

Nobel laureates' session at the European Finance Association 50th annual meeting

SAMMY OBEID: (00:06) Thank you all and welcome to this noble event.

DHAYA LAKSHMINARAYANAN: (00:09) Nobel.

SAMMY OBEID: (00:10) Yes. No bell.

DHAYA LAKSHMINARAYANAN: (00:12) Ding ding ding.

SAMMY OBEID: (00:14) Where did that come from?

DHAYA LAKSHMINARAYANAN: (00:16) No. There's no bell.

SAMMY OBEID: (00:17) Ah, clever. I'm comedian Sammy Obeid.

DHAYA LAKSHMINARAYANAN: (00:21) And I am comedian Dhaya Lakshminarayanan.

SAMMY OBEID: (00:24) And we're here today because we were asked to do this event.

DHAYA LAKSHMINARAYANAN: (00:27) Yes. Our good friend Albert Menkveld is responsible for what you're seeing tonight.

SAMMY OBEID: (00:32) Also, because the first three economists that they asked said no.

[light laughter]

(00:38) So let's begin by bringing up our moderator for the event and our dear friend, Mr. Albert Menkveld.

DHAYA LAKSHMINARAYANAN: (00:43) And to be clear, not a Nobel laureate.

[laughter]

SAMMY OBEID: (00:46) Please, round of applause.

[applause]

(00:48) No. No bell.

DHAYA LAKSHMINARAYANAN: (00:50) No bell at all.

[applause]

(00:54) Ding ding, ding.

SAMMY OBEID: (00:57) So now let's introduce the laureates, shall we?

DHAYA LAKSHMINARAYANAN: (00:59) Yes. While Albert is taking his seat, we'll get to the heart of the matter. Oliver Hart, our Nobel Prize winning professor is here. He is famous for his work on Contract Theory.

SAMMY OBEID: (01:13) Please, Oliver, you can come to the stage. Yes.

[applause]

DHAYA LAKSHMINARAYANAN: (01:24) You're allowed to give him more applause than Albert, by the way.

SAMMY OBEID: (01:28) We'd like you to applause until they sit down. That would be nice.

[applause]

DHAYA LAKSHMINARAYANAN: (01:33) By the way, Albert is smiling, so he's enjoying this.

SAMMY OBEID: (01:38) And next we'd like to welcome to the stage Professor Bengt Holmström.

[applause]

(01:43) Yes. Known for his Nobel Prize winning work on the Theory of Incentives.

[applause]

DHAYA LAKSHMINARAYANAN: (01:55) You can keep applauding until he gets to the stage. He's a big deal.

[applause]

(02:03) And also, Nobel Prize winner Paul Milgrom. He is famous for his work on Auction Theory. He's joining us from California because he's unable to be here in person.

[applause]

SAMMY OBEID: (02:25) So today, we'll just be giving a brief introduction to the event and then you'll be witnessing a fascinating panel discussion.

DHAYA LAKSHMINARAYANAN: (02:31) And now that our Nobel Prize winners are joining us in this room, the mean Nobel Prize per person is now .005. Congratulations to all of you.

SAMMY OBEID: (02:44) That's a mean joke.

DHAYA LAKSHMINARAYANAN: (02:46) Well, we're both on stage together. So we're comedians.

SAMMY OBEID: (02:50) Does that follow a normal distribution? Or is it a no-bell curve?

[audience heckling]

DHAYA LAKSHMINARAYANAN: (02:54) Wow, you're really in standup mode, Sammy.

SAMMY OBEID: (02:57) Very nice. Very nice.

DHAYA LAKSHMINARAYANAN: (02:59) Meanwhile, while you're enjoying this wonderful event with our esteemed colleagues here, Sammy and I are going to be backstage in a small room sweating while we try to come up with jokes based on what you're about to hear and see.

SAMMY OBEID: (03:15) Because we didn't prepare beforehand, basically. All the jokes will be in good jest, of course. There's no competition here because comedian is the one industry that will never be nominated for a Nobel Prize.

DHAYA LAKSHMINARAYANAN: (03:27) And we have been asked and told not to roast the Nobel laureates, which we will definitely abide by. But we've also been told that Albert is fair game.

[laughter]

SAMMY OBEID: (03:38) So please, one more hand for our wonderful, brilliant Nobel laureates.

[applause]

(03:46) And also, Albert. Okay.

DHAYA LAKSHMINARAYANAN: (03:50) Well, let's talk a little bit about why these people are on stage tonight and what they've done to deserve the Nobel Prize. Oliver Hart. Are you familiar with contract theory?

SAMMY OBEID: (04:02) Didn't read it. It wasn't in my contract.

DHAYA LAKSHMINARAYANAN: (04:05) He is well known for talking about the principal agent problem.

SAMMY OBEID: (04:09) I don't have an agent nor do I have principles.

DHAYA LAKSHMINARAYANAN: (04:13) Sammy, you should know all this, that all contracts are incomplete.

SAMMY OBEID: (04:17) All contracts are incom...

DHAYA LAKSHMINARAYANAN: (04:21) Correct. That's right. Ding ding ding.

SAMMY OBEID: (04:25) There it is again. So how do you remedy that?

DHAYA LAKSHMINARAYANAN: (04:28) Well, we never know what the future holds, what future scenarios are. So we have to anticipate the unanticipated,

SAMMY OBEID: (04:37) What, like time travel?

DHAYA LAKSHMINARAYANAN: (04:38) Possibly. We also need to understand that optimal power distribution is important and we cannot give power to the wrong person.

[Sammy hands over his mic to Dhaya]

(04:55) Next, Professor Bengt Holmström. He is famous for payment based on performance, which is sometimes not optimal because effort is unobservable and in some cases, you will need a flat fee.

SAMMY OBEID: (05:10) Flat feet? I have those. It's horrible.

DHAYA LAKSHMINARAYANAN: (05:12) Good thing we are not being paid by performance, Sammy.

SAMMY OBEID: (05:16) But the point is we put in effort, ha?

DHAYA LAKSHMINARAYANAN: (05:19) And then we want to talk about Paul Milgrom. Correct?

SAMMY OBEID: (05:24) Yes. So Professor Paul Milgrom, who won't be joining us in person today, is known for his groundbreaking work on auction theory. That must be pretty hard studying auctions. Right? Especially with how fast auctioneers talk. Right? "25,000... 50,000... 100,000... Sold to the Nobel Prize winner."

DHAYA LAKSHMINARAYANAN: (05:43) No, Sammy, that is not what his research is about. I'm so sorry, Professor.

SAMMY OBEID: (05:48) Well, it seems as you have more information than I do.

DHAYA LAKSHMINARAYANAN: (05:52) Unfortunately, yes. That's called information asymmetry.

SAMMY OBEID: (05:56) There you go again.

DHAYA LAKSHMINARAYANAN: (05:58) Did you read any of these people's work before you came to the stage tonight?

SAMMY OBEID: (06:02) To be honest, I got 12 hours of sleep last night? Yeah.

DHAYA LAKSHMINARAYANAN: (06:06) Wow!

SAMMY OBEID: (06:06) Because I started reading Professor Menkveld's work on non-standard errors.

[laughter]

DHAYA LAKSHMINARAYANAN: (06:12) Well, with that said, let's hand it over to the real moderator of tonight. Professor Albert Menkveld. Thank you so much, Albert, for having us. We'll be back soon.

[applause]

ALBERT MENKVELD: (06:26) Thank you, Dhaya and Sammy, for the introduction. And at this point, I want to express on behalf of all of us at the European Finance Association, including myself of course, the gratitude to the Nobel laureates for being here. We have 50 years of EFA meetings. My first one was 25 years ago, actually in Paris. And I've enjoyed each and every one of them. And if you have 50, then it's time to celebrate. And the idea was to have Nobel laureates, and the dream came true.

(07:02) What should we ask them? And then I thought, I should not think of that. It's actually you who should think of that. It should be the community. And you might remember that when you registered for this conference, one of the questions was, "Do you have a question that you'd like to be asked to the Nobel laureates?" And many of you answered. And I basically have half a dozen questions here that I think are very nice for us to think about and ask the Nobel laureates and discuss with them. And so that's what we're going to do in the next hour. If we're sort of close to the hour, you will have an opportunity to ask, yourself, any questions that we have not touched upon.

(07:53) So without further ado, the first question I'd like to direct to you, Oliver. Fifty years of financial economics, what good has it done to society? Have our discoveries helped society? Was it all good? Or were there ways in which we actually caused damage? In a time of Oppenheimer we know that scientific discovery is not necessarily always good. What are your thoughts on that?

OLIVER HART: (08:25) Well, thank you, Albert. Thanks for inviting me. And it's a little hard looking out to the... With the bright lights, I can't really see whether there's anybody out there, but I guess there are.

(08:37) So, one of the things... I think I can go back before, longer than 50 years, just to look at the finance generally, what the profession has done for us. I think on the positive side, I would pick out the fact that these days, if you think about how people invest their pensions, or other things, but let's say particularly pension money, I mean, many people around the world, certainly in the United States, but I think also in Europe, put their savings in the stock market. They hold a diversified portfolio and many of them would also choose an index fund. And if I think about those things, I think the finance profession can take credit for a lot of that. Because once upon a time, it was thought that a trustee for somebody who was investing their money, money on their behalf, should choose very safe things like government bonds, this kind of thing. And then over time that's evolved and now people said, "Wait a minute. What about the stock market? Isn't that better?" And you know, once upon a time, it would have been a breach of fiduciary duty of the trustee to put the money in the stock market. It would have been seen as too risky. But now it's seen as a breach of duty not to put it in the stock market. So, you know, I think the work of Markowitz and Sharpe and others certainly was very influential in that shift in view.

(10:15) And then also, if we take the efficient market hypothesis, that sort of told us, even though we know it's not always true, but it has convinced people that not many people can make money out of the stock market, can beat the stock market. So maybe the best thing to do is not to have your money actively managed in stocks, but rather to choose something like an index fund where it's passive. And I think not everybody does that, but a lot of people do that. So these are, I think, are very important and really quite enormous shifts that have taken place. So that's positive.

(10:54) I think you also want me to talk about maybe some negatives. I see a negative as coming from the fact that the finance profession, if I think of corporate finance, over the last 50 years, the emphasis has been on agency problems between managers and shareholders. They are, of course, important but somehow the view has been shareholders all want to make as much money as possible. They want share price value maximization. Managers may have their own goals. So what do we do about that? We have to incentivize managers, put them on high-powered incentives, give them shares, stock options as part of their compensation. And there are some, certainly some good sides to that but there are also some negatives. And this actually relates very much, some of the negatives, to Bengt's and Paul's work on multitasking, and we see what can happen if the compensation is too high powered. We can get things like Enron. We can get things like Boeing, where they cut costs and sacrificed safety and we had two big crashes. I think we also see pollution companies polluting because they're only focused on the bottom line.

(12:15) And I think another thing that we've got wrong is that shareholders don't always want to just make as much money as possible. Because they're human beings and they care about whether they or their children or grandchildren live in a hotter world, or whether maybe people they're unrelated to live in a hotter world. So they might want a company they're invested in to reduce their carbon footprint, even if that hurts the bottom line. This is something I think that traditionally we have not taken seriously. I think we are taking it more seriously now. And I looked at the program of this conference and there are papers on this and I'm very happy to see them.

(13:00) Just to throw in one last thing, activist investors. I used to think that activist investors were great because they were aligning preferences of managers who were doing their own thing with the preferences of shareholders. So this was all good. But I don't think of that. I don't think that way anymore because I mean, what... Let's take the case of a company that is not polluting that much. It has reduced its carbon footprint at the expense of profits. Some activists can come along and push it in the other direction. This may not actually be what the shareholders want at all. Maybe the manager is currently doing exactly what the shareholders want and the activist investor is going to disrupt that. So you know, I think these are important things that are now being considered but have not been much considered in the last 50 years.

ALBERT MENKVELD: (14:00) Yeah. Thanks so much. Bengt, Paul... By the way, Paul had a nasty accident in the kitchen. No long-lasting effects, but at least temporarily, he was vetoed from travel by his doctor. So that's why he's on video link, just to explain the situation. Bengt or Paul, did you want to comment on this question? What good? Or add some thoughts to this question? Did we do all good to society, or were there also negatives?

PAUL MILGROM: (14:37) Yeah. I'd be happy to add something. You guys hear me okay?

ALBERT MENKVELD: (14:42) Yeah.

PAUL MILGROM: (14:44) Well, so I think Oliver commented on the markets paradigm and the asset pricing contributions and the benefits that have accrued there and I agree with that. And he commented a little bit also about corporate finance emphasizing the negatives. There, of course, were some positive aspects in the corporate finance too, as we came to understand more about providing incentives, about funding startups. Certainly the financial innovation in funding new companies has been important.

(15:28) But I guess there's the third area of finance too, right, consumer finance, which Oliver didn't mention at all. Within consumer finance we've learned, for example, about the way credit cards are managed, the damage of credit card debt and how competition in two-sided markets for consumer credit cards can lead to welfare losses, which is encouraging us to understand better how those markets might be regulated.

(16:00) And the corporate finance part two, I guess we could talk about banking and I'm surprised actually that Bengt didn't speak up immediately about bank regulation and our greater understanding of how banks operate and movements like, well, my own colleague Anat Admati

at Stanford, who is arguing for much higher capital standards for banks based on our understanding of corporate finance.

(16:32) So I think, you know, in all three areas – in the asset pricing area, in the corporate finance area, in the consumer finance area – there's research that has led to deeper understanding, has affected the law and regulation, has affected behavior, which is part of what Oliver was emphasizing. I think the positives are pretty clear and I applaud what's been achieved in the last half century.

ALBERT MENKVELD: (17:07) Thank you, Paul. Do you want to comment or shall we move to the next part of this question, which is...

BENGT HOLMSTRÖM: (17:13) Let me just say...

ALBERT MENKVELD: (17:16) Just start speaking and it will...

BENGT HOLMSTRÖM: (17:18) Okay. So yes, most of the things, key things have been said already, but I think one thing to emphasize is the importance of finance for economic development around the world. We just look at our world, but especially in the most recent decades – think of China, think of Africa – it relates to this digital world a lot. Enormous advances that have brought hundreds of millions of people out of poverty where finance has played a very important role, much of it banking, just getting to be a system where people are banked and not unbanked as they have been. So I think finance from that point of view has been very big, and increasingly so will be.

(18:10) One thing, perhaps, to add on the negative side... This is not my expertise, but there's been a lot of complaints about misallocation of talent and it relates to, I think, the work that Paul and I have been doing and others about the allocation of effort, so to speak. You know, this is a very visible thing to make money and Oliver emphasized it also and it drives people in that direction and maybe there is an excessive attention to finance in general. There's a fairly sizable literature on that. I don't know how to pick and choose from that but my overall view is that finance has been tremendously valuable and keeps growing. We understand banking crises now better, even though they seem to happen more frequently, and so on. But I think we are on a, in that sense, on a good learning curve, not just in the West but also spreading it to the rest of the world. So I think finance is one of the places that economics can be really proud of.

ALBERT MENKVELD: (19:22) Good. Thanks for your views. Maybe we should switch now to the next 50 years, perhaps. What do we expect coming? Where can we contribute? Where do you see contributions of the research that all of us are doing? Maybe areas that are under researched, over researched? What is your view?

BENGT HOLMSTRÖM: (19:47) Maybe I continue just because it goes into this digital world and so on, which is something I have been interested in. That said, I think we are in some kind of inflection point. I think I've been in this business for 50 years almost or 40 years and I think it's

harder than ever, in my view, to forecast what's coming from the new technologies. They are barely started and there is also those scary scenarios and there is also big dreams about it, but I think it's going to continue. The digital world will dramatically change things. That said, I think there seems to be... I always think back, what are the real drivers for why we see particular structures come into place? Why are there banks? Why do we see debt contracts here? Why do we see equity contracts there? Why is... The questions about why humans have organized themselves in this particular way. And so, I wish people, instead of just speculating about what's coming, to sort of think, what are the things, what are the core questions, or core needs that people need to have. We need to have... We need funding. We need this and where are they coming from? And most of the literature in the past 30-40 years has been about information frictions and information asymmetries. We don't know the same things. There is adverse selection. There is moral hazard. There is verification problems. That has been a huge driver of where things have been going over the last 30 years or so – much of our career, basically. And I think one of the things that bothers me right now is that we hear about smart contracts and other things and people sort of say, "Well, now information problems are less because we have more information." We have these gigantic models that collect information and so on and smart contracts is a good example. They are just algorithms, in some sense, and they don't automatically resolve information problems, first of all. And also, there is a sense that now, these contracts will see everything and they relax. They are really just executions that if you take, for instance, Oliver's work on incomplete contracts, and you ask yourself why are debt contracts so popular? In my view, it is basically because it's a cheap contract. Collaterals are sufficient. It's very cheap. In fact, the whole point is not to dig into information. That's a little extreme, perhaps, view on debt contracts, but the purpose is not to have to find out. And that's the nature of the debt contract. Only when things go wrong, but most of the time they go right. You just pay back your loan and we never had to find out what the value of this thing was, or anything. It's a brilliant solution that's thousands of years old and it's not going to go away with suddenly these new technologies coming along. You don't want to eliminate the fact that we won't have to find out everything and that's just an example of how it could be.

ALBERT MENKVELD: (23:11) Yeah. So maybe I can... This eases into the second question that many of you asked about. You should really talk with the Nobel laureates about generative AI, generative artificial intelligence. And some people equate that with ChatGPT. You just mentioned verification problems. If we now have robots and the technology to make somebody call me sounding like my father, using the language like my father, asking for help one way or the other, it starts to be scary. Is this really Paul Milgrom?

[laughter]

(23:48) Who knows?

[laughter]

(23:52) So the question is, how will it affect the economy, you think? Verification problems – so it's harder to tell false from real. So those frictions don't become smaller, they become larger in

some sense. Right? So there's a lot of concerns. But do you see also value and what value is there to an economy of this new technology? Maybe I start with you Bengt and then, you know, relatedly people all... Well, let me not give you too much in one go.

BENGT HOLMSTRÖM: (24:28) I think Paul probably has done an actual book using this data in a particular way. But as a gentleman, I use ChatGPT, I would say, daily because it's a wonderful way of learning something about your work or Oliver's work or something. You know, if you don't know anything about it, searching Big Google is not going to do it because then you have to start reading abstracts and you have to try something... Someone's asking, what good has Oliver Hart done for finance and you will get a very nice and generous answer and actually a very good one, you know, insightful answers. Same with Paul Milgrom. I didn't like mine, but...

[laughter]

(25:16) But I pass it on to Paul. Paul, could you first identify yourself?

[laughter]

PAUL MILGROM: (25:26) Hello, everybody. Yes, it's really me here in my office at Stanford. Yeah. So I have been a little bit slower than Bengt, I guess, to find the uses of ChatGPT. I found myself using other advanced computing solutions. So when you were... If I can roll this back a little bit, when you were talking about some of the things that can be done with smart contracts, I think really much of what's going on there is just eliminating the trusted third party and the expense and the time that's involved. The algorithms can do some of the simple things that people can do. Bengt was talking about some of the subtler things that people can do, which involve perhaps using judgment, which are a little bit harder to code in advance and I think... So you were talking about the limitations but I think some of the things that people can do are now done more cheaply because they can just be written into algorithms, which perhaps can be reused and bring down the costs of implementing contracts that way.

(26:39) I found myself taking advantage of advanced computing capabilities in some of the new harder market design problems. You were asking Albert about the next 50 years. One of the things that... I've been involved with OneChronos. It's a new market that does combinatorial trading. At this point, it's still in a pretty limited way, but there are some kinds of trading or some kinds of markets that benefit, not from just trading one security at a time or one security in small amounts. They benefit from promoting large trades, while keeping them private. That's a standard thing now in financial market theory. They benefit potentially from combinatorial trades. If you're a large trader and you want to maintain the same exposure that you currently have to, let's say, interest rate risk or oil price risk, and you are trying to adjust your portfolio by buying some securities and selling others in large quantities, you might want to link those transactions, so that you sell one set of securities only if you're able to buy the offsetting set of securities and maintaining the risk balance in your portfolio. And those involve new capabilities, not exactly generative AI, but new capabilities that involve really difficult computations, which can be done now very rapidly. Well, not very rapidly by the standards of high frequency traders, but very rapidly

in the sense of a hundred milliseconds, something on that order, where you can actually solve a small scale combinatorial optimization problem and arrange trade.

(28:46) So I'm not responding, Albert, directly to your remarks about generative AI, but that's only one of the dimensions – rapid communications, rapid computation – ways in which we're making progress and able to build those into the kinds of markets that we're designing.

ALBERT MENKVELD: (29:06) Thanks Paul. Oliver, do you want to share a thought on this?

OLIVER HART: (29:10) Well, let me just say that I don't disagree with what anybody, either of the other two have said, but I think... You know, in my own work over the last few decades... I've been interested in the boundaries of the firm, long-term contracts, to what extent contracts an alternative to buying a company up. And I think in those situations, we're really talking about relationships. So that seems to be an area where I'm a bit skeptical that this technology is going to do very much for us, although, you know, I wouldn't rule it out. But it seems to me that if we have a long-term relationship where you're supplying something to me, then what's probably more important is that we actually know each other and talk to each other, communicate with each other and perhaps figure out in advance how we're going to resolve disputes. In my recent work with a practitioner, we've talked about using guiding principles that we agree to ahead of time in order to minimize frictions later on in the relationship. So, in those, in that sort of context, I don't see how all these algorithms are going to help. So I just want to mention that. But also say that... You started off with the question of how do we even know who the other person we're dealing with is, or whether it's a robot, but at least in these settings, we will actually get together and I will know that you are Albert.

ALBERT MENKVELD: (30:46) Right. Right. Right. That makes sense.

BENGT HOLMSTRÖM: (30:48) Can I just add one thing about Europe. One concern I have about the future. Europe is very big on regulating, but they are sort of almost not on the map when it comes to these digital tools and the platforms, platform companies which generate data, which generate feed into AI and so on. They are sort of, they are nowhere in sight, so to speak. You just look at Tesla, for instance. Tesla is twice as valuable as all the European car companies together because it can manage data in a different way. It's not about a better car. It's about managing data, utilizing data in a way. And I just want to flag this fact that I worry about Europe taking a position as being the regulator, basically feeding off the idea of privacy and these concerns about privacy, without understanding the gigantic values embedded in this data and utilizing the data, of course, in a meaningful way and in a respectful way. But it's kind of funny that Europe is leading the charge on this dimension. And I think they should steer their energies also to...

ALBERT MENKVELD: (32:11) So you think we're over the optimum of this trade-off between privacy and using data productively in society. We over regulate in Europe.

BENGT HOLMSTRÖM: (32:22) Yeah. Europe is doing what it knows how to do, which is regulate.

[laughter]

ALBERT MENKVELD: (32:28) That's a compliment we are happy to take. We regulate well.

(32:33) Let me move on in the interest of time. And this is one question that I personally really like and I'm happy that it came up in the registration process. And I need some words to introduce it. And I direct this to Paul first.

(32:52) "The field of financial economics..." one of our colleagues writes, "...is it's being dominated by data." There's a lot of data. There's a lot of empirical studies and we're all in the process of producing stylized facts. And yes, there's a role for theory, but it's often used to motivate very loosely. Often, the empirical analysis is rarely tested in a direct way. And then this person reflects on it and says, "Maybe, in finance theories are too simplistic." Maybe people call them overly simplistic and so taking them literally to the data is simply not ... accurate, not a good exercise to do. Would you agree or going forward, should we take theory more seriously and move towards, refer to it as structural econometrics that we really make the data, make the theory talk to the data. And what is beautiful – I've done some of that myself – what's beautiful if you push the theory onto the data, then you see the dimensions in which there's a lack of fit. And that tells you something about the model that's basically being rejected by the data and needs attention. And so that's where the insights begin, the scientific insights.

(34:20) So is it true? Are the models in finance too simple in a way to take straight to the data? Paul, I'll start with you first. Do you have any thoughts about that?

PAUL MILGROM: (34:35) Yeah. Well, first of all, I tend to agree with some of the things you were saying there. When I was beginning my career, one of the first things I believe I learned is that all theory involved simplification. We were trying to identify some of the major forces at work and in order to identify those forces we would attempt, intentionally write simple models that excluded everything else. If I was studying an auction, I would have bidders who had values for the things that were being sold and abstract from everything else about the context. There was no time. There were no alternatives. Maybe Oliver has something else he could buy that would serve the same purpose and Bengt didn't. And you know, none of that stuff was in the models, even though we knew that those things were an important part of the description of any reality. But I do think that the... First of all those theories were valuable. They taught us a lot about some of the factors, but then when you go, when you take them to data, you will find that there are things that are missing. And yes, that's part of science to see, what are the other big effects that we haven't captured in our models? And to what extent did they change the conclusions? And where do we really need to add those things because of policies that we're considering? What would happen if we changed rules? And those are the things that we then need to include in the simple models that we're studying. But it's always been the case in every science, I think, that the data helps inform theory. You get stylized facts, you build theories to account for those facts and that's just a natural part of the process of doing science. And one of the really wonderful things that's happened in more recent years is the availability of large datasets, more data, more powerful

analytical techniques. It makes sense that those would be applied. And by the way, we're making advances in econometric theory too, to help us analyze data without introducing biases. So we worry about P-hacking. We worry about, well as you do, non-standard errors. We worry about that people are milking data to find something that they can say and we're learning about what kinds of econometric techniques can be used and what kinds of checks can be run to reduce those errors? I think, you know, there's a constant tension going on, both in the theoretical side and on the empirical side to advance our understanding of how the world works in finance and elsewhere.

ALBERT MENKVELD: (37:56) Thank you. Oliver, Bengt, anything to add?

BENGT HOLMSTRÖM: (38:02) I wanted to say a word about modeling.

ALBERT MENKVELD: (38:04) Yeah.

BENGT HOLMSTRÖM: (38:05) Because I think there is a false perception... People talk about models and then testing the models and there is a... Most of the models I have been involved in, and I think Oliver also, and Paul I'm sure agrees, is because of the simplification, it's about understanding certain relationships that we may not understand well, or we think we understand it, but then it turns out, we don't really. And we go to simpler models in order to isolate what is really a core feature of the problem that they... You know, what's the core question one might say? And I learned it early days from Mike Rothschild, who was actually thesis advisor to Oliver. He said, "You need to understand that the game here is what can you leave out from a model and still have something interesting to analyze, not what you can fit in and still be able to solve." And that stuck with me, that phrase, that we... It's very common for beginning researchers to sort of try to see how complicated they can make it and how realistic.

(39:14) Let me give as an example. I would say one of the most remarkable discoveries during these 50 years, which hasn't been mentioned, is the Modigliani-Miller Theorem, which everybody thought it's obviously true that it matters. Capital structure matters. And then when they put down reasonable assumptions, they finally realized, it actually doesn't matter and it created the whole field of arbitrage from which we got option pricing and other things. And it was just a remarkably fruitful insight from going to something almost trivial, when you see the proof, almost trivial once you have formulated it in the right way. So formulations, simple formulations, that go to the core of the issues, that's one class of models or thinking that's really critical for... And there is nothing about testing really. In my view, it's about, you know, where are these ideas relevant? Why are they not relevant? There is not a setting in which you test...

(40:15) So let me close by saying finance, however, when it comes to markets and you know how markets behave and how well they fit with our assumptions about human behavior, I think that's where I feel like it's a little bit like a science. There is so much data, so much structure, so intense in terms of incentives. People are really highly incentivized to do things. So there, I think, the empirical bulk has been the interaction between really the model and the reality has been sort of more, let's call, traditional science-like.

ALBERT MENKVELD: (40:53) Yeah. Yeah. I remember Bengt Holmström taught here at the Tinbergen Institute in Amsterdam about a decade ago. I was attending, auditing his classes. At some point you mentioned, and it sticks with me still, is when you build models, you sort of speak to them, you put everything that you know into those models and at some point, it starts speaking back. There is something that you don't anticipate popping up and that's when you mentioned that that's when it gets interesting because then we start to learn something and we have that conversation with the model. So whenever I teach, I still use that metaphor. I think it's beautiful.

BENGT HOLMSTRÖM: (41:32) You should listen to the model speak.

ALBERT MENKVELD: (41:34) Yeah. Oliver, do you have anything?

OLIVER HART: (41:38) Yeah. I think I very much agree with the other two about this. I mean, I would... Just to pick another example, general equilibrium theory. I mean, I think that's a beautiful construct. We've sort of moved on from that. People don't do that so much anymore. But it's great to see how all the different pieces interact. That's what a general equilibrium model does for you. I wouldn't... You know, some people in the past have taken that literally and people have estimated of our raise... the model of the US economy or something. I have to say, I'm pretty skeptical about that. I wouldn't do that. I would think that it's more teaching us something about how markets work. But I wouldn't want to take it literally. And I think that's basically the way most theory is. It teaches you. It gives you insights. It helps you to understand the world. However, I don't see how you could understand the world without any theory. I mean, just looking at the data, you can't do it. So theory guides you but in most cases one wouldn't want to take it literally.

ALBERT MENKVELD: (42:56) Yeah. Thanks. I'd like to move on to the next question, which is another big theme – the replicability, reproducibility crisis, some people say, that's raging across all fields of science. It has entered finance. It's hard for us to replicate the results of earlier studies, some of them, using the same data and trying... You know, reading the paper carefully and doing the same thing. It's hard to get the estimates that were reported. I myself with many of you have looked at some of this by... Even if you have the same data because we know... When we have estimators to estimate population means, we know there's sampling error and so therefore, the estimator is the population mean plus noise and that noise, the standard deviation, we call standard error. And that's a source of uncertainty coming from the data. But even if you fix the data, and you give the same task to a multiplicity of research teams, who independently will test the hypothesis, and what we did was on German data, we asked simple things like two decades of trading in the local equivalent of E-Mini, the Euro stocks 50 index futures. Beautiful data, two decades of data, a bid ask spread or transaction costs, what was the annualized percentage change? So all these teams the world over worked on it and came to numbers. And of course, they make different choices in how to organize the sample, what statistical method to use, even what software to use. So they had their favorite analysis path. And we get different estimates from these 164 teams, which in and of itself is not surprising. But the dispersion in the estimates was of a level of magnitude that I had not anticipated. So that all of these small choices we make, on all of those forks of the analysis path, they add up to substantial dispersion. And therefore, if we

get a single study and a single estimate, not only is there dispersion, due to sampling error, there's also dispersion because of all these choices that teams make. And so we've labeled it non-standard error in the sense that this dispersion is coming from the fact that we don't have a standard analysis path. Everybody has a slightly different idea of what the best analysis path is.

(45:44) This is a bit of a long-winded introduction to the question, but the question is, I know you're theorists, but do you have a view on this? And this is maybe mirroring results for theory that you have to specify distributions for all of these stochastic factors in your models. You have to specify preferences. To what extent are the results dependent on those? And do we have a non-standard error even in theory?

(46:14) Where should I begin?

[laughter]

PAUL MILGROM: (46:17) I need to speak up. I think, even in theory, the other thing that... You know, we were just talking, Oliver and Bengt and I, about deciding what to include in our theoretical models. And one of the things that goes on in theory is somebody will write down a model. You mentioned a moment ago Modigliani-Miller talking about, if you write down a model in which you exclude certain things, then capital structure doesn't matter. Then you might add taxes or you might add other frictions and it does matter, but what you include in your model is going to affect the conclusions. That's all part of understanding.

(47:05) Let me widen this conversation a little bit because it isn't just about the non-standard errors. When I talk to my friends who run experiments, especially in economics, but even in psychology and other areas as well, they often speak of... You know, you don't really learn from one experiment. You might not learn from one data analysis, either. If you have a hypothesis, you want to approach it in a variety of ways and you'd like to see whether when you twist it and turn it and look at it from different angles, whether all the experiments are supporting the same general conclusion. Hopefully, our hypotheses are interesting enough that they have multiple implications. And we could have been examining all of them and trying to understand whether our theory is consistent with all of those things. What other elements need to be included to account for what we observe in the world? Which exclusions from the theory were important?

(48:12) Now, what you've talked about in non-standard errors is more specific than that. You're talking about even for a fixed data set. But I think the whole method of theorizing and applying empirical techniques, I think we have come to learn that our perspectives matter a lot. And that's the reason why we only become convinced of things when we've looked at them from multiple points of view. When Oliver writes about the theory of firm-based and incomplete contracts and Bengt and I read about it from the point of view of incomplete information and we start to say what is really driving these observations? You don't look at one paper to provide a deep answer to a scientific question. You really look at a whole literature and a whole series of experiments before you're confident in any single conclusion.

ALBERT MENKVELD: (49:19) Right. Thank you.

OLIVER HART: (49:21) Yeah. If I can just... I totally agree with Paul on that. I think it's a sort of robustness exercise that... You know, someone writes a theoretical paper. They get some result. Now, one possibility is that the result's wrong. I mean, that can happen, but one hopes it doesn't happen. But what is more likely is that the result might turn out to be very sensitive to the assumptions. And somebody else will write a paper pointing out that with a slight change, you get something entirely different. And then people will say, "Yeah. That result was true, but I don't really believe it because it's not robust." This is what I think Paul was saying about looking at it from different points of view, sort of kicking it around a bit and see whether it survives that. The theoretical ideas that last are the ones that have been kicked around and are still sort of standing.

ALBERT MENKVELD: (50:22) Right. Right.

BENGT HOLMSTRÖM: (50:24) I want to come back to the Modigliani-Miller Theorem. You know, they did it for a purpose of establishing whether capital structure matters and in what way. But the impact of the paper went in a totally different direction, which is the arbitrage part, and so on. So, it's not... You know, any little twist in these models typically have effects. So another way of looking at it is, did it lead to some interesting questions or interesting way? It's a little bit like what Paul is saying, but I'll say it, just opening up a new angle on an issue is hugely important and in that sense, it can guide empirical work and so on.

(50:08) I must say, the older I've gotten, the more subjective I have become. That is, I'm sort of asking myself, do I think... How has this paper or this set of papers affected my view of a particular problem? And I'm not, since I'm not in the business of particularly much giving advice or something like that, I'm sort of satisfied that I think I understand the world in a different way. Now, I may have to correct myself when new evidence comes, but this is the best I have right now. And so it's all... I'm pushing it a little bit. It's not kind of... natural science is trying to say what happened, how the apple accelerates when it's dropped from the tree. This is a very different... The world keeps changing over time, by the way – how people react, how people behave, and so on. It's a moving target. I don't think they're going to establish any... I think we have established what the questions are, the important questions, but the answers keep changing. Like that's the point about these new technologies as they're going to answer the same questions, age old questions about need for money, need for this – our needs. But the answers are going to be very different from what we have seen so far.

ALBERT MENKVELD: (52:28) That's good news for the new generation.

BENGT HOLMSTRÖM: (52:30) Yeah. I think that I would be very happy if I were 30 right now, for this reason. Otherwise, I think it's okay to be 75.

[laughter]

(52:42) I think I'm happier at 75 than when I was at 30. But I think it's an exciting time. Let's put it that way.

OLIVER HART: (52:49) I thought you were only 74, actually.

BENGT HOLMSTRÖM: (52:52) I'm already 75 because I'm over the [inaudible 52:54].

OLIVER HART: (52:57) Can I just make a comment about the Modigliani-Miller Theorem? It seems to me that I agree with Bengt. It's been useful in all sorts of other ways, but it still is a kind of benchmark result in corporate finance. Yes, we don't believe it somehow and as a description, but have we been that successful in moving beyond it? I mean, I've certainly tried along with... You know, others have done more on trying to come up with good theories, more realistic theories of capital structure. I don't think there's any agreed on theory out there. I mean, there are little pieces of theory. Some of them emphasize incentive issues. But then the question is, well, couldn't you sort out those incentives issues using incentive schemes instead of capital structure? I think there are lots of question marks that still mean that we haven't fully moved beyond the Modigliani-Miller Theorem, sadly.

BENGT HOLMSTRÖM: (53:59) I think it matters, but it's context dependent, it seems to me, is the answer, or they have been...

OLIVER HART: (54:05) I'm not sure if one was... So if you were asked...

BENGT HOLMSTRÖM: (54:08) When the context changes...

OLIVER HART: (54:10) If someone in the audience was asked to give advice to a company about how much debt it should have versus equity, I'm not sure we... As a professional, we could really say, "Yes, we have the answer to that question."

ALBERT MENKVELD: (54:25) Understood. Paul wants to answer...

BENGT HOLMSTRÖM: (54:27) Fischer Black, the famous Fischer Black was a consultant at Goldman and he was sent to customers to explain capital structure. And they lost quite a few customers.

[laughter]

BENGT HOLMSTRÖM: (54:43) Because his answer was, "It doesn't matter."

[laughter]

ALBERT MENKVELD: (54:47) [laughing] It doesn't matter.

OLIVER HART: (54:48) I'm not sure I would give that answer, I must say.

ALBERT MENKVELD: (54:51) Paul, I think you wanted to say something. Paul.

PAUL MILGROM: (54:54) Yeah. I just wanted to point out that although this discussion is focused on the Modigliani-Miller Theorem, it's not unique that way. You could take other equally important... Take the Coase Theorem, for example, in economics, which is similar in some ways. It tells you that who owns property or the way property rights are allocated, doesn't matter if there's no cost of transacting, just as... And of course, the idea that property rights don't matter is not something that we ever think applies in the world because there are costs of transacting. But it serves to turn our attention to those things. The Modigliani-Miller Theorem does much the same thing. It turns our attention to focus on what are the root causes of why capital structure matters? What are the root causes of why allocation of property rights matter? You can find these things when we look at general equilibrium theory, which Oliver said we're past. I have some colleagues who would disagree with that. But when you look at general equilibrium theory, no externalities in the world, really? No market power? But these simplifying assumptions often help us bring out something specific and then, yes of course, we need to account for those in real applications. But these simple theories, which aren't going to be confirmed in the data in terms of their predictions, lend enormous insight into the way the world works and I think when...

(56:40) Well, I'm just repeating myself here that often we intentionally make our theories too simple to explain the world. And then sometimes when we do need to explain the world, we want to have more elaborate theories, which we think of as often being more fragile and less clear but better for explaining particular sets of data.

ALBERT MENKVELD: (57:05) Good. Good. The next question is one that's somewhat lighter. What has been the... Now that you look back on your career, what is the biggest mistake you made? And what can we learn from that? You probably didn't make any mistakes. Right?

BENGT HOLMSTRÖM: (57:27) I made one mistake, I became an economist.

[laughter]

ALBERT MENKVELD: (57:35) Oliver, Paul, did you want to say something about lessons learned that are useful for the new generation?

PAUL MILGROM: (57:44) I remember being approached in the early 1980s when my work... It seemed to me my work was going really well at the time. In fact, a lot of it did go really well. But I was approached and asked whether I would do some work on the economics of the Internet. And I declined to work on the economics of the Internet and into the early 90's too, just before Google and I think, "Holy cow!" There was so much to understand and there were so many important things to do. And I've wished sometimes that I had been engaged in that, so...

ALBERT MENKVELD: (58:23) Good. Good. So final question for me and then I'll turn it to the audience. Who will be the next Nobel laureate in economics?

[laughter]

OLIVER HART: (58:36) If I knew I wouldn't tell you, but I have no idea.

ALBERT MENKVELD: (58:40) No idea.

BENGT HOLMSTRÖM: (58:42) I thought you were going to say, "Since I don't know, I will tell you." The forecast.

ALBERT MENKVELD: (58:51) Anyway, so...

BENGT HOLMSTRÖM: (58:52) There are many very... I would say there are a lot of worthy people.

ALBERT MENKVELD: (58:55) Good. If we can turn on the light on the audience and see if there's still somebody there. Yeah. We still have people. The microphone is in here and you have to speak into the microphone. It would be nice if you state your name and your affiliation before asking the questions. And keep the questions short so that more of you have opportunities to ask questions. Where can I throw it? Which direction? I'm sure somebody has a question.

BENGT HOLMSTRÖM: (59:36) There is one.

ALBERT MENKVELD: (59:37) Where?

BENGT HOLMSTRÖM: (59:37) A brave soul.

ALBERT MENKVELD: (59:38) Oh, there.

[Albert tosses the microphone into the audience]

ALBERT MENKVELD: (59:41) Ooh! Almost.

KAROLINA: (59:46) That work? Okay. Hi, I'm Karolina from Oxford, PhD student. I wanted to ask about the impact of climate change on financial word. But also, the impact of financial word on climate change. And how do you see the next 50 years when it comes to that? Do I throw it back?

ALBERT MENKVELD: (01:00:09) Keep it for a while and then we'll see what... So the question is about climate change.

BENGT HOLMSTRÖM: (01:00:16) Let me say one thing, I have not worked very much on climate change. Today, of course, all are concerned about it. But I have been in one group in China,

actually. They are working on it. And I really started to appreciate the value of having an exchange, that is, having something like... There, Europe is in the lead, in some sense. They have this not perfect at all exchange, but it still gives reasonable prices. And it's not the final solution, but I tell you, it's better than having nothing or having these guesses about the value and so on. So I would say just finance has in that sense, creating financial markets, I think is going to play a very big role or should play a very big role here.

OLIVER HART: (01:01:08) Well, I could say a word. I mean, that sounds like regulation. That sounds like carbon taxes or the equivalent, which I think is, of course, I think most, almost all economists think that is the way to deal with climate change, but it doesn't seem to work very well in practice because it's hard to persuade national governments to choose the right carbon tax, the right level, let alone doing this internationally.

(01:01:38) So I personally have been interested in my recent work, and that's also true for a number of other people in the audience or at this meeting, in the idea that we need to bring companies in, that we can't always rely on government to solve problems. So we have to perhaps spend more time thinking about how companies can be pushed, I think, to do what their shareholders may want. Traditionally, we haven't really asked very much what shareholders want their companies to do because we sort of assume they want the companies they own to make as much money as possible. But I think there's a lot of evidence that shareholders are actually willing to have their companies make trade-offs sometimes, reduce carbon emissions – I gave this, I said something about this at the beginning – reduce carbon emissions even if that hurts the bottom line. And so I think that's one... It's certainly not the solution to climate change because government's crucial, but if government isn't doing as much as it should be, then I think this is a complement to it.

(01:02:51) And that in the future, it's going to be important for companies to listen to their shareholders, to find out the preferences of their shareholders. I think it's going to be important for intermediaries, asset managers, to find out from their investors what they want, how they want asset managers to engage with companies. I think we can push voting decisions on company actions, so I'm very much in favor of voice rather than exit. So if you want to change what a company is doing don't sell your shares, but instead, pressure the company to do the right thing. And there are also all sorts of things going on in that dimension, in particular, voting decisions. Blackrock has announced that it's going to let some of its investors vote on company proposals. And that may sound impossible, practically impossible, because how could an individual shareholder like you or me... We don't want to spend all our time voting on things, all the proxy statements we would get. But in fact, there are solutions to that. You can sign up to some particular guideline, which will do the voting for you. Express your preferences, how much you care about the environment, how much you care about some other social things, and then there'll be an algorithm that will vote according to those preferences. So you sort of delegate the voting decision. New technology, this is one of the things we've talked about. Older technology that's what made smart contracts possible, but there's this new technology that can also make this sort of delegated voting possible and indeed there's a company that I know about where you can actually... They'll personalize the algorithm to you. So I've actually done this with this company.

They ask you to fill out a questionnaire. It doesn't take very long. You do it once and then they will do corporate voting on your behalf. And you can see what they're doing and if you don't like what they're doing, you can always take the voting decision back or change to somebody else. And I think that we can... There's going to be a lot more of that that'll be possible. And I would like to think that financial economists will play a role in guiding that.

ALBERT MENKVELD: (01:05:18) We even have that in politics. We have so many parties in this country today that now you can online fill out how you feel about different issues affecting the country. And it will direct you... It will basically rank the political parties for you. Now you still have to see if you trust the people behind the parties, but it's similar in spirit.

BENGT HOLMSTRÖM: (1:05:39) And can I just make a correction here? I'm sorry, to disagree. Cap and trade is certainly not regulation. And that's what I'm talking about. Government puts a cap on how much you can...

OLIVER HART: (01:05:50) Of course that's regulation.

BENGT HOLMSTRÖM: (01:05:51) Well, but it's the simplest kind. That said...

OLIVER HART: (01:05:54) It's the cap. The cap is the regulation.

BENGT HOLMSTRÖM: (01:05:56) Yeah. But that's not subject to a whole lot of problems of the kind that we usually think about regulation. I mean, it's the simplest kind and...

OLIVER HART: (01:06:05) Yeah. But you have to decide on the cap.

BENGT HOLMSTRÖM: (01:06:08) I think deciding on the cap is not an enormous problem in this context, but it is exact. The cap and trade is something that... I think it's better than just setting a tax, for instance, because you don't know where the tax should be. But cap and trade gives you some indication, but...

OLIVER HART: (01:06:28) I can't...

BENGT HOLMSTRÖM: (1:06:29) Let me just say one thing about this...

ALBERT MENKVELD: (01:06:31) So we have... Paul, do we have... Cap and trade, is that regulation or not? Paul maybe you have an opinion on that?

PAUL MILGROM: (01:06:41) Well, I was going to add... We've already gone on a long time about this question, but I've been reacting with some feelings of skepticism both toward things that Oliver and Bengt have been saying. I know in China, for example, when China continues to want to reduce carbon emissions, it decided to impose limits on the largest companies. And part of what we've seen as a result of that is that they subcontract and they push the emissions off into the

smaller companies. Meaning, it's not enough to have decisions by most companies to reduce emissions. We need something that is wider, more economy wide and I don't think the kinds of solutions that voting in individual companies or the simple kinds of regulations that apply only to big companies will work in places like China. And for small companies, we have the usual problems of complying with regulations. This is a very hard problem and it doesn't have simple solutions. I wish I could suggest something in response to the question, but I don't have simple solutions to offer. So I just react with some skepticism.

ALBERT MENKVELD: (01:08:17) Good. Thanks, Paul. There's a new question. I think... Yeah. Go ahead.

SIMONE KUHNEN: (01:08:22) Hi, my name is Simone Kuhnen. I work for the Dutch Financial Authority for the financial markets. And my question is, how do you view the developments in the space of cryptocurrency, digital assets and decentralized finance?

ALBERT MENKVELD: (01:08:34) So how do you...?

SIMONE KUHNEN: (01:08:35) View the developments in the space of cryptocurrency, digital assets and decentralized finance?

ALBERT MENKVELD: (01:08:40) Cryptocurrency and digital finance? How do you view that? Is that good?

BENGT HOLMSTRÖM: (1:08:51) Cryptocurrency with skepticism, but I think decentralized finance is bound to come. And it's going to play a big role, I think in sort of restructuring payment systems for central banks, central bank currency and I think that will come. The wholesale central bank, meaning it's still under the control of central banks. And I think these new technologies... There's a lot of projects going on, MRates, there is regulated liability networks, very exciting stuff about how to revamp completely the payment systems with the central banks in control.

ALBERT MENKVELD: (01:09:33) We have another question.

LAURA VELDKAMP: (01:09:34) Hi, this is Laura Veldkamp from Columbia University. I'd like to know... We've touched on climate already but what other big questions out there would you like to see the next generation of financial economists address?

ALBERT MENKVELD: (01:09:51) What should we work on? You know, of course, climate finance. What else is out there for us to...

BENGT HOLMSTRÖM: (01:09:57) If I knew I would be working on it.

[laughter]

(01:10:01) Questions, it's a tongue in cheek, but actually the questions are the hardest things. You know, once we ask the right questions, we tend to get answers, but there is a shortage of good questions and so it's not easy to give an answer to this.

ALBERT MENKVELD: (01:10:18) In a way, you know, finding the questions is part of the fun and the challenge in and of itself.

BENGT HOLMSTRÖM: (01:10:23) That's the big challenge in my view. There's a shortage of people with good questions. That's clear.

ALBERT MENKVELD: (01:10:28) Yeah. So maybe there's more good questions. I think, one last one over there. I noticed that there was a hand raised for a while and then we'll close the session.

(01:10:40) Catch it? Yeah.

AUDIENCE: (01:10:45) [inaudible] Business School. You've talked a little bit about the digital economy and I wanted to ask you, what are your views on competition? Or lack of competition? Do you think that market power is a first order problem and we should work on that or not?

BENGT HOLMSTRÖM: (01:11:04) I mediate different parts of the world. China has, for I think very different reasons, broken up a very, very dynamic and competitive economy. You know, Alibaba, Pinduoduo, Tencent, JD. They had a lot of companies that really competed fiercely with each other and new companies being born. So it looked like a very healthy kind of market economy or competition economy 10 years ago, five years ago even still. Until now, all the crackdowns and the political interventions. So now you see from the market values, how they have dropped and the mood is fairly sour there in that area. The US has taken the view that 'let a thousand flowers bloom'. The usual thing, let the market sort things out. I think eventually, they are going to come and deal with the scale problems and other things, but they take the view, which I think is reasonable, let's first invent things that we know what we are supposed to regulate. This was my criticism of Europe. I mean, Europe doesn't have anything. They have no companies.

[laughter]

(01:12:26) You know, they are... No seriously, Europe is regulating America. That's what they are doing. There is nothing to regulate here in Europe with regard to this competition side. So they...

ALBERT MENKVELD: (01:12:39) That's what we're good at, regulating. So that's what we do.

BENGT HOLMSTRÖM: (01:12:42) What?

ALBERT MENKVELD: (01:12:43) We're good at regulating. So that's what we do.

BENGT HOLMSTRÖM: (01:12:45) Yes. It's very understandable.

[laughter]

ALBERT MENKVELD: (01:12:49) Paul, did you want to say something? Or did I misread your facial expressions?

PAUL MILGROM: (01:12:53) No. No. No. I didn't have a lot to add there. No, I don't.

ALBERT MENKVELD: (01:12:58) I think with a view on the clock, I want to close this part of the session. And you know, as a token of appreciation, I want to give you a gift. And this is maybe the first EFA where we don't have a building as a logo of the conference. We have a drawing by a professional artist here in Amsterdam. She does a lot of these and I particularly like this one. It's a professional print and the Rijksmuseum here uses the same printing services. And she has actually personally written down a message for you in the print. I think she's even here today. Are you? Can you please stand up? It's her birthday today, people.

[applause]

(01:13:50) Thanks a lot. Congratulations with your birthday and thanks so much for letting us use this beautiful image for the conference. Let me thank you Oliver and give you one.

OLIVER HART: (01:14:07) Thank you.

ALBERT MENKVELD: (01:14:08) Bengt, thanks so much. Here is one for you. We also thought about since you have to travel, this can go in your hand luggage.

BENGT HOLMSTRÖM: (01:14:16) Yeah.

ALBERT MENKVELD: (01:14:17) And this one we'll ship to you, Paul.

PAUL MILGROM: (01:14:21) Thank you.

ALBERT MENKVELD: (01:14:22) So with that. I hope you... Well, let me call the Masters of Ceremonies back on stage who were in the Green Room.

SAMMY OBEID: (01:14:34) How about another hand for our panel here today.

[applause]

(01:14:39) Yes. Yes. The comedians are back or as you can call us the misallocation of talent.

[laughter]

DHAYA LAKSHMINARAYANAN: (01:14:47) And happy birthday. That was very stochastic that it was your birthday today.

[laughter]

(01:14:54) We were backstage P-hacking jokes to tell you tonight.

SAMMY OBEID: (01:15:00) And apparently that's not a urine test.

[laughter]

DHAYA LAKSHMINARAYANAN: (01:15:05) I wanted to base my jokes on theory, but Sammy wanted laughs so he decided to P-hack our way into success.

SAMMY OBEID: (01:15:14) So, I guess first question to me is, is it finance or finance. I'm a little bit confused.

[laughter]

DHAYA LAKSHMINARAYANAN: (01:15:20) I think if you have a Nobel Prize, you can call it anything you want to.

SAMMY OBEID: (01:15:24) Right.

DHAYA LAKSHMINARAYANAN: (01:15:24) That's why we have to call it fee-nance.

SAMMY OBEID: (01:15:27) This event was free-nance. You're welcome. So, we talked about Oppenheimer in the beginning.

DHAYA LAKSHMINARAYANAN: (01:15:35) Yeah. You said that Oppenheimer has done a lot of terrible stuff with science and we want to know if economics and finance can do something good in the world. So yes, I don't think economists and finance professionals are like Oppenheimer. You do good in the world. You're more like Barbie.

[laughter]

(01:15:56) Speaking of economic development, we talked about how economists and finance professionals have done a lot of good in the world, including in China and Africa. We talked about getting the unbanked banked. And I know Sammy has a bank account.

SAMMY OBEID: (01:16:12) That is correct.

DHAYA LAKSHMINARAYANAN: (01:16:14) How did you get your first bank account?

SAMMY OBEID: (01:16:16) My parents.

DHAYA LAKSHMINARAYANAN: (01:16:17) Nice. I think that's great because your parents also helped the unbanked in Africa and China get bank accounts too. Would you lend them out?

SAMMY OBEID: (01:16:26) I would, but they gave me a really low interest rate. So I wouldn't recommend.

DHAYA LAKSHMINARAYANAN: (01:16:33) All right, well, we are also saving our best jokes to be auctioned off later on. So if these are low value, then that's why.

[laughter]

(01:16:42) I also liked Bengt how... You said you use chat GPT daily for questions like, "What good has Oliver Hart done for finance?"

[laughter]

(01:16:54) Although we are not allowed to roast the Nobel Prize winners, they're doing a great job roasting each other.

[laughter]

(01:17:05) We talked about what the inflection point is going to be and what's going to happen in the next 50 years. And just because you have a Nobel Prize doesn't mean you can look into the future. They're not fortune tellers. But you did make a prediction, which that the digital world will transform us dramatically. I could not agree more. The digital world is amazing. I've already invested all my money in crypto and I make all my food through TikTok recipes.

[laughter]

(01:17:36) Also, this is a fascinating observation about Tesla. You remarked that they're not necessarily better cars, they just use data better, which is the reason why in the future, that data scientists will be great racecar drivers.

[laughter]

SAMMY OBEID: (01:17:59) Well, yeah, we talked a lot about the unpredictability of the future and how hard it is to forecast and that just gave me an all-out anxiety attack. So I decided for the rest of my jokes. I would use ChatGPT to fill in some of the blanks. So I asked ChatGPT to write some jokes about the things we were talking about or the things that you were talking about and you may have noticed, these are really bad jokes.

DHAYA LAKSHMINARAYANAN: (01:18:22) That's what happens when you don't choose a human to be your writing partner, Sammy.

SAMMY OBEID: (01:18:26) Yeah. I guess we should be paying on performance. So basically, I asked ChatGPT for some jokes. They weren't good. So I decided to co-write with ChatGPT. Of course we didn't have a contract.

DHAYA LAKSHMINARAYANAN: (01:18:39) Wow!

SAMMY OBEID: (01:18:39) We had to do our best.

DHAYA LAKSHMINARAYANAN: (01:18:41) ChatGPT is a free writer in that case.

SAMMY OBEID: (01:18:43) Yes. So I'm going to read you some jokes that are co-written by myself and ChatGPT. And if they're bad, that's the point. Why did the economist bring a ladder to the bank?

DHAYA LAKSHMINARAYANAN: (01:18:56) I don't know, Sammy. Why?

SAMMY OBEID: (01:18:57) Because he heard the interest rates were going up.

[laughter]

SAMMY OBEID: (01:19:01) They're going to get much worse. Don't you worry.

[laughter]

(01:19:04) How many Nobel laureates does it take to change a lightbulb? None. They prefer to illuminate the theoretical aspects of darkness.

[laughter]

DHAYA LAKSHMINARAYANAN: (01:19:16) That's good.

SAMMY OBEID: (01:19:16) Thank you. I did some of that too. Why did the finance professor or finance professor always carry a college ruled notebook?

DHAYA LAKSHMINARAYANAN: (01:19:25) I don't know.

SAMMY OBEID: (01:19:26) Because he loves studying margins.

[laughter]

SAMMY OBEID: (01:19:31) We got a laugh on that one.

DHAYA LAKSHMINARAYANAN: (01:19:34) Who laughed on that one?

SAMMY OBEID: (01:19:36) Professor Hart for sure.

[laughter]

DHAYA LAKSHMINARAYANAN: (01:19:37) Oh, nice.

SAMMY OBEID: (01:19:39) Why did the mathematician refuse to invest in the stock market with the number pi? Because he couldn't deal with irrational behavior.

[chuckles]

(01:19:49) I love the people who laughed at that one. Why did the economist break up with his calculator? He felt like the relationship was just adding to his problems. How does a finance expert stay cool in the summer?

DHAYA LAKSHMINARAYANAN: (01:20:06) AC?

SAMMY OBEID: (01:20:08) They keep their assets liquid.

[laughter]

SAMMY OBEID: (01:20:11) Okay. Here's a couple more specialized ones. Okay? Why did the capital structure start a band? Because it wanted to find the perfect harmony between debt equity and a killer drum solo. I really liked that one for some reason. Okay, here's my favorite. Why did Professor Albert Menkveld refuse to play hide and seek with the market?

DHAYA LAKSHMINARAYANAN: (01:20:34) Why?

SAMMY OBEID: (01:20:34) Because every time he tried, the market found a way to reveal his strategies.

DHAYA LAKSHMINARAYANAN: (01:20:40) I liked that one, Sammy.

SAMMY OBEID: (01:20:41) Yeah, that one is good.

(01:20:42) Why did the non-standard error go to therapy? Because it was tired of constantly being misunderstood and thought of as an outlier.

[laughter]

(01:20:51) Why did the non-standard error refuse to go to the party? Because it didn't want to deviate from its plans? Okay, here's the good one.

DHAYA LAKSHMINARAYANAN: (01:21:01) We wanted to save this to auction off but Sammy is going to give it to you for free.

SAMMY OBEID: (01:21:06) Why did the statistician become a magician? Because they are great at making P-values disappear.

DHAYA LAKSHMINARAYANAN: (01:21:14) That was the best one, everyone.

[laughter]

(01:21:17) Thank you.

[applause]

(01:21:21) I think we P-hacked our way into that.

SAMMY OBEID: (01:21:24) Yeah, we're going to... This is being recorded. We're going to go and post and edit everything so the P-values are...

DHAYA LAKSHMINARAYANAN: (01:21:28) Why don't you applaud and laugh one more time so we can use it in post-production.

[laughter][applause]

SAMMY OBEID: (01:21:34) How about a hand for our amazing Nobel laureates, Albert Menkveld, Professor Oliver Hart, Bengt Holmström and thank you Paul Milgrom for joining. We appreciate you all coming out today and joining us. Have a great end-afternoon. Thank you.

DHAYA LAKSHMINARAYANAN: (01:21:47) Thank you. Bye bye.

[applause]

[End of Transcription]