Edward Thorp · Math genius who beat the dealer and the market

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Interviewer: Chat With Traders episode 109. This is your key to the minds of trading's elite performers, those who profit in relentless markets. Here on the Chat With Traders podcast, you'll hear about the skill sets and tactics that lead winning traders to win, so you can level up and become a better trader. Here's your host, Aaron Fifield. This episode is brought to you by tradestation.com, a top online broker used by many professional traders, including past guests of Chat With Traders, and myself, too, for what it's worth. Trade Station's platform and market monitoring tools are excellent, commissions are fair, support is never far away, and all round, just a really great broker to be with. To learn more about Trade Station, please visit tradestation.com. Support for this episode also comes from squarespace.com. Squarespace is quite possibly the easiest way for you to build your own website, whether that's a professional blog, an online store, or a website for your brick-and-mortar business. So, make your next move at squarespace.com. Start a free trial today and use the coupon code traders to get 10% off your first purchase. Well, guys, I'm not sure how to best say this, but my guest here on Chat With Traders episode 109 is kind of a big deal. Not only in the world of financial markets, but he's also a household name amongst the gambling scene. The gentleman's name is Ed Thorp, the man who beat the dealer and later beat the market. Let me explain. It was the late '50s, early '60s, when Ed, a math genius and professor at MIT, took on the challenge of discovering a way to get an edge playing gambling games such as blackjack, roulette, and even baccarat. Long story short, Ed won, and he's now considered the father of card counting. From there, the next obvious move for Ed was to take on financial markets, which he also did with a great degree of success. Ed's first hedge fund, Princeton Newport Partners, achieved an annualized return of 19.1% before fees over a 19-year period with out of 230 months being profitable. The worst monthly loss being less than 1%. And his second fund, Ridgeline Partners, averaged 21% annually over a 10-year period. Now, I must say, full credit to Jack Schwager for these stats, as I pinched them out of Hedge Fund Market Wizards. Now, throughout the interview, we mostly discuss the interesting path Ed has taken through life, but also his thoughts on having an edge and money management. I really wish I did have more time with Ed, as there were so many more questions I would like to ask him, but we did speak for about an hour, and I'm extremely grateful for the opportunity. One last thing, I would like you to make note, Ed has a new book which has just been released, and it's titled A Man for All Markets. It's available now on Amazon, so if you go to chatwithtraders.com/thorp, t h o r p, that will take you directly to A Man for All Markets on Amazon. Anyway, I hope you find this episode interesting. I'm Aaron Fifield. Please welcome my guest, the legendary Ed Thorp.

Ed Thorp: I'm on it pretty much every day, so I'm quite familiar with how it all works, but um man, thank you very much for taking the time to speak with me. It's it's quite the honor.

Interviewer: Oh, thanks. Ed, I I've begun reading your book, and I got quite a kick out of hearing that your very first job was actually the same as my very first job. We were both paper boys.

Ed Thorp: Oh, yes. I thought that was that was very cool to read about.

Interviewer: And one of the other similarities, to some degree, which I also thought was quite interesting, is that you ran an independent radio station. Yes. What sort of things were you broadcasting? How long did you keep that up for?

Ed Thorp: Well, I got my ham radio operator license when I was just turning 13. And I was on 2 m voice, and also I did a little bit of code, and so I used to play chess with people in my part of the country, and just chat with people up and down the state. At that time, 2 m was very short range with the equipment people had and the techniques they had. So, you could only go about maybe 100, 120 mi. And then I I was qualified to go on all the other bands and use code and talk around the world, but I mainly just had fun talking on 2 m.

Interviewer: Okay, okay. So, it wasn't really a radio station as such, like we think about a radio station today.

Ed Thorp: Well, it was it was a a ham radio station, is what it was, transmitter and receiver, but it wasn't a radio station in the sense of having any any commercial or public outreach.

Interviewer: Got it, got it. Okay. What sparked your interest in that sort of thing? How did you Like you were very young. I think you actually said in your book you were maybe the youngest person in the class going for your radio license. What sparked your interest?

Ed Thorp: Well, I got fascinated by all things science when I was about 10 or 11, and so I just explored on my own, and electronics, as they were in that in that day, vacuum tube electronics, caught my interest. So, I decided to learn about it, and when I did, I realized that there was this whole world I could potentially talk to if I got a ham radio license, so that was something I pursued.

Interviewer: Well, tell us a little bit about your childhood. You know, set the scene for us here. What was your childhood like? I know you're born in I think it was 1932, which was right when the Great Depression was beginning. What was your childhood like during that phase?

Ed Thorp: Well, actually I was born in August '32, and the Dow Jones hit its all-time low in the

crash in July of '32. So, it was it was all up from there, but it was a long a long haul for people to dig themselves out of. And I remember when I was five or six, I was selling Kool-Aid to WPA workers in the street. I would buy a 5-cent pack of Kool-Aid and make six glasses out of it, and sell them all for a penny a glass. And they were very happy to see me because they were working out in the heat for very little pay, and very hot and tired in the summer. So, I I realized I could turn 5 cents into 6 cents over and over with a fair amount of work.

Interviewer: What was the drive to start working and start trying to earn some money? Like you were very interesting, you know, as a young child. You were very kind of experimental, even quite the prankster in some ways. Like where did this sort of come from? You were quite different from most kids at that age.

Ed Thorp: You know, I'm not sure. I I think that a lot of it was I was an early very early reader, and I got into books a lot, and I found out that I learned so much stuff that there wasn't a whole lot of commonality I had with other kids, except except playing, going out playing games in the afternoon, and that sort of thing, but the things I wanted to think about and talk about, nobody else seemed to be thinking and talking about except adults.

Interviewer: So, where did that Where did that thirst for knowledge come from?

Ed Thorp: Well, I think partly it was my father. When I was not quite three, I hadn't talked yet, and then one day I started talking in basically complete sentences, which seemed to amaze everybody, so my father then said, "Let's I wonder how much he can learn." So, he started to teach me things, and I was very happy about that, so I I learned to read, I learned to count, I learned to do arithmetic operations, you know, add, subtract, multiply, divide, and that seemed to come very easily, and then I began to read more and more advanced books. So, by the time I was seven, I was reading basic high school level books very comfortably.

Interviewer: And what do you think it was about, particularly math and science, that was so interesting to you?

Ed Thorp: Math and science, I I didn't I didn't Math I liked, I just enjoyed numbers. They seemed very interesting, and they had rules. It was fun to learn what those rules were. Science came a little bit later. I think I started with a mineral set when I was about 10, and then learned the Mohs scale of hardness they had, a number of examples. Of course, they didn't have the top one, diamond, which has a hardness of 10, but they had everything up to nine in there. And so, that was pretty interesting to me. And then a little little time went by, and I began to poke around with chemicals. I learned how to make gunpowder out of an encyclopedia, and that's kind of caught my interest. I made bombs and rockets and so forth. And from there, just one thing led to another, and so when I got a paper route at age 11, I started putting part of my money into science equipment.

Interviewer: Okay, now, as a 10-11 year old playing around with gunpowder, did that land you in any sort of trouble?

Ed Thorp: Well, things were different in those days. You know, there wasn't any kind of regulation. And the corner druggist was very happy to sell me lots of things that would terrify parents now. At a nice markup. Things like concentrated sulfuric acid and concentrated nitric acid, ether. I actually thought about knocking myself out with ether to see what it was like, but I decided it wasn't a good idea because I wouldn't be able to tell whether I had gone too far or not. So, I decided to forget about the ether.

Interviewer: That that was probably a smart move. That sounds quite dangerous. So, Ed, what did you do after finishing school? What was the next move for you from that point? You mean after finishing high school?

Ed Thorp: Yes. Well, everybody was poor in those days and we went through the depression and World War II, but I managed to save money for an education, at least for part of an education by delivering newspapers and doing other odd jobs. So, I went off to the University of California to study chemistry. And as time passed, I realized I was more interested in physics, so I changed to physics. And then finally when I got halfway through my doctorate in physics, I'd done all the work except the last part of my thesis, I realized I had to learn a lot more mathematics to finish. So, I went to the math department to take the courses and when I got there, I found out that I would be able to get a math PhD sooner than finishing my physics PhD. UCLA was notorious then for keeping people around for 10 years in graduate school before they got out. So, I in 2 and 1/2 years I was out in math and it was a good decision.

Interviewer: Okay, and from that point you went on to become a professor actually teaching math. Is that correct?

Ed Thorp: Yeah, I got a position as a C.L.E. Moore instructor at MIT. That was my first position. That's a kind of an honorary sought-after position. They have competition all over the country to get that job and they appoint anywhere from one or two to six depending on the year and how much space and money they have. So, that was a great experience. So, I spent 2 years in Cambridge teaching at MIT and my then my wife said, "No, we can't stand these winters anymore." At least she couldn't. Tiny baby and all. So, we got a really good relocation to New Mexico State who had just gotten a whole lot of National Science Foundation money. So, I went there and I had my pick of graduate courses, 6 hours a week, pick of top graduate students who they were paying to come in. And so, after 4 years of that, I learned a lot of math and went on to UC Irvine when it opened up out in Southern California. And actually live not far from there now. And just to put this in perspective for us, where do you kind of sit on the spectrum? Like your

understanding of math and [unclear]

Interviewer: That field is very advanced. I believe you competed in like numerous competitions, maybe more so in your earlier days, but like where did you stack up in those competitions?

Ed Thorp: Well, when I was in high school, I needed to enter competitions to get scholarships and earn money, so I took the All Southern California chemistry contest which had one or two top students from each high school and I came in fourth in that and then I took the physics contest the next year and I came in first in that. And then I was a finalist for the National Science Talent Search. There were 40 winners out of 11,000 contestants all over the country. So, I went to Washington, D.C. and got some money for going there and then I got a scholarship from UC Berkeley which continued as a scholarship when I went to UCLA. So, piecing all these together went a long way toward helping me get through a college that I couldn't otherwise afford.

Interviewer: Just skipping forward a few years now, how did a mathematics professor become curious about blackjack?

Ed Thorp: Well, when I was a kid growing up in high school, I was left on my own a lot. My parents were working in defense or in that case war industries and they had my mother had the swing shift, 4:00 p.m. to midnight and my father had the graveyard shift, midnight to 8:00 a.m. at another industry. And so, I and my brother kind of took care of ourselves and grew up without any particular supervision. Now, that was good and bad. It was bad because I didn't have the opportunities that kids with more money and who went to a better high school would have, but it also taught me to think on my own about things. And so, when I came across situations later in life, I often looked at them for a fresh viewpoint. For example, when I was finishing my PhD at UCLA, I was going to go to Las Vegas to have a nice vacation with my wife over the Christmas holidays. And I learned before I went that there was a way to play blackjack published in a statistics journal that would give you not quite an edge, but you come pretty close. Your disadvantage only was less than 1%. So, I said, "Well, I don't know anything about gambling, but I'll risk $10 to see what happens." And I was also interested in going there for a second reason which was that I had figured out in the physics part of my career that roulette wheels might be predictable. And I had good reason to think that they almost surely were predictable if you could measure the position and velocity of the spinning rotor and the position and velocity of the spinning ball, you could predict with enough accuracy, not perfect accuracy, but enough accuracy to actually get an edge on the casino. So, one of the reasons I wanted to go to Vegas besides the cheap vacation and have fun playing blackjack as just as an experience was to look at roulette wheels and see whether they were like I thought they were from just pictures and hearsay and so on. And the reasoning. And sure enough they were. And I set out to beat roulette by building a hidden computer, wearable computer on a person's body. But when I played blackjack, I also stumbled across the knowledge that the people playing didn't know what they were doing and the

people running the game didn't know what they were doing. And there were some obvious things that they were missing and I said, "I can beat this game, too." So, I set out to basically beat both of them at that point. And that was a distraction from an academic career and from mathematics, but not enough of a distraction to take me out of the academic world, just enough to be stimulating and give me something one more great thing to do.

Interviewer: Now, that first trip to Las Vegas, how did you go playing blackjack and roulette?

Ed Thorp: Well, you mean where did I go to observe them or—

Interviewer: Did you do well? Like did you make money on that first trip?

Ed Thorp: Oh, that's a good question. Yes. Well, I had 10 silver dollars that I was willing to risk and that was it. So, I played for about 40 minutes and I lost 8 and 1/2 of my 10 silver dollars, but everybody else at the table was smashed. And at first I thought I was some sort of screwball with my little strategy card which I checked and I was also playing rather slowly because I wasn't used to all this. It was all new. And then after about 20 minutes, there was a remarkable hand that I drew. I drew a seven-card 21 following the instructions on the card which I had no intention of drawing a seven-card 21. It was just that the instructions led to this, led to me sacrificing a pretty good hand and continuing to draw cards until I ended up with an unbeatable hand. And so, at that point, the people watching me were kind of electrified at what had happened. And they thought that I did this on purpose which is not true. And so, I realized from their reactions that they didn't have a clue. That led me to go back and think about the game and I very quickly reasoned out in principle how to beat it. And then the work began.

Interviewer: Okay, so walk us through that process. How long did you spend trying to work out and come up with a formula for beating the casinos at blackjack?

Ed Thorp: Well, I spent a substantial amount of time during the spring and summer of 1959 trying to do it by hand. And I realized as I made relatively little progress that the computation was so enormous that I was never going to finish in my lifetime or actually 100 lifetimes. At that point, I learned that MIT had an IBM 704 computer and as a staff member, I could use it. So, I taught myself programming, something called Fortran II and entered left groups of punch cards at a bin every 2 or 3 days to check parts of the program that I was writing, subroutines. And they would come back sometimes with errors which I had to fix and sometimes they would run perfectly. When I finally built all my subroutines and put them together, this was probably early 1960. So, I continued to turn stuff out from the computer through a large part of 1960. And then I got all the information I needed and I saw I could beat the game. And I saw how to do it in multiple ways. So, I would say that I spent overall about oh, maybe half or 2/3 time for a year and a half.

Interviewer: And once you'd come up with this formula or these various formulas for beating the casino at blackjack, correct me if I'm wrong, but you actually went public with that formula or your strategy. What was your thought process in actually going public with that? Did you have any doubts about doing that?

Ed Thorp: Well, to me it was a math problem and people thought that you could not beat casino games. And there was a lot of evidence to that effect. There were theorems in fact that had been proven as probability developed over several previous centuries. They proved theorems which said that most of the standard gambling games could not be beaten no matter how you varied your bets, you would lose at a rate that was predictable. But blackjack didn't quite fit the assumptions that they'd used to draw that conclusion which I observed later when I began to learn more about probability itself and the history of the attempts to beat gambling games. And what was different about blackjack was that as you deal through the cards, they don't reshuffle after every hand. So, the composition of the deck tends to change as play continues. And with the change in composition of the deck, the odds for and against the player and the way he should play his hands, those things shift also. And so, what I saw very early when I thought about the game was that the shifts would undoubtedly be large enough to give me a substantial edge during a fairly large part of the time that I was playing. And so, then the next step was obvious. If you can tell when you have an edge, you bet big when you have the edge and you bet little or leave when you don't have an edge. So, you win a majority of the big hands and you lose a majority of the little hands and overall, you come out pretty well ahead. I could compute how rapidly I could make my bankroll grow.

Interviewer: So, what happened after you went public with this formula, this way of beating the casinos at blackjack? Did that attract the attention of quite a few people?

Ed Thorp: Well, I gave a talk at the American Math Society thinking this would be really interesting mathematics. And so, when I sent in my talk, the abstract committee thought this is another crank who is sending in more garbage. He's claiming he can do something that we've already proven is impossible. And the mathematics committees that screen abstracts for meetings get a lot of this stuff. There are quite a few famous things in mathematics where it was eventually proven that you couldn't do it. One of them is trisecting an arbitrary angle with compass and straightedge alone. It took from the time the Greeks tried to do it and couldn't, it took almost 2,000 years before somebody came up with a mathematical proof showing in fact that it was not possible. There were some angles that were not trisectable. And so, with the gambling games, over the 17th, 18th, and 19th centuries, they developed a rather tight proof that nearly all of them were not beatable. So, anyhow, I said this is going to be interesting mathematics. The abstract committee said this is some other wingnut who's sending in this stuff. And just by chance, one of the members of the committee was somebody from UCLA who knew me when I was there and he was an eminent number theorist and he said, "No, no. If this guy says he can do it, he probably

can." So, the abstract survived and was published in the little notices that they had before the meeting and then the papers got wind of it. And after that, it went kind of viral on the print media. And then I got a flood of people who wanted to either know the secret so they could get rich, know the secret because they were in dire straits and needed the money, or who wanted to bankroll me and go out and share the money.

Interviewer: And that's how you met the infamous Manny Kimmel. I'd love to hear the story about how you actually met him and, for those who don't know, describe a little bit about this character. Like who was he?

Ed Thorp: Well, many people came to my talk and afterwards, there was a lot of publicity in both print and on television. And then I began to get people offering to bankroll me. And one very persistent guy kept calling and finally I said, "You know, the casinos are scoffing at me. They're saying this is all garbage. They're saying they'll send a cab for me and if I don't do anything, people are going to say, 'Well, this guy is just a blowhard who claimed to do something but couldn't back it up.'" And I felt it was obligatory for me to show that what I'd done was actually correct and worked. So, I finally decided to listen to Manny Kimmel who drove up from New York. And so, we talked for a while and he got very excited. Turned out all I didn't know all this at the time, but not

Interviewer: Not only was he a wealthy businessman who owned 64 parking lots in New York City among other things, but many years later, I discovered from um Connie Bruck who wrote a biography of uh Steven Ross called Master of the Game, I discovered that Manny Kimmel had been associated with mobster number two, a guy named Longy Zwillman. That is up. He was the mobster king in New Jersey in the '30s. So, he probably made his original money from bootlegging, prostitution, and so on. Be that as it may, he actually was an important businessman at that time as well as a knowledgeable gambler. He wasn't an educated man. He probably never got past uh 7th or 8th grade. Uh but he'd been around the casinos. He'd been a big better in Cuba before it got shut down in uh '59, '60. So, anyhow, I showed him what I could do and we had some practice sessions in New York where he verified that uh I won pretty steadily against his uh dealing. So, anyhow, we went out to Las Vegas and we brought a $10,000 bankroll. He wanted to bring a lot more, but I figured that I wanted to play with something that was small for him in case things went wrong. And we did a little better than double our bankroll in the uh well, 20 hours of serious play and about 20 hours of uh getting used to it play. So, a $11,000 win on a $10,000 bankroll doesn't sound like a whole lot, but it's a little more than you'd think because money in that day uh adjusted for inflation was about eight times what it is now. So, think of it as an $80 bankroll and maybe a uh $90,000 win.

Ed Thorp: Yeah, I mean that's that's a significant amount, especially in such a short time frame. Yeah. It's very impressive.

Interviewer: Uh and how long did your relationship last with Manny for?

Ed Thorp: Well, I wasn't I was more interested in being an academic than a gambler. So, what I decided was I wasn't going to spend a lot of time doing this. I might go occasionally if I needed uh money for something, but uh it was kind of an avocation. But uh casinos continued to scoff and I decided to uh write a book about it and see how they fared when thousands or tens of thousands of players came out to the casinos and started counting cards. And of course, uh the book became a New York Times bestseller and tens of thousands of players did show up and some of them were good card counters. So, the casinos eventually panicked and they on April Fool's Day, 1964, they announced from the Nevada Casino Resort Association, there came an announcement that they were changing the rules of Blackjack. They were taking away some of the choices people had involving doubling down, pair splitting, and so forth. And I was asked what was going to happen and I said, "Well, what's going to happen is the ordinary players from whom they make all their money are going to be very irritated by this and they're going to lose a lot of business. So, they're going to have to uh give in and change back, which is what happened." And so, the tactic then was to do a mixture of things. Uh in those days, there was a lot of cheating. I don't think as much now. And at least not in the uh casinos that are run by the big corporations. And they also uh would shuffle up. They'd bar players. They had a a blacklist of people when they identified them and so forth. So, this kind of battle between players and casinos uh really heated up and the good players got very clever at disguising themselves and inventing extra new techniques for winning more money and so forth and so this this battle goes on. There are good players out here now who still make their living. They get together every January at the Blackjack Ball and kind of celebrate the Blackjack life.

Interviewer: So this is very interesting. So during this time you you'd kind of worked out a way to well you not kind of you had worked out a way to beat the casinos at their own game yet you didn't want to really pursue it too much. You really wanted to stay doing your academic work. Why was that?

Ed Thorp: Well I never had a focus on trying to make a lot of money. It wasn't important to me. I basically just wanted to learn things be around people that I liked. Um especially smart people who knew a lot and I figured the academic world was the place to be for that kind of experience. But I also had this element of uh not doing things the way everybody else does and trying new things and having a certain amount of adventurousness as well probably from my childhood the way I grew up um making nitroglycerin shooting off rockets and so forth.

Interviewer: Time just a short break here to mention our sponsor of this episode Trade Station. Trade Station are a trusted online broker that've been in this business for a really long time and still continue to win awards for their services and trading technology. The upside of being a Trade Station customer include platform availability on web mobile and desktop various real-time

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Ed Thorp: Well roulette actually is the first thing I thought about in my life that was a beatable casino game. It was way back when I was in high school and studying physics. And what I realized was that the roulette ball orbited kind of like a planet and the spinning rotor uh didn't really make any difference. It just changed the relative rate in which the ball orbited around whatever pocket it was going to end up in. So I thought of it mainly as a lot like a system that is so predictable the emotion of the planets around the sun. And I know there's friction and there are a lot of other elements like little deliberate vein deflectors that are set in the side of the stator which which the ball hits on the way down uh to make randomness. So there are little things that make randomness in it that still seem predictable. And then time passed and then when I was after I got my master's in physics I was having a chat with people one afternoon and they were claiming that you couldn't beat any casino game and I said well I think you can beat roulette. I argued that you could beat roulette and the argument was fairly heated. So I decided that I would prove it. So I and a couple of other people set out to do it and the other people dropped away very quickly. I continued. And then when I was at MIT and I had worked on my Blackjack ideas I wanted to publish them quickly because one of the things that happens especially in the gambling world and sometimes in mathematics people steal your ideas and claim that those ideas are theirs. So in order to get quick publication the place to go was the proceedings of the National Academy of Sciences. They took short papers so you couldn't put most of what you knew in the paper but you could at least make an announcement that you'd done something and describe it briefly. But you had to have a member of the National Academy uh send the paper in for you and basically sponsor you. And the only one in mathematics at MIT was the one named Claude Shannon. He was famous because he invented something called information theory which is the basis of of modern

computing and modern communications. We wouldn't be talking you're probably if I hadn't been for him. So Claude Shannon um I looked him up. Uh they told me that I would maybe get 5 minutes if I was lucky. And he didn't really spend time with people unless he got really interested. So we went through my uh proposed paper for the National Academy and he liked it and said looks like you solved all the main problems in this area and have all the big ideas so I'll send the paper in. Then he said well what else are you working on? So I told him about uh attempting to build a computer a wearable computer to beat roulette. And so he got very excited because as it turns out he was one of the most famous gadgeteers of all time. Built lots of different devices just playing machines maze solving robots um I could go on for quite a while here. So he got excited and wanted to work on this too so we decided to team up. We spent the next 9 months um we bought a full-size roulette wheel set it up in his basement and used some equipment from the MIT labs to make really accurate measurements. And then we figured out how to build a small computer which is now at the MIT Museum incidentally uh that you could hide on your body. And one person would sit in with the computer and use their big toes to tap switches uh for inputs as the roulette ball and the spinning rotor in the middle went around and then the computer would tell you where to bet on the wheel. And the other person which was me was sitting at the roulette table not even able to see the ball sitting at the far end on purpose. And I when I heard the instructions from the computer then I put money down on a few neighboring pockets. For example uh 0 13 23 36 is the little group that uh hangs together on the wheel. So um we divide we we bet on four or five numbers that were neighboring. And a pile of dollars would blow up into a whole lot of dollars very quickly because we had it turned out a 44% edge which is really huge. I mean you almost never come across anything like that. But the equipment was fairly crude. We had little wires that ran up from the radio receiver hidden on my body up into my ear canal where there was a tiny loudspeaker and that's where I heard the instructions to where to bet. And those wires were very fragile the size of a human hair they would break quite easily. Copper just almost falls apart when it's that size. We had steel wires and they were still still too fragile. So I'd have to go back and get rewired periodically. And then I thought about it. I said you know if they forbid us to bet after the ball is spun then we can't predict.

Interviewer: We need to use the motion of the ball to make the prediction. And characteristically they let you bet until almost the end because they want to get people as much time as possible to get people as much time as possible and they want also to have more spins in a given hour. Um anyhow so I thought about it. I said this is this is not going to go unless we're really clever. We spent a lot of time disguising ourselves and a lot of time I guess misdirecting the casino so they think we're other than the kind of people we really are. Uh blackjack players got good at this. There'd be a big player betting huge amounts of money and wandering around from table to table with uh a beautiful companion on his or her arm. And that was a pretty good disguise for a while. Pretty good misdirection. Anyway, I didn't want to spend my life doing that sort of thing. So I said, you know, this is this is fun. It worked. It's a good idea. Other people, by the way, took it and made lots of money. And but I'd rather continue with my academic life. So I decided to do that until I got

deflected one more time into the world of uh real money and real action.

Ed Thorp: So just before we get into your trading venture, I've got to ask, like you mentioned a little earlier that you know, you knew of people who had been blacklisted from casinos and that sort of thing. Did you have any run-ins with casino owners and security during that time? I I imagine, you know, you probably had a target on your back to some extent, like I've seen what they do to card counters in the movie Casino and it's not pretty.

Interviewer: Well, the movie Casino was written about 10 years after I played. And the book in the movie and things were worse when I played than they were in the movie Casino to give you a way the way things were going. So the '50s were terrible. People like Bugsy Siegel got shot up. The El Rancho Vegas got burned down in a dispute and so forth. In the '60s people were getting beat up. One person was almost murdered that I know about. Another person was murdered. And then uh in the '70s it was like the movie Casino. And in the '80s it was better because the corporations were coming in and people were going legit. They realized there were certain benefits to going in that direction. Life in some ways was better than mob life. So yes, there was a lot of risk and I didn't realize that initially. But as time passed, I it began to become clear to me. One of the episodes in the book is about another thing that I discovered how to beat the side bets when they were there in a a game called baccarat. The game that James Bond originally plays in Casino Royale, the first version of the movie. And it's uh one of the highest or the highest stake game in the world. People were betting uh just routinely to the $10,000 a hand. And the side bets we could bet five to 100. And I figured out a way to beat them systematically. And so we came and did that night after night after night until finally they drugged my drinks and barred us from playing anymore. And on the way home a strange thing happened to the car I was driving. The accelerator locked to the floor when I was coming downhill in Arizona and nothing I could do with the brake seemed to be able to stop it. So I finally got to 80 miles an hour, I put on the handbrake the foot brake put it in a low gear turned the engine off and used the drag of the motor. Also, I was finally able to bring it to a stop. And then somebody came by and looked at the car and said, "I've never seen anything like what's going on here with the connection to the accelerator pedal." So the person was able to fix it but their opinion was that it had been tampered with. This is somebody who knew mechanics that I did not. And then we resumed our trip home somewhat chastened.

Ed Thorp: So if they got serious Yeah, that's really heavy. And in your interview with Jack Schwager for his book Hedge Fund Market Wizards, you mentioned that you later discovered that some of the casino owners were actually plotting to take you out. What's the story there?

Interviewer: When they changed the rules in blackjack, there was a big discussion which only came out publicly about 30 years later when one of the people there wrote it up and published it in one of the Las Vegas newspapers. There was a big discussion about how to deal with me and the card counters. And so one of the proposals was to break knees or worse. And people explained that

that wouldn't be a good idea. They needed to tone it down and do something else. So they changed the rules instead. But there was there was quite a mix of people at this meeting. This was the Nevada Resort Hotel Association meeting where they decided to change the rules. So that was a good decision. Changing the rules was a good decision on their part. It wasn't effective but it was better than what they might have come up with.

Ed Thorp: So tell us about how you got into financial markets. How did that come about?

Interviewer: Well, I'd made some money gambling and from book sales and I started to invest it. And I didn't do very well. And when I don't do very well I sit down and decide whether I should be doing whatever it is at all or whether I'm going to change and do it very well. So I decided that I would learn what I could about investing. I spent the summer of 1964 all summer just reading books on investment. And then I decided to do the same thing again in the summer of 1965. And at the very beginning of the summer I happened to come across a little pamphlet on think something called a warrant which is like a call option. Only it's issued by a company. And in those days it wasn't on an exchange. It was traded over the counter. And so it was a real pain to try to trade these things because you had to deal with people that were really greedy and had huge bid-ask spreads. In any case I saw almost immediately that you could mathematize most of the uncertainty in how a warrant behaves. The main thing that affected it was the price of the underlying stock. So then I saw that if I were to hedge short a warrant and buy the stock or the other way around, I could get rid of the stock risk. So what did that leave? That left mispricing risk. Well, it's no longer risk if I can tell whether the warrant is relatively overpriced or relatively underpriced. If it's relatively overpriced I can sell it short and buy the stock get rid of the stock risk because the warrant and the stock tend to move together. If the warrant is relatively underpriced, if it's cheap, I can buy the warrant short the stock against it and get rid of most of the risk. And if the stock moves around, changes its price, I can change the mix of the warrant against the stock. So I realized that this was something that I could almost certainly solve mathematically. And so I set out to do that. And I happened to be moving to the new UC Irvine campus when it opened in the fall of 1965. And I was telling somebody there about this idea. And they said, "Wait a minute, we've got somebody else coming in who is doing the same thing." And it turned to be an economist named Sheen Kassouf. So we realized that we were doing the same sort of thing. Only he had been doing it for real with real money for two or three years and he'd written a thesis about trying to price warrants. So I said, "Well if we put our two heads together, we can do better yet." So we started meeting and I brought a lot of math to the table and we evolved our analysis of warrants and warrant hedging. And we wrote a book called Beat the Market. That book uh inspired quite a few people. I was having lunch with Nobel Prize winner Harry Markowitz a week or so ago and he was telling me that he spent three years co-managing an operation an investment operation in New York because he read Beat the Market. He wanted to follow up on those same ideas and do that sort of thing. And then he decided that he'd rather be an academic than get deflected off into the marketplace and financial trading and so on. And then uh two academics, Fisher Black and

Myron Scholes, were aware of Beat the Market. And that got them to thinking about the fact that you could make the hedge riskless in principle if you adjusted it like in very small increments. So if you could do that then you could figure out what the right discount was for the stock and for the warrant, two uncertain payoffs. And you could figure out what the right price was for the warrant. So they went ahead and did that. I had I coincidentally, sometime before they did that guessed that uh because the warrant hedge is essentially riskless that we might as well look at it from the standpoint of a person who is risk neutral. If we did that then we get the Black-Scholes formula. So when I got their paper in 1973 a paper which said uh yes, we uh were inspired in part by your idea in Beat the Market. When I got that paper, I already had the formula. I'd already been using it for four years. Cuz I had uh I figured out with plausible reasoning what the formula must be. And uh sure enough But I checked what I had with different notation against what they had, they were the same. So, their paper came about the same time as the Chicago Board Options Exchange opened. And it was one of the reasons that exchange opened is because they had shown that you could price warrants with the formula for it. And so that made the warrants somehow, well, options I should say, more legitimate than this the by appointment only kind of trading that existed before.

Ed Thorp: You know, you've come from playing the games in the casinos, you've come into financial markets now. Was it easier for you to find an edge like you've just described here? Was it easier for you to find that edge in financial markets than it was to find an edge uh playing games at the casino?

Interviewer: Um I don't know. Uh if it was easier or harder. Probably about the same.

Ed Thorp: Right. And as I bring up edge, this is a question I'm really keen to ask you and I've asked it a few times on the podcast, but I'm uh particularly interested to hear how you describe this. How would you describe an edge? Like when we talk about an edge, what exactly does that mean?

Interviewer: Well, the way I see it, if you're playing a gambling game, uh that's the easy The gambling game is the easiest. And by the way, uh understanding gambling games like blackjack and some of the others is one of the best possible training grounds for getting into the investment world. You learn how to manage money. You learn how to compute odds. You learn how to reason what to do when you have an advantage. So, what do I mean by an advantage or an edge? In a gambling game, it's an advantage or edge over your opponent, meaning that if you were to continue to play the game for a long period of time against your opponent, you would in the end win money at what might be a fairly predictable rate. For instance, uh playing blackjack, if I have a 2% edge half the time and the casino has a 2% edge half the time, it looks [unclear].

Ed Thorp: Like I don't have any advantage. But if I bet considerably more when I have a 2% edge

and considerably less when they have a 2% edge, then in the long run, I'll tend to win 2% of my big bets. I'll tend to make 2% of the amount of my big bets. I'll tend to lose 2% of the amount of my little bets. So, actually my advantage is the difference between those two numbers. In a gambling game, you can often, but not always, calculate what your advantage or edge is. Now, mathematicians call this edge the mathematical expectation. And it's typically uh what you would win in the long run or in a specific situation, either uh if that situation repeated many times, what you would win divided by uh how much you put up. I call what you put the total that you put up the action. So, if I make a thousand $100 bets, that's $100,000 worth of action. If I have a 2% edge, I expect to make 2% of $100,000, plus or minus. So, that those are gambling games. Now, in the securities markets, it's harder cuz you don't you're not able to calculate precisely what the payoffs are and what their probabilities are. You might know what the payoffs are, but you may not know the probabilities. You're unlikely to know both. Uh for instance, if I were to buy a cheap option, cheap call option, I know the stock is going to be somewhere or other in the future and it'll follow some likely distribution that I can hypothesize that's fairly close to what's going to happen. But I don't know exactly what's going to happen. This distribution is just an estimate based on past experience. And the distribution might turn out to be somewhat different than what I forecast. Uh if I do it many times, what I do in the securities markets is I try to think through how good or how bad some uh something might be compared with my most probable estimate. And if it looks if even the bad situation looks good, then I know I've got something worth uh playing on. And now you've brought up managing your bankroll, you know, money management. Well, that is the thing where gambling is a master teacher. Because when the odds are computable, like in blackjack, there's a solution, a mathematical solution to how much to bet on any given situation. And that if you're only betting in favorable situations, then the solution is that you bet an amount, roughly speaking, equal to your expected edge or advantage divided by the amount of uncertainty that there is in the bet, the standard deviation of it. That's a rough estimate of what you bet. There's an exact estimate um which you can compute using logarithms and probability theory and so on for all these situations. And I and two other guys have co-edited and written part of a book called uh The Kelly Criterion. So, it's a treatise on how to apply this Kelly criterion in well, almost any situation you can think of. And what the Kelly criterion does is if you apply it, it maximizes the expected growth you're going to get in your bankroll. So, a guy using this is likely after a period of time to have more money than somebody who just does something significantly different. So, anyhow, blackjack's a perfect training ground for that because you get a lot of bets. And so you get into the long run very quickly. I mean, playing 100 hands an hour in a $100, you play 10,000 hands.

Interviewer: So, what I'll do is I'll link to uh the Kelly criterion book that you mentioned there, which you co-authored. I'll link to that in the show notes. So, if anyone listening wants to find out more about that, um but just as you bring this up, would you mind just explaining what is Kelly criterion just a little more? Just um probably um in simple terms if possible.

Ed Thorp: Sure. Okay. Suppose that I have an infinitely rich adversary and one of the Koch brothers, maybe. And they say, "Look, uh bring your bankroll. We're going to flip a coin. This coin is in your favor by 2%. Bet as much or little as you want. You lose your money, you're gone." How much should I bet? Well, the Kelly criterion, if you go through the calculations, says with a coin toss, it's different for other things, bet 2% of your bankroll. And so, at first, when your bankroll is small, if you bet 2% of your bankroll and your edge is 2% of that, you're basically expanding your bankroll by four basis points on average per bet. Not much. But as your bankroll grows, uh the expansion gets faster and faster. Okay, so why is this intuitively sensible? Well, suppose instead of betting 2% of your bankroll, you decided to bet as little as you could, a dollar, let's say. Well, betting a dollar all day long with a 2% edge, you're not going to make a whole lot of money. Suppose instead you decided to go for what mathematicians call maximum expected return. Well, you bet the whole bankroll. Your expected win is 2% of your bankroll on that one flip, way more than 2% of 2% of your bankroll. However, you're not going to win all the time if you keep betting your whole bankroll. Eventually, you're going to lose and then you'll end up with nothing. So, the guy who bets his whole bankroll, if you have a whole lot of people doing that, one guy may end up with a gigantic amount of money, but all the other guys will be wiped out. And the one guy will be wiped out, too, if he keeps going. So, the upshot is that it's too risky to bet your whole bankroll, even though if many, many people were all doing it at once, the group would win more money that way. So, anyhow, the Kelly criterion is a compromise between timid betting, where you make very little, and way overaggressive betting, where you're almost sure to be wiped out. And it turns out you can show mathematically that it's the optimal compromise for somebody who's going to play for a long time. Now, critics say, "Yeah, but, you know, it's not everybody wants to play for a long time." The answer is, "Well, then you may not want to use the Kelly criterion. Use something else. Use whatever it is that you think is optimal for your situation." It's just a recipe for people who are going to make a lot of bets over a lifetime. Early on, that was my situation, so that's what I've done.

Interviewer: Yeah. Uh yeah, like I said, what I'll do is I'll link to uh the book you mentioned about Kelly criterion in the show notes. And I might also dig up I know there's a couple of articles that flesh out the actual formula for um this way of of managing money. So, I'll include links to those in the show notes at chatwithtraders.com. While we, uh, sort of on the subject of edge here, I guess this is sort of just general advice, um, and suggestions for some newer traders, how would you encourage newer traders to think about gaining an edge over the market, like putting the odds in their favor?

Ed Thorp: Well, there are two parts to making money as far as I can see it. One is finding a good situation where you have an edge, and the other is managing your money. And Kelly criterion and things like it take care of managing your money. But, harder than using the Kelly criterion and figuring out how much to bet is finding the advantage situation in the first place. And, um, that changes from time to time and from, uh, ability to ability. People have different knacks for doing things. There are guys like Warren who've spent their whole life picking stocks and keeping track

of companies and knowing balance sheets in their head and looking for, uh, bargains when they occasionally come by. Uh, there are people who at the other end who are high-frequency traders. They have computer algorithms and they're wired into the exchanges and they have they get to look at orders before other people. Uh, that's a different game entirely. So, there's so many different games. So, what you have to do is go find one that works and that suits you. But, I can't really tell you which games uh, which games would work for you. Uh, or even, um, very many of the games that are out there.

Interviewer: Yeah. Now, that's a that's a really fair comment. Putting, you know, trading and gambling aside, I'd like to ask you just this one last question. You know, someone who has made a great fortune and done very well in life, how do you encourage others to think about money, wealth, and success?

Ed Thorp: I think that if your pursuit is money or your pursuit is success, uh, you're looking at things the wrong way. I think people should be doing what they enjoy and what they love. And hopefully things that something they're good at. And if they do that, I think they're very likely to get money and success along the way. Uh, a lady I know wrote a book called Do What You Love and the Money Will Follow. I think that's, uh, not far off.

Interviewer: And speaking of books, you've just released your latest book, A Man for All Markets. You know, as we've mentioned, you've written a number of books in the past. How is this one different and what can readers expect from also reading this?

Ed Thorp: Well, A Man for All Markets, uh, which will be coming out, uh, January 24th, actually, in the US and probably about the same time in the UK, uh, a little bit later in China, Korea, Japan, and uh, I think Germany, too. It is a memoir. It's also the story of, uh, how I got started in life, how I got into things like blackjack, roulette, and the stock market, and then what I learned along the way, uh, different profit centers that I found, uh, hedge fund, uh, statistical arbitrage, advice to people about investing, what to do if you don't know anything, you can still beat 90% of investors, uh, without doing any work, uh, what to do if you want to try to do better than that, what's it going to take, and then some general thoughts about what is really important in life. And I find that a lot of people don't get it. Um, one person I know who's a billionaire, uh, is getting divorced because he just won't stop working. Uh, he's got a wonderful wife. They've got along for, uh, several decades, but I think she finally said, "Gee, I'm growing old and it's time to enjoy all this money we've made." But, people just get hooked and they won't stop. And I I would say if you can never have enough, then I can't give you any advice because you're just going to be driven to pile up more and more and more. And at the end, you'll end up saying, "What was it all for?" And you won't have an answer. I say enjoy the people that you love and the people that are worth being with and don't spend all your time just trying to pile up wealth.

Interviewer: Sound advice, very sound advice. Um, and guys listening, if you want to grab a copy of Ed's book and just take a close look at it, uh, chatwithtraders.com/thorp, t h a r p, will take you directly to A Man for All Markets on Amazon. So, uh, Ed, I just want to say what an honor this has been. I'm very grateful for your time. Thank you.

Ed Thorp: Pleasure meeting you and talking with you.

Interviewer: You've reached the end of this episode of Chat With Traders. But, rest assured, there are more episodes loaded with real market insight and zero hype on the way soon. So, to stay updated with each great new release,

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