Winning and Losing Strategies for Casino Gambling

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Announcer:

Greetings and welcome to Mind Matters News. It's well known that when it comes to casinos, the house always wins, or at least almost always wins. Legends tell of players with the skills to beat the casinos at their own game with techniques like card counting, shuffle tracking, and more. This week we talk with one such player, Sal Cordova, about advantaged play, the history of computers and algorithms in gambling, and the Holy Rollers. Enjoy.

Robert J. Marks:

Welcome to Mine Matters News. I'm your winning host, Robert J. Marks. I teach a graduate course in probability and stochastic processes. There I teach the stupidity of casino gambling. In statistics, there's a theorem called The Law of Large Numbers. It teaches you can't win in the long run at casino games. Period. The law of large numbers is a mathematical truth. It's a law of serious as the law of gravity. It's why casinos always get rich and the gambler always gets poor. There is a chance that you will win the lottery or win a million dollars jackpot in the casino, but there's also a chance you will get hit by falling space debris while juggling. In games like roulette, craps, there are no winning streaks. When played fairly, there is no chance of winning in the long run. It's a mathematical law. I tell people it's better if you give your money to me and I'll decide whether or not to give it back. You have a better chance of walking away with money in your pocket.

Our guest to talk about this today is Sal Cordova. Sal is an interesting guy. He has degrees in mathematics, electrical engineering, computer science. He has a master's degree in applied physics from Johns Hopkins University, and he's done a lot of graduate studies, a lot of graduate work in biology at the National Institutes of Health. And the reason we have Sal here is because he has made money card counting as part of his career. And that's going to be an interesting thing to talk about because he knows about gambling and knows about these law of large numbers. So welcome, Sal.

Sal Cordova:

Oh, thank you for having me on.

Robert J. Marks:

It's a pleasure to have you. Now you are from the Philippines, right?

Sal Cordova:

Yes.

Robert J. Marks:

Okay. And you have a Spanish name. Why are the Spanish in the Philippines?

Sal Cordova:

They were conquered by the Spanish and they just got taken over, and so I ended up having a Spanish name because the Spanish culture invaded that Asian island, so that's just kind of the story behind it. I

do get funny looks when people don't know what I look like and then they see me. It's like, oh, I was expecting to see someone Hispanic, not someone that looks Asian.

Robert J. Marks:

Okay.

Sal Cordova:

And so usually if you do see people that have Asian features but a Spanish name like mine, Salvador Antonio Cordova, he's probably Filipino.

Robert J. Marks:

Wait, wait, you only have three names. I thought in Spain you had four names.

Sal Cordova:

Oh, well, I just gave you my legal name. My full birth name was Angel Salvador Antonio Cordova.

Robert J. Marks:

Okay.

Sal Cordova:

I'm trying to pronounce it like someone from Latin America. I can't imitate their accent perfectly.

Robert J. Marks:

Okay, well, great. As I mentioned, casinos always win. One of the things that you know about, which I want to talk about is the history of gambling, in the mid 20th century there were two geniuses from, I think they were both from Bell Labs and-

Sal Cordova:

MIT-

Robert J. Marks:

Oh, okay.

Sal Cordova:

It was MIT.

Robert J. Marks:

Shannon was with Bell Labs and he did a lot of work at MIT, so Thorp was with MIT.

Sal Cordova:

MIT, yes.

Robert J. Marks:

Yeah. So it was Claude Shannon and Thorp. And one of the things they did is they wore one of the first body-worn computers into a casino and they tried to gamble it. Tell us about that.

Sal Cordova:

That's kind of a famous team because of who they were. Claude Shannon obviously was the one who authored Shannon's Theory of Information, and that through him they coined the word bit. And so Information Theory and the internet and the Modern Information Age owes a lot to Claude Shannon. And Edward Oakley Thorp, probably very successful hedge fund manager, he should have won the Nobel Prize in economics because he independently arrived at the Black Shoals equation for options pricing.

Robert J. Marks:

Really?

Sal Cordova:

So instead of being an academic, what he quietly used his knowledge, he became a very successful hedge fund manager, which is the casino of the stock market. So these are basically two guys that were-

Robert J. Marks:

I've never heard of that.

Sal Cordova:

Yes.

Robert J. Marks:

But okay. It's the casino he-

Sal Cordova:

Thorp wrote the book, Beat the Dealer, which is how to beat the casinos, but he also wrote the book Beat The Market, and he actually did beat the market. So he applied gambling theory in two venues, one in brick and mortar casinos and one in the stock market, which is the giant casino.

Robert J. Marks:

You know, you shared a paper with me, A Favorable Strategy for 21. It was published in 1961. It was published in the proceedings of the National Academy of Sciences, which is pretty prestigious. And it was sponsored by Claude Shannon-

Sal Cordova:

Claude Shannon.

Robert J. Marks:

So they were good buddies. So do you know what happened when they wore the computer into the casino?

Sal Cordova:

They brought their wives with them and the wives were kind of in on this, too, and they were going to hit the casinos and run up some winnings, but the computer broke down. And this is in the era before they had really developed VLSI. They did have 1961 technology to be doing some of what they were attempting to do. Certainly if they had anything transistor-based, the memory capacity couldn't have been that big. So they did attempt to use a little bit of physics prediction to help them estimate the odds and, therefore, beat roulette. But they were unsuccessful basically because of a technical failure.

But it was still the theory of blackjack that Thorp especially was able to break. Thorp was the one who was the pioneer of blackjack figuring out how to beat it. And he spent a year, that was his research. So that's kind of an interesting research project to publish in How to Beat the Game. But he was a math professor at Massachusetts Institute of Technology, and I don't know how he got his department chair to approve that project, but I guess-

Robert J. Marks:

Well, when you're in mathematics, especially pure mathematics, you don't expect a lot of external funding because nobody cares what you do. You know, you want to be in applied math if you're going to get funding of that sort.

Sal Cordova:

Oh, that's the other thing is some mathematicians are actually pretty offended if you find some practical use for what they found.

Robert J. Marks:

Exactly. Yeah, exactly. That clearly was not Thorp. He was really looking into doing something with his thought. Yeah, I had heard that they were looking at roulette. I don't know where I read this, but apparently if there was any sort of slanting or imbalancing of the roulette wheel, there was redundancy in the winnings and they were trying to figure that out. Now they were trying to cheat. They were trying to game the system. I guess maybe that's where gaming the game came from. Is there any history of casino cheats? Is there a good way to go in and cheat in casinos at all?

Sal Cordova:

It's probably not a good idea today because you could get prosecuted for it.

Robert J. Marks:

Oh, serious. Well, yeah, I guess could.

Sal Cordova:

There's like there are laws in Las Vegas if you actually now bring computers in and use it to beat the games, you could be prosecuted for that. I mean, stuff that is done now is only called cheating by law, but in my book you're not really going against the rules of how to actually play your hands or anything. So I've really not looked much into the techniques of cheating because I just didn't want to get prosecuted.

Robert J. Marks:

Oh, I see.

Sal Cordova:

But there has been... I'm trying to think of any examples where I knew anyone. I can't think off the top of my head.

Robert J. Marks:

Well, I read a book called Race Hoss. There was a story about a Black in southern United States that got sent to prison for terrible things. His mother was a prostitute and he was raised in this terrible house, but one of the things they used to do is gamble a lot. He maintained that he could throw a dice in order to get a high probability of a seven. He literally knew how to throw the dice, but it had to do with something like sliding the dice.

Sal Cordova:

Oh, yeah.

Robert J. Marks:

And you can't do that in Las Vegas anymore.

Sal Cordova:

Not anymore. They actually passed a law. So just kind of like how gyroscopes work, if you have a lot of angular momentum, it resists certain motions. And so what they would do, these dice sliders, they'd throw the dice-

Robert J. Marks:

They called them dice sliders?

Sal Cordova:

Right. So when you throw a football, you try to throw it with spin because that helps stabilize it. And so-

Robert J. Marks:

Oh.

Sal Cordova:

They were throwing the dice with a lot of spin and then sliding it across the table so it never tumbled. So whatever you set the dice, you know, just have a seven on top basically with your two dice, if you could slide the dice there was no randomizing. And so Las Vegas realized these people were so good at it that they were changing the odds. And so first they passed laws and then they started to pass rules within the casino.

Robert J. Marks:

Now wait, these were not casino laws, these were state laws or something, or city laws?

Sal Cordova:

So it was the Las Vegas laws that you couldn't dice slide. But then on top of that, the casinos began to put felt so that the dice wouldn't slide and then they put these little pyramids on the ends, and then they forced you to throw the dice in a certain fashion so it-

Robert J. Marks:

It has to bounce against the back wall-

Sal Cordova:

Has to bounce-

Robert J. Marks:

At least in the movies.

Sal Cordova:

Yes, it has to bounce. It has to fly. You can't slide it. So they made it... And then they started to put a arresting wires so that if you tried to slide it across from where you are, it would hit the arresting wire, so they forced you to basically lob it and they made-

Robert J. Marks:

Oh, so it's like jumping a hurdle.

Sal Cordova:

Yes. And then they made very sharp corners on the dice. They got some good physics as a countermeasure, but those must have been the glory days of being a craps player, because if you're really well practiced at this, you only needed to tilt the odds even. You didn't even need to do it all the time. If you could just get maybe a few percent in your favor, you could beat the game.

Robert J. Marks:

Isn't that fascinating?

Sal Cordova:

Now I do recall some instances of cheating where-

Robert J. Marks:

Sure.

Sal Cordova:

It was prosecuted. It's when the dealer had colluded with the players. So the dealer, yes, so how the dealer could collude with the players, and there's two famous cases I had to go back into-

Robert J. Marks:

Playing what game?

Sal Cordova:

Things like blackjack or baccarat. So if the dealer reveals the card that they call the hole card, it's the card that the players aren't supposed to see so the player will make playing decisions based on... If he could make a playing decision based on knowledge he's not supposed to have, he has a huge advantage. So in blackjack, the dealer has what they call a hole card and saying, okay, this is the card you can't see. And after you've finalized your decision as a player, then he's going to reveal it and then you find out whether you're going to win or lose-

Robert J. Marks:

Oh. And probably he didn't reveal it, actually reveal it, he probably gave him signs like a third base coach in baseball touching the-

Sal Cordova:

Well, actually he could subtly reveal it if with his hands he could bend the card a little bit so the player could actually peek and see it.

Robert J. Marks:

Okay. Okay.

Sal Cordova:

And in one case, it was really funny. The casino surveillance noticed that the dealer was dealing out the exact same set of cards each time. He had used the false shuffle. So someone-

Robert J. Marks:

Okay, tell me about the false shuffle. What's a false shuffle?

Sal Cordova:

A false shuffle is where you look like you had actually shuffled the cards but you didn't. I don't know how that is physically accomplished. You have to have good hands. It's kind of... Magicians are able to do that. And there's a technique where you can make it look like you shuffled the cards but you didn't. And so he was dealing out the same set of cards each time, and then they were realizing why are the players so good at predicting what the next card's going to be? So all they had to do is the dealer would deal out one set of cards and the players would somehow take note of what the cards were. I don't know how they did that. And then the dealer would do a false shuffle and deal out the exact same sequence the next time. And when that's done, the player has huge advantage.

So the casino bosses began to be suspicious why this particular player was winning so well. He knew what the next card was going to be. And so they have casino surveillance and they used video cameras and they realized, oh wow, this is how it was being done. And the FBI came in and they prosecuted the guys.

Robert J. Marks:

Really?

Sal Cordova:

So those are the two big instances I know, and this is kind of interesting to me because it starts to deal with issues of probability and kind of my areas of interest. What's the chances that you could deal the

same deck of cards the same way each time? And this relates to things in some of our interest in biology and stuff and so I was just fascinated.

Robert J. Marks:

So if I know Vegas, they had to come up with some sort of rule where the dealer doesn't shuffle or something like that. Is that true today? How are the decks shuffled for blackjack? Do you know? Does the dealer shuffle them?

Sal Cordova:

It depends on the casino. There's some things where it would shuffle the deck and then he'd put it in something called a shoe.

Robert J. Marks:

Yes.

Sal Cordova:

And it's dealt out there. And so they have these automatic shufflers, and then they have these things called continuous shufflers where after the dealer deals it out, he puts it back in the machine and it shuffles it with the cards in the deck. So they're all sorts of devices that they can use to shuffle, or it could be hand-shuffled. The preferred method, I think, would be machine shuffling because it's faster and it can randomize the cards to the standards that the casino would want.

Robert J. Marks:

I see.

Sal Cordova:

Because there are some people that are just savants. They'll actually memorize the sequence, and if they have a good understanding of the shuffling techniques, they can start to interleave it in their own brain and then they're able to predict.

Robert J. Marks:

Did you ever watch the movie Rain Man with Dustin Hoffman and Tom Crews?

Sal Cordova:

I actually never saw that one.

Robert J. Marks:

Yeah, well, he's a savant and he goes in and they're playing 21 and he keeps on saying hit or skip or something like that so he knows what's going on somewhere.

Sal Cordova:

So those people that can do that are called shuffle trackers.

Robert J. Marks:

Shuffle trackers?

Sal Cordova:

Shuffle trackers.

Robert J. Marks:

And there's a whole nomenclature for consumer gamblers.

Sal Cordova:

Oh, yes. There're shuffle trackers. There're ace trackers or card counters. And sometimes you would have teams. Yeah, there're all these techniques. So you mentioned the law of large numbers, and the casino always wins with the law of large numbers. So these players that are able to beat the game legally, we would call them advantaged players, they actually turn the tables figuratively speaking and use the law of large numbers in their favor.

Robert J. Marks:

So tell me about advantaged players. I would imagine a card counter would be an advantaged player.

Sal Cordova:

Advantaged players. So there's kind of a terminology, it's a little bit derogatory. The advantaged players are usually your math guys. And-

Robert J. Marks:

So listen up all you nerds, right?

Sal Cordova:

Yeah.

Robert J. Marks:

Listen up.

Sal Cordova:

They know the odds, they have the proper skills to execute it in the casino, and they're able to turn the statistical advantage in their favor because they use their minds. And ordinary gamblers they call ploppies because these guys just kind of plop in their seat and just-

Robert J. Marks:

Ploppies?

Sal Cordova:

Get sawed down and beaten down by the casino. They're like sheep being sent to the slaughter and we call them ploppies. So you're either a player or a ploppy.

Robert J. Marks:

I see. I want to be a player, not a ploppy.

Sal Cordova:

You want to be a player.

Robert J. Marks:

Yeah.

Sal Cordova:

And so the advantaged player uses his math skills, first of all to decide is the game beatable at all? If it's not, then he shouldn't play it. Now there's an interesting anecdote to that. The worst week in Las Vegas history was when the American Physical Society had their annual meeting in Las Vegas.

Robert J. Marks:

Oh, boy.

Sal Cordova:

And the casino-

Robert J. Marks:

This is a gathering of nerds, right?

Sal Cordova:

Right. And the casinos were like, yeah, this is going to be great. We're going to have the American Physical Society here. After that week, Vegas lost so much money they said we'll never allow them to host another conference here.

Robert J. Marks:

Really?

Sal Cordova:

Yes. And it wasn't, ironically, because all these physicists were great gamblers. I mean, in the sense that they were, they just didn't play. They knew that it wasn't worth it and so Las Vegas didn't make any money off of them. And so Las Vegas was opening all their hotels and stuff-

Robert J. Marks:

Giving them free food and comps and free drinks and-

Sal Cordova:

Or whatever. And they said that had been the worst week in history. They said they'll never invite the American Physical Society there again. So the first thing of an advantaged player is to realize when he can't beat the game, you don't play it.

Robert J. Marks:

I see. So they would not participate in something like roulette or craps?

Sal Cordova:

They're ways to even beat that game but you have to have a certain advantage.

Robert J. Marks:

At craps?

Sal Cordova:

There're ways to beat it, but it's not within the rules of the game. There's another angle to this. The casinos often give, in the stores you get coupons, they also give coupons to gamble. So sometimes they'll give you free bets as an incentive or you can buy-

Robert J. Marks:

Or they give you free chips.

Sal Cordova:

Free chips, or you buy these coupon books for like $14. Or if you get happen to get ahold of a bunch of them and you might be able to get a whole bunch of coupons, there have been teams of advantaged players that have pooled their coupons and they took the casinos for millions. Or if you work out deals-

Robert J. Marks:

They... Oh, so a bunch of people came in, they all got their coupons and gave it to some advantaged player. Is that right?

Sal Cordova:

Right. Coupons is one way where they figured out the casinos were loose with their coupons, something like that. There's an angle. The ones where these unbeatable games where you can actually beat them is the casino worked out a deal that they didn't realize was way too advantaged. So let's give an example. So in craps, the advantage I think of the house on what they call the pass line bed is 1.4% against the player.

Robert J. Marks:

Okay. Now that's the difference between winning and losing. Is that what you mean? What's the 1.4%? I don't get that. That's a very small number.

Sal Cordova:

It's like over the long haul, let's say you're betting $10 every bet...

Robert J. Marks:

Okay?

Sal Cordova:

And say you played a bazillion "hands"...

Robert J. Marks:

On average, you'll lose 1....

Sal Cordova:

1.4%.

Robert J. Marks:

1.4%.

Sal Cordova:

That's the expected value. So let's say you were playing dice and you're betting $10 at a time but your total action over, let's say a million "hands", would be $10 million, well, you take 1.4% of that, that's how much you're expected to lose. Now there's variance, so you have the expected value and the variance around that expected value. So you may not exactly be at 1.4%, but the law of large numbers will tell you that your expected value over time would be 1.4% of the total action.

Robert J. Marks:

Isn't that interesting?

Sal Cordova:

Yeah.

Robert J. Marks:

Let me ask you as a mathematician, in something like craps, for example, is there anything such as a winning streak?

Sal Cordova:

Yes. Yes. But since the trials are independent, what we call Bernoulli independent trials-

Robert J. Marks:

Yes.

Sal Cordova:

You can't use the streak to predict whether you're going to win or lose. And see, these are the illusionary patterns that can fool people. They think they're on a roll and, therefore, what they call the dice table being hot, you want to be there because you're just going to start winning. And then you have the people that look for opposite patterns. It's like, well, this table's just been losing and losing, it's got to win, or just all sorts of things.

Robert J. Marks:

And I've heard the casinos take advantage of this. One of the things they do over roulette tables is they put a list of the history of the winnings, right?

Sal Cordova:

Right.

Robert J. Marks:

And they put, and I don't know the numbers, I'm making them up black 32, red 14, green double zero, et cetera, and people look at this table and they think, oh my goodness, black is overdue.

Sal Cordova:

Overdue, right.

Robert J. Marks:

We've had six greens in a row, so it has to come up black this time. But that has nothing to do with it. It's totally independent of the past. Right?

Sal Cordova:

That's right. And still it's very hard to explain to some people that over time it may work sometimes, and that's enough to make them feel that they've got a system, and it just doesn't work. I did want to complete one thing.

Robert J. Marks:

Go ahead.

Sal Cordova:

Because you did ask how can you beat these unbeatable games? Let's say that in craps the past line advantage of the house against you is 1.4%. Well, if they're giving you a 20% rebate on your losses, you're going to kill the casino. And sometimes-

Robert J. Marks:

Oh, and these come from the cards and the comps, is that what you're saying?

Sal Cordova:

Sometimes when they have what they call a whale, that's a customer that has a lot of money, they want to give them a big incentive and so sometimes they'll make a mistake.

Robert J. Marks:

Okay, that's another word for my glossary, whale.

Sal Cordova:

Oh, yeah. We have all these terms, whales. And so sometimes the way they get these whales who actually are advantaged players, is the player's just a really good con artist. He might have come in there and just acted like he's a total drunk and degenerate and just frivolous. He's a really good actor. And they're just like, hey, we'll give you this 20% loss rebate so when you have a really bad night, we'll give you 20% of all your losses back.

Robert J. Marks:

Really?

Sal Cordova:

Yeah.

Robert J. Marks:

And that that's cumulative throughout the night?

Sal Cordova:

Yeah.

Robert J. Marks:

Oh, my goodness. Okay.

Sal Cordova:

So now, where does this come into play? And the audience here can look at the history of someone named Don Johnson.

Robert J. Marks:

Don Johnson.

Sal Cordova:

Now there are a lot of people named Don Johnson.

Robert J. Marks:

Well, he was in Miami Vice, wasn't he?

Sal Cordova:

Right. That was the actor. There's the Don Johnson who cleaned out Atlantic City. So just Google it in the last 10 years-

Robert J. Marks:

He cleaned out Atlantic City?

Sal Cordova:

Oh yeah, he did, because he had this 20% loss rebate, and it was only a matter of time before his advantage started to assert itself. So what he did was he got a loss rebate from one casino, and then he told the other casinos, he said, look at the rebate that this guy is giving me. And so they started upping their loss rebates while he was on a losing streak. But he knew that in the end, all he needed to do, I think maybe he actually got lucky that at the start he was losing, but he had deep pockets, and so they started competing for his business because they thought he was a loser.

So I guess no one bothered to analyze his playing skills, which were decent enough that his blackjack was only playing at a loss of half a percent. And so then he got that winning streak that was inevitable.

He just needed to survive and the law of large numbers eventually kicked in and he cleaned out some casinos. Their monthly revenue was negative just by that one player. So I invite-

Robert J. Marks:

That's embarrassing.

Sal Cordova:

I invite the readers to look at that. So he actually... That's an example of an advantaged player actually playing a game that was guaranteed to lose the way the style of blackjack he played without card counting. He could have done this with craps or anything, but they're giving him generous loss rebates. And so even some of these online casinos in some of the early days where they had some of these casinos that were overseas or whatever and they weren't very sophisticated, they're offering loss rebates. I know some players who just cleaned out those casinos because the loss rebates, they realized, were too generous. They may have figured out how to have multiple accounts or something so that they could really run it up, but they became millionaires within a year.

So these are some of the skills of the advantage players in their repertoire is it's not just the game. It's the marketing incentives and they find a defect in it. So for the viewers there who want to try to beat the casinos, maybe not try to do something as hard as card counting. Just look at those sort of marketing things. And then you mentioned the comps. So if you play even an average game and not lose too much money, say at like the Venetian in Las Vegas, you could be put up in $400 a night suites.

Robert J. Marks:

The Venetian is... That's one of the casinos?

Sal Cordova:

Yes. It's my favorite casino.

Robert J. Marks:

That's your favorite one? Okay.

Sal Cordova:

Yeah. It's real classy place. Nice and clean.

Robert J. Marks:

Have they ever comped to you?

Sal Cordova:

Yeah. I was staying in $400 a night hotel rooms for a week, and I think I probably only lost $20 on some of their games. So there are other ways to be compensated than just the cash. And there are other casinos around the land that are in really nice, luxurious places, and if you're an advantaged player, you could just get a very nice discount basically on your travels. So there are other ways to game the system using marketing comps.

And so for the audience, I would recommend those. It takes a lot of skill and ability to actually beat it like using card counting and some of these other techniques where you really have to be thinking and

using your mind heavily. Whereas using the marketing comps, you can kind of play an average game, and you don't have to develop a lot of the skills. And certainly there's skills I didn't develop like shuffle tracking. Oh, those guys, they're just on another level of ability. One guy, he said, yeah, every night he would take a deck of cards and just go through all of them. He'd wake up in the morning, he'd recite the sequence.

Robert J. Marks:

Oh, my gosh.

Sal Cordova:

Yeah. These guys were-

Robert J. Marks:

As I get older, I don't know if you've ever heard it, but the long-term memory of a goldfish averages about three seconds. So I think that that's about my long-term memory. Yeah. I couldn't do it overnight.

We ended up last time, talking about Don Johnson and how he cleaned out Atlanta. Do you know how much money he made?

Sal Cordova:

Atlantic City?

Robert J. Marks:

Atlantic City, okay.

Sal Cordova:

Oh, it's probably in the tens of millions of dollars.

Robert J. Marks:

Tens of millions of dollars?

Sal Cordova:

In the course of a few months.

Robert J. Marks:

Wow.

Sal Cordova:

Yes. He was very good at his craft.

Robert J. Marks:

And so this was a guy that came in, he used comps in order to offset his probability of loss and was able to-

Robert J. Marks:

Said his probability of loss and was able to turn that to his advantage and won tens of millions of dollars. So they had to have found him out, because if I was him, I would keep on going until somebody kicked me out.

PART 1 OF 4 ENDS [00:28:04]

Sal Cordova:

Oh yeah. Well probably even before they found him out, it was just they were losing so much money, they said, we can't afford to keep this guy here. And I can't believe that this is such obvious basic math. So the comps that he was offered was a loss rebate. So he was playing a losing game of Blackjack. But, again, going back to the law of large numbers, his loss rate was only half a percent, and they're giving him loss rebates of 10, 20%.

Robert J. Marks:

Was he card counting?

Sal Cordova:

No. No.

Robert J. Marks:

Is that right?

Sal Cordova:

He was doing what they call basic strategy, which going back to Edward Oakley Thorpe and his predecessors, they figured out if you play your hands just a certain way, so if the dealer has a certain card and you have your set of cards, in 21, you what they call hit or stand, hit means you draw another card and you hope you don't go over 21, what we call busting, or you stand where you just say, I'm not going to take any cards. In fact, the casinos will even give you the playbook. If you just ask the pit boss, they'll say, okay, this is the right way to play it.

Robert J. Marks:

It's a publication they give you?

Sal Cordova:

Yeah. It's just a little index card with all the proper plays.

Robert J. Marks:

Do they give you probabilities with them?

Sal Cordova:

No. They'll just say, this is the optimal way.

Robert J. Marks:

This is the best way to do.

Sal Cordova:

So if the dealer has this card, you play it. And I said, that was really nice of them. But you see that's-

Robert J. Marks:

So you still end up losing. If I remember right, from a freshly shuffled deck, your loss is what in Blackjack?

Sal Cordova:

On average about half a percent if you use this optimal strategy that even the casinos will give you. Now you think that they're being nice. One thing the casinos realize is, you there's an old saying, you can shear the sheep many, many times. You can only skin him once.

Robert J. Marks:

I'd never heard that. That's a good one.

Sal Cordova:

So the way they realize that they could get repeat customers is if you don't hurt them too bad, you let them have some good times, they'll keep coming, they'll be repeat customers, it'll add to the atmosphere of the casino. And you want to see people looking happy. You don't want to have all these sad faces there. And they keep coming back. So they realized not gouging them is a good way. So again, you can shear a sheep many times, you can only skin them once. You don't want to skin them. So what Don Johnson was doing, he was just playing basic strategy. So at least from the standpoint of whether they're dealing with an advantage player, superficially, he looked like he was just an average Joe. Now he's a very good con artist. He would look like he was a loser. He did things that made him look like a degenerate, all the girls and stuff surrounding him and just his mannerisms. But he was hiring actors.

Robert J. Marks:

He hired actors?

Sal Cordova:

Well, he hired actors that were adult movie actresses.

Robert J. Marks:

Oh, from porno?

Sal Cordova:

That's the reports I read.

Robert J. Marks:

That's the reports. Okay.

Sal Cordova:

So he looked like a real degenerate and he acted the part real well. But he was playing just basic strategy. But it was another department they weren't monitoring that was giving him all these loss rebates, and so he cleaned them out.

Robert J. Marks:

So let me ask you this. Casinos learn from their mistakes and they fix them. I understand today they have to very carefully balance the roulette wheel. There's no more tilts. We talked about shooting Craps last time and how you have to shoot Craps right now where you can do no dice sliding. How do they get rid of this thing that let Don Johnson win all these big bucks?

Sal Cordova:

I think they had to lose enough money and they came to their senses. But like a lot of organizations, you have pockets of total incompetence in one department, and it's going to negate all the skill and diligence that's handled in another. And so this is what happened. The marketing department was out of sync with basically the quality controls, and the accounting and just managing expectation values. And Don Johnson, somehow he sniffed that out, that the marketing department was not really looking after the bottom line like they should have. And someone was asleep at the wheel or asleep at the helm. But the funny thing is, I think it was multiple casinos that began to start to compete. I guess they figured, oh, they're doing it, so we ought to do it too. And apparently they weren't too sharp.

Robert J. Marks:

So I'm wondering, do they still offer comps? I think they would've gotten rid of them.

Sal Cordova:

Lost rebates like that. Well, unfortunately, for advantage players, Don Johnson decided to keep making some more bucks, so he started to become a consultant to these casinos, how not to do stuff like that. And so his fellow advantage players were mad at him for that. So it's just funny how that-

Robert J. Marks:

It's like a hacker that gets caught goes to work for the NSA or the FBI.

Sal Cordova:

Exactly. So this is an example of, again, a lot of organizations, they'll have pockets of competence and little pockets of incompetence. And this is where it hurt the casino, and an advantage players always looking for that, where someone probably in the higher ups made a really dumb mistake

Robert J. Marks:

Looking for the weakest link.

Sal Cordova:

Right.

Robert J. Marks:

So I used to think that the game of poker was a game that involved skill, until I think it was about a year ago, a artificial intelligent program named Pluribus beat the world champions at Texas Hold'em, which

really surprised me. I thought there was so much psychology in the game of poker. But the fact that an algorithm could beat the world champions in Texas Hold'em, which appear seemingly every year, you get the same people rising to the top playing Texas Hold'em, that really fascinated me that there was really minimal contribution to psychological aspects of the game. Had you heard of that?

Sal Cordova:

No, I've not heard of that. And because I don't have a poker face, people can read me really easily, I've never touched that realm at all. But there are some people that are very good at reading other people, the reactions to the hands that they've been dealt and their bluffing patterns.

Robert J. Marks:

Does that surprise you too?

Sal Cordova:

That actually does surprise me a lot. So I could only assume that the algorithm is keeping track of bluffing patterns of its opponents.

Robert J. Marks:

Yeah. I don't know the details of it. But anyway, they taught it to do it, and that to me was just astonishing. Let's talk about gaming oversight. The casinos have oversight of the games. And you see these casinos and they have these little black half spheres on the top, which are cameras that are monitoring what's going on. What are they looking for?

Sal Cordova:

One of the first things is game protection, meaning the casinos want to make sure that their own employees are not stealing.

Robert J. Marks:

Oh, you mentioned that to me, that that's their biggest fear, is that the dealers, for example, are going to stick a few bucks in their pocket, right?

Sal Cordova:

Or up their sleeve. And there's one case where in one casino in Tunica, Mississippi, the box man, I think they call it, it's been a long time since I've played Craps, the head of the Craps table was-

Robert J. Marks:

He was called the box man?

Sal Cordova:

I think he's called the Box.

Robert J. Marks:

Okay. Last podcast we started to make a glossary, so we're going to add that to this, box man. Okay. He's the guy that's head of the Craps table?

Sal Cordova:

I think so. And he would take these thousand dollars chips and put it in his sleeve or something very discreetly, and then somehow he would put it in his mouth, and then he would kiss an employee and transfer the chip-

Robert J. Marks:

Oh my goodness. Okay.

Sal Cordova:

His girlfriend employee. And so for a while, surveillance was having a hard time figuring out how's he-

Robert J. Marks:

Do they check dealers and box men when they come off the floor, do you know?

Sal Cordova:

I don't think they do. So that's what the surveillance is trying to track. But he was really good at concealing where all this was going, because they were trying to see if he was pocketing it or something. I don't know. There was some action he was doing. He might have not even touched his pocket. I think maybe he was really good at using his hands and his palm to hide it, and he would maybe just put his hand up to his mouth and then put it in his mouth. And they thought, well, he's obviously not swallowing it or whatever, but he's exchanging it when he was-

Robert J. Marks:

Those chips are pretty big. They would be hard to swallow.

Sal Cordova:

I know. I know.

Robert J. Marks:

Unless you wrapped it in a meatball maybe or something.

Sal Cordova:

Yeah. So that's the first thing. That's what the cameras. Also, they try to protect the patrons in case one patron's trying to steal money from another. I do have some stories about that. Some of these ladies would come up to you, and if you have a big pilot chips, they'd start to be really cozy with you. And I would have to put my hands around my chips because I didn't want her stealing it.

Robert J. Marks:

Oh, really? They would sneak up and slip a few chips?

Sal Cordova:

They called them rail bandits. Yeah.

Robert J. Marks:

Okay. There's another one. What is it?

Sal Cordova:

A rail bandit.

Robert J. Marks:

A rail bandit. Okay. That's a good one. Okay. A rail bandit.

Sal Cordova:

And they could be women of ill repute, you really don't know. And sometimes they'll cozy up or they'll try to say, "Hey, can you spare a chip here or there?" And so the surveillance will be watching some of this. That's to protect the patrons.

Robert J. Marks:

And do the casinos discourage you from giving stuff to these ladies, to these rail bandits?

Sal Cordova:

They try to discourage the women from being there if they figured out who they are.

Robert J. Marks:

I see. Okay.

Sal Cordova:

Yeah. Yeah. Bad for business.

Robert J. Marks:

Do they have the ability to ban people from casinos?

Sal Cordova:

Oh yes. So one of the better things actually is that they ban addicted gamblers. So some of these gamblers that enter a program to be in recovery, the casinos will cooperate with each other to say, we're going to make sure this guy doesn't get in. And one of the reasons for that, I mean, unfortunately the casinos would love them to come back, but sometimes the city or state laws say, okay, you can't set up a casino here unless you have a gambler's recovery type program to help them with their addictions. So the casinos will comply. It's like, okay, we want that license, so we'll do it. Even though we'd really like to just get these guys, we're going to meet them halfway because some of these advocacy groups will insist.

Robert J. Marks:

But how do they monitor people? Maybe a card counter gets expelled or a gambling addict gets expelled. Do they do face recognition? Do they got a guy at the door that has memorized all these mugshots?

Sal Cordova:

They use facial recognition now.

Robert J. Marks:

They do?

Sal Cordova:

And then also, sometimes now they will have guys, you have to present your ID, and I don't know if they're scanning it now. It would be really easy now to just present your ID, scan it. Also, if you're a frequent patron, the dealers would recognize you, the staff.

Robert J. Marks:

But just like a card counter, you can casino hop, it seems to me?

Sal Cordova:

Until they start, they photograph you really well, and then they circulate your photo, which they did to me. And it's called the Surveillance Information Network. The acronym is SIN. So my photograph is circulated in the SIN network, and one time I was in a casino in Michigan and I got axed.

Robert J. Marks:

Really?

Sal Cordova:

And I drove 300 miles and I said, they're not going to get me there.

Robert J. Marks:

And they got you.

Sal Cordova:

I walked in, I played little bit, and they said, "Oh, well done, Mr. Cordova."

Robert J. Marks:

Oh really?

Sal Cordova:

Yeah, they had me. And I'm just like-

Robert J. Marks:

So what do they do? They come up and tap you on the back?

Sal Cordova:

Well, sometimes they'll be subtle like that where they don't want a physical confrontation. But if they really want you out, they'll bring security and say, they'll come and say, "Sir, may we have a word with you? We've determined that your action is too strong." Or they won't even say anything, but they'll

come up and say, "Sir, may we have a word with you. Please step away from the table. You can cash your chips, but you're not welcome to come in the casino anymore."

Robert J. Marks:

I see.

Sal Cordova:

Or sometimes they'll be half nice. They'll say, "You're welcome to play any other game, but you can't play Blackjack anymore."

Robert J. Marks:

I see.

Sal Cordova:

Now, they have these tribal casinos around the land that are run by Indian reservations, and so they're not subject to federal and state law. I mean, I'm sure that there's some things that the states can do. But in those cases, one time I was taken aside by the casino security and then detained. And they said, "Well, it's up to the tribal elders to decide your fate."

Robert J. Marks:

Oh my gosh. Because you're not on U.S. land.

Sal Cordova:

Exactly. I'm on the reservation. They let me go after they just tried to in intimidate me.

Robert J. Marks:

Did it work? Oh, yeah. I would imagine. I'm easily intimidated.

Sal Cordova:

It worried me for a little bit, but I said as long as they're not going to draw their guns if I try to run away, then I didn't feel that. What they did is they took my driver's license and wouldn't return it.

Robert J. Marks:

Are you serious?

Sal Cordova:

Yeah. They said, "Can I have your ID?" And then he just ran off with it. And I said, okay, I could walk out the casino, but I can't drive my car back home.

Robert J. Marks:

So how'd you get your license back?

Sal Cordova:

They came back 15 minutes later and said, "Okay, we'll let you come back to the casino, but you can't play Blackjack the way you're playing it. When you bet, your starting bet has to be, you can't veer your bet." Because that's how you beat it is when you've calculated the odds are favorable to you, then you raise your bet. So sometimes it's very obvious if you're a card counter, you start off betting $5. Now there's one guy, I saw it in Las Vegas, this is not on the tribal casino, but this is the ideal way to play it, is you're just betting the minimal amount, or better yet, you're just standing at the table and watching the other players bet. And then what they call the shoe is hot, meaning it has a very high density of ACEs and tens.

Robert J. Marks:

Okay, so you got all the bad cards out of the way.

Sal Cordova:

Exactly. So this is basically the idea. See in Craps, it's independent trials. But in Blackjack, the information you gather from the cards that are dealt out are telling you what's remaining in-

Robert J. Marks:

What's coming out?

Sal Cordova:

Right, in the deck. And so if it's a hot shoe, meaning it's rich in tens and ACEs, that's the time to bet. And so this guy, he started betting $5 at a time. By the end of the deck he was betting 1500. I'm just like, yeah, it's really obvious. He knew the odds were in his favor. It was fun to watch him play. So the countermeasure they could say is, well, we're going to be nice. We'll let you play Blackjack, but you can't veer your bet. They call it flat betting. Whatever you start off with, you just got to keep betting that amount.

Robert J. Marks:

Now we've seen the casinos always look at the games, and if they find a way of cheating, they change the rules. We did that with dice sliding with Craps. Now, what do they do to discourage card counting? What are some of the things that they do? Other than surveillance, clearly they can do surveillance.

Sal Cordova:

Right. Yeah. So other than banning you from the game or banning you from the casino, and there are all sorts of, like the softer countermeasures where they'll just say, you can't veer your bet when you're there...they change the rules.

Robert J. Marks:

Ok. What is it normally, is it a bet as much as you want? Is there a limit that you can bet?

Sal Cordova:

Normally there's a limit. Because the casinos want the law of large numbers to be in their favor, and so if they allowed the bets to be big, they could actually be wiped out by variance, meaning-

Robert J. Marks:

Oh, the volatility.

Sal Cordova:

The volatility. And that's really scary in the Craps games for them, because sometimes there could be this event that might happen once every two years or three years. And what sometimes the players will do is they'll win and they'll just re-bet everything that they won, so they just keep doubling their bet. And if they happen to be on a streak that is typical, it could cause the casino to lose a large amount of money. So the way the casinos defend against that is to put betting limits.

Robert J. Marks:

I see.

Sal Cordova:

Because to help the law of large numbers work in their favor. But you're asking about the other things that the casinos have done to circumvent. They've changed the rules, the payouts in the game. So it used to be if you got a Blackjack, it would pay three to two. You'd basically get 50%. So if you had a $10 bet, you would normally, if you won, you would normally get $10. But if you happen to have a Blackjack, they'll give you 15.

Robert J. Marks:

I see. Okay.

Sal Cordova:

The first thing they did is change the payouts in some games to six five. You can't beat that game with ordinary card counting techniques. The other thing is they've had these continuous shuffle machines, where after the dealer deals out the hands, they'll put it right back in the shuffler. And so you lose all the advantage because the idea is-

Robert J. Marks:

Oh, so the cards are returned, and there's an automatic shuffle and it's a new shuffle. And so it's just a fresh deck all the time?

Sal Cordova:

Exactly.

Robert J. Marks:

And you can't card count that.

Sal Cordova:

That's correct.

Robert J. Marks:

Yeah. Okay.

Sal Cordova:

Unless you have a full table where you might be able to get a little bit of an advantage because you've seen some of the cards. You don't have a very large advantage in that. Some people have tried, and for the most part you don't do it. Now, the only time that I've known the continuous shuffle machines were beaten is again, because the casino made a marketing mistake. They made a marketing mistake like the loss rebates, and this time it was the coupons were too generous. And somehow the advantage players got ahold of all these coupons and they cleaned the casinos out for millions in Macau.

Robert J. Marks:

That's fascinating. They also use multiple decks now. They used to not use multiple decks.

Sal Cordova:

You can count down multiple decks. I've done it.

Robert J. Marks:

Really? So how many decks can you count down?

Sal Cordova:

Eight.

Robert J. Marks:

You can go up to eight?

Sal Cordova:

Yeah. I've counted down eight.

Robert J. Marks:

Oh my gosh. And they also do surveillance. How does that work? They watch how you play and ...

Sal Cordova:

They can watch how you play, or they have a videotape of how you play, and then they'll put it through a computer and say, okay, these are the cards that were dealt out. This is how the player is betting and the way he's playing his hand. And the computer will do an evaluation. And he'll watch you play through three shuffles, three shoes or three decks. And then they'll say, okay, the odds of him doing this randomly are like that.

Robert J. Marks:

Otherwise, they do this in real time, is that right?

Sal Cordova:

No, no. Sometimes they'll just do it just through video surveillance tape. So the next time the patron comes in, that's what they did to me when the tribal elders had ... They reviewed the tapes and said, this guy's too good. And so that's what happened to me. If you have something there about some of the interesting players, I could share that too, because that's interesting too.

Robert J. Marks:

Sure. Tell us about the interesting players.

Sal Cordova:

Well, some of them are math professors. One of them, you can look up the name in Wikipedia, Michael Canjar. C-A-N-J-A-R. Yeah. He was a math professor at Detroit Mercy School.

Robert J. Marks:

Do you know if they made a movie about that? There was one where starring Kevin Spacey. It was a movie called 21.

Sal Cordova:

21.

Robert J. Marks:

Yeah. Was that about him?

Sal Cordova:

No. That was somewhat fictitious. But MIT had a big tradition starting with Ed Thorpe of all these skilled players coming. And so the movie was loosely based on the true history of that MIT tradition of technical excellence. So they're good at engineering and they're also really good at the casinos. So math professor, he won a quarter million dollars, and that's even considered not too big among the professionals. But he gave a large portion of charity. And there was also a Catholic priest. He had the vow of poverty. And so he was an economics MIT graduate, PhD. And he said, "Well, I'm doing this for the greater glory of God." And so he donated his winnings to Boston High School, which is I think related to Boston College. And he got their athletic centers. Now, some of the other ones went on to be hedge fund managers, like Ed Thorpe. One of them invented SMTP, Semyon Dukach. So he was phenomenal.

Robert J. Marks:

I don't know what-

Sal Cordova:

In email, SMTP.

Robert J. Marks:

Oh, okay.

Sal Cordova:

Yeah. So usually some of these guys are just, they would be skilled. They had the minds that would give them advantage. I think one of the most influential would be Bill Gross. He ran a gigantic hedge fund.

Robert J. Marks:

Spell his last name.

Sal Cordova:

G-R-O-S-S. After he got kicked out of Las Vegas, I think he had an injury. And so during his convalescence, he learned how to card count. He went to Las Vegas for a year. They kicked him out, which probably was the best thing for his career. He went on to be trading in bonds and he had the largest bond hedge fund. I think it managed a trillion dollars. And his saying was, the way we run our hedge fund is we're just like playing Blackjack every day. We're always looking for advantages. So these are some of the interesting characters. There's Russell Sands, who was a Blackjack player and a backgammon player. He was the backgammon champion.

Robert J. Marks:

They have champions in backgammon?

Sal Cordova:

Yeah.

Robert J. Marks:

Okay. I guess that makes sense.

Sal Cordova:

I don't know that he made money off of it. But it, again, displayed, he may have made a little bit, but it displayed his skill. He teamed up with Richard Dennis. Richard Dennis is a famous futures trader. Dennis, he started out with 400 or $1,400, turned it into 400 million using mathematical techniques. I think he teamed up with a mathematician named Eckhart and they just made a killing. So there was a bet between him and someone else to say, can we actually make good futures trader, or is it something that they just is intuitive? And he formed what was called the Turtles. And the Turtles were, he just gave them this program of how to do futures trading. Just very simple rules. And they obeyed it and they made a killing.

Robert J. Marks:

Was this after Black-Sholes?

Sal Cordova:

Yes, after Black-Sholes. And so Russell Sands was one of the Turtles, and he's also a famous Blackjack player. So there's some really interesting characters that have ended up being casino advantage players. And so there's a rich history even of how these guys, where they ended up post their career after they get kicked out of the casinos. Another one was Alan Woods. He made $2 billion in horse racing.

Robert J. Marks:

Really?

Sal Cordova:

And he had computer analysis and he just made a killing off of it. During the crash of 2008, he had all these futures, I mean, I'm sorry, options bets on the NASDAQ market. And he pulled out six weeks too early. He would've owned the Nasdaq figuratively speaking. He would've made a killing during that big meltdown. He was just six weeks off if he had held it. So there's some very good ... They apply their

casino skills in brick and mortar casinos and apply it to financial enterprises. And some of them are very quite successful.

Robert J. Marks:

That's amazing. Let me ask you this, is there still an opening for an advantage player in Vegas? If a person is smart enough, could they go in and there's still these loopholes where they could be advantage players?

Sal Cordova:

That's a good question, and I don't know the answer because it's been 12 years. No, it's been about 10 years since I was kicked out. And after I was kicked out, I went on to other things. And so I haven't followed it. The last time I went into a casino was just to use the restroom on my way to one of the conferences you and I attended actually out in there in West Virginia. So, West Virginia casino. So I'm sorry, I don't have the answer to that.

Robert J. Marks:

Okay. So you haven't followed any other people that have gotten rich recently?

Sal Cordova:

That's correct.

Robert J. Marks:

Okay.

Sal Cordova:

That's correct.

Robert J. Marks:

That's interesting.

Sal Cordova:

So I would suggest to the viewers, they could probably just look it up, and if you can make money, do it. If you have the skill and the discipline, I would caution them that if they have the gambling types not to go in the casino. That's the best thing you can do. That's the really sad side of it. So I was on the fun side for a while, but the sad side is just seeing how it ruins so many lives. And I had to close my eyes to that a little bit, otherwise, yeah, I'd probably not want to wander in.

Robert J. Marks:

That is really interesting.

Sal Cordova:

Now, since this is Mind Matters, I did want to offer one thing. This is an interesting application of human and computer intelligence. So the computers were a big part of, sometimes, particularly in Blackjack,

calculating if the game was even beatable in formulating a methodology. So Dr. Thorpe is using computers for a year up there in MIT. And people at Aberdeen Proving Grounds, the Jet Propulsion Labs.

Robert J. Marks:

This is very interesting. Thorpe publishes paper of favorable strategy for 21 in 1961, which was roughly around the same few years that Bernie Woodrow at Stanford used a neural network called the Adeline to play 21, and claimed, I don't know the details, but he did claim that his Adeline computer beat the theoretical maximum of winning. I don't think he did any card counting. I think it was assuming every hand was from a freshly shuffled deck. But it came out fine.

We're talking to Sal Cordova about casinos, how to win at casinos if you're really a nerd and can find some angle to get in and pry the money away from them. And Sal made his living for a while card counting. And what was the period of time in your life where you did this card counting? What years?

Sal Cordova:

I'd say from 2005 to 2014. But it wasn't my full-time job.

Robert J. Marks:

Okay.

Sal Cordova:

On the weekend-

Sal Cordova:

... 14, but it wasn't my full-time job.

Robert J. Marks:

Okay.

Sal Cordova:

On the weekends, I would go to the casinos and sometimes drive long distances. It wasn't that profitable. My father had passed away, and it was a chance for me to just decompress, just driving the long distances, and kind of my way of coping. And so, it really wasn't that profitable. It really wasn't that much of a career. It was more or less a side hustle. So, that's a little bit about my experiences there. The professionals, they had to be good con artists. I was not

PART 2 OF 4 ENDS [00:56:04]

Robert J. Marks:

They have to be actors, I guess, right?

Sal Cordova:

Very good actors just persuading the casinos that they're degenerate gamblers. I would walk in there, I think people knew right away. It's like I kind of stood out. I looked like looked like a scholar and I spoke like one.

Robert J. Marks:

Okay, Yeah, you look suspicious.

Sal Cordova:

Yeah, you just immediately.... And it is like if you wander in there and you look like you have brains, it's like, yeah, you're automatically under suspicion.

Robert J. Marks:

That's fascinating. So, I want you to give us a tutorial in card counting. But before I do this, how difficult is it? We talked before, and you said it's just playing the piano. You just got to figure out which keys to touch at what time. But you don't get to be a concert pianist grand master by figuring out which keys to touch at the right time. There's a lot of skill to it. So, it's not as simple as that.

Sal Cordova:

That's correct. The concept is not hard. It's just like saying playing tennis is just returning the ball.

Robert J. Marks:

Yep.

Sal Cordova:

I mean, I'm exaggerating, obviously. But I'd say if one wanted to card count, there are computer simulations out there that will teach you, that will examine your ability and grade you. So, there are a number of counting systems, and they were generated by computers to give you a heuristic. So, this is where the computer-

Robert J. Marks:

So, they used computers to generate card counting. I thought Thorp did it in 1961 just by looking at the math of it.

Sal Cordova:

Correct. And that counting system was brutally difficult. You had to maintain... So, let's just contrast the actual in practice methods toward the ideal one. The ideal one would be that you knew exactly... you could recapitulate all the cards that you've observed, and then you could calculate the odds in real time for all the cards that you observed. That's extremely difficult to do. Now with the computer, the role of the computers in this was one of the major roles was to find an estimation system, an estimation system that a human could actually execute.

Robert J. Marks:

You have to have a good short-term and maybe even long-term memory in order to do this, is that right?

Sal Cordova:

Relative, A good short-term memory. You actually have to be reasonable at arithmetic. So, I'm going to give you the counting system that I used.

Robert J. Marks:

Okay, let's hear it.

Sal Cordova:

But this was developed by the computer. So, the computers will give you... it'll estimate the optimality of your heuristic. So, this is a heuristic... Maybe since you're a computer guy, you could probably explain what heuristics are.

Robert J. Marks:

Well, it's just an intuitive algorithm. It's one you make up by the seat of your pants and your experience, your life experience.

Sal Cordova:

Right. So, this was just kind of an estimation system. It turned out that in terms of the bets, what would be the optimal bet to put forward. It's 99% accurate. In terms of the optimal play of your hands, it's 75% and it was good enough. So, that would mean that-

Robert J. Marks:

Okay, pass that by me again. 99% was what?

Sal Cordova:

Betting, meaning it would tell you whether you're supposed to put out a thousand dollars versus, say, 5 dollars.

Robert J. Marks:

Okay, this was the optimal algorithm?

Sal Cordova:

Versus the optimal algorithm, the one that you have as a human that the computers figured out is 99% good enough.

Robert J. Marks:

Oh wow. Okay.

Sal Cordova:

But as far as playing strategy, it was only 75%. So, what would this mean? If your advantage, again with the law of large numbers and expectation value, if the theoretical advantage were, say, 2%, you could get 1.5%, which is enough to put the casinos on their knees if they let you play long enough.

Robert J. Marks:

I see.

Sal Cordova:

Because what ends up happening is as you keep winning money, you have an exponential growth law.

Robert J. Marks:

Yes.

Sal Cordova:

And so, that's why they want to nip it in the bud. Because you could start out with $10,000 in what they call your bankroll. And I mean, if you think about it, if you have a 1% advantage, wouldn't it be nice to just kind of exercise 1% advantage like, say, in your bank account over a certain cycle?

Robert J. Marks:

Yeah.

Sal Cordova:

So, if you're growing your bankroll by 10% every week, you're just going to kill the casino at some point.

Robert J. Marks:

You are, yes.

Sal Cordova:

And that's why they want to get... They're not worried if you're still at the small scale, but some of these guys will grow their bankrolls from like $10,000 to millions, and then they start to become a real threat to the casinos.

Robert J. Marks:

Well, one of the challenges is if you have a bankroll, you have to be very careful in the way that you bet it. For example, you don't want to put your entire bankroll down on one bet. And I learned this, I was in a business called Financial Neural Networks, and there's this risk security tradeoff. You have a balance between the risk that you take and the amount of money you make.

And the risk was a big choppy curve. It went up, but it shot up, it shot down, it shot up, it shot down, and you made lots of money with lots of risk. But that curve went up and down and up and down and up and down. Whereas if you erred on the side of security, it went up very gradually, but not as much.

Sal Cordova:

Right.

Robert J. Marks:

And one of the things I found out, which is obvious once you know it, that if you're jumping up and down, and you jump up and down and that curve hits zero, you're done.

Sal Cordova:

Right. That's called gambler's ruin.

Robert J. Marks:

The gambler's ruin. Okay, so if you bet too much and your bankroll gets wipe out, totally done. And you can do that when you're playing with probabilities, right?

Sal Cordova:

Right. And actually, this is a important theoretical result by John Kelly who also worked with Bell Labs, an MIT guy. So, there must have been some connection in that era between Bell Labs and MIT. This was an achievement, and it's actually very simple. If your advantage is like, say, 1%, approximately the most you should bet on any one given bet is 1%. Beyond that, you start to lose efficiency. And if you double it, you'll go to ruin. So, we call it not over betting. And preferably, if you wanted to limit that variability, you would only do fractions of what they call the Kelly. So, when they say full Kelly, you're maximum amount of growth, but you're going to have too much variance. So, you want to be at-

Robert J. Marks:

It's jumping up and down. That's the variance. That's where you go jagged where it goes straight up, but man, it just bounces up and down as you go up.

Sal Cordova:

So, the professionals will often operate at quarter Kelly or one-eighth Kelly, and then the hedge fund managers realized they could actually import those ideas into management of their hedge funds.

Robert J. Marks:

Ah, okay.

Sal Cordova:

And so, this is why it's really nice to see the casino math play out like that. Now there's some stuff where you can actually start to put in a little bit more to refine the Kelly betting. I simplified it, but it's there. The listeners can look it up. And so, that's very interesting. And so, just Google Kelly criterion, the Kelly criterion. Another way of framing it in terms of just raw metrics is the expected value versus the variance. So, they call that the sharp ratio. You divide the expected value by the variance or vice versa.

Robert J. Marks:

In engineering, we call that the signal-to-noise ratio.

Sal Cordova:

Yes. Yes.

Robert J. Marks:

It's exactly the same.

Sal Cordova:

I'm embarrassed because I'm an electrical engineer. I should know that.

Robert J. Marks:

No, yeah. Well, the expected value is what you get, and that's the signal because you want to maximize that. But the variance on the bottom is the amount of wiggle or uncertainty that you have, so that's the noise.

Sal Cordova:

And that goes back to Shannon who said, okay, this is the amount of information you could transmit on that. See, this all connects.

Robert J. Marks:

It all connects.

Sal Cordova:

That's why think of Shannon there trying to beat the roulette wheels.

Robert J. Marks:

Yep. Yep

Sal Cordova:

Oh yeah, I should have known that. So, back to the actual card counting. They formulated using the computers, all these various counting methods, but I'll give you the one that I used. And so, what you do-

Robert J. Marks:

So, there's a number of ways to card count, right?

Sal Cordova:

Yes.

Robert J. Marks:

And probably some are more difficult and require more memory than others.

Sal Cordova:

Right. So, the MIT team used a relatively simple count, but the initial counting systems were just brutally difficult. You had to keep track. The simpler ones are just a single count, and I'll explain how that is. So, let's say you keep a running sum. So, if you see a certain card like an ACE or an eight in the advanced Omega II system, that's the one that I've use.

Robert J. Marks:

That's the card counting system you use, Omega II?

Sal Cordova:

I used, right. If you see an ace or an eight, you just add zero to your running total. So, you're just, okay, so the dealer's dealing, and you observe ACEs and eights from his deck. And you say, "I'll just add zero," which is easy. If you see four, five, or six, you add the number two.

Robert J. Marks:

Okay.

Sal Cordova:

And so, you could see how that you can get confused because you see a four, it's like I add two.

Robert J. Marks:

Okay.

Sal Cordova:

I see a six, I add two. So, you have to try to separate the numbers. And then at that time, also in all of that, the dealers calling out numbers like you have 16 or so, and you have to be able to separate the numbers out. So, that's the first skill, not to be confused.

So, aces and eights are zero. Two, three, and seven, you add one. Four, five, six, you add two. Face cards, which are like 10s, jack, queen, king, you subtract two, and nines you subtract one, and that's it. That's one of the best card counting systems in terms of accuracy.

Robert J. Marks:

Really?

Sal Cordova:

And then you can do what they call, if you want to keep two counts in your head, you count the number of aces that have come out. When you can keep those tallies, you have some idea of then the remaining strength of the deck.

Robert J. Marks:

So, what do you do with that number? You have the number. How do you use it?

Sal Cordova:

Okay, so just basically if it's a very high number, you start increasing your bet. If it's a low negative number, you want to reduce it. But to refine that-

Robert J. Marks:

So, what's a high number? It's just kind of a fuzzy-

Sal Cordova:

Okay, in single deck, there's what they call the... I think it's called just the running count, the raw count.

Robert J. Marks:

Okay.

Sal Cordova:

But then you have to adjust it by the number of cards dealt out. So, the true count, I think you call it the true count. So, what happens is let's say you have a single deck game, that's the easiest, and he's dealt out half. And let's say your running count is at six. You divide six by a half, now it's at 12. That's when you bet your maximum.

Robert J. Marks:

Oh, really?

Sal Cordova:

The advantage would correlate to, again, so with each hand, I mean with each count level, there's an associated advantage. I think the maximum advantage you might have when the counts are that high could be like 6%. So, then that's when you had the computers actually figure out beforehand how much you're going to bet.

And so, before I would go into the casinos, I'd look at my bankroll, say it's $30,000, and the computer would say, okay, if you're operating at a Kelly fraction of one-eight, this is how much you can entitle yourself to when you have the maximum count. And you'd go into the casinos and say, okay, if I have a true count of six, this is how I could push out $300. If a true count of three, I would push out this amount. You have all these tables you would memorize, and that's how you would use it.

So, the first skill is to actually be able to count the decks and keep that running count. And then you have to divide it by the number of cards dealt out. And you can either use your eyes to just guesstimate, or you could actually count also the number of cards that were dealt out if you really wanted to be an aficionado. And then you could also be counting the aces, and you could adjust the counts with the number of aces dealt out.

And so, why would anyone try to do this? It's just like you see these neighborhood kids, they have these hoops in their driveway, and they're just trying to take basketball shots and seeing how farther away. Well, you just get to the point you're just challenging yourself mentally and seeing just how far can I push my mental abilities here. And so, it began to be a game of like, okay, can I keep these counts accurate?

Robert J. Marks:

You'd have to be sharp when you did this. You couldn't be sleepy or tired.

Sal Cordova:

It'd be undesirable. And the thing you did not do is drink.

Robert J. Marks:

Oh, of course not.

Sal Cordova:

Of course, I don't drink. I rarely drink anyway. But that used to be the running joke. If you see someone drinking bottled water, that was just like, no.

Robert J. Marks:

I wonder if the casino bosses look at that.

Sal Cordova:

Oh yeah, it's like this guy's just... he looks like a scholar, he drinks bottled water, and he doesn't seem to be bothered whether he loses or not.

Robert J. Marks:

And by the way, card counting doesn't guarantee you win. It just increases the probability you win.

Sal Cordova:

Right. And so, again, the idea is you don't over bet because then you try to get the law of large numbers in your favor. So, some of the skills, that gives the skills that have to be developed to beat the game of blackjack.

Robert J. Marks:

Yeah.

Sal Cordova:

And so, the ones that are good at it just love the game just for the challenge. Bill Gross, who's that hedge fund manager of a trillion dollars, he likes to play blackjack. He's not doing it for the money. He has to sneak into the casinos now because they know who he is. And sometimes you can get away with it. You have to go in there in a disguise. And when I started to get photographed, my favorite outfit was the pimp outfit.

Robert J. Marks:

But you said you're a bad actor, too.

Sal Cordova:

I was a bad actor. It didn't fit. So, I'd be there in my pimp hat and my loose, and I'd have to walk a boy from the hood.

Robert J. Marks:

Do you have any pictures of yourself? I'd love to post it on the podcast page.

Sal Cordova:

I don't think I do, unfortunately.

Robert J. Marks:

Okay.

Sal Cordova:

Now the getup that they said looked at least halfway convincing was I'd be in my cargo pants and wearing a deer hunter outfit.

Robert J. Marks:

Okay.

Sal Cordova:

That made me blend in. They said just look like you're just like a guy who'd been... some of these workmen who paint houses or whatever.

Robert J. Marks:

A good old boy.

Sal Cordova:

Yeah, a good old boy. And I had some partners there that tell me, "Yeah, that look looked pretty convincing until they heard you talk."

Robert J. Marks:

I see. Well, see, I was born in West Virginia, so I have mastered an Appalachian accent, and I could break into my Appalachian accent any time I wanted to.

Sal Cordova:

That's pretty good.

Robert J. Marks:

And so, I could pass. Yeah, that is good. Oh yeah, I'm in West Virginia for three weeks and, man, I'm just talking like the natives. It's amazing.

Let me ask you a question. Clearly there's different levels of card counting depending on how complex things you can juggle in your mind. And as you go up the difficulty, the chances of you winning are better, right? So, that suggests that there is an optimal, there's a best way of doing it. Now that would require you to literally be a computer, but of course you can't be a computer.

Now MIT, and I'm going to ask you about this. MIT, there was a graduate student that came up with something called AlterEgo. And the idea was that, and I'm not sure the way they got his face, but just bear with me. It's the idea that you use your teeth as a keyboard. And when you use your teeth as a keyboard, you did this, I forget what they call it, a sublingual sort of message.

Some people move their mouths when they read, for example. But there's these little micro changes in your face. And those micro changes in your face can be picked up as a communication to a computer. And this guy that was showing AlterEgo would go around and they would ask him questions like what's the capital of Luxembourg or something. And he would go... and then he would answer.

And clearly what he was doing is kind of typing on his teeth. I think it's more complex than that, but typing on your teeth is the easiest way to explain it. He would move his tongue around to give these messages from his face. And then there was vibrations from his face, too, that also communicated from the computer to him. Now all of this can be done through a cellphone. I don't think that they ban cell phones from casinos. Do you know?

Sal Cordova:

I don't think so. No, I don't think so.

Robert J. Marks:

Yeah, I can't imagine them doing that. So, if you did that, could you really clean up at card counting if you had an interface to a computer program which told you the optimal play as you begin to type in all of the cards that have been played?

Sal Cordova:

No, no.

Robert J. Marks:

That's a surprising answer.

Sal Cordova:

No, because this is really interesting because the merging of human and computer intelligence, the computer intelligence gave you the human strategy to play it. But as I said, the correct plays are still 75%. So, the correct plays being you memorize all of these tables. And I had pages of tables memorized where it would tell you, okay, under this count, this is the best play to make.

Robert J. Marks:

Really?

Sal Cordova:

It would be 75% of what the computer could do. And in that book, I loaned you the book by-

Robert J. Marks:

Okay, yeah, let me talk about this.

Sal Cordova:

Yeah.

Robert J. Marks:

Sal, give me a book. It's called The Theory of Blackjack, and it's in its sixth edition. And the subtitle is The Compleat Card Counters Guide to Casino Game of 21. So, this is going to tell you-

Sal Cordova:

By Peter Griffin.

Robert J. Marks:

By Peter A. Griffin, G-R-I-F-F-I-N, and it's in its sixth edition. Did you learn from this book?

Sal Cordova:

No, I learned from Blackjack for Blood by Bryce Carlson.

Robert J. Marks:

Blackjack for Blood. Oh, what a terrible name. Okay, so anyway, you were explaining-

Sal Cordova:

But that book was the theoretical... It elaborated on Ed Thorp's original work,

Robert J. Marks:

Which you said he gave forth a very complicated algorithm.

Sal Cordova:

Very complicated counting system. And it tested out well, but it was brutally difficult to use in the casino.

Robert J. Marks:

So, what you're saying is that this simple card counting algorithm that you came up with is pretty close to as good as you can do.

Sal Cordova:

Right.

Robert J. Marks:

That's amazing.

Sal Cordova:

Now, you did mention about these computers.

Robert J. Marks:

Yeah.

Sal Cordova:

There was originally some long time ago, Keith Taft, who he built the first wear... another wearable computer, and he would use his toes to activate...

Robert J. Marks:

That was the other thing I was thinking,

Sal Cordova:

... to type the cards that he was observing, and then it would buzz when the counts were high and tell them, and he would play. So, he was successful at that. And then he teamed up with some kind of, not the most savory characters. He would have these people as observers with the computers and then the big whales or the big betters team up. And the big betters would just rely on the guys with the computers just standing behind them, and the guys with the computers would let them know when to start raising their bets.

Robert J. Marks:

Okay.

Sal Cordova:

And they would play probably basic strategy or some variation of the strategy, and they're cleaning out for a month until the casino surveillance figured it out.

Robert J. Marks:

Well, see, that's a question. Usually the casino, if you figure out something's going on, they change the rules so that you can't game it, if you will.

Sal Cordova:

Right. And that resulted in a Las Vegas law that you can't bring computers into the casino.

Robert J. Marks:

You can't. But what's interesting is you can bring cellphones in, and that those cell phones are more computationally powerful than anything Claude Shannon could have brought in there.

Sal Cordova:

So, I think what they would say is you can't use it in the commission of the game. You could get in big trouble.

Robert J. Marks:

Really?

Sal Cordova:

But again, because you could beat the game, you could still beat the game and you're 75% efficient. Most of my professional gambler buddies would say don't even try. The risk of you getting thrown in jail and prosecuted, even if you're innocent, just don't even give them an opportunity to hassle your prosecution.

Robert J. Marks:

So, my idea about AlterEgo and typing on the teeth would get me arrested if I did that if found out?

Sal Cordova:

Yeah, yeah.

Robert J. Marks:

Okay, wow, wow.

Sal Cordova:

So, just learn.

Robert J. Marks:

There goes my get rich quick scheme.

Sal Cordova:

I know, I know, I know.

Robert J. Marks:

That's too bad. Well, Sal, this has been fascinating. We've been talking to Sal Cordova. The guy has more degrees than a circle. He has degrees in mathematics and computer science, electrical engineering, a master's in physics and has done a lot of graduate work in biology. And he made a living... No, you didn't make a living. You just made extra bucks.

Sal Cordova:

A nice side hustle, yeah.

Robert J. Marks:

Could you have made a living?

Sal Cordova:

If they let me keep playing, yeah.

Robert J. Marks:

If they let you keep playing. So, that's the big thing. Well, one of the things-

Sal Cordova:

I'd have retired in a year, because it's the exponential growth law.

Robert J. Marks:

It is, yes.

Sal Cordova:

Anything that you could... I mean, if you could be doubling your bankroll every few weeks, yeah.

Robert J. Marks:

Yeah, there's the old story about the king that awarded somebody for some reason by putting rice on a chessboard where he put one grain of rice, then two, then four, then eight, and that's the payment that the guy asked for. And then they found out when they got to the 64th square that that was more rice than existed in the world. That exponential increase is just astonishing. Well, we're going to talk next time about card cheating Christians.

Sal Cordova:

Card counting.

Robert J. Marks:

Card counting. I'm sorry, yes.

Sal Cordova:

They were Christians, and they played honest.

Robert J. Marks:

And they played honestly.

Sal Cordova:

Oh yeah.

Robert J. Marks:

Okay. So, we're going to talk about that next time. It was a movie called Holy Rollers.

Have you ever taken advantage of your skills in betting with other people?

Sal Cordova:

Yes, team play.

Robert J. Marks:

Oh, team play.

Sal Cordova:

Team play.

Robert J. Marks:

But this is a team play at a casino?

Sal Cordova:

Yes.

Robert J. Marks:

Okay, we'll talk about that in a minute. I want to tell you one of the great examples. I want to tell you a way to be honest and always win in a lottery. Would you like to know?

Sal Cordova:

I would like to know.

Robert J. Marks:

Okay.

Sal Cordova:

I've never heard of that.

Robert J. Marks:

This is where you're in a situation where they collect ballots, and they put them in a hopper and turn the hopper. And they invite somebody up and they reach in and they pull out a winner.

Sal Cordova:

Like a raffle.

Robert J. Marks:

Like a raffle. That's exactly right. The way that you increase this, and I learned this, by the way, from my sweet wife who doesn't have a dishonest bone in her body. But you take your entry and your crumple it up so that it's crumpled up in all of these other flat entries, and that gives it more volume. And you get a better space, you get more space in which to draw.

And I'll tell you a true story. Have you ever heard of Hugh Ross?

Sal Cordova:

Yes.

Robert J. Marks:

Okay. Hugh Ross, a great Christian man, great apologist, a great cosmologist. He visited Baylor, and he says, "I'm going to have a drawing for my DVD." He had a new DVD that he was putting out. And he says, "I'm going to send around these cards," and they were like index cards. And what he wanted was to collect some emails and stuff in order to increase his email list and things like that. And so, you filled it out and you handed it back in.

So, I was sitting with my wife and my brother. And I elbowed my wife and said, "Fold it up." So, we folded it up like an accordion and we handed it back in, and my wife did, too. And I asked my brother to do it, and he said, "No, I'm not going to do it." He felt dishonest.

So anyway, it was not put in a hopper. Rather, Hugh Ross took all of the cards, kind of shuffled them, and then he held them in his left hand. He reached down with his right hand and grabbed a place where it was convenient and put the card up, and then the next card was the winner. Guess which one he chose. Me, and I was the host. And everybody said, "This is fake. Mark has hosted Ross." But I got his DVD. And then he put my card aside, and then he shuffled them again and he did the same thing, and he chose my wife's card. True story, true story.

And so, he looked at it and he said... Ross is a very smart guy. And he looked at it and he said, "There's something wrong here." And so, he put that one aside, and he chose the next one which was my brother. So, that's a true story and that's hilarious. So, that's how to cheat at raffles.

Sal Cordova:

Oh, wow. Oh, I see.

Robert J. Marks:

The entire idea is to get the volume of your entry bigger so that you have a bigger chance. I learned the following interesting story from Bill Dembski. It's from a book called The Broken Dice by Ivar Ekeland, E-K-E-L-A-N-D. And it turned out the kings of Norway and Sweden back in the Middle Ages, they were having this fight to determine the ownership of the island of Hising, H-I-S-I-N-G. It was a settlement that had ultimately belonged to both countries. And you know how they were going to do it? Instead of fighting a war, they were going to roll die.

Sal Cordova:

Wow.

Robert J. Marks:

And so, they're upon King Olaf, the king of Norway, cast the die. And one six shows on one of them. I'm sorry, no, it wasn't King Olaf. It was the other king. Anyway, that's not important. But one of them threw the die, and it got a 12.

And the only way that it could have progressed, according to the way we think about it, is that King Olaf had to also throw a 12. But this was in the Middle ages. The dice were probably made of clay. And Olaf took the dice and he threw them, and one of the dice broke in two. And so, he had a six on one, and the other one he had a four and a three. So, he got 13. And so, he declared himself the winner.

So what he did, and this is one of the ways to win in such situations, is to take the assumption of uniformity of results and go in and game it some way in order that it's advantageous to you. Breaking the die was advantageous to King Olaf, and crumpling up my entry for the sweepstakes was a way that I destroyed the uniformity assumption...

Robert J. Marks:

This was a way that I destroyed the uniformity assumption of the lottery. So anyway, those are some things you can take with you and add them to your arsenal for future use. Now, there have been a few movies made about card counting. One is 21 with Kevin Spacey, if I remember the movie right, it's been a long time since I've seen it, if I remember the movie right, he was a professor and he was training some people on how to card count. He had discovered how to card-

PART 3 OF 4 ENDS [01:24:04]

Sal Cordova:

Yes.

Robert J. Marks:

Are you familiar with the movie?

Sal Cordova:

Yes, and it's loosely based on bringing the house down. There is a true story where the professor... Actually, there might've been a manager, but there's some MIT guys, and I think they formed a corporation called Strategic Investments.

Robert J. Marks:

Oh, okay.

Sal Cordova:

And they pulled a substantial amount of money. They got people from MIT and also Harvard School of Business to be card counters, and they'd had the bank roll. So the idea is one, if you have numerous people betting smaller, the law of large numbers helps you. Again, the Kelly criterion, applying it. But it was also to disguise their betting patterns. So that was one.

Robert J. Marks:

Oh, yeah. So that they were more stealth in what they did.

Sal Cordova:

Yeah. Oh, this was clever. It was the big player model. And so what would happen is you'd have some guy who would sit at the table and his job was to count. And when the count was very high, when the shoe was hot, he would signal that the shoe was hot. So you have these big card... These are actually nice multi deck shoes. And so when the shoe was hot, they're all... It was loaded. And so this big player that would be looking for the signals would walk around and he would see it and he's like, "Wow." And so, you have the little card counter sitting there.

Robert J. Marks:

And he's not winning anything. He gets up and it looks like he's-

Sal Cordova:

Maybe he's betting 25, 25. And then so the big player comes in and just throws a $20,000 bet.

Robert J. Marks:

Because he's new, there's no track record of what he bets and so they think, "Ah, this could be normal."

Sal Cordova:

Right. He just wandered in the table. Again, you have to be a good actor, but he'd wander in the table and just said... If he is a good actor, he'll just be throwing all this money. And the law of large numbers would start, you'd have to do this process quite a bit. But it started to rake in the money and so they kind of avoided the problem of surveillance at one level, because what they would do would be focusing on the guy that was just sitting there the whole time. And that was one form of team play.

Robert J. Marks:

Now have you ever participated in team play?

Sal Cordova:

Not at that scale. So because I was a marked man, I had a female team player and I would be signaling to her.

Robert J. Marks:

Now is this when you were dressed up as a pimp and she was one of the girls?

Sal Cordova:

Yes.

Robert J. Marks:

Okay. So here comes the pimp and his girl. Okay.

Sal Cordova:

And there are other advantages to that because surveillance cameras are from the top, and not that I ever got her to do this, but-

Robert J. Marks:

Well, if you were a pimp, you had a big hat. Right?

Sal Cordova:

Well, ideally you would have one that would like to have her a very low cut dress, and you hope that the surveillance guys would be distracted.

Robert J. Marks:

Are you serious? There's lots of psychology in this, isn't there?

Sal Cordova:

Yeah. And so one time I was at a table once and this woman that was practically showing really too much, it was a talk of the pit bosses, especially a female pit boss was like, "Did you see that girl sitting there?" And I was like, "Hey, I could just kind of blast away and I'd be the invisible man," and I was just like, "This is great."

Robert J. Marks:

Really? So it was like a magician and she was your distraction?

Sal Cordova:

Oh yeah. I didn't worry about being surveilled. So sometimes if you're a card counter, you don't want to display your skill level. So sometimes you'd deliberately not play to your full maximum. Just because you didn't... The guy playing at his full maximum to going be betting from five to $1,500 and it's going to be so obvious you're skilled. And so sometimes you try not to be that way. So I had the female partner there and usually... Okay, so I'm an Asian male, I look scholarly. It's like, yeah, I'm going to be target. She looked like just an ordinary person and I just kind of, I'd signal her discreetly. I was trying to remember. Oh yeah, it would be a verbal cue. I would just, depending on what I would say, she'd know to raise or lower her bets.

Robert J. Marks:

Oh, was she playing simultaneously with you?

Sal Cordova:

Yeah.

Robert J. Marks:

Okay. So it wasn't one after the other like in the Kevin Spacey movie?

Sal Cordova:

Right. That's the Big Player model.

Robert J. Marks:

Right. Gotcha. That's the what model?

Sal Cordova:

That's the Big Player. That's-

Robert J. Marks:

The Big Player model?

Sal Cordova:

So there's a book called The Big Player by Kenny Uston. And Uston was also, he was the executive of the Pacifics.

Robert J. Marks:

How do you spell that?

Sal Cordova:

U-S-T-O-N.

Robert J. Marks:

U-S-T-O-N. Okay.

Sal Cordova:

And he wrote the book, he was an executive of the Pacific Stock Exchange. So there again, you have that connection to what we call the real casino, which is the stock market versus the brick and mortar. So he was the one that started the Big Player model, and then the MIT team started to copy it.

Robert J. Marks:

But how did they know that she wasn't card counting if you were sitting at the same place?

Sal Cordova:

They'd eventually figure it out. But a woman is usually, I know this sounds so sexist, but she's usually not suspected of card counting.

Robert J. Marks:

Seriously? Okay.

Sal Cordova:

Yeah, because women are known to be intuitive and most of the card counters are almost dominantly male, so she didn't fit the demographic profile.

Robert J. Marks:

Yes. Interesting.

Sal Cordova:

So yeah, I'd be signaling her. And it was fun because then I didn't worry about... They never her on it, so that was like-

Robert J. Marks:

But they got you.

Sal Cordova:

They got me as a solo player. So I didn't get to have that partner very often, but it was fun.

Robert J. Marks:

Isn't that interesting?

Sal Cordova:

And also, we did this with craps where they have the pass line and then they have the don't bet. And they basically negate each other unless the dice were rolled like a 12. But the idea is you limited variance. Even though it was a negative game, but you had so little variance. So I'd play like the boy from the hood and she's the sophisticated-

Robert J. Marks:

Variance, by the way, you can say that as risk, right? The bigger the variance, the bigger the risk.

Sal Cordova:

It's volatility, you might say. But we had ended up having very stable expectation. The expectation was very much in line with the... Just the variance is very, very little. But the trick was we had all these marketing coupons, and so the marketing coupons would be much larger than our disadvantage. And so that was one of the advantage plays we would use. So that's where I was getting these 20% loss rebates, but we weren't able to... Those were toward the ends of my casino days.

Robert J. Marks:

I see. There was another movie about card counting called Rounders with Matt Damon at Edward Norton, and they got caught card counting and some thugs took them out in the back and beat them up. Did you ever get beat up or do you know of anybody that got beat up? Does that happen or is that pure fiction?

Sal Cordova:

It doesn't happen this much in this day and age.

Robert J. Marks:

This much? Now you left the door open for it possibly happened.

Sal Cordova:

I haven't known of anyone because, like in Las Vegas, because of all the surveillance cameras, I've not heard, and they don't need to hurt anyone. They just ban them from the casinos now it's facial recognition. They could just make sure they never come through the doors. So that's how they're able to deal with them. But in the old days when the mob owned the casinos-

Robert J. Marks:

Oh, this would be in the thirties and forties and-

Sal Cordova:

Even in the early sixties.

Robert J. Marks:

Early sixties. Okay.

Sal Cordova:

Yeah. You did not want to be winning too much or they'd be onto you if you were doing something, they could beat you up then. Now the one time, one incident I know of Kenny Uston getting beat up, it was-

Robert J. Marks:

Did you mention him before, Kenny Uston?

Sal Cordova:

Yeah, just now. He's The Big Player.

Robert J. Marks:

Oh, The Big Player. Yes. Okay, thank you.

Sal Cordova:

It was when he was insulting a dealer in the mob actually took offense to that and they beat him up for that.

Robert J. Marks:

Okay. But not for card counting or cheating?

Sal Cordova:

Not for card counting.

Robert J. Marks:

Okay. I'm sorry, I keep using the word cheating. If you play the game by the rules, you're not cheating.

Sal Cordova:

You're an advantaged player.

Robert J. Marks:

You're an advantaged player. Okay.

Sal Cordova:

Now I will tell you this, I can't speak for the other countries how the casinos are run there. There's some places that are nice to play on, but you may not want to be there because you don't know how you'll be

treated. I do know, I've heard instances, like some of these cruise, these boats, these gambling boats that go out. The captain is the law out in the sea, and I heard that they'll threaten to throw you overboard.

Robert J. Marks:

So it's like the old pirate movies, you got to walk the plank.

Sal Cordova:

You got to walk the plank.

Robert J. Marks:

Or they'll keelhaul you, have you ever heard of that? They take you and they put you on one side of the boat and drag you under the boat to the other side.

Sal Cordova:

So one advantaged player at a boat, I love playing and I made money on that boat. Now I'm kind of realizing I was kind of in danger there, was that they've discovered this guy was an advantage player. They may have flyered him, meaning, that's another term. They circulated his photos. It got to the surveillance team. So they have sometimes these things where you're flyered, they'll go through this photo album, say, "Okay, if you see this guy, he's a bad guy." Well actually, we tend to think of ourselves as good guys. But anyway, he won a lot of money and they said, "Nope, we determined you're a card counter. We're going to take all your winnings and all your chips."

Robert J. Marks:

Oh, boy.

Sal Cordova:

And he protested and the captain said, "You protest, we're going to throw you overboard."

Robert J. Marks:

Seriously?

Sal Cordova:

So they took all of his money that he won legally, but because they took the money when he was out in the open ocean.

Robert J. Marks:

So it's international law, probably a law of their own.

Sal Cordova:

Right. A law of their own. He got back there, he didn't have any of his money. So that was one example of using force of violence against a patron.

Robert J. Marks:

Now both you and I are Christians, we're followers of Christ. You did some consulting on another card counting movie called Holy Rollers, which was about Christians that card counted. Could you give us the, first of all, kind of a summary of the documentary Holy Rollers, and then your involvement and whatever?

Sal Cordova:

Well, actually I wasn't a consultant. I was part of the crowdfunding donors.

Robert J. Marks:

Oh, you were a donor?

Sal Cordova:

Yes.

Robert J. Marks:

Okay. Well, the reason I know that, you're listed on the end credits. I saw the end credits and I said, Sal Cordova, I know the guy. Okay. So I knew immediately that, yeah, you had something to do with it.

Sal Cordova:

I put my first and last name, but they only put my first name. So I'm amazed that you're watching the credits and you saw my name and you knew it was me. I was like, wow.

Robert J. Marks:

I swore I saw your entire name. You don't think so?

Sal Cordova:

Well, the version of the DVD I had only had my first name and I was kind of disappointed because I was kind of proud of that.

Robert J. Marks:

You were kind of proud of that. Okay, first of all, tell us what the movie was about, and then your involvement.

Sal Cordova:

It's about, again, one of the most successful card counting teams, blackjack teams, they took the casinos from multimillions of dollars. Now, they didn't use the Big Player model. What they would do is they would just send players in there with a lot of cash. They'd be throwing down these $10,000 bets or whatever. And if they got burned out and got kicked out, so be it. Then they'd bring another way. It was a different style of play. It was just kind of, yeah, we'll just keep playing until they kick us out, type thing. But the idea was they're going to use the law of large numbers. But to have a team like that to be successful, they had to be very honest because you're going to give a guy a hundred thousand dollars, you expect him to report that if you really lost a hundred thousand dollars versus just pocketing it he was being honorable. And that's why the team was so effective, because everyone trusted each other and they were honest.

Robert J. Marks:

Now these were, to complete the story and why they call them holy rollers, they were missionaries to Seattle, I believe. Wasn't it Seattle?

Sal Cordova:

They were pastors and elders.

Robert J. Marks:

Pastors and elders. And typically they were on... Well, typically you have to work a second job from any ministry positions. And so I think that they figured, well, let's not work a second job and go out and toil, let's go to Vegas and card count. And that's the way that they earn their money. Is that right?

Sal Cordova:

Exactly. And again, it's the exponential law, they were able to leverage that. So they didn't start out with a lot of money, but because they kept reinvesting, the collective bank roll got bigger and bigger and bigger until the point they were, I think their total winnings at the time, and this was some years ago, was three and a half million dollars. In today's dollars, would that be like 10 million?

Robert J. Marks:

Wow.

Sal Cordova:

And they were called-

Robert J. Marks:

And do you know what they started with?

Sal Cordova:

The head of the team probably had $700.

Robert J. Marks:

Oh, Jesus. Boy, that is the power of the exponential.

Sal Cordova:

Now, he was really lucky because that's kind of a smallish bankroll. But I think his story was he was on food stamps at the time, and that was the only thing he could do, and he had a baby to feed.

Robert J. Marks:

And plus he had a Christian ministry. Okay.

Sal Cordova:

So they found me, and I was just very moved by the story because I'm a Christian and it's really funny that the Christians have had a long history in advantaged play, partly because I think it's the discipline of

following the book. And to be a good successful gambler, you want to follow rules and play by the book, so to speak.

Robert J. Marks:

Sure. You want to be honest,

Sal Cordova:

Right. Well, the Christian tradition, our book is the Bible, but that form of discipline extends to other areas of life. You play by the rules and you're disciplined and-

Robert J. Marks:

We're taught to submit to authority, and that's following the rules is.

Sal Cordova:

Following the rules.

Robert J. Marks:

Part of submitting to authority.

Sal Cordova:

So if the computer says this is the optimal mathematical play, you do it. You don't. And so it was that mindset. You also live a clean life. You don't drink. And the idea really, honestly, you don't gamble. Meaning if you play by the rules, you're not getting a thrill out of throwing the money in there and kind of taking the risk. You're there because it's a job. You're doing this for the honor and glory of God. Just like Father Fahey of-

Robert J. Marks:

Repeat that story. It's been a few years.

Sal Cordova:

Oh yeah. Father Fahey was a Catholic priest. He was an MIT graduate in economics, and he taught mathematics and economics and always his last class that was so popular, he would say, "Okay, now I'm going to teach you how to card count."

Robert J. Marks:

A Catholic priest.

Sal Cordova:

Being a Catholic priest, you have a vow of chastity and poverty. And so he gave all his winnings away and he was able to get computers for a particular school that he was a part of, part of the athletic facility and the library. So Christians have done well. I mentioned in one of the episodes, Keith Taft, who had the wearable computer. He was a Christian. And there are other Christians like Kevin Blackwood and others. I don't know why that is. And then you have the Holy Rollers and their story.

Robert J. Marks:

It's a great documentary, by the way. I would really recommend it.

Sal Cordova:

Oh yeah.

Robert J. Marks:

They do it so well.

Sal Cordova:

Yeah. And I could identify with these people. I mean, there are moral issues that you deal with. It's like, is this the right thing to do? And it's stuff that I dealt with. But for some of us, we felt like we're hurting the casinos and they're the bad guys.

Robert J. Marks:

Well, they are the bad guys. And also I think one of the people on Holy Rollers said, "The casinos say, come in, have fun, get rich. But if you go in, you have fun, and you get rich, they kick you out, even by their own rules. And that just isn't consistent." So I thought it was interesting. I've been at a casino once, and I went in and it struck me, all of these people were figuring out ways to game the system and some of them were so stupid. One guy was there pumping, I don't know if it was quarters or tokens or whatever, into a machine. And every time he did it, he pulled the one arm bandit and then he put his hand across the screen like that would increase his chances of winning. And it was clear he was doing that for some reason. And you know that these-

Sal Cordova:

Superstitions.

Robert J. Marks:

You know that these things have to happen all the time at these places.

Sal Cordova:

Well, one thing that this influenced me on is there's a theological thing called Pascal's wager. And I began to conceive of life this way at a personal level. And then also I realized everyday life also has... You're wagering on things where you have incomplete information and it's kind of the benefit to cost, the reward to risk ratios. And I began to view things very differently in other realms of my personal life, because I'd done this kind of semi-professionally, and it did affect the way I looked at the world and how to live my everyday life and how to invest time, et cetera, and money and resources and things. I would say it affected my personal life in a very positive way. Ironically.

Robert J. Marks:

Pascal's wager, by the way, is incredible. Blaise Pascal, by the way, was the guy that, well, the metric unit for pressure is named after Pascal.

Sal Cordova:

Pascal.

Robert J. Marks:

He invented one of the first computers called the Pascaline, which his father was in accounting or something like that so he invented that and marketed it. That's the reason there was a computer language called Pascal.

Sal Cordova:

Pascal. I could actually program in that.

Robert J. Marks:

Oh, you do program in Pascal?

Sal Cordova:

Yeah. I'm giving away my age here now. I used to program in Pascal. I think Basic was my first language, Pascal is my second.

Robert J. Marks:

Well, the other thing he did with Vermont was create the world of probability. There's a famous book called The Unfinished Game, and it's a series of letters between the great mathematician Vermont and Pascal going back and forth trying to figure out. This is not complete, but it's like somebody played the World Series and it's the best of seven games, but they played five games and Team A won three games, Team B won two games, but they all got killed in a plane crash. The winner was to get a million dollars. So the question is, how is that million dollars to be divided up? So that was the unfinished game, and they put these letters back and forth and found and came up with probability. And in a few years they had things like actuaries, they had insurance, because people could forecast the future in a probabilistic sense. And it's so obvious to it to us now, but back then, the idea of talking about the future was just kind of ridiculous until Pascal and Vermont did it.

Sal Cordova:

And I would add one other thing. So it was Pascal of Pascal's wager that actually formulated a lot of the gambling stuff. So like the concept of expected value, that was Pascal.

Robert J. Marks:

That was Pascal.

Sal Cordova:

Which now it reverberated through all of physics because a lot of quantum mechanics is expressed in terms of expected value. You'll just see that the idea of notion of expected value. So this is kind of your interesting how all this-

Robert J. Marks:

All this goes together.

Sal Cordova:

Oh yeah, absolutely.

Robert J. Marks:

But Pascal had, I guess what a Baptist would call, a born again experience. In fact, on his deathbed, they found some letters on him. Have you heard this? It was called The Night of Fire. And where he became a Christian, he recognized who Christ was and decided to follow him and he wrote down a lot of his feelings from The Night of Fire, and they're preserved for history. We can go back and read them. So from that point on, he spent all of his time in apologetics, for example, in doing Pascal's wager and just an astonishing man. And he died when he was 39.

Sal Cordova:

Unbelievable, the contributions. So theology wise, and then his contributions to mathematics, and then which now led to just big breakthroughs in physics. And then it comes back full circle, it got used in casinos where it started.

Robert J. Marks:

Yeah, the probability that Vermont and Pascal. Well, let's get back to the topic. Final question. Somebody hearing this might go, "I want to learn card counting and I want to go out and make big bucks." Do you have any advice for those sort of people?

Sal Cordova:

I'd say don't do it. Don't do it. Your time is better spent elsewhere. But if you just love it for the game, just get on a computer simulator and pretend you have, because in a computer simulator, you could bet a million dollars in.

Robert J. Marks:

Nobody cares.

Sal Cordova:

Nobody cares, and you could feel. So that's the advice I would give. There are a lot of gambles in life if you really like gambling, which I hope you don't, but there are plenty of places you can take risks. And so I would say take risks for the things that are of value in your life.

Robert J. Marks:

Like the stock market.

Sal Cordova:

I don't know. I can't tell you where to take risks, but for me, take risks for good causes. Take risks for other people to care for them. If I had to do it all over again, that's where I would say, "Okay, I might give money to this charity or that charity and could be squandered, but that's a worthy risk." And there might be career decisions to take a risk but again, if you feel that the outcome might outweigh your potential losses, then take the risk.

Robert J. Marks:

Are you ever going to card count again?

Sal Cordova:

I haven't since I got kicked out.

Robert J. Marks:

Since you got kicked out.

Sal Cordova:

So I don't know.

Robert J. Marks:

But you just got kicked out of one place. There's lots of casinos. You could.

Sal Cordova:

But I'm on the Sin Network now, the surveillance information. Oh, yeah.

Robert J. Marks:

Okay. So you've been blackballed.

Sal Cordova:

Bye-Bye. I'd have to sneak in in my pimp outfit if I want to do that.

Robert J. Marks:

No, you need something else. It's out there now that you dress up as a pimp. So thank you, Sal.

Sal Cordova:

Oh, thank you.

Robert J. Marks:

This has been a great time. We've been talking to Sal Cordova, Sal has degrees in mathematics, computer science, electrical engineering. He has an MS in applied physics from Johns Hopkins. I think your other degrees were from George Mason, is that right?

Sal Cordova:

Yes.

Robert J. Marks:

And he's also done NIH work in biology, and he knows a lot about gambling and card counting so thank you for sharing this with us. We appreciate it.

Sal Cordova:

Thank you.

Robert J. Marks:

So until next time, be of good cheer.

Announcer:

This has been Mind Matters News with your host Robert J. Marks. Explore more at mindmatters.ai, that's mindmatters.ai. Mind Matters News is directed and edited by Austin Eggbert. The opinions expressed on this program are solely those of the speakers. Mind Matters News is produced and copyrighted by the Walter Bradley Center for Natural and Artificial Intelligence at Discovery Institute.

PART 4 OF 4 ENDS [01:48:46]