates their lower, uncorrelated cards, you should fold.

How should this pay out? It doesn't play out like this. In Vegas, there's virtually 100% chance Jessica calls here, to Irene and Jessica's dismay, but to the benefit of everyone else at the table. But what should happen? If you're playing in this situation, and everyone's playing rationally, how do you think this will play out at \$200-\$400 blinds.

STUDENT: So Irene would just push it, [INAUDIBLE]

PROFESSOR: Yeah, so if you're in the big blind, and you're pushed into, what's your calling range? Zero, it's 0%. There are no cards that you should call. And then every single person at that table has that 0% calling range. However, knowing that your fold equity is virtually 100%, every single person, at the first opportunity, should just go all in. Under the gun, every single hand will open push, and everyone else will fold. And every single hand, that will happen until the blinds eventually put someone all in against their will.

So this is a situation where ICM comes into huge play, like people really screw this up, especially live. That's why satellites are one of my favorite types of tournaments to play-- is because like every idiot will tell you that calling with Kings here is clearly the right move, when even folding Aces is like way, way, way better than calling with anything. You should definitely do your best to identify opportunities like this, because to the extent that you find a tournament like this that ends up in these types of situations, it's really hard for live players to get this right.

Let's jump to late game. Late game-- I don't have that much to talk about. Late game, you just have to keep steal, re-stealing. You're going to have an M less than 10 probably, unless you literally just doubled up. Yeah?

STUDENT: What is re-stealing?

PROFESSOR: Stealing is when you try to steal the blinds, because they're so valuable. Re-stealing is when someone you identify as stealing your blinds, and you re-pop them some percentage of the time. It's like protecting your blind, or in some cases, when you see someone steal before you, and you're not necessarily a blind, just raising against them. This is all going to be pre-flop stuff. Just be conscious of ICM, like maybe it's not a good time to take a coin flip for your life. Like don't call with Ace-King, here, because you have like a 2% edge for [? a certain ?] range.

OK, so that's it for late game. I really don't find it to be hugely different. Late game just plays like a 10-handed sit-and-go. The biggest difference is that it's as if all the players are playing way above their head, because say you're bankrolled for a \$100 tournament with 1,000 people, and you get down to last 10. It's now is if you're all playing in a \$10,000 tournament. So to some extent that changes it up, but it should generally be treated as if it is a sit-and-go that just pays out a little bit flatter. That's it for tournament play. Any questions on that? Otherwise, we can move on to bankroll management.

This is really the stuff that's going to be about poker as an investment. So what's a bankroll? Bankroll has a couple different definitions. The bankroll is like the amount of money you can devote to playing poker, making poker investments. However, like I think it should be defined as the amount of money that you would have to lose to never play poker again. Not because you're necessarily ashamed of how much you lost, but because like you lost so much money that the stakes that you would be required to play, given your remaining amount of money would be so low that you would never make that amount of money back.

It's like if you can conceivably put like \$20,000 into poker, and you lose like \$19,900, you're not going to grind out like one-cent, two-cent games until you have that \$20,000 back. You would just stop playing poker. You would just be like OK, you would get a normal job and rebuild your bankroll through something else. So that's how I'm defining bankroll. It's the amount of money where poker is no longer a

realistic option to be making money for you. This only matters if you're a winning player, because if you're losing player, I mean, you should play not at all. You should figure out how to win, or more accurately, you should move down to stakes that you're actually a winner. That only matters if you're winning.

The formula for your right bankroll doesn't work if you're in negative expectation, because you're eventually going to go broke no matter what. Some examples of what this is-- for like a new player, you're just going to think of what's a lot of money to you. If you're a new player to poker, and you lose \$10,000, you're probably never playing poker again. You're a huge underdog to ever make that up, so that's probably the end of your poker career, if you're fairly new.

If you're an amateur, realistically I would consider your bankroll your liquid investments-- cash that, if you lose-- like you shouldn't mortgage your house-- but like a portion of the money you have in the bank that if you lose, you wouldn't be homeless seems kind of realistic, here. The amount of money that you're not investing for the long term, but if you lost it, and as a result, would have to stop playing poker, you would find that to be reasonable. The threshold here is like-- the bankroll management rules are such that you're at a 2% chance of ever losing your bankroll. So that's a kind of ballpark for someone who's an amateur.

And for pros, it's all of that money, plus as much money as they could possibly borrow before they get cut off. Look, if you're a Phil Hellmuth-- he's probably worth like \$5 million or something-- and he loses \$5 million, he's not quitting poker. He's going to raise another million dollars and start playing again. So his bankroll is probably like \$8 million before every single person goes OK, I'm not loaning you any money, and then he has to get a job at like McDonald's. So they're in a different situation, and especially when we're talking about like staking. You can have no money and have a bankroll of a couple hundred grand, if you have a track record that's good enough that people will just loan you money.

Let's go through some rules of thumb for bankroll management. This is the idea. This was the motivation. Someone did the math on this. I remember checking it

before. It seemed about right. So we're assuming a 2% chance to go broke based on your average buy-in, and we're assuming you don't change stakes. People kind of forget what this assumption is, so if you change stakes, you're never going to go broke. Why? Because when you lose half your money, you're going to drop down to half the stakes. So like, you asymptote near zero, but you're never going to actually lose all that money, you're just going to lose a lot, until eventually your hourly is not worth it.

And when you go up in stakes, it's the opposite. Like your 2%-- -- say one the rolls is like \$100 buy-ins. So if you have \$100 buy-ins for the main event of the World Series-- like you have \$1 million dollars, and then as a result of winning that, you start playing \$50,000 buy-in tournaments, you're not that still 2% from the beginning to go broke, you are now a new 2%. So it causes a multiplying factor if, when you win, you take on more risk. And the same way, if you lose and take on less risk, it has a dampening factor. So this 2% is only if you don't change stakes, and you really should be changing stakes, especially because there's a high correlation between actually losing and not being a good player at whatever stakes you're playing, and it'll give you a chance to identify what's the right place for you to play.

That's what the numbers are. I'd recommend-- I happen to play over bankroll, typically, just because I find 2% a little bit too-- like I wouldn't be happy with 2% that I lost all my money, but some people are. I usually double these. If you're kind of nervous when you play poker, it's either because you're new, and you've never done it before, in which case, you'll get over it. But if you actually get hurt by losses, to the point where it's always on your mind, it's probably because you're not really bankrolled appropriately. It's because if you lost five of those buy-ins, you would stop playing poker, which meant that you didn't really have 20 buy-ins worth of bankroll. You only had 5. So the theory here, it's based on-- do you have question?

STUDENT:

Yeah, when you play a cash game, and say you double or triple your money, should you just walk away, or should you just, because you're playing well, you have a bigger stack, should you just keep playing? What's the [INAUDIBLE]

PROFESSOR: So if they're really bad players-- This is based on average buy-in, so basically, if you double your stack, and then a lot of players at the table also doubled, you're playing a game that's twice as big. So it's not like that makes it your normal game, especially if they're bad. These numbers go way down if your ROI goes up materially, or your win rate. So if you're winning a game by a lot more than average, you can go with fewer buy-ins. So if you're in a situation where the other players are bad, I would just stay there. If you're in a situation that they're good, I would, as soon as I double up, I would change tables.

STUDENT: So it depends on the table.

PROFESSOR: You can't take money off a table in a casino, but in general, I wouldn't be too happy about having now like more at risk than my normal risk metrics dictate.

The theory, here, is based on the Kelly Criterion. Kelly was a big guy in information theory a couple of decades ago. His idea is that, say your utility curve is logarithmic, you maximize your utility by betting with regard to your edge. For example, if you're in a one to one bet, where you're 60% to win, you should bet 20% of your bankroll. And he proves it out. You can look up his paper. It's pretty famous. He's been getting a lot of flak, because this is probably not a great assumption, the logarithmic utility. So this is used in blackjack, in particular, where the crux of counting cards is that when the count is in your favor, you bet more, such that eventually your wins outpace your losses. And then investment management, it's the same idea, where you're going to put more money to what you consider higher alpha-generating ideas.

The World Series of Poker is an example I find to be really ridiculous, because it's like the biggest tournament in the world-- at least, live-- 6,000 entries, \$10,000, like one of the biggest entries in the world. So the right bankroll is like \$1 million dollars for this tournament. And given the risk of playing a \$10,000, 6,000 person tournament, like you're not getting good returns on your \$1 million investment. I always found this to be a paradox. For someone who actually plays poker for money, no matter how easy The World Series is, you're not getting good risk-

adjusted returns, especially when you count overhead.

However, The World Series of Poker, the average player is really bad, still. And you have good upside in that I think there are a lot of good outside benefits from making big live scores. Like Chris MoneyMaker has made way more money as a result of winning the World Series and getting these sponsorships than he has from actually winning, I'm sure. And he won, I think, like probably more than \$1 million. It wasn't huge then. But there are a lot of pretty big upsides there.

However, you can do-- for the summer tournament, I think it's very common for pros to do some risk management techniques. One is staking. If I have an investor that has more than \$1 million, he can allocate this to his portfolio and stake like 10 people and have a little bit more of a diversified investment. So the common deal for this, just so you know, is them getting 50% of the upside. So they get the first \$10,000 and 50% of the remainder. And to the extent that it's a long term staking deal, you don't get money until they get money. So if we play two of these, and I lose the first one, they get \$20,000 of the second one, plus 50% of the remainder.

That's a pretty common staking deal. It generally works out. And that was, to the extent that you don't need to worry about friction-- like trustworthiness-- it seems to work out for everyone involved where there is a lot of overhead, but the player is grinding out like a high dollar amount, and the investor is getting good diversification to his portfolio. And it's an equity investment-- like you don't owe this money back if you lose it. They're just partnering with you in the tournament.

Something that is more common recently is selling shares and trading percentages. So this lets them create some sort of syndicate. I think it's all like handshakes, but it makes it so that they're pretty diversified. In addition, with regard to outside investors, players will just sell shares of themselves to other investors. They'll cut their next 10 tournaments into 10 pieces, and they'll try to raise like \$15,000 for them, where they sell it off in \$1,500 pieces. So it lets a relatively small investor diversify across a lot of different players. This make a lot more sense from a finance standpoint in terms of you still get this dollar amount, but you're reducing the

variance by quite a bit.

So counter-party risk is important, for staking, certainly. Like if you stake someone, and they don't play the tournament, or you need to worry about them not paying you back if they win, that's a huge friction, in addition to if you play in like underground card rooms or play online, you may not your money back, and you should keep that in mind. So if you think the club that you pay in is 1 in 10 to get raided during any night that you play, you should probably reduce your expected gross winnings by 10% and factor that in.

The current poker environment is-- online poker started out, basically, back in 2003, where The World Series of Poker started investing a lot of money to build up the publicity. They invested in hold card cams, and then they really built it up. And then Chris Moneymaker-- arguably the worst poker player, yet the most charismatic-- won the tournament. And he was a great ambassador. And then the following year, someone else who played a satellite to get in also won-- Brehmer, who was a pretty good guy-- so poker blew up, and then online poker blew up. And it was great, because people could just, like your average Joe college student could just load like \$50 on Poker Stars and lose it to me. So that was really good for like five years, and then eventually the natural course of the game is players get better.

Then eventually Black Friday happened a couple years back, where Full Tilt, one of the poker sites, turned out to be a Ponzi scheme, and they actually took everyone's money, so anyone who had money on that got it confiscated, and they possibly got a percentage back, although I'm not sure exactly how that worked. Then all of the poker sites got banned from the US. So online is kind of gone, and like that was a bit of a nail in the coffin.

Then poker has contracted quite a bit. The World Series of Poker used to have-- you could sit down at a table, and there would be like six amateurs, one pro, and two guys reading like *Poker For Dummies*. Now it's like 50-50. Like for a \$10,000 tournament, it's still pretty soft. But like I played a couple years ago, and I played in a cash game, where 10 people at my table were saying that they were professional

poker players. Probably a couple were lying, but it's much different than it was before.

However, if you use good game selection, if you can find games that are soft-- like the side games of the World Series are soft, and like low stakes games are always soft-- I find it to be something that could add a lot of value to an otherwise good, separate career, like it diversifies your own investments, especially if you handle the bankroll stuff properly. And that's it. So thanks a lot, everyone.

[APPLAUSE]