

An interview with

EDWARD THORP



CHAT WITH TRADERS

The Man Who Beat the Dealer, and Later, Beat the Market - Edward Thorp

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Foreword

Well, 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 Edward Thorp—the man who beat the dealer, and later, beat the market.

Let me explain; it was the late '50s and 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 is 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 227 out of 230 months being profitable, the worst monthly loss being less than 1%.

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.

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.

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, that will take you directly to “A Man For All Markets” on Amazon.

Interview

Aaron Fifield: Thank you very much for taking the time to speak with me, it's quite the honor.

Edward Thorp: Oh, thanks.

AF: Ed, 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.

ET: Oh, yes... [laughs]

AF: I thought that was very cool to read about. One of the other similarities to some degree which I also thought was quite interesting is that you ran an independent radio station.

ET: Yes.

AF: What sort of things were you broadcasting and how long did you keep it up for?

ET: Well, I got my ham radio operator license when I was just turning 13, and I was on 2-meters voice and also I did a little bit of code... 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 two meters was a very short range, with the equipment people had and the techniques they had, so you could only go about maybe 100, 120 miles. Then 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-meters.

AF: Okay, so it wasn't really a radio station as such, like we think about a radio station today.

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

AF: What sparked your interest in that sort of thing? You were very young... You actually said in your book you were maybe the youngest person in the class going for your radio license.

ET: Well, I got fascinated by all things science when I was about 10 or 11, so I just explored on my own. Electronics, as they were in that day caught my interest, so I decided to learn about it. 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.

AF: Well, tell us a little bit about your childhood. Set the scene for us here; what was your childhood like? I know you were born in 1932, which was right when the Great Depression was beginning... What was your childhood like during that phase?

ET: Actually, I was born in August '32 and the Dow Jones hit its all-time low in the crash in the July of '32. It was all up from there, but it was a long haul for people to dig themselves out of.

I remember when I was five or six, I was selling Koll-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 off for a penny a glass. 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 realized I could turn five cents into six cents over and over, with a fair amount of work.

AF: What was the drive to start working and start trying to earn

some money? You were very interesting as a young child; you were very experimental, even quite the prankster in some ways. Where did this come from? You were quite different from most kids at that age.

ET: I'm not sure... I think a lot of it was I was a very early reader, and I got into books a lot. I found out that I learned so much stuff that there wasn't a whole lot of commonality I had with other kids, except playing. We were 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.

AF: And where did this thirst for knowledge come from?

ET: 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. My father then said, "I wonder how much he can learn", so he started to teach me things. I was very happy about that, so I learned to read, I learned to count, I learned to do arithmetic operations - add, subtract, multiply, divide... That seemed to come very easily, and then I began to read more and more advanced books. By the time I was seven, I was reading high-school level books very comfortably.

AF: What do you think it was about math and science that was so interesting to you?

ET: Math I liked... I just enjoyed numbers; they seemed very interesting, and they had rules, and it was fun to learn what those rules were. Science came a little bit later. I think I started with the minerals set when I was about ten, and I learned the

Mohs scaled hardness. They had a number of examples, of course they didn't have the top one, diamond—which has a hardness of ten, but they had everything up to nine in there. That was pretty interesting to me.

Then a little time went by and I began to poke around with chemicals, learning how to make gun powder out of an encyclopedia. That kind of caught my interest; I made bombs and rockets and so forth. From there, one thing lead to another, so when I got paper route at age 11, I started putting part of my money into science equipment.

"I began to poke around with chemicals, learning how to make gun powder out of an encyclopedia. That kind of caught my interest; I made bombs and rockets and so forth."

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

ET: Well, things were different in those days. 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.

AF: Probably a smart move, that sounds quite dangerous! Ed, what did you do after finishing school? What was the next move for you from this point?

ET: You mean after finishing high-school?

AF: Yes.

ET: 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, or 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. As time passed, I realized I was more interested in physics, so I changed to physics.

Then finally, when I got halfway through my doctorate in physics, I'd done all the work except for the last part of my thesis, I realized that I had to learn a lot more mathematics to finish, so I went to the math department to take the courses. 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 ten years in graduate school before they got out. In two and a half years I was out in math, and it was a good decision.

AF: Okay, and from that point you went on to become a professor, actually teaching math—is that correct?

ET: Yeah, I got a position as a CLE Moore instructor at MIT, that was my first position. That's 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. That was

a great experience.

I spent two years in Cambridge teaching at MIT, and 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, six hours a week, a pick of top graduate students who they were paying to come in.

After four years of that, I learned a lot of math and went on to UC Irvine when it opened up out in Southern California. Actually, I live not far from there now.

AF: And just to put this in perspective for us, where do you sit on the spectrum—your understanding of math is very advanced. I believe you competed in numerous competitions, maybe more so in your earlier days, but where did you stack up in these competitions?

ET: Well, when I was in high school, I needed to enter competitions to get scholarships and to 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. Then I took the physics contest next year and I came in first in that. Then I was a finalist for the National Science Talent Search, with 40 winners out of 11,000 contestants all over the country. So I went to Washington DC and got some money for going there.

Then I got a scholarship from UC Berkeley, which continued as a scholarship when I went to UCLA. Piecing all these together went a long way toward helping me get through a college that I couldn’t otherwise afford.

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

ET: Well, when I was a kid growing up in high school, I was left of my own a lot. My parents were working in defense, or in that case war industries. My mother had the swing shift (4 PM to midnight), my father had the graveyard shift (midnight to 8 AM) at another industry, so I and my brother kind of took care of ourselves and grew up without any particular supervision.

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. So when I came across situations later in life, I often looked at it from a fresh viewpoint.

For example, when I was finishing my PhD at UCLA, I was gonna 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'd come pretty close - your disadvantage was less than 1%. So I said, "Well, I don't know anything about gambling, but I'll risk ten dollars and see what happens."

I was also interested in going there for a second reason, which was that I'd figured out in the physics part of my career that roulette wheels might be predictable, and I had a 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 a cheap vacation, and have fun playing blackjack 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. I set out to beat roulette by building this hidden, 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. There were certain obvious things that they were missing, and I said "I could 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 one more great thing to do.

AF: On this first trip to Las Vegas, how did you go playing blackjack and roulette?

ET: You mean where did I go to observe them?

AF: Did you do well? Did you make money on this first trip?

ET: That's a good question. Well, I had ten silver dollars that I was willing to risk and that was it, so I played for about forty minutes and I lost eight and a half of my ten silver dollars, but everybody else at the table was smashed. At first I thought I was some sort of screwball with my little strategy card. I was also playing rather slowly because I wasn't used to all this, it was all new. Then, after about 20-minutes, there was a remarkable hand

and 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 lead to this, lead to me sacrificing a pretty good hand and continuing to draw cards until I ended up with an unbeatable hand.

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. So I realized from their reactions that they didn't have a clue. That lead me to go back and think about the game. I very quickly reasoned out in principle how I'd beat it, and then the work began.

AF: 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?

ET: 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 gonna finish in my lifetime, or actually a hundred 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 left groups of punch cards at a bin every two or three days, to check parts of the program that I was running (subroutines). 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 churn 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 maybe half or two-thirds time for a year and a half.

AF: 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?

ET: Well, to me it was a math problem. 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'd proved theorems which said that most of the standard gambling games could not be beaten; no matter how you varied your best, you would lose at a rate that was predictable.

"To me (blackjack) was a math problem. People thought that you could not beat casino games, and there was a lot of evidence to that effect."

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.

What was different about blackjack was that as you deal through the cards, they don't reshuffle after every hand, so your composition of the deck tends to change as play continues. With

the changing composition of the deck, the odds for and against the player and the way he should play his hands - those things shift also.

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. Then the next step was obvious - if you can tell when you have an edge, you'd bet big when you have the edge and you'd bet little or leave when you don't have an edge. So you win a majority of the big hands, and you lose the majority of the little hands. Overall, you come out pretty well ahead. I could compute how rapidly I could make the bankroll grow.

AF: 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?

ET: Well, I gave a talk at the American Math Society, thinking this would be really interesting mathematics. So when I said it in my talk, the abstract committee thought this was another crank - "He's just 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 were 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 straight edge alone. From the time (?) tried to do it and couldn't, it took almost two thousand years before somebody came up with mathematical proof showing in fact that it was not possible; there were some angles that were not trisectable.

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 gonna 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. 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 have before the meeting, and then the papers got wind of it. After that, it went kind of viral in the print media.

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 wanted to bankroll me, and go out and share the money.

AF: 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. Who was he?

ET: Well, many people came to my talk, and afterwards there was a lot of publicity in both print and on television, and I began to get people offering to bankroll me. 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 gonna say “Well, this guy is just a blow-hard who claimed to do something but couldn’t back it up. I thought 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. We talked for a while, and he got very excited. It turned out, although I didn't know it at the time, that not only was he a wealthy businessman who owned 64 apartment lots in New York City among other things, but many years later I discovered from Connie Bruck who wrote a biography of Steven Ross called *Master Of The Game*, I discovered that Manny Kimmel had been associated with mobster number two, a guy named "Longy" Zwillman. He was the mobster king of New Jersey in the '30s, so he probably made his original money from bootlegging, prostitution and so on.

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Be that as it may, he actually was an important businessman of that time, as well as a knowledgeable gambler. He wasn't an educated man, he probably never got past the 7th or 8th grade, but he'd been around the casinos, he'd been a big better in Cuba before it got shut down in '59 and '60. So anyhow, I showed him what I could do, and we had some practice sessions in New York, where he verified that I won pretty steadily against his dealing.

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. We did a little better than double our bankroll in 20 hours of serious play, and about 20 hours of getting used to it play.

An \$11,000 win on a \$10,000 bankroll doesn't sound like a whole lot, but it's a little more than you think, because money in that day, adjusted for inflation, was about eight times what it is now, so think of it as an 80k bankroll and maybe a 90k win.

AF: Yeah, that's a significant amount, especially in such a short timeframe. It's very impressive. How long did your relationship last with Manny for?

ET: 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 money for something, but it was kind of an avocation. But casinos continued to scoff, and I decided to 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.

Of course, 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 on April Fool's day of 1964, 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.

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 gonna be very irritated by this and they're gonna lose a lot of business, so they're gonna have to give in and change back", which is what happened. So the tactic then was to do a mixture of things.

In those days, there was a lot of cheating - I don't think as much

now, at least not in the casinos that are run by the big corporations - and they also would shuffle up, they'd bar players, they had a blacklist of people when they identified them, and so forth. So this kind of battle between players and casinos 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.

This battle goes on. There are good players out there now who still make their living. They get together every January at the Blackjack Ball and kind of celebrate the Blackjack life.

AF: This is very interesting. During this time, you had worked out a way to beat the casinos at their own game, yet you didn't want to pursue it too much—you really wanted to stay doing your academic work. Why was that?

ET: 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 like, especially smart people who knew a lot, and I figured the academic world was the place to be for that kind of experience.

I also had this element of not doing things the way everybody else does them... Trying new things and having a certain amount of adventureness as well, probably from my childhood, the way I grew up... Making nitroglycerine, shooting off rockets and so forth.

AF: Tell us a little bit about the other games that you were able to beat the casinos at. We spoke about blackjack there quite extensively, you also mentioned roulette earlier as well, as something that had piqued your interest. How did you go with

roulette?

ET: 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. What I realized was that the roulette ball orbited kind of like a planet, and the spinning rotor didn't really make a difference, it just changes the relative rate at which the ball orbited around whatever pocket it was going to end up in. I thought of it a lot like a system that is so predictable - the motion of the planets around the Sun.

I know there's friction, and there are a lot of other elements like little deliberate vain deflectors that are set in the side of the stator which the ball hits on the way down to make randomness; so there are little things that make randomness in it, but it still seemed predictable.

Then time passed, and after I got my masters in physics I was having a chat with people one afternoon, and they were claiming that you couldn't beat any casino game. 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.

I and a couple of other people set out to do it, and the other people dropped away very quickly. I continued.

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. 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 send the paper in for you and basically sponsor you.

The only one in mathematics at MIT was a gentleman Claude Shannon. He was famous because he invented something called "Information Theory", which is the basis of modern computing and modern communications. We wouldn't be talking here, probably, if it hadn't been for him.

I looked him up. They told me that I would maybe get five minutes if I was lucky. He really didn't spend time with people unless he got really interested. But he went through my proposed paper for the National Academy and he liked it. He said, "Looks like you solved all the main problems in this area, and have all big ideas, so I'll send the paper in." Then he said, "Well, what else are you working on?" So I told him about attempting to build a wearable computer to beat roulette.

He got very excited, because as it turns out, he was one of the most famous gadgeteers of all time. He built lots of different devices: chess playing machines, maze solving robots, and 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 nine months... 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. Then we figured out how to build a small computer - which is now at the MIT museum, incidentally - that you could hide on your body.

One person would sit in with the computer and use the big toes to

tap switches for inputs as the roulette ball and the spinning rotor in the middle went around. Then the computer would tell you where to bet on the wheel. 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 when I heard the instructions from the computer, then I put money down on a few neighboring pockets.

For example 0, 13, 23, 36 was a little group that hangs together on the wheel. We'd bet on four, five numbers that were neighboring, and a pile of dimes would blow up into a whole lot of dimes 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. That's where I heard the instruction as to where to bet. Those wires were very fragile, the size of the 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 too fragile. So I'd have to go back and get rewired periodically.

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; we need to use the motion of the ball to make the prediction. Characteristically, they'd let you bet until almost the end, because they want to give people as much time as possible, and they want also to have more spins in a given hour.

Anyhow, so I thought about it and said, "This is not gonna 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'd think we're other than the kind of people we really are. Blackjack players got good at this. There's be a big player bet huge amounts of money, wandering around from table to table with a beautiful companion at his or her arm, and that was a pretty good disguise for a while, a pretty good misdirection.

Anyhow, I didn't wanna spend my life doing that sort of thing, so I said, "You know, this is fun, it worked, it's a good idea. Other people, by the way, took it and made lots of money, but I'd rather continue with my academic life."

I decided to do that until I got deflected one more time into the world of real money and real action.

AF: Just before we get into your trading venture, I've gotta ask... You mentioned a little earlier that 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 this time? I imagine you probably had a target on your back to some extent. I've seen what they do to card counters in the movie Casino, and it's not pretty.

ET: Well, the movie Casino was written about ten years after I played (the book and the movie) and things were worse when I played than they were in the movie Casino, to give you the way things were going. The '50s were terrible. People like Bugsy Siegel got shot up, 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. In the '70s was like the movie Casino. 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; their life in some ways was better than the mob life.

So yes, there was a lot of risk. I didn't realize that initially, but as time passed, 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 game called Baccarat - the game that James Bond originally plays in Casino Royale, that first version of the movie.

It's one of the highest or the highest stake games in the world. People were betting routinely two to ten thousand dollars a hand. The side bets - we could bet five to a hundred. I figured out a way to beat them systematically, so we came and did that night after night after night, until finally they drugged my drinks and barred us from playing anymore. 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.

"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."

I finally got to 80 mph, I put on the handbrake, the footbrake, 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.

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." The person was able to fix it, but their opinion was that it had been tampered with us... Somebody who knew mechanics that I did not. Then we resumed our trip home. So, they got serious.

AF: 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?

ET: When they changed the rules in blackjack there was a big discussion, which only came out publicly about three 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. One of the proposals was to break knees or worse. 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 quite a mix of people at this meeting. This was the Nevada Resort Hotels Association meeting, where they decided to change the rules.

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.

AF: Tell us about how you got into financial markets—how did that come about?

ET: Well, I'd made some money gambling and from book sales, and I started to invest it, and I didn't do very well. 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 gonna change and do it very well. So I decided that I would learn what I could about investing, and I spent the summer of 1964, all summer, just reading books on investment. Then I decided to do the same thing again in the summer of 1965.

At the very beginning of the summer I happened to come across a little pamphlet on something called a warrant, which is like a call option. It's issued by a company, and in those days it wasn't on an exchange, it was traded over the counter, so it was a real pain 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 mathematicize most of the uncertainty. The main thing that affected it was the price of the underlying stock. Then I saw next that if I were to hedge - short one 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 not longer a risk if I can tell whether the warrant is relatively overpriced or relatively underpriced.

If it was relatively overpriced, I could 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 and 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. I realized that this was something that I could almost certainly solve mathematically, so I set out to do that.

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.” It turned out to be an economist named Sheen Kassouf. 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.”

We started meeting, and I brought a lot of maths to the table, and we evolved our analysis of warrants and warrant hedging, and we wrote a book called *Beat The Market*. That book 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 investment operation in New York because he read *Beat The Market* and wanted to follow up on those same ideas and do that sort of thing. Then he decided that he’d rather be an academic than get deflected off into the marketplace and financials and trading and so on.

Two academics, Fischer 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 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, coincidentally, some time before they did that, guessed that 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 you did that, then we get the Black-Scholes formula.

When I got their paper in 1973, a paper which said, “Yes, we were inspired in part by your idea in *Beat The Market*”, when I got that paper I already had the formula, I had already been using it for four years, because I figured out with plausible reasoning what the formula must be.

Sure enough, when I checked what I had, with different notation, against what they had, they were the same. Their paper came about the same time as the Chicago Board Options Exchange opened, and it was one of the reasons that exchange opens, because they had shown that you could price warrants, that there was a formula for it, so that made the warrants somehow - well, options, I should say - more legitimate than this by appointment only kind of trading that existed before.

AF: You’ve come from playing games in casinos, and now you’ve come into financial markets. Was it easier for you to find an edge, like you’ve just described here, than it was to find an edge playing games at the casino?

ET: I don’t know if it was easier or harder. Probably about the same.

AF: 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 particularly interested to hear how you describe this; How would you describe an edge? When we talk about an edge, what exactly does that mean?

ET: The way I see it, if you’re playing a gambling game, the gambling game is the easiest... And by the way, 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.

“Understanding gambling games like blackjack and some of the others is one of the best possible training grounds for getting into the investment world.”

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, playing blackjack - if I have a 2% edge half the time, and the casino has a 2% edge half the time, it looks like I don't have any advantage. But if I bet considerably more while I have the two percent edge and considerably less when they have the 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, and I'll tend to lose 2% of the amount of my little bets. My edge or my advantage is the difference between those two numbers.

In the gambling game you can often, but not always, calculate what your advantage or edge is. Mathematicians call this edge 'the mathematical expectation', and it's typically what you would win in the long run or in a specific situation, if that situation repeated many times, what you would win divided by how much

you put up. I call the total that you put up 'the action', so if I make a thousand hundred-dollar bets, then it's a hundred thousand dollars worth of action. If I have a 2% edge, I expect to make 2% of a hundred thousand dollars, plus or minus. Those are gambling games.

In the securities markets it's harder, because 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.

For instance, if I were to buy a cheap call option. I know the stock is gonna be somewhere in the future, and it will 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, if I do it many times.

What I do in the securities markets is I try to think through how good or how bad something might be compared with my most probable estimate, and if even the bad situation looks good, then I know I've got something worth playing on.

AF: You brought up managing your bankroll, money management...

ET: Well, that is a thing where gambling is a master teacher, because when the odds are computable, like at Blackjack, there's a mathematical solution to how much to bet in any given situation. 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 there

is, the standard deviation of it. That's a rough estimate of what you bet.

There's an exact estimate which you can compute using logarithms and probability theory and so on, for all these situations. I and two other guys have co-edited and written part of a book called The Kelly Criterion. It's a treatise on how to apply this Kelly Criterion in almost any situation you can think of.

What the Kelly Criterion does is if you apply it, it maximizes the expected growth you're going to get in your bankroll. A guy using this is likely, after a period of time, to have more money than somebody who just does something significantly different.

Anyhow, Blackjack is a perfect training ground for that, because you get a lot of bets, so you get into the long run very quickly. When you're playing a hundred hands an hour, in a hundred dollars you've played ten thousand hands.

AF: What I'll do is I'll link to 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.

As you bring this up, would you mind just explaining a little more, what is Kelly Criterion? In simple terms, if possible.

ET: Sure, okay. Suppose that I have an infinitely rich adversary - one of the Koch brothers maybe - and they say, "Look, bring your bankroll. We're gonna 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 do I bet?

Well, the Kelly Criterion, if you go through the calculation, says

- with a coin toss; it's different for other things - that 2% of your bankroll. 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, the expansion gets faster and 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 gonna make a whole lot of money. Suppose instead you decided to go for what mathematicians call 'maximum expected return'. Well, if you bet the whole bankroll, your expected win is 2% of your bankroll in that one flip, way more than 2% of 2% of your bankroll. However, you're not gonna win all the time if you keep betting your whole bankroll; eventually you're gonna lose, and 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, while the other guys will be wiped out. And the one guy will be wiped out too if he keeps going.

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. Anyhow, the Kelly Criterion is a compromise between timid betting, where you make very little, and way over-aggressive betting, where you're almost sure to be wiped out. It turns out you can show mathematically that it's the optimal compromise for somebody who's going to play for a long time.

Critics say, “Yeah, but not everybody wants to play for a long time.” The answer is, “Well, then you may not wanna use the Kelly Criterion and 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.

AF: While we’re on the subject of edge here—I guess this is general advice and suggestions for newer traders; how would you encourage newer traders to think about gaining an edge over the market? As in, putting the odds in their favor...

ET: Well, the 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. The 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. That changes from time to time and from ability to ability. People have different knacks for doing things. There are guys like Warren Buffet who spend their whole life picking stocks and keeping track of companies and knowing balance sheets in their head, and looking for bargains when they occasionally come by.

There are people, at the other end, who are high-frequency traders, they have computer algorithms, and they’re wired into the exchanges and they get to look at orders before other people. That’s a different game entirely.

There are so many different games, so what you have to do is go find one that works and that suits you. I can’t really tell you which games would work for you, or even very many of the games

that are out there.

AF: Trading and gambling aside, I'd like to ask you one last question. As 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?

ET: I think that if your pursuit is money or your pursuit is success, you're looking things the wrong way. I think people should be doing what they enjoy or what they love, and hopefully something they're good at. If they do that, I think they're very likely to get money and success along the way.

"I think that if your pursuit is money or your pursuit is success, you're looking things the wrong way."

A lady I know wrote a book called "Do What You Love And The Money Will Follow". I think that's not far off.

AF: Speaking of books, you've just released your latest book, "A Man For All Markets". And 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 reading this?

ET: Well, "A Man For All Markets", which will be coming out 24th January in the U.S. and probably about the same time in the U.K., a little bit later in China, Korea, Japan and Germany too - it is a memoir, it's also the story of 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, different profit centers that I've found (a hedge fund, statistical arbitrage) advice to people about investing, what to do if you don't know anything - you can still 90% of investors without doing any work, what to do if you want to try to do better than that, what's going to take, and then some general thoughts about what is really important in life.

I find that a lot of people don't get it. One person I know, who's a billionaire, is getting divorced because he just won't stop working. He's got a wonderful wife, they've got along for 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.

I would say if you can never have enough, then I can't give you any advice, because you're just gonna 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.

AF: Very sound advice. Guys listening, if you want to grab a copy of Ed's book and just take a closer look at it, chatwithtraders.com/thorp will take you directly to "A Man For All Markets" on Amazon.

Ed, I just want to say, what an honor this has been. I'm very grateful for your time, thank you!

ET: Pleasure meeting you and talking with you.

Thanks for reading.

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