

**UNEDITED TRANSCRIPT**

# **Innovation: From Idea to Reality**

A Conversation with Richard Sandor  
and Steven Kaplan



FOR ECONOMICS AT UCHICAGO

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**MICHAEL GREENSTONE:** Thank you for joining University of Chicago's Becker Friedman Institute, the Polsky Center for Entrepreneurship and Innovation, and the Coase-Sandor Institute for Law and Economics for a conversation today on taking innovation from an idea to reality. My name is Michael Greenstone. I'm a professor of economics and director of the Becker Friedman Institute for Economics.

And it's my tremendous pleasure to introduce today's speakers, both of whom I respect deeply and think of as friends. And so first, let me begin by introducing Richard Sandor. He's the chairman and CEO of American Financial Exchange, chairman and CEO of Environmental Financial Products. And at the University of Chicago, we think of his most important title as the Aaron Director Lecturer in Law and Economics at the University of Chicago Law School. He has received an endless series of awards, appointments, and has appointments that together I think constitute careers for several highly successful people.

And rather than take the hour to enumerate all of them, I'm going to turn to some of my favorite things that people have said about Richard. So the city of Chicago honored him as the father of financial futures. In 2002, Time named him a hero of the planet. And I just want everyone, Steve is going to try and up that with something that was said about him. And in 2007, he was named as one of the magazine's heroes of the environment for his work as the father of carbon trading.

So today, Richard is going to share insights from his journey as an economist and entrepreneur, focusing on the origins and sources of financial inventions and their commercialization. And I'm sure we'll talk about some of the exciting work he's doing right now that I've been following closely.

So joining Richard today is Steven Kaplan. He's a Neubauer Family Distinguished Service Professor of Entrepreneurship and Finance at the Booth School at Chicago, as well as being the named faculty director of the Polsky Center. Steve conducts research on issues in private equity, venture capital, entrepreneurial finance, corporate governance, and corporate finance. Like Richard, he has an endless series of accomplishments, which we could take the hour to recite.

Instead I will turn to two things that were said about him Businessweek magazine named him one of the top 12 business school teachers in the country. Every faculty member wakes up hoping for some kind of acknowledgment like that. But that's really kind of small peanuts compared to Fortune magazine referring to him as probably the foremost private equity scholar not on the planet, but in the galaxy. So I can't think of two better people to lead a dynamic discussion around financial entrepreneurship.

Following the conversation, we'll open the discussion to an audience Q&A. At any point during the program, you can submit your questions using the Q&A function at the bottom of your Zoom screen. Please identify yourself by name and an affiliation as you submit your question. So without further delay, let me turn the program over to Richard and Steve. Thank you, again, for joining us today.

**STEVEN KAPLAN:** Great. Well, thank you, Michael. It was a very kind introduction, and welcome to Richard, who combines the finance and the entrepreneurship, which I do and is in my title. So it's a great pleasure to be with you. And it's pretty amazing that you're the first one to come up with financial futures, carbon trading, and now AMERIBOR, which probably makes you one of the great financial innovators and entrepreneurs of the last 40 or 50 years.

And it's interesting. You sent me a slide deck, which you've used, and in the slide deck you say it's really hard to be a financial innovator, and you sort of have this discussion of Henry Ford versus Luka Pacioli. So can you explain that? And who is Luka Pacioli?

**RICHARD SANDOR:** [LAUGHS] I think the point-- first of all, thank you, Steve, and thank you, Michael, for the kind words. I'm truly honored to be among you two and this conversation and, of course, the best university in the galaxy, if I can say, Steve. And thank you very much.

Financial innovation often is overlooked and often derided. And so I make the point that Paul Volcker, who was chairman of the Fed, said he thought the most important financial innovation of the 20th century was the ATM. Joe Stiglitz saw no value whatsoever, a Nobel Prize winner, in derivatives, et cetera. So my question often is, why?

And I point to Henry Ford because everybody knows who Henry Ford is, obviously mass production, the Ford automotive. Luka Pacioli nobody knows about. He's not a character from The Godfather, by the way, not sleeping with the fishes.

**STEVEN KAPLAN:** That's Luca Brasi, right?

**RICHARD SANDOR:** Luca Brasi-- he's not sleeping with the fishes. But I would hypothesize that he's far more important than Henry Ford. He invented double-entry bookkeeping. He is considered the father of accounting and the father of probability. And one could argue that financial innovation, certainly double-entry bookkeeping, and the invention of the LLC might be responsible for 500 years of European rule, so to speak, in the 20th century, from the 15th to the 20th century.

So it's overlooked. Why is it overlooked? Its wholesale, Steve. It's not patentable. And nobody know who Intel was until they put this sticker on everybody's PC that said the Intel Inside. And so it's really a wholesale commodity, a financial innovation, and not really retail oriented.

**STEVEN KAPLAN:** Now, if that's the case, why are you not unknown?

**RICHARD SANDOR:** I think I'm unknown too in the same sense, or maybe I'm known to a few economists and some people in finance. But I think that obviously the general public doesn't have much interest in interest rate risk transfer. I don't think the average American has any idea what LIBOR is and how it was created, yet their mortgage, their credit card, their personal loans, their small business loans are tied to it. Nobody even knows what it is, and it's \$500 trillion of transactions.

**STEVEN KAPLAN:** Well, I would say you're not so unknown. There are almost 300 people here, which is pretty good for a webinar, so you're understanding a little bit. And people probably **know about carbon trading and the climate exchange**. That maybe not a household name, but people know what that is. So we'll talk more about that as we go. So you've **been successful** at least three times. How do you get an idea to start a new market?

**RICHARD SANDOR:** I think, like anything else, there's an aha moment, right? The what's the source of this? And there's no formula for it. You get up one day on the telephone, and you talk to some friends, and they tell you, hey, Royal Bank of Scotland just fired four people for manipulating LIBOR. And you say, whoa.

When they're starting to fire their own and it's rumors-based why they did it, you begin to say, this may be the beginning of the end, that the emperor finally has no clothes. Here's an idea. In the case of other things, it's just a whimsical moment in which you managed to come up with an idea as the result of a trip event.

**STEVEN KAPLAN:** So where did the climate exchange / carbon trading come from? You were way ahead of your time -- that was **some** 30 years ago.

**RICHARD SANDOR:** Yeah, I had been working on climate change since 1990. So it is actually 30 years-- yeah, 1991. Somebody came up to me in the late '80s and said, we're having all kinds of pollution. You commoditized interest rates, which people thought were heterogeneous and couldn't be homogenized. Could you commoditize pollution?

And I said, sure. [LAUGHS] And so they said, well, we're thinking about acid rain. And Michael knows a lot about this. And it was a group of lime producers. And lime is used to suck the sulfur out of flue gases. And they wanted the act passed. And they said, have you done this before?

And I said, yeah, with financial futures we got to get an act of Congress, so I get this. I know who has to be visited and turned. So I worked on passing the acid rain legislation. And I thought, well, jeez, if you could do it with sulfur, you could do it with carbon. And somebody from the UN came to me and said, we're having this conference in Rio. Would you design a worldwide carbon market?

And it's theoretical, but we're thinking about it. So I wrote a paper and went to Rio and started. And I sat on the beach with a Caipirinha after doing this, and I looked out on Ipanema, I said, I can do this. I know how to do this. Maybe I could put some of the work that I've done to really public good and deal with this imminent threat. And Steve, it's really interesting because it was almost like a year ago when everybody said COVID-19 is nothing.

In 1991, there were very few people who worried about climate change. And if you said, oh this is going to be-- but if you spoke to the scientists, they were pretty sure it was going to be a very serious matter in the next 20 or 30 years. So it's not unfamiliar that often you have science telling us what is going to happen, and by and large, people don't realize it until the event becomes imminent.

**STEVEN KAPLAN:** Interesting. And going back to financial futures-- we'll do all three-- where did that come from? It's hard to imagine they didn't exist 50 years ago.

**RICHARD SANDOR:** I was a restless academic, and I taught at Berkeley in the '60s. And the source of a lot of ideas came from there. It was the age of everything was free, [INAUDIBLE] and everything that has become now was then a dream of the students. And I started trading stocks. And I did not too bad, and somebody said, well, you have a talent at this, a guy, a friend of mine who was from MIT. And he had studied under Paul Samuelson and Kuttner.

And he said, ah, you're trading stocks. Why don't you try commodities? So I started trading commodities, and that was interesting. And then I'm sitting in my office in '69, and there's a minor credit crunch in California. California was an underdeveloped country in '60, Steve. It had 60 million people. Interest rates were 1% higher to attract deposits than they were in the Boston area because all the money was in Boston and all the housing demand was in California.

And so the mortgage market really was in disarray. And somebody who was a real estate professor said, hey, these interest rates are going up. I wonder, how could people hedge? And, boom, the lights went off, and it was California. And so I got a grant from a center for real estate to try to homogenize interest rates.

I took a portfolio of 18,000 loans to a Bay Area S&L. It actually ended up as an article in the Journal of Business, you may recall.

**STEVEN KAPLAN:** Not sure I recall that, but--

**RICHARD SANDOR:** Way back when. In any event, one thing led to the other. I ended up as chief economist of the Board of Trade. They said to me, what can you do? And I said, you've got to redefine what a commodity is, and we can trade financial futures.

**STEVEN KAPLAN:** So once you've got that idea, how do you then take it from the idea to actual reality? Because I know there **are a number** of steps that happen every time. How do you do that?

**RICHARD SANDOR:** I got it. Steve, it's really a long journey. And I think most people and economists as students of economics, where we teach micro or macro, we assume there's a market for widgets, right? And then we draw curves and things like that. So my experience, it takes 10 years for that assumption and costs between \$30 and \$50 million. [LAUGHS]

**STEVEN KAPLAN:** 10 years, wow.

**RICHARD SANDOR:** And a decade. And I think I threw up in that thing. There's a German philosopher by the name of Schopenhauer, and I think he says the truth goes through three stages. In the first, it's ridiculed. In the second, it's violently opposed. And in the third, it's self-evident. So every one of these ideas that I've been involved with has been ridiculed at the outset. So you know you're in good shape if people are snickering at what you're saying. It's a bad sign if they need it.

And one of the lessons that I've always learned and try to pass on is if you want to be on time for a financial innovation, you better be early. You can't establish a new market when it's self-evident that one is needed. The building of these markets takes an incredibly long time. So in the case of AMERIBOR, the new interest rate benchmark, we got it in '11. We thought it should be an American.

The idea that LIBOR ever would go away was absolutely ridiculed. There was no way. And for three years, we went not to the establishment, because first movers tend to be medium-size entities, never the big entities. And so I got on a plane and visited 125 small banks around the country. I had--

**STEVEN KAPLAN:** I don't know if everybody knows what LIBOR. What is LIBOR, and what is it used for, and then why do the small banks care?

**RICHARD SANDOR:** OK, LIBOR is an interest rate benchmark, like asset classes also often have benchmarks. The stock market has the S&P 500. Crude oil has several of them. Fixed income has Barclay's and Bloomberg, et cetera. So it's an interest rate benchmark.

And it was invented, Steve, in a peculiar way. Six banks led by Manny Hanny in '68 thought that interest rates were going up, and they convinced the Shah of Iran to borrow based on a floating rate. And they walked out of the room. The story goes that they said, OK, he's bought into a floating rate loan. How are we going to determine when we change it? And they said, let's just call each other.

And so that interest rate became a benchmark for corporate loans, for mortgages, for credit card debt. And people said, let's use this benchmark. And then we would add a specific risk premium to reflect the borrower or the collateral underlying the loan.

**STEVEN KAPLAN:** And was this done in London? Is that why it's called LIBOR?

**RICHARD SANDOR:** It was done in London, and it stands for the London Inter-Bank Offering Rate, LIBOR.

**STEVEN KAPLAN:** LIBOR, but it's dollar-denominated rate, right?

**RICHARD SANDOR:** It's dollar-denominated rate because we had a lot of dollars in the '60s and '70s that went overseas and so a dollar borrowing rate. First of all, it was absurd to me, Steve, that all of the US market-- London had LIBOR. Tokyo had TIBOR. Europe had Euribor. The world's largest economy didn't have its own benchmark. It seemed very, very peculiar.

**STEVEN KAPLAN:** OK, and that's where AMERIBOR came from.

**RICHARD SANDOR:** Yeah. I said, OK. I called in my colleagues and said, let's call up the patent lawyer and Trademark it and make it an IBOR, except let's make it American. And thus we birthed AMERIBOR. And if it was going to be American-- America is-- instead of going to London and Paris and China for carbon trading, I was in Tupelo, Mississippi, Bentonville, Arkansas, San Antonio, Texas, Memphis.

I can tell the 284 participants where to get the best pulled pork and ribs of any place.

**STEVEN KAPLAN:** So now, why did you have to do this? So you decided to start it. Was there a legislative hurdle? What was the hurdle? Because you said with futures, you needed legislation. With the climate change, you needed that. Did you need legislation here, or what are the commonalities?

**RICHARD SANDOR:** Well, the commonalities were the following. First of all, the big banks said, go back to Chicago because LIBOR is never going away. And this is a dumb idea, and it's not what we do, and it's never going away. So that's number one. Number two, I got on a plane and said to folks in Bentonville, Arkansas and whatnot, do you want an American benchmark? Does LIBOR fit you?

And they, at this point, were not too happy with the big banks. It was 2011 and 2012. It was after '08-'09. They felt that their destiny was not theirs. And I said to my colleagues, look, there's 5,374 banks. Let's leave the eight big banks alone, and let's go and try to find the 5,366 other banks and develop a benchmark for them, build an entire ecosystem.

Now, overnight unsecured borrowing was already being done, so it was exempt from securities or commodities regulation. So unlike acid rain or carbon in Europe or others, there was no regulatory need, per se. Alternatively, there was no way that there were any transactions going on, Steve. It was zero interest rates at the time. We had just emerged out of the '08-'09 debacle. Borrowers borrowed from the US government and lent to the US government, so the government was on both sides.

So there was, prior to that, a market for overnight unsecured. And so our job was to rebuild that market and then take the average rate based on transactions, not on opinions, and call that AMERIBOR. So there were two challenges, build the exchange, recruit the members, and then design the particular transaction.

And those are two challenges that are very important. How do you design an exchange? And then how do you design a particular contract so that you minimize, in both cases, transaction costs?

**STEVEN KAPLAN:** So minimizing transaction costs, which is very Coasian--

**RICHARD SANDOR:** Yes.

**STEVEN KAPLAN:** --is the driving force for both, so the architecture, the exchange, and then the specific contracts. So let's go to the exchange. How do you think about that minimizing transaction costs? And I guess you had to do that in the other cases as well. How do you think about that? What are the variables? What are the considerations?

**RICHARD SANDOR:** Well, you start from what is LIBOR? What is the hypothesis? And the hypothesis is you're going to design the anti-LIBOR. So LIBOR was opinion based, so it would be all transaction based. Right?

**STEVEN KAPLAN:** And then LIBOR was nontransparent. It was in a closed room.

**RICHARD SANDOR:** It was opaque. So you added transparency. It was not rules based. It was over the counter. You would make it rules based. It was international in big banks. You would make it American in small banks. And the business model was horizontal and homogeneous. So the top 18 banks were large. The counter parties were in the same credit class.

And the money flowed upstream. So little banks borrowed from mid-sized banks. Mid-sized banks borrowed from regionals. Regionals borrowed from money center. We decided we would make it heterogeneous and vertical so that little banks could lend to big banks. Little banks could lend to each other. So to optimize the liquidity-- and we recognized that the US was like a little bit of an undeveloped country. Interest rates were different in Des Moines than they were in Little Rock, than they were in Tallahassee.



And there were local regional economies. And supply and demand of funds varied by region. So if we could create a geographically diverse vertical model, we could create an American interest rate. And it would be subject to lower volatility because it was a lot of arbitraging one region for the other. So you sell where prices are high. You borrow where prices are low, and then the rates tend to equilibrate.

So it was just an architectural interest. And then you created not an all or none, but a credit and a lending filter. So it's lender driven-- London Inter-bank Offering Rate. So the lender decides the quantity and the price. So our model is different because it's not all or none, and it's not 500 million at a clip. You may discriminate on both price and quantity to a borrower. And in that way, you maximize the liquidity and minimize the transaction costs.

**STEVEN KAPLAN:** So is that describing the contract now? That I'm not sure I understand.

**RICHARD SANDOR:** That describes the contract. The exchange--

**STEVEN KAPLAN:** The exchange takes everyone across the country. So it's a national exchange, not geographic.

**RICHARD SANDOR:** Right. And you have to decide, is it going to be corporately owned or mutually owned? In the old days, the New York Stock Exchange, the Board of Trade, the [INAUDIBLE] Mutuals, they weren't corporates. This one would combine corporate form of ownership but mutual decision making. Like the design of the contract, compliance, peer review, business conduct would all be committee based, and you'd be tried by your peers for infractions of rules and regulations-- very different than LIBOR.

No policing. Nothing like this 130-page rule book which governed behavior. So you then have to decide, do I buy or do I build? So I want compliance. Do I set up a 30-person compliance department, or do I license a self-regulatory? So we bought rather than build the compliance services of CBOE that was a regulated securities and futures exchange.

We had to decide, would we be regulated or non-regulated? We had a choice to be unregulated, but we chose to be regulated by an SRO like CBOE that would independently make sure that the markets weren't being manipulated or rigged in any way because we wanted to create a regulated entity be opposite of what it was.

And the other was it was clear this time that there was no need for floors, that you could do it all electronically. So it was a corporate form. And the only thing the exchange was left to do was invent products and market. So it had no other functions like compliance or any of those things. It was all left to outside entity.

So we could create an entity that had, to your entrepreneurs, and we did it before, an entity that would have 12 people, 20 people that would have an enterprise value, if successful, of multi-billion dollars. And the last exchange we started had 25 people, and we sold it to ICE for \$600 million, and our investors made 7 and 1/2 to 15 times their money because we have no overhead.

**STEVEN KAPLAN:** And you don't on this either. So now, going back to the contract, exactly how does the contract work? You look at the transactions? Where do you get data on the transactions?

**RICHARD SANDOR:** It's great, Steve. You know, Michael wants to borrow and you want to lend. He logs on to the trading platform. He sees an array of offers and bids. You're a lender. You like Michael's credit. You say, I'm going to give Michael a \$100 million line.

His bid shows up to you as green, which means that you've given him a line of credit. Mine comes up as red because you don't like my credit, and so you see-- and you hover over it in yellow to see how much of the credit line has been drawn down on or whatnot. So you might see Michael's green. You've given him \$100 million. But you've only got \$70 million left, and so you can hit his bid for his \$70 million.

And then once it goes-- it was anonymous on the screen. You just get a wire that's saying, you just lent \$70 million to Michael Greenspan. Here's his ABA number. Here's the wiring instructions, and then you wire him the funds. You report to the exchange that the funds have been wired. He reports that the funds have been received, and the transaction is consummated. And then--

**STEVEN KAPLAN:** OK.

**RICHARD SANDOR:** --very simple. The idea-- and people often comment, and we're very proud of it, that the simplicity of it is really what makes it very attractive. It takes 10 minutes to train somebody to borrow or lend it. It says buy or sell and the interest rates, and that's it.

**STEVEN KAPLAN:** And then the rate-- the AMERIBOR, the rate, is the average rate that clears? And how does that compare to LIBOR? And what's happening to LIBOR? Because this is also-- and there are alternatives. So this is a bit controversial, actually.

**RICHARD SANDOR:** Yes, Steve. You're hitting on all of the key points. So the answer is that AMERIBOR is simply the weighted average of all the transactions during a day. So if there was two, one at for 1% and one at 1 and 1/2% and they were the same volume, you just average them. If it was 2/3, one third, you'd weight them by the amount that's borrowed or lent.

**STEVEN KAPLAN:** And LIBOR still exists or LIBOR is not going to exist?

**RICHARD SANDOR:** LIBOR exists and will go away by the Bank of England. This has been-- it's been a big scar on the whole UK because this interest rate was rigged. So the Bank of England took a very hard look at it and decided and led the way. Well, we're not going to do this. And Michael, I haven't told you, but I am telling for our members, we just got a confirmation yesterday that we're going to have-- hopefully you'll sponsor Mark Carney as the lecture series that we have. So he'll be appearing on May for the faculty and for our AFX members. And he's going to be talking about sustainability and banking.

So the Bank of England, he in particular, and a lot of other people decided that they would call an end for it. They demanded that the people who calculate it stop calculating it. And it will die on December 31, 2021. We didn't design it that way. This is past your chance favoring the mature mind. We began in '11. We said it would end in 10 years, and we got lucky. It's going to end in 10 years. That doesn't mean the business is successful. But fortuity was on our side.

**STEVEN KAPLAN:** So now this issue between the SOFR and AMERIBOR, then, is not **one or the other**. It would be nice if they picked AMERIBOR, but what's SOFR, and what's the difference between that and AMERIBOR, and does it matter?

**RICHARD SANDOR:** Yeah, it matters a hell of a lot.

[LAUGHTER]

I'm kind of-- we were like Jimmy Stewart, It's a Wonderful Life. This is a Frank Capra movie of spreading joy. We represent the small, medium-sized regional Guys. We represent all of the minority depository institutions. We're not messing around. SOFR is good, and I'm being a little glib. But it's a secured rate. It's a repo rate where you borrow based upon government securities.

It is the tool of the big banks. And in 2014, actually, we had gotten a lot of rough riding going between 2011 and '14. When the Fed announced it was going to come up with a LIBOR replacement, we got energized. So their rate is a risk-free rate. Ours has a credit sensitivity.

We represent-- our banks don't trade governments, although Citibank just-- we signed a joint venture with them, and they're going to join AFX. So we kind of had a Chick-fil-A strategy. We started in small towns and then built our way up the same way Sears and McDonald's did and Walmart. We started in small and we went big.

And they started big with a tool that would be good. So we represent the actual marginal cost of borrowing for Northern Trust, for Wintrust, for Signature, for City National, for Regions Bank and Fifth Third, et cetera. They represent the marginal cost of borrowing for the large banks that can borrow on a secured basis.

So our thought process is-- and it's been an uphill battle to say that choice is critical and that there shouldn't be a single benchmark. Well, SOFR is something that is the tool of the big banks and supported by the central bank. There ought to be choice like there is in the stock market-- Russell 2000, S&P, Dow Jones, NASDAQ, more stock indexes than stocks, more fixed-income indexes than fixed income.

So we had been advocating choice. And we think that the result will be better for the economy and certainly for our member banks.

**STEVEN KAPLAN:** Are people using **Ameribor** as a benchmark now? what are the syndicated loan market **and** direct lending market using at this point?

**RICHARD SANDOR:** It is being used. 2020 was a big year for us. Signature bank, which is the largest independent bank in New York, actually \$73 billion, just issued subordinated debt with \$375 million where the floating is AMERIBOR and the backup is SOFR.

If we take a look at a number of banks in the US, they're beginning to price loans and deposits. So First Merchants just did a swap and takes deposit rates, and they index them to AMERIBOR. Frost Bank in Texas has started commercial loans, which are indexed to AMERIBOR and not LIBOR. Service First, a \$10 billion Alabama bank, just stopped using LIBOR completely and only uses Prime, AMERIBOR, or Fed Funds,

So this is a year for us that's very, very critical. And we either have gotten it right or gotten it wrong. But we've never been more bullish, Steve. We've survived, and we're standing on a beach in Normandy erect and having a fun time meeting different challenges.

**STEVEN KAPLAN:** I'm going to start going through the audience questions in a couple of minutes, but let me ask a couple **more of my own** before I do that. So are there more opportunities out there? Is it all done, or are there other markets to be created? And where should people look? And I guess you think about them with transaction costs, but how do you do that?

**RICHARD SANDOR:** I think there's more opportunities than there have ever been. I just wish I could do it for the next 50 years because I think it's endless. First of all, with big data, whole new markets open. There's potential markets in water, which we've been advocating and we worked on at the climate exchange, but we were seduced by LIBOR's inadequacy, so we switched direction.

There's biodiversity. I think there's huge opportunities in medicine. The very fact that we spend \$18 billion, 18% of the US economy on medical care is outrageous. And I think there's all kinds of new tools that have to do with insurance, pricing, risk transfer, and the medical area. And we're spending 10% more of our GDP than is necessary. We spend double what the Western world spends and not the same goals. And financial engineering and organized markets and any place there is an externality that's negative or positive.

As a matter of fact, when I taught this spring, one of the student projects-- a student project came up with a market based on the vaccination, so I give them. And another one came up with a market-based solution to space junk. And another one came up with a project to do a cap and trade on prison population.

So the number of ideas that are out there are mind boggling. And for the entrepreneurs listening, that 40 years ago or 50 years ago, exchanges had no value whatsoever.

**RICHARD SANDOR:** Right now, the CME is bigger than Ford and General Motors combined in market cap. ICE and the CME are a hundred billion in market cap, all based on financial products that never existed, energy products that never existed, and all new. So there's an opportunity for huge value creation and most importantly, social good. They're democratizing.

**STEVEN KAPLAN:** Well, on that note, I'm going to ask some questions from the audience. And this one is from Oliver Wilson, who's in eighth grade at Lab. His dad is Don Wilson, whom you probably know. Many people think that carbon markets are a bad idea and won't solve climate change. Why do you think that is, and I guess is that right or not?

**RICHARD SANDOR:** Well, the important part-- Oliver, I do know your dad very well and have the greatest respect for him. He's wonderful, and it's the right question. But, Oliver, the two things that combine environmental markets are cap and trade. So the first thing it does, it puts a cap on emission. So by very definition, it solves the problem. It's just the question of how efficient the road is to that lower emissions level.

**STEVEN KAPLAN:** Very interesting. Let's see here are a couple about AMERIBOR. The first one came earlier and said the Fed has endorsed SOFR over AMERIBOR. But SOFR is effectively just the rate that the Fed pays on reserves, because it's collateralized and its riskless. So is there any new information in SOFR?

That's a softball question, by the way.

**RICHARD SANDOR:** The answer is, yeah, actually, there is. Because it gives you an instantaneous measure of the futures price. So it does send a price signal. And that's important. The Fed has not really endorsed SOFR, per se. When Jay Powell was asked a question about what he thought about AMERIBOR at a Senate Finance Committee, he said he thought it was useful for certain kinds of banks in different situations.

So they have been very careful to politically not say this is the only benchmark that is of use.

**STEVEN KAPLAN:** And that's another question -- So you can have SOFR and AMERIBOR last forever together.

**RICHARD SANDOR:** I think this is terrific. The SOFR backers have 1,864,000 employees, and we've got 12. And I think that's a fair fight.

[LAUGHTER]

**STEVEN KAPLAN:** OK. And this is a question about how does either AMERIBOR or SOFR guard against manipulation that you had with LIBOR?

**RICHARD SANDOR:** We have specific rules. We have policing powers. We can ban you. We can limit your trading sizes. We watch it every day. I assume that the Fed does the same thing, although that's something that's done by the central bank and not by a private organization.

**STEVEN KAPLAN:** OK. Here is a quite different one. There are a lot of good questions. This is from Michael Klowden. In your professional career, what has been your greatest disappointment and your greatest satisfaction?

**RICHARD SANDOR:** I think I've got a career riddled with failures. And they taught me, instructed me. So one of the disappointments is insurance derivatives, which we came up with the idea in 1970 and failed as a future but has succeeded as an over-the-counter product. So that's been-- and I realized a lot by it.

And the biggest satisfaction generally is the thread of democratizing markets, whether it's financial futures, carbon, acid rain, AMERIBOR. I love the ability to enable and [INAUDIBLE] the small and the medium and democratize. And I think markets are very, very good equilibrating mechanisms, as long as there's no barriers to entry.

**STEVEN KAPLAN:** So let's go now to a couple of questions back to climate. So this is from Mangupta. Can you tell a bit about the potential of offset futures in the carbon market?

**RICHARD SANDOR:** Well, first of all, an offset, for those of you, it's a technical term. An offset is essentially a negative emission. So when you burn coal, emissions go into the air. When you plant trees, they suck carbon out. So it's a negative emission from an economist's point of view.

It can be done by burning methane that comes out of a garbage dump. It can be done through reforestation. It can be done through a substitution of renewable energy for fossil fuels. And I think the market's enormous. As a matter of fact, U Chicago and Michael is heading up an effort-- I'm going to be shamelessly self-serving-- which I am the privilege of being on the board of at the University of Chicago.

But I think offsets are very, very important. In the University of Chicago tradition, the people who-- or very often, people use command and control. And the idea was to punish the polluter. The market-based environmental markets are to reward the people for not polluting. And there's a very, very different moral lens that these are looked at.

And offsets provide all of us the opportunity to create negative emissions. It's often criticized because it says, you're letting the polluters getting away with polluting. And we're saying, well, the least-cost provider of the solution ought to be incentivized to provide the solution rather than punishing the person. If the goal is to reduce emissions, then we as people who get harmed by emissions should not care how it is being done if the societal good is being served.

And very often, there's an underlying tension, Steve, in the offset community versus the polluting community. And people get-- I think Isaac Asimov said never let your morality get in the way of doing the right thing.

[LAUGHTER]

And I think that you've got to be careful about getting morality confused with solving the problem. The job is to solve the problem. It's not necessarily to punish. So I'm really bullish on it. I think it's important. The University of Chicago's involved. Mark Carney is heading an effort worldwide to create offsets. And I believe they are the least-cost way of stopping pollution.

**STEVEN KAPLAN:** And that's related to this question from Connor Anderson, who's a Booth student. He's looking at how cap and trade can be used to incentivize farmers to transition to sustainable farming practices. Where do you feel the biggest obstacles are or opportunities to improve the process?

**RICHARD SANDOR:** And enormous opportunities. When we ran the Chicago Climate Exchange, we recruited people like DuPont, who might do genetic engineering of crops so that they would have bigger root structures. If they had bigger root structures, then it would go deeper, and the carbon would be absorbed not only for the plant above the ground, but the root structure below ground. And the more that they did, you trapped carbon and it went away.

The other thing is to create carbon credits from changes in tillage practices. So you incentivize farmers not to have deep tilling but to have low till or no till agriculture, sustainable, so that the roots which have been buried in the ground don't go up. So you also can encourage them to do tree planting. You also can do range management, where you move cattle herds in such a way that you minimize the carbon emissions.

So we had a long list of proven protocols. You take dairy cows and take the manure and put them in a pond and capture the methane, and that sustains the milking machine, so you have a complete cycle. So there's enormous ways, if you put a price on carbon, that you can incentivize changes in behavior. We know as students of economics that price matters.

**STEVEN KAPLAN:** That's a good segue to **another question**. How has your business experience challenged what you learned in economics? Meaning, is economics useful or useless? I shudder to ask that. But as an economist, how do business and economics mix?

**RICHARD SANDOR:** Listen, I think it's provided an enormous analytical and mathematical structure for me to function. So I was trained-- I went to the University of Minnesota, the orientationist theory there and econometrics as well. And so I was heavily trained at the theoretical side. It gave me a framework to analyze problems. I don't simply look at it in a partial equilibrium sense.

And I also can look at it in macro. And having studied things, even in graduate school, on the general theory of the second best and to think about local optimums as opposed to global optimums, mathematically and practically, what can I achieve in a constrained optimization model? And so thinking about it-- and I think Ken Arrow said the key part of modeling is not that they give you the answers. They give you a framework for thinking about problems.

And economics has done that for me. It's given me a framework. So I think of Coase, and I think of regulatory, legislative, building institutions, the economics of single bargain. So I think of economics, and then I think of economics and law and psychology and sociology. Because in the business that I'm in, markets are a complex web of economics, sociology, as you know, psychology, law.



**STEVEN KAPLAN:** Let's go into psychology. So speaking of psychology and economics, we've had two **related events** that have been in the news . One is all the GameStop and AMC craziness. **Do** you think that's going to have an effect on regulation and particularly with regard to short selling?

**RICHARD SANDOR:** [LAUGHS] I hope not. I just have looked at this, and often prices become reasons to regulate. And I don't think that's necessarily the right way to look at it. It is headline grabbing. I don't think it has any impact on the market.

If it causes people to study some of the issues, that's fine. But I'm always concerned about a knee-jerk reaction because some hedge fund is short and some young person wants to trade. And some people lose money, and some people make money. And that's OK if it's not systemically risky.

**STEVEN KAPLAN:** OK. And another one where price is getting a lot of attention, Bitcoin and blockchain. I noticed you've used blockchain in AMERIBOR. So what do you think of blockchain and Bitcoin?

**RICHARD SANDOR:** We use blockchain. We're the first exchange to use it every time a trade occurs. We don't sell the coins, but on the coin, we actually have-- and Steve, you'll find this interesting. So we have-- normally the New York Stock Exchange will tell you 1,000 shares of Apple traded at XYZ, or the CME will tell you Treasury bond futures traded at 100 and whatever, 69 and 12/32s.

Because we're a principal-to-principal exchange, we know who the lender was and who the borrower was. We don't have brokers, so we know the principals and what they do. So we can tell you, at any given time, the money is flowing out of Alabama to Idaho. We have an online, second-by-second movement of liquidity throughout the United States.

We can also tell you if it's moving from tier one capital to tier two capital. We can tell you what the risk basis of the borrower is, what the lender is. So this is an enormous valuable database. So every loan that takes place, we can pinpoint every-- how many non-performing assets does the lender have? How does the borrower have?

So we're building-- and, as you might expect, the regulators are quite curious about this database. So it's a very efficient way to store data. And I believe that digital assets, a digital dollar are very, very important for the central bank. I think that we have to be very careful here, lest we lose to other central banks that are thinking more advanced about digital RMBs, digital currencies.

There's the speculative aspect of it and the substitution value. But to me, the blockchain itself, the distributed ledger has enormous value. And it does in the environment. You can track an avocado growing in the Central Valley of California to its eventual consumption and find out how much carbon has been used in the entire track. So this blockchain has enormous value.

**STEVEN KAPLAN:** Interesting. Well, let me end with one last question. And it comes back to entrepreneurship. What is the most essential trait of an entrepreneur?

**RICHARD SANDOR:** [LAUGHS] I think-- in my case, I think the most important thing is you have to enjoy competing, and you have to hate losing. And you've got to be persistent. You got to-- more than anything else. Every day, the odds are stacked against an entrepreneur, OK?

There's so many-- and you have to be-- and there are only two franchises for an entrepreneur to have, and that's speed and flexibility. So those are the two franchises that you've got to be good at, is you've got to really get off something when it's wrong, and you've got to pivot, and you have to be fast. And most importantly, you have to look at a wall, crash into it, back off, assess the damage, and then crash into it again.

**STEVEN KAPLAN:** Excellent. That's an excellent note to end. **on** So this was wonderful. I learned a ton. And I hope our audience enjoyed it. And Richard, thank you so much for doing it, and thank our audience for sticking around, as many of you did. And I hope you enjoyed it as much as I did.

**RICHARD SANDOR:** Steve, thank you very much. Thank you to you, to Michael, to the University, to my board of directors, my members of my family who have tuned in. Thank you very much, Steve. It's great to be here with you. I've really had a lot of fun with it. And Thanks for asking those very probing questions. Have a good day.