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WEBINAR

THE FUTURE OF MONEY: THE END OF CASH AND THE RISE OF DIGITAL CURRENCIES

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P R O C E E D I N G S

MR. WESSEL: I welcome you to the event today to celebrate the publication of Eswar Prasad's new book, *The Future of Money*, with this incredibly artistic cover that we've been discussing and approving of. Eswar is a colleague of mine at Brookings in the Global Economy and Development program and also a Professor of Trade, Policy and Economics at Cornell University.

And I'm joined also this morning by Glenn Hutchins who is Co-Chair at Brookings Board. The man who put Hutchins in Hutchins Center and who has been interested in cryptocurrency and block chain for many years, well before it became a fad. And Glenn and I discussed, you know, how do I explain his conflicts of interest and the answer is whatever he talks about today, he has a conflict of interest in because he's an investor in this space.

But I invited him because he knows a lot about this and I thought it would be a great combination to have an academic and policy person like Eswar talking about the really interesting features of his book and Glenn who really has his hands in this market place.

Following our conversation, we will be joined by a number of experts in this field in a panel moderated by Gillian Tett who is on the Financial Times and will think there much more about the -- particularly about the public policy issues.

And if you have questions that you would like to ask, you can use the sli.do software S-L-I dot D-O, hashtag #FutureofMoney and we'll keep an eye on that feed to see if you have anything to ask. This is on the record and being recorded.

And I wanted to start by reading the first paragraph of the conclusion of Eswar's book, which I think puts it in perspective. Eswar writes, "The era of cash is drawing to an end and that is centrally bank digital currencies has begun. Money, banking, and finance are on the verge of transformation. Physical money is becoming a relic. The digital payment system is becoming the norm around the world. Banking is going to change as other forms of financial intermediation gain prominence. Much of the world's population will gain access to at least basic financial services, improving lines and economic forecasts. In some respects, the new era will look dramatically different. In others, though,

things will remain much the same."

So, Eswar, with that as background can you give us a snapshot of what you think the future of money will be like if we were having this conversation say a decade or two in the future? Will I no longer have a leather wallet with dollar bills in it? Will we all be buying coffee at Starbucks with Bitcoin? What's your forecast about what the world will look like? And what will be different and what will be the same?

MR. PRASAD: Thank you for that introduction, David. I should begin by saying that with deep regret I have no conflicts of interest because I did not have the foresight when I launched my analysis of digital currency to actually invest in Bitcoin. So sadly, at the end of this I have a book but no Bitcoin.

We had a very interesting juncture in terms of the evolution of money. Certainly, I think the likelihood that we will have cash in our physical wallets in the years to come is going to diminish. By the end, it's already diminished very substantially in some very advanced economies such as Sweden. But also, in many of the developing and emerging market economies.

So change is clearly at hand with digital payments of various forms becoming the norm around the world. But if you step back a little bit and think about the broader arch of history here. There are more fundamental changes at play.

Many, many centuries ago, when paper currency was created there was essentially a creation of currency by private individuals by private merchants and eventually private currencies which were in competition gave way to fiat currencies issued by central banks, which essentially blow out private currencies because they could not compete with government backed money.

Now, we are coming to a point where, in fact, private currencies may once again compete with government issued or fiat currencies. And these new forms of money are taking two forms.

One is decentralized cryptocurrencies such as Bitcoin which are certainly gotten a lot of attention. And also, more centralized cryptocurrencies which in some sense draw their value from being backed by fiat currencies. These are the so-called Stablecoins with even Facebook planning to issue one

of its own.

But what is important in my view is really a new era of competition that could ultimately benefit both consumers and businesses, but it's going to be in the form of digital payments of various sorts. And this is going to be good not just for consumers and businesses within economies, but cross boarder payments where there are a lot of frictions that effect, say, economic migrants any money back home, exporters and importers. All of these barriers are going to become much less significant impediments to the flow of finance.

I think we're also going to see a bifurcation of the rolls of money. Now, the traditional way of thinking about the roles of money is this unit of account, a medium of exchange, there is something that can be used for transacting and also as a store of value. I think with digital payments of a variety of sources, you're going to see decentralized as well as centralized cryptocurrencies and other digital payments. Essentially, taking over some of the function of central bank issued money especially in the form of payments.

But my abiding views is that ultimately what is essential for the store of value is not just the ability to conduct transactions quickly and efficiently and cheaply, but also an institutional framework that creates that trust.

Now, the promise of Bitcoin was that it could replace trust in a government or in a financial institution with a form of public decentralized consensus. And that is certainly had some traction. But I think over the long run what we will see is that the viable source of value are really still going to be the fiat currencies. So this bifurcation, I think, will have certain important implications.

But stepping back even further, I think what is interesting is that there are new financial technologies that are really going to have a transformative effect not just in terms of money, but in terms of broader aspects of finance with direct ways of connecting savers and borrowers becoming more important. And these are going to have huge benefits.

I think a lot more people will be included in the financial system. They will have easy access to digital payment systems without necessarily having to have a debit or credit card or a bank

account. You will have easier access to a portal for basic banking products and services for managing risk for getting credit, for making savings and so on. And this is going to effect at some level even the structure of financial markets.

So even what we know about central banking, how the actions of central banks effect the economic activity could be affected not just by changes in the nature of money, but also by changes in the structure of financial markets and institutions.

So I think in principle this is a wonderful world that is coming out, but it is not going to be without risks. I think after the global financial crisis, the somewhat holistic notion that financial engineering could basically dissipate risks in the system is something we have learned. It might be a bit of mirage so there are going to be new risks, but also new opportunities.

And I think governments are going to continue playing a very important role in making sure that we can get the right sort of benefits from these decentralized payment systems and decentralized finance more broadly. The opportunities are great but we are going to have some stumbles on the way ahead.

MR. WESSEL: Eswar, I want to make sure I understand. Define a couple of terms for me. When you refer to private, Bitcoin being private. Do you mean nongovernment, right? It's public in the sense that there is this decentralized ledger out there; is that correct?

MR. PRASAD: That is correct. When I refer to private here, I refer to the issuer which is not a government entity or a central bank.

MR. WESSEL: And when we hear talk of the federal reserve or in the Bank of Finland, as we will hear later, the e-krona. There is showing a central bank digital currency that's much like a dollar, but it's digital. Does that involve the blockchain as well? The underlining technology or is that not part of the blockchain empire?

MR. PRASAD: It could. So the blockchain is a technology underlying Bitcoin and it's proven to have very many benefits not just in facilitating payments but essentially as an architectural for a different financial ecosystem.

But the problem with the blockchain especially the Bitcoin version of the blockchain is that it is not very easily scalable in terms of managing a lot of transactions especially microtransactions. Now, as David has pointed out, central bank digital currencies, CBDCs are very much in the air. The Swedish Wicksburg and we hear about this some modestly going out from the Deputy Governor of the Wicks Bank.

The Chinese central bank and many others are already running trials of CBDCs which will essentially replace all the complement to the existing physical versions of their currencies to have a digital version of the new one in addition to the physical version of the new one.

MR. WESSEL: I see. When I was looking up an event, we had in 2016, which was quite a while ago, five years ago. And I remember talking to you about that event. It must have been even before that. And you said that you thought there was a chance, maybe only five to ten percent chance, that the blockchain, this distributed ledger, could be as important an innovation as the protocols that allowed us to use the internet with browsers and apps and all that.

And I just wondered whether the world has evolved as you anticipated? Or faster or slower in that direction?

MR. HUTCHINS: So thank you, David. I mean I'll answer that question. I want to say a couple of things first. I want to congratulate Eswar on a brilliant and very timely book. Well done, bravo.

And I want to correct David. The most important thing I did was put the Wessel in the Hutchins Center not the --

MR. WESSEL: Thank you.

MR. HUTCHINS: So let me take a step back and I think to have these conversations coherently, I think we need to make first a fundamental differentiation between a digital currency and a cryptocurrency. People use them interchangeably and they are not in my view.

A digital currency is in my view simply the digitization of an algoid object. It's not unlike the Wall Street Journal analogue paper being converted into a website. It's a very simple kind of straightforward thing. And as a consequence of which most of the digital currency we're talking about that

central banks would create -- would offer are digital currencies, they're not cryptocurrencies.

A cryptocurrency is something very different and is a fundamental innovation. A crypto -- I'm going to spend a few seconds on this just to level set everybody. The cryptocurrency came from sort of a solution started with Bitcoin, by the way, and it has evolved way beyond Bitcoin now in the entrepreneurial world to a theorem which is about smart contracts on the (inaudible) for about a host of applications, but we can come back to that later.

But the Bitcoin solution was about the problem of trust region exchange. It combined network theory, which is about promoting efficiency. Gain theory, which is about creating incentives, using incentives. And cryptography which is about security. Into one solution, which involves a protocol which is the network. A token which is the incentive system and a blockchain which provides security as well as accounting.

Any understanding of cryptocurrencies absent those -- understanding those three are inextricable as part of the solution. They cannot be presented and used separately in any sort of innovative way. It doesn't understand what a cryptocurrency is.

Some other points I would make. One is the Stablecoin is most effectively used right now. And I think its goal -- it's use will be as a bridge between digital currencies or fiat currencies and cryptocurrencies solutions. Or maybe if they understood it as an entry and exit ramp.

And then secondly, let's talk about blockchains and tokens. The three elements, protocol, blockchain and a token are inextricably linked like an internal combustion engine has a battery, a powertrain and a set of pistons. And you can't just look at a battery or a powertrain or the pistons and say one of those things makes the car. They work together to make the car go.

The people who look at blockchain independent of cryptography solutions are just looking at a fancy database. A private blockchain associated with one solution is essentially like the intranet. The magic of the blockchains is when they all get connected together, worldwide rubber blockchains like the worldwide internets were connected, the worldwide web to becoming the internet.

So you can really -- a blockchain is not interesting as an innovation independent of the

token and a protocol. The token itself is catnip for journalists. They like to talk about what its price is. You know, trades and it's on CNBC and all that kind of stuff. But again, the value of the tokens are primarily in their use case as they attach to cryptocurrency solutions.

So digital currency, cryptocurrency completely different. Looking at blockchains or tokens independent of protocols and independent of all three working inextricably fails to understand the nature of the innovation.

The last point I'll make and I'll stop here is the most conventional application of Bitcoin and it seemed like the real world that people would understand was payments. But it really is, is a new form of computing, decentralized computing. And as part of the new paradigms of computing one of the fundamental paradigms of computing, we've gone from it. My investing a lot of times from mainframes to minis to micros to distributing computing to (inaudible) computing and the mobile computing. Those have each created massive changes in creation and destruction of value.

Decentralized computing is a new computing paradigm. So this cryptocurrency solutions are best thought of as a decentralized computer. Decentralized computing that creates all sorts of opportunities to create exchanges of value. With value defined very, very broad. We can come back to that if you like.

MR. WESSEL: Okay. Eswar, let me ask you two questions. One is do you look at the world the way Glenn does? Or do you see a different framework for thinking about this stuff?

MR. PRASAD: So it took me about two 40-page chapters to go over what Glenn so very succinctly just said. And he is right in the fundamental point that the blockchain technology is really a marvel in many ways. And we very much focused on the fact that it doesn't work that well in terms of scaling up payment systems. But what it has spawned is a financial ecosystem that is going to be capable of a lot more.

The promise of decentralized finance I think is really quite remarkable. And there are all these products out there that bridge many missing financial markets that can create real financial value. But having said that, one point I should make to complement what Glenn said is that the notion that these

decentralized products are ultimately going to also very effective at self-governing as one thing that I worry a little bit about.

There are certain technological issues that still need to be sorted through, but in addition there are certain vulnerabilities that we may not even know about at this stage that I think should all give us some pause before we too quickly move into a world where decentralized finance takes over. I think there is still going to be a very important role for regulators in terms of making sure that these risks can be managed.

But I think Glenn is very correct in terms of pointing out the enormous promise that blockchain has in terms of the de-marketizing finance.

MR. WESSEL: So what is the biggest risk that you worry about as we go forward here?

MR. PRASAD: So let me give you one example. It does so that you can take a variety of firms, specific financial currency and combine them like financial Legos into a much more composite product that allows you to get access to, for instance, large amounts of credit for very short periods of time. This allows for rush possibilities across markets and ultimately makes financial markets work somewhat more efficiently.

You could even in principle plug regulatory modules into these financial products which in principle should make them safer. One of the concerns I have, however, is that the more of these modules are built in this sort of attacks surface for malicious actors increases. And since this is a self-governing community, it's not obviously going to have solutions in real time that can fix these vulnerabilities.

One of my colleagues, Ira Jewels (phonetic), in fact, pointed out that there was one example where he and his colleagues found a flaw where certain box, you know, automated computer algorithms could basically front run certain financial markets and create profit seeking opportunities. And what they did, of course, because there was nobody to report this problem to, they publicized it in the hope that people would protect themselves instead.

It generated a bot making industry that exploited this opportunity before ultimately the

community came by and fixed it. So certainly, the notion that a lot of this code is opensource, that things can be fixed has a lot appeal. And I think ultimately, it's going to work out to everyone's benefit. But in the short run, I think there is some risks we need to keep our eyes on.

MR. WESSEL: So, Glenn, it seems to me that in general, what we want from regulation in this area is protection against abuse, people being ripped off, financial instability on the other hand, but we want also make sure that regulation doesn't become a damper on innovation especially given the interest, the vested interests will have in preventing some of the democratization of finance that this technology offers.

So when you think about what's the right framework for regulation of cryptocurrencies and fin tech in general, how do you think about what the principles should be?

MR. HUTCHINS: Good question. So and I want to come back to a few other things as I before said, but on the regulatory point. It is my view, it's very, very important for this industry for it to operate inside a regulatory framework that allows it to define what's good practice and what's bad practice. And will allow it, in my view, to thrive just like any other financial services ecosystem, which I have invested over the last 25 years. It's very, very important.

And I have advocated that in the 2016 meeting you talked about was one where we brought together a bunch of regulators as you recall to begin to understand this space so that they can begin to craft smart regulation.

I'll give you one example of kind of groping towards a solution. In the bipartisan infrastructure bill there is a pay for people on the (inaudible) know what payfors are. That's associated with better tax compliance coming from cryptocurrencies, market makers, et cetera. And the industry is -- all the industry leaders are completely supportive of better tax compliance or appropriate tax compliance.

The problem is that the first draft of legislation brought in software developers and miners and validators who had no access to the information necessary to make the reporting. They were just infrastructure developers or people who were licensing software to people who were doing the cryptocurrencies transactions. The regulators knew so little about the space that they actually were

actually imposing reporting requirements on people who did not have the access necessary to make the reports.

That's a very good example of it. And the industry was able to rally and kind of stop that and maybe sensitize the regulators to kind of how to make the distinctions between people who have the information and people who just service the technology for that. But that's an example of a lack of understanding at the regulatory level that can actually impede innovation as opposed to create the circumstances in which innovation flourishes because you've got a regulatory framework that works.

The thing that I would say, I think Eswar made a very good point about short-term problems versus long-term solutions. You know, I would say that the regulators and commentators tend to focus on short-term solutions as short-term impediments. Entrepreneurs tend to focus on them as opportunities.

And so, for every impediment that there is in this space is a company being formed to address that. So every impediment in my view an investment opportunity. And we can go through it, but the main -- I think the best analogy for -- is decentralized computing system that Eswar was talking about. Whether it's issues around communities adopting practices that are constructive in the near term.

The best example of this would be when we started introducing opensource software particularly Linux in 20 years ago. And the producers of the closed system Unix and SQL, the Microsoft. All said it was going to be much less robust, much less secure. And now, we look fast forward 20 years and it's the standard. And the ones that are promoted by -- it's closed sources as opposed to opensource actually proved to be less secure and more expensive to use.

So I think we have a history. We have very good analogy in the history of time, what you might call opensource actually outperforming close source kind of things.

And the last point, I make about regulations is -- and you alluded to this, David. Is regulation can also be used as a barrier to entry by the regulated companies. And every time I see a CO of a major financial service company denouncing Bitcoin as a fraud, it strikes me that that's just an attempt to keep a regulatory kind of around their organization.

In the world of moving money around the world. So in the world of trading and stocks in the last 20 years, the price of trading and stocks has been reduced by 99.5 percent today. It's literally .5 percent of what it was 20 years ago. The world of moving money around the world, credit card payments, remittances, foreign exchange transactions, et cetera, has gone up during that same time period.

And the companies that are in those segments want desperately to keep those prices high. And they will use regulatory barrier entries and obfuscations to protect themselves, and we should just be aware -- alert to that.

MR. WESSEL: Thank you. Eswar, you speak a lot in the book about central bank digital currencies that is that the federal reserve might someday do what the Wicks Bank is doing in Sweden.

And I wonder if you could talk a little bit about whether you think the fed should do a central bank digital currency? And what are the pros and cons? Clearly, the fed doesn't want to be a pioneer. They want to let someone else experiment first and that probably makes sense given the reserve status of the dollar.

But is it a good idea to have a central bank digital currency in the United States? And what difference would it make?

MR. PRASAD: So central bank digital currency at some level as Glenn mentioned is basically just a digitization of the dollar bills in your wallet. And that's the way the world is going. I mean most of us now pay for our purchases of coffee using debit or credit card or Apple Pay.

But the key thing about a digital dollar is that it would make this very low-cost digital payment system available in a much more democratic fashion even to the unbanked and underbanked. So long as you have a cell phone, you might have easy access to a central bank digital wallet that gives you a payment system that is very low cost, that is very efficient without all the other financial accoutrement.

So that's certainly a good thing. In addition, from the government's point of view, it certainly makes sense to have its digital currency be in a form that is not easily usable for nefarious activities such as terrorism financing or money laundering. It brings a lot more economic activity out of

the shadows into the formal tax net which some of us might consider a good thing, a libertarian might not.

In addition, it expands the policy tool kit off the central bank. Now, one wouldn't want to think about this as a normal policy tool, but certainly with the central bank digital currency count. And if cash wither away almost organically because of these digital payments. You could, in principle, in dire economic circumstances have a negative, nominal interest rate. Cash is a zero nominal interest rate, but if you could reduce the balances in a CBDC account that would in principle encourage consumers to go out and spend and businesses to invest.

You could also do something like the Corona virus stimulus payments directly to infusion of cash into the central bank accounts, but this is not without cost. I mean, you touched upon this. There is a risk that a very low cost government mandated payment system could end up squelching private sector innovation and we don't quite want that to happen.

Having a CBDC account and running fiscal policy through that does have certain risks for the central bank if it starts being seen as an agent of government policy. And most importantly, if CBDC accounts were seen as safer than commercial bank accounts even if the CBDC accounts did not pay a positive rate of interest, you could have deposits moving from the commercial banking system to the central bank which then starts becoming more responsible for allocating credit.

Nobody including a central bank wants that to happen. Plus, we would lose privacy in our transactions so there is a fine balance, but these risks can be managed. And Wicks Bank trials, the Chinese central banks trials are beginning to show us that there are ways to manage this balance.

You can, in fact, have versions of the CBDC that allow you to undertake at least low value transactions without completely compromising privacy. There are ways of limiting the amounts of money you can put into CBDC accounts such that you don't lose the commercial bank's importance in the financial system. So I think we are moving towards a world where CBDCs are really the wave of the future.

And I think we'll come to policy and design scenario where ultimately many of these risks can be managed. But I think we're going to have a conversation, David, not just about the technical

economic aspects but also about the social aspects because ultimately anything digital is going to leave a digital trace. And whether we want to live in a world where every payment ultimately is going to be visible to payments provide of the private sector or the government is something we need to have as a society.

MR. WESSEL: Well, Eswar, I think there are two things you mentioned there I just want to tease out. One is so I think there's the popular view that Bitcoin is a way for elicit transactions that people are somehow able to hide themselves behind the unanimity of Bitcoin.

But you make a really good point there that, of course, if I have a $100 bill and I give it to some drug dealer that there's no record of that. He has my $100 bill. But with digital -- any kind of Bitcoin thing, there is going to be a ledger. And as we've seen there are ways to trace that. So I think that's interesting. People sometimes I think confuse that the -- after all, we know who's using $100 bills in $500 Euro notes and it's not the average person buying coffee at Starbucks.

But secondly, I'm not sure it's a great marketing tool if I wanted to convince Americans that we should have central bank digital currency that it's going to allow the federal reserve to impose negative interest rates on us. It seems to me the political reaction to that could strangle this baby in the crib.

MR. PRASAD: David, I think it's important to make the point that that is an extreme policy tool for extreme circumstances. And I think every central bank that is moving forward with the CBDC is making the point very clearly that this is a compliment to cash and it will have cash like features. It is interest bearing and that it will have just a digital representation of cash.

What I'm talking about is an academic. It is the possibilities. And you're absolutely right that once we start talking about these possibilities which may be reserved for particularly perilous circumstances that could make it difficult to get CBDCs off the ground so perhaps we should just talk about the more mundane possibilities.

On Bitcoin, David, the distinction you make is a very important one. It shows us that one of the remarkable features of Bitcoin's blockchain is that at one level the radical transparency because every transaction, the amounts and the digital item of the trading parties are posted on a public ledger

that anybody with a computer has access to because it's closer to marketable computers.

But in principle, it does provide unanimity. You need to use only a (inaudible). It does so that it promises unanimities that are difficult to maintain when the digital world meets the real world. Where you actually have to transfer the money into a real bank account or buy something real with it. There are new currencies that are offering more promises of unanimity but I don't think that's going to be the key defining feature of the cryptocurrencies is to come.

MR. WESSEL: Well, what should I make of this Facebook move that is now called the DM, their currency. Is this a big deal? A little deal? Just Facebook getting in on a party or what?

MR. HUTCHINS: So I'll answer that question. I do want to respond to a couple of things or highlight a couple of things that Eswar said, which is I'm not -- let's put it this way. You said I'm a walking, talking conflict of interest because I have invested in everything that I'm talking about, right?

MR. WESSEL: Including you. I want to be clear. I didn't make --

MR. HUTCHINS: Yeah, you're right. But I won't elaborate it in that I'm not an investor in DM. Put it that way. I think that's my answer to that question.

And so, but on two things, Eswar said. I want to put a little point of emphasis on. Cash. Only five percent of cash, $100 bills are in circulation, right? The other 95 percent are underground. It is the U.S. $100 bills are a primary means by which the bad guys around the world exchange the store value. We should understand that. There's a huge cash problem that needs to be addressed. And I think the digital -- even though there are some serious privacy issues, the digital currency is a way of doing that.

Michael Gronager is going to be on your panel next. Full disclosure, I have an investment in his company too. But he has the best tools for the surveillance of blockchains around the world and the best information about illicit transactions. He'll tell you, but the worse year if I have it right -- the worse year for Bitcoin just less than two percent of Bitcoin transactions were for illicit purposes versus 80 to 90 percent U.S. $100 bills. And on average, it's usually about one percent.

The notion that Bitcoin is used primarily for illicit transactions is just fundamentally wrong

and it needs to be disposed of by people who keep saying that. And Michael has the data to show you that.

The other thing I would say is that with respect to innovation, I am deeply skeptical about the capacity of government agencies to be innovative. And it took U.S. central bank five years to adopt -- at least five years to adopt Cloud technologies after industry had broadly adopted them. And the notion that a government agency is going to be on the forefront of innovating in this space strikes me as highly, highly unlikely.

Though, I think his ideas are good from an academic perspective and I agree with them. And he said, he's stating, I think very clearly what he is trying to accomplish which is to highlight what can be done. In the practical world in which I live, I'm deeply skeptical that it will done.

MR. WESSEL: And, Eswar, finally could you just tell us what you think about the experiment in El Salvador where they have largely dollarize their economy to begin with and now they're trying to make Bitcoin a medium of exchange with some hiccups.

MR. PRASAD: I think one point that experiment has to be is revealing. Is that ultimately there is no substitute for good government policies. If you try to import a foreign currency, decentralized or otherwise, it's not going to work very well. And Bitcoin, I think as a medium of exchange has certainly not lived up to its promise.

But can I think this with the question you raised to Glenn, David? I think while a major currency such as the dollar, perhaps the Chinese you want, the British pound sterling, the Euro, this won't be challenged by private decentralized currencies or even by stable coins such as Facebook's DM.

There is a real existential threat for small economies or economies with central banks that are not very credible. That the availability of digital versions of the dollar or the (inaudible) or such other currencies around the world, which is not on the cards quite clear, but could happen soon. Or even the availability of the cryptocurrencies assured by a major corporation with wide reaches as Facebook could very quickly displace some of these currencies.

So there is a lot going to happen not just to the domestic level, but even in terms of the

international monetary system.

MR. WESSEL: Thank you. Okay. With that, I want to thank both Glenn and Eswar. Eswar will probably be back later at the end of the program. It's really interesting. I told some friends that I was doing this event and they said, I hope that you'll ask questions so that I can understand the significance of what this all is.

So now, we're going to give us a moment and we're going to switch to a panel that my friend, Gillian Tett, from the Financial Times will moderate. And again, if you have questions, sli.do, S-L-I dot D-O, hashtag #FutureofMoney or Twitter FutureofMoney. We'll keep an eye out for those. So, Gillian, over to you.

MS. TETT: Fantastic, right. Can you all see me and hear me? Fantastic, okay. I think we've got everyone here. Well, listen, I found that to be fascinating because if nothing else it helped to demystify and clarify a lot of the concepts. I mean one of the big problems as a journalist writing about this is that in a sense, you need to have, you know, a skill set which involves not just good economic analysis, but you need to have good technical analysis. You need to understand cryptography and you also need to understand behavioral science, sociology, dare I say anthropology speaking as a former anthropologist. You need to understand all of those fields to understand what's going on.

And very few people have all of those three separate skill sets. So thank you for clarifying so much and thank you for the great book, Eswar.

And we have a group of practitioners who are confronting these issues in a very direct day-to-day way. Not just in terms of theoretical analysis, but actually on the ground practical how do we turn this into reality.

Cecilia Skingsley is from the Riksbank. She is Deputy Vice Governor, I believe, who is one of the key people who launched Sweden's efforts to create an e-krona digital currency which in many ways have been the forefront of central banks around the world. So I'm going to ask her a bit about that in a moment.

John Taylor is a luminary of the world of (inaudible) Economics, former Central Banker.

Someone who is famous for the Taylor Rule. Now a Professor at Stanford University who seen how this plays out in terms of policymaking.

Michael Gronager is founder a CEO of Chainalysis, which is a company which is trying to provide, as the name suggests, analysis of what's actually happening out in cyberspace and really look at issues about due diligence, oversight, et cetera, et cetera. And he's also founder of Kraken, which is working in the field too.

And last but not least, Chris Brummer, Professor Brummer, is a Professor at Georgetown who has been looking at these issues from a regulation perspective and also worked with a number of different regulatory bodies be that the CFTC, FINRA, et cetera, et cetera.

So we have an academic, if you like, or rather a regulator. We have a central banker economist. We got a tangible central banker today who has been at the forefront of this and we have someone who is trying to build a business around this. An amazing combination.

So perhaps, I could start with you, Cecilia, and ask you -- I mean most people don't know quite what an innovative role Sweden has played in central banking over not just the years, but centuries. In many ways, you were at the forefront, the Riksbank, of many central banking ideas in the past. Tell us why you created the e-krona and what exactly you see as a future of CBDCs from a central bank perspective?

MS. SKINGSLEY: Well, thank you, Gillian. Thank you for the kind words about my institution. I think, yes, we have been on the forefront, but for many reasons out of necessity. My society changed central banks as to change with it.

And if we had still been offering sort of 20 kilo copper coins as our predecessors did about 350 years ago, I think we would have been out of business by now. So being there, providing service for people, providing a good version of money, stable store value with efficient medium exchange is really left, right and central for the central bank is all about.

But we looked at the situation sort of six, seven years back and we could see that the Swedes were rapidly abandoning cash and cash usage. And the technology, the technological

possibilities has just made it possible to very happily live your life in Sweden without ever using notes and coins.

And it wasn't perhaps so much of a dramatic change in most people's lives, but for society as a whole, it's kind of a new situation for two reasons. One is that we firmly believe that the integrity and the sort of trust in a monetary system especially in the fiat monetary system is the one-to-one parity between what we call commercial bank money and central bank money.

That people know that you can always switch one for one and, you know, but if you put one dollar into the system somewhere it will come out as a dollar at the other end. So it wasn't crypto assets that forced us to look into this or a financial inclusion problem. But more about how should the central bank continue to provide its service to society in a safe and efficient way?

So the integrity is one thing. But it was also that we're looking into a future where spontaneously the market for payment services would become privatized. And this is not a market just like any market. It's a high level of network effects, high economies of scales and we didn't want to have a situation where the private sector sort of took over without actually having a conversation in society.

How do we want monetary system and payment system to work in the future? So we started this. And a couple of lessons learned. One thing is we knew from the start that this was going to be complex. It's about technology, but it's also about policy and an assigned choices and it's also about rules, regulations and supervision.

And you really have to come back sort of like more than a hundred years. It's groundbreaking what we're trying to do now as our predecessors did around the turn of the century, 19th to the 20th century when the note issuing monopoly was sort of settled and banks weren't allowed to become banks.

And something, the last thing I'll say is that also a bit more surprising to me was there was quite a low level of understanding out there in society. And not only among sort of people in the street, but also on central bank (inaudible). Actually, it was on the academic side and also within banks. How does the money tree system work really? You know, nuts and bolts? What is the difference

between central bank money, commercial bank money? And there's a huge difference between fiat money and crypto assets.

So we are really doing an educational effort here across the globe because this is changing for everybody. Not only for Sweden. And then the only thing I'll say about e-krona is that, yeah, we are investigating this. We're into a pilot phase, but we still haven't made any decision whether to launch and this is also a political decision to come in Sweden. I'll stop there. Thanks.

MS. TETT: Well, that's fascinating. I think the communication point that you highlight is very real. I mean on that note if I turn -- I'd like to ask John Taylor next what his thoughts are, but before I turn to that. I mean we got a very interesting question already from the audience which I just would like to bring in. Which I think cuts the core of a lot what we've been talking about.

Which is how much of the foreseen transition judicial currencies is driven by a narrative? And I use that in a sense that Robert Shiller used the word narrative and how that interacts with economics and finance.

How much of it is driven by the narrative hype, if you like? And how much is actually reflecting the actual promise? I mean you are still testing out the e-krona but do you actually need it? Is it just a bit of, you know, is it just a great narrative?

MS. SKINGSLEY: Is that a question to me or to John?

MS. TETT: It is a question to you and then I would like to ask a question to John.

MS. SKINGSLEY: Yeah, that is an excellent question. Do we really need it? I would say that if you want to maintain the integrity of the monetary system, protect people's trust in the sense that I just said.

That you get one-to-one parity between central bank money and commercial bank money. You still want to provide that offer to society? Yes, then you need a central bank to digital currency when the old technology, which I called notes and cash are being phased into history.

If you break that offer, you have basically you created a privatized monetary system. You can still supervise it and you can regulate it. But there you get into a different problem, which is about the

markets of payment services. Which is not a very contestable market. There is a lot of economies of scale network effects and it's a classic area where the public sector finds it really difficult to maintain security, efficiency inclusiveness and things like that.

So, yeah, I think there is a need to maintain our role in history here too into the future.

MS. TETT: All right. Well, Professor Taylor, you know, your name came stamped all over 20th century central banking and economics because of the, you know, contributions you've made. As someone who became so famous within 20th century economics, how do you make sense of this 21st century innovation?

MR. TAYLOR: Well, I think first of all as far as what lists all the main issues. And so, you look at that and you'll get the main innovations that are current.

I think a narrative is kind of how you interpret that. It's important but I think there's so much -- so many facts here that we have to grapple with. And I think that's what I would emphasize.

One thing that hasn't been mentioned is just that it's a cheaper way to make payments across borders as Glenn Hutchins was saying. It's incredibly expensive. And that I think is a real challenge, and we should get the price down. I think Libra and DM are trying to do that as one contribution.

And I say when we do that let's not throw out what's working. I think El Salvador experiment maybe the dollar was just fine and so let's stick with that. Don't just replace it because it's the dollar.

I think regulation is very important and there is a tendency for regulation, I'm sorry to say, to stifle innovation. It's sort of squashing out things from the private sector that maybe there. I had an experienced a number of years ago with a firm called Basis, but I think it was regulated out of business. So let's be careful about that.

I'm not a great fan of negative interest rates. I hear was Eswar is saying in his book. But I heard some of the commentary already but I think we need to be very careful with that. It's tried a little bit. It's not worked out well. The fed hasn't gone in that direction yet so much.

I think that globally maybe more emphasis can be placed on that. I think that there's been a tendency for central banks to follow each other a little bit. That's I think because of the exchange rate issues. And so, it could be with a new currency, a new ability to stabilize that we would prevent that kind of cotangent and I think would be beneficial. That is one of the problems with the current system.

Maybe just mention one other thing, it's related to diplomacy. So however, we go whether it's Stablecoin, whether it's the kind of thing that Cecilia was indicating. I think some notion of what good central banking is, is important, part of this discussion. I like rules which is a way to think of that where the interest rate is set. There's other rules to have but I think that's going to be a big part of the story.

When you have one of these currencies that Eswar has described and other people have discussed. What is the mechanism to create stability? We don't want to have a global hyperinflation or something like that. We don't want to -- well, in the U.S., of course, has had some problems with inflation recently. But the notion that you have a process or a strategy with a central bank, and it could be more global. Quite frankly with the new currency coming into play.

But I think there's great opportunities and a lot of it has with cross border payments, the possibility of greater stability, the possibility of less contagious of policy across borders. And we should strive for those and don't regulate it out. Look for new ideas. Some of them can come from the private sector. And I think that's the way to go. Anyway, thank you.

MS. TETT: Well, I must say, I spent quite a bit of time digging through this recently for a number of pieces and talking to people in Singapore. For some reason, the most innovative countries in this area all begin with the letter S. Sweden, Singapore, South Africa, places like that.

But Singapore, you know, the regulators there are quite upfront. But actually, one of the main impacts of this whole blockchain revolution may actually end up being to make the existing payment systems, which have been very flabby and not subject to proper competition in the past to force them to suddenly become more combative and offer better solutions without crypto. So that's an interesting point to discuss. I'd love to ask what you think.

But, Chris, John has pointed the importance of regulation and regulators. The U.S. right now is in a complete mess. It is, you know, to take Bitcoin. If you think Bitcoin is a currency, it probably ought to be the fed that looks at it. If you think that it's a security. It ought to be the FCC. If you think it's a commodity, it probably ought to be the CFTC.

What is it? And no one really regulates it right now as Chairman Genzer (phonetic) has pointed out a few times. You know, does this concern you?

MR. BRUMMER: Well, those are really hard and interesting questions. I would say to just starting backwards. It's not that nobody regulates crypto assets in the United States.

We do have rules. And we have different kinds of rules depending on the facts and circumstances of different kinds of transactions. Now, you know, as one of the challenges for the regulators will be trying to think through what crypto assets mean in the context of our existing legacy regulatory infrastructure. And there's a lot of reasons why you can say, you know, that work has a long way to go, right?

And let me just sort of have a running start by just, you know, trying to connect the dots a little bit for many people who are probably thinking about this from a banking sort of regulatory perspective. And what it really means when you talk about regulation from, let's say, a market regulatory perspective because it's a bit different, right?

So I think one of the challenges when you think through what does it mean to have a blockchain based digital currency or virtual currency is that, you know, when you think about the traditional use cases of money. Ultimately, what you're seeing now is that this new technology is expanding the possible use cases. And this is something as Mark pointed out initially in his initial remarks, right?

So in addition to thinking about it as a store of value, a medium of exchange, and unit account. I mean, ultimately, now we have this idea that money itself can operate as a code.

You know, as in particular a kind of code that can be designed to execute and operate, you know, according to preestablished technical parameters. You have this idea of money as an

infrastructure. More importantly a digital infrastructure. So where you could have contingent value transfer relationships on top of which other kinds of relationships can be built.

So money as a platform, right? And then, you know, social or closely related you have this idea that money can be a commercial or even social ecosystem and this is something that was also brought up in the previous panel.

Now, why this is important from a market regulatory posture is that when you start to get into issues like digital infrastructure, it touches on questions relating to security's law. It touches on issues relating AMLKYC. It starts to touch on issues possibly relating to, again, depending on what kind of infrastructure is being built, a derivatives law, right?

And these -- the way in which regulation operates, the kinds of requirements that are applied differ according to what part of the financial system that infrastructure could be touching, right?

And so, you know, for obvious reasons many times the banking regulators are looking at certain kinds of infrastructure and, you know, macroeconomists are thinking about the operation of monetary policy. But the market regulators are looking at what's actually being built, right?

And how and the degree to which what is being built is fitting into, again, this preexisting legacy regulatory architecture.

Now for the market regulators in the United States, many of those rules were built in the New Deal. You know, or like right after, you know. Basically, in the 1930s, right? Which did not anticipate anything that we're seeing today, right? And so, by, you know, there's a quiet debate going on as to how do you map that onto what we're seeing today?

And that conversation in itself -- and it's really -- here are the details kind of matter. There's a bifurcation. And a lot of times we use the word regulators. But I think what we also heard from Cecilia. You hear it popping up. There's a difference between whether or not you're a banking regulator, a market regulator and then whether or not you're frankly talking about politically elected officials. And what are the interests and the levels of expertise coming out of the United States, out of Congress?

And those things really do matter. What we've seen thus far is that there are instances

where crypto assets do pretty firmly implicate existing rules and laws. It's not necessarily put together in a very clear and clean way. And for that reason, you're seeing a lot of people in Congress putting forward just this week, you know, a number of attempts to streamline and to make clear the tools that are available.

Clearly, just coming from some of the regulatory actions coming out of the FCC, it's not as if the FCC has, you know, lacks tools. I mean the FCC does have tools, but the way in which they are used could be viewed as either novel or unconventional or as second best given the specific technology that we're talking about.

I would say just as a, you know, excuse me for waxing too philosophically as a law professor, but, you know, I think that one of the challenges that the regulatory community is going to face even if they think through, okay, we have certain kinds of objectives that we have under our mandate. How do we fulfill those objectives based off the tools that we have? I mean I think clearly one of the challenges that is going to be consistency. You know, in terms of how you apply those tools. Predictability, you know, these are actually sort of frankly from an international standpoint sort of general principles of law.

And there's what you're hearing from people perhaps not using that terminology, are questions arising as to whether or not those principles are having the same priority in the application of the tools that are (inaudible) when you are going through and examining that technology.

MS. TETT: Well, that's a very real issue because obviously what happened with a FCC last week indicating that it was clamping down on lending within the defi space in a way that many people find quite, you know, mystifying. They can't quite see the reasoning. You know, it's caused outrage in part of the defi community. It's very striking.

And again, to go back to Singapore. I was very struck that when I did a lot of speaking recently to people in Singapore about why they're leaping ahead, the countries with S? One reason is that Singapore in regulatory system is basically one body, one institution that can move very fast in tandem with the private sector to a degree that would be unimaginable in the U.S. today.

Which brings me into hearing what Michael Gronager has got to say because, you know, you are actually trying to turn these ideas into a tangible business plan. You know, you have worked pretty hard to try and keep the regulator on board from what I can see. And yet, you know, as I understand it even you are facing challenges in trying to work out what is happening.

And having spoken to a lot of people in the private sector in the last few months, you know, I get this constant eye roll of, well, you just do not understand. So tell us what we're getting wrong in your views. And by us, I mean both the academic, regulators and central bankers.

MR. GRONAGER: Yeah. I think these are really good questions. And I would say that maybe we should like rewind everything 10 years ago and think about the early days of crypto and the early days of Bitcoin.

In those days, the perception of Bitcoin was like this is anonymous money. And that that was a value proposition. The fact is actually the exact opposite. That this is like the most transparent financial system that has ever been created. Everything single transaction is public. It's hard to analyze, but when you actually analyze it, it's out there.

It's similar to the early days of the internet and I'm not talking about the '90s but the '70s. The internet is pretty old. And there was no DNS. There were no names. It was just like numbers that you would contact if you wanted to get anywhere. So that maybe was for all practical purposes anonymous and useless.

But then later on came DNS so we can actually access www.ft.com or we can do other things. And then we can also search it and Google. So suddenly it had facility and it was not anonymous anymore and we could use it in various different ways. The same thing is happening in crypto. So this is like the evolution that we're seeing.

Another thing that we are seeing in the crypto space is that in the early days of crypto, the perception were like, I cannot send a Bitcoin because I might be implicated in the bad uses of Bitcoin when I do so. Now, we understand that if I sent a Bitcoin to Chris. First of all, he becomes happy that's one thing. But the second part is that I'm actually not implicated in any other transactions in the crypto

network even though it's being used for bad purposes at this time.

And I should add to that one that the bad purposes in crypto is that someone send a double transaction while use of this is really minute here. But then when you look at defi, and now we get into the next page. Like this is very different and some of the wording is confusing as well.

So some of the words around defi is like, it's a decentralized exchange. O means that they'll have to be KYC and help the other things. The fact is that the technology actually facilitates bio-equity pool. That ability to go from one type of asset to another. It could be from Euro to dollars. It could be Bitcoin to (inaudible). And that is basically again completely transparent.

So we are suddenly looking at how should we regulate? So all the laws of regulation have been written in time where it was a completely opaque financial system. The only one who knew how I used my money was my bank. And that means the bank had a reporting requirement. But those who know where I -- like those who can have OSI or defi are actually everyone. So it means that the regulators have full visibility into the usage of defi to the problems of defi to whom can use it and to whom might misuse it.

And it means that you actually don't have the same need for regulations simply because it is so transparent. So it is changing how we should think about regulations. And I would also stress here that it is important to not necessarily just apply the old rules on a new technology. I would agree with Chris that sometimes it does actually make sense to apply the old rules because it is what it is and it is transaction. And sometimes that's the case.

But in other situations, we have to move back and say, why did we put the regulations in place in the first place? What is it solving? And all the things, regulations solve for, I think the entire industry can subscribe to. It's good. It's about protecting citizens and we want that.

MS. TETT: Maybe besides the fact that obviously private chains can't be scrutinized by everybody. You know, public chains can, but private chains can't. But, you know, that I can appreciate.

But, you know, I understand that you've developed tools to try and track Bitcoin transit factions for law enforcement purposes. And you're trying to take the fact that you do, at least to the public

chains having record of what happened that you shouldn't, could enable you to identify, you know, who's behind transactions.

How are you actually doing that in practice? Do you think that your ability to use that transparency to trace dirty money will actually in any way change the public narrative or the political perception of Bitcoin and other aspects of this world?

MR. GRONAGER: I think it has already. So when I talk to our prime customers. We have customers from the public sector in more than 30 countries in the world. And all of them, for example, law enforcement agents, they would attest to and they would do so like since 2015 when we launched our first product.

They would attest to that it's actually easier to follow the flow of funds in the crypto economy than it is in any other. If you want to follow the flow of funds between bank accounts, you need to send subpoenas to banks. You need to go through the -- in that system abroad. So it takes months to years to actually follow a transaction.

In the crypto system, it's very simple. You can immediately follow the flow of funds and they learned that. And they have constantly been telling regulators that this is actually easier to make enforcement actions in this financial system than in the one that they came from.

So I would say that that's actually working pretty well. I still think that like every time there's a new word that appears like NFTs or defi then we have a new like level of education that we need to go through before everyone will be able to be on board with that.

And in that process, there is also always a misunderstandings and potentially bad regulatory actions that would happen.

MS. TETT: I must say, I think the fact that Dow has failed in 2016 and the fact that the hack failed in August of the platform with Ether, I think was quite striking. But, Chris, would you agree that in fact there's more transparency, not less in this world?

MR. BRUMMER: Well, certainly, you know, and this is something that's worth playing out as well. I mean when you move things to a digital world, you start to leave your -- an imprint and it makes

it much easier to work backwards. I think there was this massive misunderstanding at first.

You know, I would say that -- and this is just, you know, to emphasis this how difficult this job really is for regulating this space. I mean even within the industry, right? Many of the terms that are used are terms of art, right? And even with an industry sort of people can literally -- when you talk about like what is a blockchain? I mean sometimes people will have their own perception as to what is a blockchain? What is decentralized? You know, what does that mean? And even within the industry in terms of sort of figuring out, well, when is something decentralized? People can have their own difference of opinion.

Now, obviously when you want to move those slogans or terms of art or ways of doing business to a regulatory, you know, fine. That's even more challenging, right? Because now you're trying to define with real precision and with all consequences what those terms mean from a regulatory perspective.

But I do want to, you know, cosign, you know, this idea that look. I mean when the regulators were theoretically, the idea should be to save themselves -- and I'll just use the idea since you brought up the FCC. You know, when we talk about what is an investment contract?

One of the things I always try to share with both industry and my own students is that that Howie test. It's not like just somebody just decided to say to themselves, hey, I'll just come up with these interesting standards, right?

It's because each of those line items, you know, an investment of money and a common enterprise with an extension of -- they're trying to highlight certain kinds of risks, right? So if you're putting your own money at stake maybe you're really excited or you're really fearful. If you are -- if someone solely has discretion over how something works that means you have lack of control.

If you're in it with a whole lot of other people, there may be, you know, decision making problems or incentives that arise that maybe, you know, you maybe depending too much on other people. So in other words, the FCC is saying when you have all these things together, we are going to step in and require registration and all this other kind of stuff.

However, when you have technology, it does change for the better and for the worse in different ways risk profiles, right? And how you think about risk and the degree to which anyone is empowered or not, right? And if you're not being serious about thinking through what that technology means, you could come up with a suboptimal outcome.

And I think that's why, you know, my original remarks about general principles are really kind of important. You know, in terms of with the recent technology. If you want to have any hopes at getting something that's going to be effective and right and good and acceptable for both industry as well as the end user and that's what this really comes down to.

MS. TETT: But before I turn back to the central banking aspect, I really would like to go back to Michael and ask you, Michael, which regulatory do you think gets it best? Because you're dealing with regulators around the world.

MR. GRONAGER: It's hard. I don't like picking between all of them. Like a lot of them are customers of ours, of course. I would say the people at --

MS. TETT: Well, what part of the world?

MR. GRONAGER: Well, yeah. In what part of the world? I actually think that the level of education amongst many people in tertiary is really, really high. It is really good. And tertiary gets it, understands it really well.

I would say that they're probably the ones that I would rank highly there as being really thoughtful. Understand how it works. And the interesting thing is that you build -- if you build laws and you build regulation there are people that are helpful. Like all the civil servants that are part of this have an extremely good understanding of the crypto system here. And they are also the ones that have been listening to agency -- like other government agencies, to law enforcement and hearing their stories and really understand.

So I would say they're probably some of the ones that I would highlight here.

MS. TETT: Right. And that's so tactful and shows why you have survived and stayed out of the headlines so far.

But let me turn to the central bank side of things. And I mean, I'd like to ask. There's a question from the audience maybe to Cecilia but also again John as well.

What could you do with the CBDC which you can't do with the current traditional payment method? It comes back to the point of, you know, Singaporeans keep making to me. That actually the end result of all this might be to make the existing legacy systems a lot more efficient because of the competition. But, you know, what is the point of a CBDC as opposed to other things? I mean I think John has got strong views on this. But let's hear from your first, Cecilia, and then John.

MS. SKINGSLEY: Well, I take it back then to the 19th century when the American, you have the so-called wildcat banking system where private banks were known to issuing notes. And for those who liked that system, were happy enough to hold notes from a bank of a good reputation. That question would have been the same. Why would I need dollars issued from a federal reserve bank? What's the point? I'm pretty happy as it is.

Well, you count the times in history where the public sector has to put its foot down and be clear about the structures and coordinate interests in a way that makes the system work for everybody. And I think the person that might have asked that question is financially included, knows how to move around. But if you look at U.S. data, I can see that a number of people, and a growing number of people, are actually financially excluded.

And John's comment about how cross border payments in the world works is I agree with that. That is a poor system. I think both the private sector and the public sector have failed there. But it points to me that it -- it tells me that about 1.5 billion people in the world does not have sufficient access to financial services.

And as we now go into a digital society, I think we have to make sure that everybody gets decent access to be able to make payments in a safe and efficient and effective way. It doesn't mean that central banks should try to be particularly innovative. I agree with Glenn Hutchins' point in the previous panel that that's not our best side. But providing an infrastructure that supports resilience, inclusiveness, and competition, I think we could be able to sort of pull the monetary system into a much

brighter future.

If you're happy with the current, you're probably happy with your bank. You don't have to do a thing. You can just sit still. It's not for those persons in the society we're working.

MS. TETT: Which, of course, is one reason why the emerging markets right now are, you know, potentially going to leapfrog. And see what happened with MPACER play out several times over with CBDCs and stuff like that.

Chris made a great point. I was going to read out before I turn to John, which is at MICA. Which is for those of you who don't know, it's a European commission's new prepared regulatory framework for Markets in Crypto Assets, MICA. He points out that they are also doing some very interesting work in terms of looking at particular Stablecoins.

And I know this is a Washington-based panel at Washington, Brookings Institution, but it's worth looking across the Atlantic to see what's happening there.

And by the way, I should stress it's worth everyone who is interested in this and looking very hard at what's happening in Asia right now. Not with China, but Hong Kong and Singapore are fascinating.

John, do you see any point in having a CBDC? Could we just do this beneficial and payment systems across borders?

MR. TAYLOR: No, no. There's huge improvements that could be made. So you mentioned the cross border costs were going up. Glenn mentioned the statistics. That's a real problem. And we tried to work on that 20 years ago with various mechanism to improve the payments, but we haven't got there. And I would say that's one of the focuses.

You know, how can we make the world a better place with this new technology? And we can. The dangers that people are mentioning. What is over regulation? But I think you still have to worry about the basic rules for monetary policy. Let's not forget this is an increase in money.

MS. TETT: Taylor Rule amongst others, yes.

MR. TAYLOR: Or whatever. I just think that some focus on that. And, you know, if it --

what are the Chinese trying to do? Are they trying to replace the dollar? And just a little of a global aspect. And I think it's a real issue. You're mentioning Asia is important.

But here, you know, you have to think, what is going to replace central bank policy? Because it's a new currency. It's a new method. Is there rules? Interest rate rules? I mean I'm talking about macro rules. Not micro rules. Sorry.

MS. TETT: No, I was going to say, I think that's something that's barely been discussed yet in terms of what this means for, you know, the future of -- never mind private money, but central bank money. And how central banks in the future will or will not run their policies.

We are going to get at the end of this month, hopefully, a report from the Boston fed about the experiment that the MIT group have been doing to try and build an additional dollar. They're using a proprietary technique not taking sort of platforms that other people have used to date. Like a theory than others. And it is going to be very interesting to see what comes out at the end of the month from the Boston fed in that respect.

So before I hand it back to Eswar, I'd like to ask everyone to quickly give me a number which is if you look forward five years, what probability do you assign to having a CBDC in the U.S.? I'd like to ask you all because numbers are great in terms of crystalizing odds. Maybe, I could be fair to Cecilia and ask her the probability in Sweden, but for the rest of like John and Chris and Michael. I'd like to know, Chris, to know what you think the probability of actually having a digital currency, a CBDC, in the U.S. in five years' time? Maybe I can ask you, John, first since you are somebody who has been in the center for this for such a long time.

MR. TAYLOR: Well, I think we had a discussion of definition here a bit. I think to some extent if you have something which is stable relative to the dollar, I think it would occur pretty soon. You know, how much are we using currency right now? I've been using a dollar a long time, for example. So I think that's happening as we speak and I think the fed is probably a little cautious, extra cautious, but I think five years is a good guess as any.

MS. TETT: So kind of wholesale CBDC in retail in a way. What do you think, Chris?

MR. BRUMMER: Yeah, you know, definitions are important. And so, I guess we're talking about like a -- because the fed would probably say we already have one, you know? You know, we do have a digital dollar even if we're talking about some tokenized digital dollar. You know, five was, you know, a guess. As good as any, I think.

You know, can I just sort of say that I think the conversation because there is a policy conversation behind that question here in the United States. You know, what good is it? What will it do? Up to this point in time, it's been a macroeconomic monetary conversation, but I do think that one of the conversations -- one of the things that will seep into the conversation both for the CBDC and even when you get into the cryptocurrency issue that's really been not fleshed out is this question of financial inclusion.

Wealth and equality in this country, particularly racial wealth and equality is a big deal. It is one with political salience. And so, one of the questions and I'm sure one of the policy concerns will ultimately be, you know, not just when you think about the still considerably large numbers of unbanked people in the United States, but also the question of the underbanked and badly banked people who tend to be more -- to have much more modest means.

You know, what does, you know, an additional or a new rail either in -- both in terms of payments and frankly if you're talking about it to a recognized infrastructure where you can build new kinds of applications on top of it. What does that mean with a government more -- and with the federal reserve, you know, more honed in on -- you know, focusing on the question of financial inclusion. And I think we'll hear more about that I think as the conversation matures.

MS. TETT: Definitely. Michael?

MS. GRONAGER: Yes. Okay. So I would actually say that we already have one. So we have one for all practical purposes that's fine. We have Tether. We have like USDC. We have a lot of stable currency out there. They are checks to the dollar. They can move like with -- across any border. So the problem is solved. It's there. It's privatized, which is probably great. And it's in competition because they're multiple so we already have one.

The question -- if you rephrase the question and say should we state issued? Then I think the chances got to zero.

MS. TETT: Nice prerogative point. Cecilia, as someone who is actually in a central bank trying to work on this. What odds would you give for both Sweden and the U.S.? You can give us both.

MS. SKINGSLEY: Sort of frame it down to a retail CBDC. So, you know, the people can access to that. The probability for Sweden in five years? We have sort of already sort of outlined all the work that needs to be done and it's also dependent on the legislation. So within five years, I would say the probabilities is low. I'm not going to give you a number, but it's low.

But if you expand the horizon going five or ten or fifteen years out, I think globally we will have a future where several countries have CBDCs for different reasons, but mainly to maintain the integrity of the fiat monetary system, efficiency in terms of financial inclusion and effective payment services.

But I also expect that we will have a couple of well-designed Stablecoins which can actually be seen as a sort of private version of a CBDC. And I think most of the crypto assets that we see floating around now, I think is about sort of 7,000 or 8,000. They will be gone. And there will be a lot of people that have been subject to quite a lot of nose bleeding as they won't.

MS. TETT: Well, Cecilia, that was a very powerful, punching note on which to end. And I think it sums up the sort of overarching message of the debate, which is that there is real movement happening right now. Much faster than many people recognize or expect, and it's partly the understanding is low in the public because of technical complications.

The developments won't be quite in the way that the Evangelists expect or hope. There are likely to be very uneven and complex. There will be big winners and losers, but I guess the one big takeaway from all this is we need a lot more information and understanding both amongst practitioners but also in the public sector regulators and investors, which is one reason why Eswar's book is so incredibly timely. Not least because it simply explains what's going on and what we need to know about this.

So I'm going to hand back to Eswar at the end of this and say a very big thank you to our panelists for a very provocative discussion. And hand back to Eswar for a few closing thoughts to finish off what has really been a really fascinating hour and a half long discussion. So thank you. Eswar, the floor is yours.

MR. PRASAD: Thank you, Gillian. Wow. That was a panel with a tremendous amount of policy, research and academic expertise and I'm grateful all those perspectives.

So what I will try to do is just summarize what I see as three of the main themes that came out on this discussion. And I'm, of course, seeing them through the lens of my book.

The first theme is that we are at the cusp of a technological revolution in finance. And financially, innovation, of course, is not a new thing, but I think the new technologies that have been spawned by Bitcoin that are underpinned by blockchain really hold out a tremendous amount of promise. We are going to see significant improvements in payment systems as they turn digital.

And these benefits are going to accrue across the border to consumers and businesses in the form of a cheaper and more efficient visible payments within borders, across borders. Economic migrants sending (inaudible) back to their home countries. Exporters and importers using the international payment system, they all going face much fewer impediments.

And I think this is good for global trade, for global finance and ultimately it is going to be helpful in terms of economic welfare.

And in addition, I think what Bitcoin has done is also lit a fire under central bankers which as some of the panelists have indicated might sometimes be somewhat slow to move and reactionary, but I think we are seeing central banks beginning to get into the game by realizing that to remain relevant at least in terms of their retail money, they do need to act. And many of them as is the case with the Wicks bank, they are acting.

The second issue that I think despite all these technological revolutions, there is still going to be a very important role that central banks play and policy overall plays. And ultimately, there is no good substitute for -- as John pointed and as Cecilia alluded to. A rule-based institutional

infrastructure that can support all of these developments and make sure that we can generate all the benefits that it can deliver while managing many of these risks.

And that's going to require, you know, a lot of nimbleness on the part of regulators. And I think both Chris and Michael and also Glenn have pointed out that you could have an overbearing government that ends up stifling innovation which I think is not worth anybody including, you know, these central bankers and government officials want, but we will need oversight of what is blooming.

And it's going to be very difficult I think for this system to really thrive without the bedrock of sort of the trust that government institutions and the protection of contractual and property rights which only a government can enforce. I think those are going to be essential.

And the third and final issues is that I think we have to keep in mind with technology is not going to solve all problems. Certainly, the flow of information is going to be much greater, but this could end up becoming, you know, a cascade of information that becomes very difficult to filter through and for people to process. So you might have in financial markets, you know, bandwagon effects, cascading effects. Basically, leading people to follow the herd and creating even more instability.

While the radical transparency of Bitcoin and blockchain technology more broadly is going to be a very helpful. I think the ability to filter information is still going to be really crucial. So some institutions will certainly continue to play a very important role.

And equally, I think governments will have a role to play in making sure that certain elements that as Chris pointed out, still ferment inequality don't end up leading the new technologies to making things worse. Right now, digital access, financial literacy are all very unevenly distributed across populations within countries and across countries.

So I think governments have a real role play in making sure that these underlining problems don't get magnified by the new technologies. And also, the new technologies can all be counted on to fix all problems. I mean network effects, for instances, will come back to bite with a vengeance even in payment systems as Cecilia point out. Payment systems are not entirely contestable.

There are network effects and I think it will be important for some degree of regulation to

make sure there is a leveled playing field and there are templates that are developing very quickly in the DS unified payments interface, for instance, is showing how you can bring a lot of people into the financial system, manage problems like loyal customer requirements. When at the same time giving a large part of the population access to digital payments as well as supportive to basic banking products and services.

So I think there is a prospect of a much brighter future, but it's going to take a lot of work on the part of all of us, not just financial market participants, but governments and citizens around the world because ultimately, again, to recall Cecilia's words, this is not just about technocratic issues or about economists determining things.

Ultimately, a lot of these things have to be debated, discussed, and decided at the societal level. So once again, thank you very much to all of you for participating in this event and for being at my book launch and to David Wessel and the Brookings Hutchins Center for organizing this.

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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