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GARY GENSLER: So we're going to sort of come back to central banking. I thought it was appropriate to have two classes on this when I was laying out the whole semester in August, thinking about how to build the class. In part because central banks play such a significant role to the world of finance, but it's really about their role in money. I mean, money and central banking have been so intertwined for 300 or 400 years, and they are the custodians, the essence of what Fiat money is. And of course, this course is blockchain and money. And many of the things we're talking about here actually do relate to Bitcoin and crypto finance, even though a central bank digital currency doesn't have to be tied to a blockchain technology.

So I'm going to do a little bit back to what we talked about Tuesday, partly because Robleh Ali was with us on Tuesday, I moved up some of the content from today to then as well just to go through that.

And of course if we do end up-- end early, we can always talk about Tuesday's election too. That's all right.

So we're going to, as always, sort of touch on the readings. I'm going to be asking you all a bunch of questions about things like Ecuador and Senegal and Sweden and maybe the Philippines that were in the readings and so forth. But it's all experimentation by those four countries and others.

We're going to talk a little bit about-- I'm just going to try to come back to what we were talking about Tuesday and why, again, I think it's relevant to any course in blockchain technology, and particularly if you're interested in Bitcoin and crypto finance.

Introduce a new subject, really, which is stable value tokens, which are a significant part of experimentation right now, again, in the world of crypto finance, but relate them back to the world of private banknotes. Because I see in the current approach to stable value tokens something similar that we saw in the past.

Central bank digital currency, which we introduced on Tuesday, and that's going to be the bulk of what we talk about today, and you're going to-- hopefully we'll have a nice discussion to see what all of you think of these Sweden, Senegal, Ecuador and the Philippines a bit. And so that's what we're going to try to do.

And again, we're going to sort of dive into these questions as we go through those four countries. We talked a little bit about MasterCard when Sriham was with us-- right? Priya's husband was with us because he was with MasterCard, but we can touch back. That was really a reading for today, and MasterCard took a out of a patent on fractional banking.

So central bank, goals and functions. Anybody remember we talked about Tuesday as to what are central banks about and what their main goals are and their functions? Anybody want to--

STUDENT: Maximum employment [INAUDIBLE] stability and also the moderate long term interest rates.

GARY GENSLER: Wow, that's pretty good. You've got the three-- the three things that go into the US dual mandate. So there's an economic function, that central banks in almost every country have taken on some role to promote the economy. But dominantly, it's about price stability. And how does price stability relate to money? Anybody? James. Is that a hand up?

STUDENT: No, but I can give a guess. Inflation?

GARY GENSLER: All right, inflation.

STUDENT: Inflation, making sure--

STUDENT: I would add [INAUDIBLE].

GARY GENSLER: So that's cost of money. Right. So price stability and money relate because, what's the three functions of money?

STUDENT: Dependable unit of account.

GARY GENSLER: So a dependable unit of account. It's right in that. So the third function of money-- store value, medium of exchange, a unit of account.

So stable pricing is about making sure that unit of accounting, that unit of pricing, has some stability. So price stability is really about money. And it also promotes an economy.

They sit at the center of the money system, central banks. At first a check on the king to make

sure that the king didn't overspend when he was at war with another king in another country. That's where it all started, but they sit right at the center of money.

So the four things we talked about, they managed the nation's Fiat money in every country-- the supply, the price, the payment systems. Payment systems are how we move money around.

So if you really want to just boil it down, you can take a whole course. There's wonderful professors here that teach central banking. But I'd say manage the nation's Fiat money. Oversee the banking system, because the banking system is a way to basically move money around the system and provides credit-- Tom, what does a bank do when it provides credit? Just use the word "money" somewhere in your definition.

STUDENT: It expands the quantity of money.

GARY GENSLER: Expands the quantity of money. And how does it do that?

STUDENT: Lending money.

GARY GENSLER: Lending money. So banks stand in between investors or savers. We can call them depositors. So on the one hand, you have depositors or investors. On the other hand, you have borrowers. And banks are just in the middle. And that's why it's called financial intermediation-- intermediates, they're just in the middle. It's more than just being in the middle. I mean, it's a big role, but--

So the banks in the middle are all about money. And so central banks want to get involved to manage those institutions.

Initially, commercial banks came before central banks. Commercial banks were around, and they kept failing, even in a time of the small Italian states. They would fail, and there were some family usually, or central authority that helped out. And ultimately, the central banks seem to-- today, it seems like the central banks came first. But the commercial banks kind of came first and then there was a central way to protect the system.

Central banks are bankers to their own governments. Paul Tucker, who now teaches over at the Harvard Kennedy School, but Paul Tucker just came out with a book-- he was the deputy governor of the Bank of England-- about the unelected power.

Central banks are unelected usually. They're don't stand before the voters, but they have a tremendous amount of authority. So the four types of buckets of things they do.

So we talked about-- I used this chart the other day a little bit, but the three different types of money. Please.

STUDENT: In the context of currencies, I would add also that the central bank have a key role in international payments and international reserves.

GARY GENSLER: Well, so the question is, will the central banks have a similar role for cryptocurrencies? Anybody want to take one side or the other about it? Eileen, you think it's going to go to 0. So you would probably say central banks will not have any role if cryptocurrencies go to 0.

STUDENT: I'm trying to understand the question, what do central banks have to do with cryptocurrencies?

GARY GENSLER: All right, so Alin just took the other side. He said, what do central banks have to do with cryptocurrencies?

STUDENT: I mean, there's going to be a currency for one country. They will still need to manage international reserves and manage international cross-border payments. If it's going to be a global currency, they need to [INAUDIBLE].

GARY GENSLER: So it's a hypothetical.

STUDENT: But it's a choice, right? It's whether you want your currency to float versus Bitcoin, or whether you want to defensively buy Bitcoin and hedge your currency. I think the central bank has a choice to pursue [INAUDIBLE].

GARY GENSLER: So any other views on whether central banks will get steeply involved in Bitcoin and cryptocurrencies? Brotish.

STUDENT: I think if your currency can [INAUDIBLE] of its own [INAUDIBLE] where it does not interact with the Fiat currencies, then the role of central banks would be completely restricted to the governance of activities [INAUDIBLE], whatever it takes to get involved in that [INAUDIBLE] attracting the Fiat currency at any level, then the central banks' role becomes more involved in that.

GARY GENSLER: The more [INAUDIBLE], the more it's more central. So isn't it possible that-- I mean, we don't know what the future will bring. And Alin might be right. If cryptocurrency doesn't take off, then

central banks can kind of just wave it away as some experiment on the side of finance.

But if it starts to take off, I think-- do you pronounce it Guillermo? Guillermo says that if it becomes somewhat central, as British and others have said, I think that there would be a role for central banks. If a country actually was going to use it as its medium of exchange, a unit of account, a store of value-- and particularly if there became fractional crypto banking. This Mastercard patent. Like if you actually saw somebody taking crypto deposits and making crypto loans, and you had credit facility through crypto-- we're a far way away from that. We're not there. But I'm saying, if that happened. Sean?

STUDENT:

So I was just curious. A follow up on that, if that happened, and it becomes a fraction of the monetary supply, in order for the central bank to carry out its functionality, just like [INAUDIBLE] operations, does that also apply to-- kind of if the cryptocurrency plays a role, does that also apply to [INAUDIBLE] to the cryptocurrency project?

GARY GENSLER: Well so Sean's asking, if we really were in this world we're not yet in, and cryptocurrency was a dominant form of finance, banking and so forth, would you envision the central bank trying to do an open market operation?

Anybody want to tell the class what open market-- it's not in the readings, but what open market operations are used for?

GARY GENSLER: Is it increasing or decreasing the money supply? So yes the central bank can buy some of the money or sell some of the money which affects the supply and thus affects the price.

So open market operations effectively affects the interest rate. You have often probably read the interest rate targets. The Federal Reserve has a target. But what they're doing in an open market operation is really buying and selling supply of money. And when you influence the supply of something, you change the price. And the price of money is measured in interest rates or foreign exchange rates.

So Sean, I would say that if it becomes a dominant part of an economy, then some central authority might want to try to influence its price. But there's a challenge.

Does anybody want to guess what challenge I'm thinking about why cryptocurrency-- let's say Venezuela was adopting Bitcoin as a central means in that country. What would be their challenge of trying to influence the price of Bitcoin in Venezuela? Alin.

STUDENT: Well if the other economies outside Venezuela are using Bitcoin--

GARY GENSLER: [INAUDIBLE] so Venezuela might be only a small portion of the overall Bitcoin usage around the globe. So it's one thing if you're one country and trying to influence the price of the currency that's in use in that country. If Sweden wants to influence the price of the krona, or Israel the-- Shekel? But it's far more problematic if it's a worldwide currency. Hugo and then Tom.

STUDENT: I mean, I could see that being kind of like what we saw earlier this year or last year when there was like a Korean-- the price of Bitcoin in Korea was higher than the price of bitcoin in the rest of the world because there was so much demand there.

So if you get like the Central bank of a certain country buying Bitcoin in their currency, they're basically devaluing their currency in relation to Bitcoin and it might not-- like it might not affect the world market in the way that they think it would. Right? Unless they're effectively buying Bitcoin on all open markets around the world.

GARY GENSLER: Right. And do you have a view as to why the pricing went up in Korea versus elsewhere? It's called the kimchi premium. Literally, I don't make this up. But that was what it was called in Bitcoin, the kimchi premium, which was that Bitcoin was valued at a higher price in Korea than elsewhere.

Hugo, do you have a-- you had one reason you said it's just thought that the Koreans were trying to buy a lot of it, so there was a kimchi premium. Other? Tom, we're going to get to you.

STUDENT: In order to open an account on a Korean exchange and [INAUDIBLE]. So you weren't really able to arbitrage very--

GARY GENSLER: All right. So Hugo, you're on to something. You're saying arbitrage. Ben?

STUDENT: [INAUDIBLE] it was difficult to arbitrage because of the capital controls in Korea. Is that something--

GARY GENSLER: All right. So it was difficult to arbitrage. So the basics of finance-- we're moving a little away from Bitcoin. But the basis of finance is arbitrage has been a part of finance for, again, thousands of years. If I can buy something in France and sell it for a different price in Switzerland, and it doesn't cost too much to travel the roads between France and Switzerland, I might buy it in one country, sell it in another. And that's called locational or geographic

arbitrage.

In a modern digital age, digital assets don't have much locational arbitrage. Oil still has locational arbitrage because you might be buying it in the Gulf Coast and selling it in Africa. Or, you know, there might be locational arbitrage in physical commodities. But in digital financial assets, there's far little locational arbitrage.

And it's interesting, in Korea's case, there was a locational arbitrage. What was this about? And it was because it was hard for regulatory reasons. So there was a kimchi premium, literally, for quite some time, because it was hard to move Bitcoin across the borders for regulatory constraints and so forth. But now, we've got-- Tom, you [INAUDIBLE].

STUDENT: Yeah, when we talk about bank capital requirements, does US Federal Reserve require banks to hold dollars? Or are banks allowed to hold any currency [INAUDIBLE]?

GARY GENSLER: Has anybody been in banking? Want to answer Tom's question?

STUDENT: Whether or not bank capital, bank reserves, have to be held in dollar denominated--

GARY GENSLER: Josh, you've spent a lifetime in banking, right?

STUDENT: Yeah, so there's a lot of rules. A lot of the rules are based on the liquidity of the assets that you're holding. So if you're holding capital, if you hold it in treasuries, which are very liquid, and you could get out of them in a certain amount of time, there's a big premium to hold your capital in those types of assets.

So I think the rules don't necessarily specify whether it's dollars or another currency, but they heavily favor very liquid.

GARY GENSLER: So Josh is right. It's basically-- it's all brought back to the home nation's currency unit, dollars or euros or renminbi. In some accounting books it's brought back into that, but there's different haircuts or weights depending upon some perceived model of liquidity.

So a US treasury bond versus a German government bond might have similar liquidity and the regulators will count it the same. But you're, in a very real time basis, using the foreign exchange rate to bring it back to the unit of your home country.

STUDENT: Yeah. I'm jumping the shark a little bit on my knowledge of finance and central banking. But thinking about whether or not Bitcoin becomes a reserve currency, or whether or not banks

hold it, to Guillermo's point of-- if central banks aren't allowing financial institutions to get credit for holding bitcoin [INAUDIBLE]. Why would they have to do it?

GARY GENSLER: Well, currently, central banks are not that favorable to Bitcoin and cryptocurrencies, but they're probably right. There's not a deep history, there's not a lot of liquidity, and there's high volatility. And the underlying markets are highly susceptible to manipulation.

We don't know for sure what the real pricing is at any given time. But in the hypothetical world, where it's becoming largely adopted, I would suspect that central banks around the globe would have some capital regime that would treat it more favorably than it's treated today but less favorably than government Fiat currency.

STUDENT: Right. I mean, you trust the German bond because you trust the German government [INAUDIBLE].

GARY GENSLER: Generally speaking.

STUDENT: More so than you do decentralized governance structure.

GARY GENSLER: So there are three types of money that central banks are involved in. Does anybody remember? There's even a chart up here you could see, you can grab it from. Akira?

STUDENT: [INAUDIBLE] central bank databases Fiat authorized?

GARY GENSLER: Fiat what?

STUDENT: Fiat collateralized.

GARY GENSLER: Fiat collateralized. No, we're going to get there. That's going to be about stable value tokens. I'm talking about--

STUDENT: M1 M2 and M3.

GARY GENSLER: All right, so we talk about M1, M2, M3. So what's the what's the first thing that you might think about? What's that? I heard the word "cash," but--

some deposits. But starting with just cash is money. So did I make it green? Yes! There we go. Thank you. I got some help here. Cash. That's one form of money, and we all have it or-- actually, I've never asked. I always have cash in my pocket. How many people in this room actually currently have cash of some country in their pocket?

So we're down to about 70%, but 30% have no cash in their pocket. You're putting yours away?

STUDENT: \$1.00.

GARY GENSLER: \$1.00. If we were in Japan, it would probably be higher though. Right? So one form of money is cash. Another form of money that the central banks--

STUDENT: Central bank reserves.

GARY GENSLER: Central bank reserves. Let's see if I made that green. Yes! So central bank reserves. Again, I'm just going back through this from Tuesday. Reserves started, but because they were commercial banks-- and when governments set up central banks, they said, you have to save and put some of your money-- a reserve-- with the central bank. So that we might give you deposit insurance. We might give you access to liquidity in hard times, which is called opening up some liquidity or lending facilities.

So you have to keep a reserve from us. That's where the word came from. But it's a form of money. And the third form of money, the form of money that almost everybody in this room uses on a daily basis? The real form of money that we use almost all the time? So we had cash. We had central bank reserves. What do we actually use almost every day? What's that?

STUDENT: Deposits.

GARY GENSLER: Deposits. So our bank deposits, we are actually transacting-- when we go into Starbucks, I know it doesn't feel this way, but you're actually moving some of your bank deposits to their bank deposits. That's how we're really moving money. So those are the three forms of money. We never see Federal Reserve or central bank reserves, we just see the cash in the bank deposits. Kelly?

STUDENT: You talked about being able to facilitate lending when times are tough. So we go back a decade, how have the rules sort of change to prepare for that scenario where banks-- were the central bank would need the ability to have a lot [INAUDIBLE]?

GARY GENSLER: So Kelly's asking, you know, we all lived through the financial crisis. How many of you in 2008 were in banking? In any way? All right. Oh Josh, you-- Alpha, where were you working in 2008? You were at Goldman Sachs. Yeah, I've heard of them. The other people that raised

their hands? Who else raised their hand? Where were you working?

STUDENT: I was working for Bank of Tokyo Mitsubishi.

GARY GENSLER: Bank of Tokyo Mitsubishi. I've heard them. Very big bank. Josh? A hedge fund, right?

STUDENT: A mortgage hedge fund.

GARY GENSLER: A mortgage hedge fund. Yeah. Yeah, uh-huh. We thank you, Josh. So the question is, how would Josh, Alfa or Kira get money today? Who-- did anybody work in central banking? No.

So the 2008 crisis came along, and Josh, we let him fail. He was a mortgage hedge fund?

STUDENT: We did pretty good.

GARY GENSLER: OK. What's that?

STUDENT: He let us fail.

GARY GENSLER: He let us fail. Goldman Sachs got a bit of government support. Bank of Tokyo Mitsubishi, did you get any government support?

STUDENT: No. We had some [INAUDIBLE], but not critical [INAUDIBLE].

GARY GENSLER: It was not critical. But the central banks around the globe, particularly here in the US, provided liquidity in multiple ways. But it wasn't going to be enough. They were providing liquidity, one, for some banks that were failing, Bear Stearns in 2007 failed. And through a legal authority they had from Congress from the 1930s, where you could actually lend to a financial institution-- actually, you could lend to any company in society. But they had never used the authority. But they used the authority that you could lend versus collateral. And that was done with Bear Stearns in 2007, and then it was done again in 2008 for others.

And what did they do with Lehman Brothers? On the fateful weekend that Lehman Brothers failed, what did the Federal Reserve say to Lehman Brothers?

STUDENT: Let them go bust.

GARY GENSLER: James said they let them go bust. That is correct. They said, we can't use this authority. And then we all know in the history books it's written how that fateful week in September of 2008, then everything falls bust. Because there was uncertainty in the marketplace.

And so what they did next, Kelly-- so they were using traditional authorities. And what they did next is they started to test the limits of their legal authority, along with the Treasury Department and the Federal Deposit Insurance Corporation, and they put a series of other things in.

And under an old authority of the Federal Deposit Insurance Corporation, they actually guaranteed all debts of the banking system in the US for a period of time. Under other authorities, they figured out how to put a guarantee on money market funds. It was about \$2 trillion in money market funds.

All of these almost extra legal authorities. I mean, they were not written right into congressional law, but they pushed the outer boundaries. And we knew when Larry Lessig was here he said that every contract has some ambiguity. Every law has some ambiguity. And the best lawyers at the Federal Reserve, the best lawyers at the US Department of Treasury and elsewhere were thinking, where is the ambiguity? And can we use that uncertainty in the law to save the system?

And then they went to Congress. They went to Congress and asked for \$700 billion. When Hank Paulson Treasury Secretary went to Congress, they sent a four page, but it might have been three page legislative request for \$700 billion.

I remember I first read that three or four page request, because then a senator from New York, Hillary Clinton, asked me, this thing's come up. Will you read it and give me your advice?

It didn't take me long to read three pages. It was an outright request for \$700 billion. It finally did pass. It first failed in the House of Representatives. It became, I think, a couple hundred page document. But \$700 billion of US taxpayer money went to the treasury, and the treasury then lended out and so forth. So it was multiple things.

10 years later-- 10 years later, a law here, Dodd-Frank, limits some of what the federal government can do. It tightened the ability to be the fire department in the midst of a raging fire.

And there's lively public debate recently. Tim Geithner, who was Treasury Secretary at the time, has come out publicly, and Ben Bernanke, I think, and they've written an Op-Ed and some other pieces saying, it would be good to loosen some of those Dodd-Frank restrictions.

But there's others on the other side who have said, no, we need to keep those restrictions tight. Because if the restrictions are loose, then we have something called moral hazard. Does anybody know what moral hazard might be?

STUDENT: I think it's you run a risk that is not commensurate with what you can do. But if you're confident because [INAUDIBLE].

GARY GENSLER: And who will run the risk?

STUDENT: It could be a bank or it could be--

GARY GENSLER: So the banks or financial institutions, if you know you're going to be bailed out, will take more risk. It's human-- it's who we are.

So my father had a small business in Baltimore. He never had more than 30 employees. It was a cigarette and candy and pinball machine business. If he couldn't make payroll on Friday, the city of Baltimore was not going to help him out on Monday. His employees might give him another week or two-- hey, Sam! My dad's name is Sam. We'll give Mr. Sam another week. But two or three weeks later, they would have all quit.

But the banks, so large, so tied into their economies-- for many decades. 2008 wasn't the only time. The sovereign steps in. The central bank steps in.

So Kelly, the answer to your question is, there's probably less ability for the central bank in the US to step in. They still have very real tools to be the firefighter in the middle of a raging fire, but they're a little bit more constrained. We as a society spoke through our Congress and said, we don't want bailouts. But in the midst of the next crisis, some Treasury Secretary, and some Federal Reserve chair, and maybe some president, will be testing the limits of those statutory authorities. And they might be knocking on the doors of Congress again.

STUDENT: I guess my question is more testing out the implications of if we were to have-- for example, if Bitcoin were to be backed by central banks what those implications would be that say, all of a sudden, instead of a ton of Bitcoin had to be issued, we probably all know there's a restriction on the supply there. So--

GARY GENSLER: All right. Anybody want to take the other side of Kelly's question? Bitcoin's now the currency that's-- hypothetically, the Bitcoin or some crypto. Alin would tell us it would be some other crypto. Maybe it's Algorand or something. What happens? What's going to happen to the

flexibility of a central bank and a government to bail out their economy if it was a crypto?

STUDENT: It goes down. Kind of like the example of the EU.

GARY GENSLER: Remind me your first name?

STUDENT: Isaac.

GARY GENSLER: Isaac. So Isaac says it goes down. What do you mean? It means their flexibility goes down? Tom?

STUDENT: I mean, if it's a crypto currency, like we know from today, it's impossible. Right? I mean, there has to be a finite set of coins, tokens, whatever they are. And there has to be consensus protocols. it has to be--

GARY GENSLER: Eric? So Tom contends-- Isaac says it gets a lot harder. Tom says it's not just harder, it's impossible. Eric?

STUDENT: It depends on the design of the cryptocurrency platform that underlines the crypto that's being used. Because we will see maybe later in this class there are some known collateralized stable coins that actually have smart contracts that enforce money supply policies to keep [INAUDIBLE] stable, which is really similar to handling money supply in an automatic way.

GARY GENSLER: So Eric is saying-- we'll take one more.

STUDENT: Well in the case of Bitcoin rates--

GARY GENSLER: Remind me your first name.

STUDENT: I'm Santosh.

GARY GENSLER: What's that?

STUDENT: Santosh.

GARY GENSLER: Santosh.

STUDENT: [INAUDIBLE] like the mining system contains protocol. [INAUDIBLE]

GARY GENSLER: So what Eric and Santosh are saying is there's some flexibility-- either flexibility written into the

algorithm, or flexibility in that the 51%, if there's a consensus or a hard fork, you might be able to adjust. But at its core, it's probably-- as Isaac introduced it, it's harder. I don't know if it's impossible, but I think it's a lot harder. Just like the European Union has a lot harder time helping out Greece because you now have multiple countries involved in the decision making. The consensus-- what satisfies German economics and German politics is different than what might satisfy Greek economics and Greek politics. [INAUDIBLE]

STUDENT: So I'm a bit confused, because I guess we're switching terminology. So when you say central banks and cryptocurrency, you don't mean central banks and CBDCs? You mean something else? It's not-- [INAUDIBLE].

GARY GENSLER: Yeah, yeah. I think we're dealing in a hypothetical discussion. What if a cryptocurrency were to actually take hold, like a Bitcoin, in the future? I think that's what your questions were about. Eric?

STUDENT: [INAUDIBLE] popular enough and used.

GARY GENSLER: Popular enough. Used enough as a store of value, used enough as a medium of exchange. And then there was a crisis. Very different than a central bank digital currency. Yes. [INAUDIBLE]

STUDENT: [INAUDIBLE] sort of like an old days stat specialist on the foreign exchange. Would they make markets know that there was-- if there was hard selling, then they could actually come in, be a backstop or [INAUDIBLE].

GARY GENSLER: Andrew's asking, could the private sector be--

STUDENT: [INAUDIBLE] the central bank serve sort of like a private sector really works.

GARY GENSLER: So could a central bank in essence come in and support a cryptocurrency? To some extent, for sure. Depends on what their reserves are. And they also, of course, are part of a government that has a taxing authority, has a military. I mean, there's a lot of extra might that comes with being part of a government.

So I think the answer is yes. But multi-jurisdictional currencies usually fail on some level. The euro is still an experiment. It may still fail some decades in the future. It's been tested. But multi-jurisdictional currencies in the past, high probability is they usually fail. Because you don't have one political system, one unified set of government accounts, one taxing authority. You

know, there's a bunch of challenges.

But let's move on and try to hit some of the things on-- so that's kind of a review a little bit of the other day. We said, what's Fiat currency? We've talked about it of course. Fiat currency then represents all three forms-- bank deposits and notes and reserves, and it's accepted for taxes and it's legal tender. In this hypothetical case, we hadn't even gotten to whether would Bitcoin be accepted for taxes with Bitcoin, or crypto be accepted as legal tender. But I would remind everybody, whatever the future holds, I think wide adoption in any country you'd have to address, will the government accept it for taxes? Will the government say it's accepted as legal tender?

And until and unless that happens, usually it wouldn't have wide adoption, even in a country that's in distress. Again, we're not talking about central bank digital currency, but you could say the same thing about central bank digital currency. Unless it's accepted for taxes, which it probably would be, or accepted as legal tender.

So I wanted to go back to private banknotes. So commercial banks have issued notes in the past. Think of this as basically a piece of paper that represents a bank deposit. The same way that we might be moving mobile money now, think of it-- but most of this was done before there was a time of central banks. And in the US, it was called the free banking area.

Andrew Jackson was the seventh president of the United States, and he really didn't like a central bank. It was called the second bank of the United States, but he let it expire in the 1830s. Andrew Jackson-- does anybody know what piece of currency Andrew Jackson is on? Where is his portrait? \$20 bill. The one that we keep passing around and everything.

Andrew Jackson also was president in a period of time that it paid off the national debt. Paid it off to zero. He was a Tennessean that had a strong view about finance. We had a very tough time in the 1840s, so I'm not sure we should have paid off the debt completely. But the free banking era, the notes that went around in the US for 20 to 30 years, were all banknotes.

And then the Civil War came along, and the US government needed to finance a war. And the word "greenback" comes from 1863, when the North, the union, wanted to raise some money. And they literally started printing greenbacks.

And also the first National Bank Act passed during the Civil War. And the National Bank Act set up something called the Comptroller of the Currency. And the Comptroller of the Currency--

those two words, they confused me a lot when I was on Wall Street. Why was the bank regulator called the Comptroller of the Currency?

But in the 1860s, it was to control all these banknotes that were being issued by a bunch of commercial banks, most of which that failed. Hundreds failed. Many of the pieces of paper would trade at different values, discounts to each other and so forth.

And some say that the world we're living in now with cryptocurrency, this new market, is a little bit like the private note period.

Interestingly, there's two countries or two areas that still use private banknotes. Anybody from Hong Kong? James and Anton. So who issues your currency, your cash?

STUDENT: There are three banks.

GARY GENSLER: Bank of China, HSBC and Standard Chartered. Bank of China represents the People's Republic of China. HSBC represents local Hong Kong and Standard Chartered represents Britain.

STUDENT: Actually, we should also add the monetary authority. Because they issue [INAUDIBLE] \$10.

GARY GENSLER: They do, but it's not really a private bank note.

STUDENT: [INAUDIBLE]

GARY GENSLER: No. So in Hong Kong, the notes-- the dominant notes, am I right?

STUDENT: Anything over \$10.

GARY GENSLER: Anything over \$10 is by a bank. They have to follow the rules of the central bank. And anybody from Scotland or Ireland? Is that too far north? But similarly, in the United Kingdom, there's Sterling Bank notes. So we still do have some of this. There's still a little legacy of it left-- a tightly, highly constrained legacy because it's-- the monetary authority, it's called in Hong Kong?

STUDENT: Actually, no.

GARY GENSLER: Is it called a central bank?

STUDENT: It's not called central [INAUDIBLE].

STUDENT: It's called [INAUDIBLE] financial authority.

GARY GENSLER: Monetary and financial authority. So the word "monetary" is right in there. Just like in the 1860s in the US, the bank authority was called the Comptroller of the Currency. And it still is called the Comptroller of the Currency. James?

STUDENT: [INAUDIBLE] UK. If anyone ever travels to the UK and gets a Scottish bank note, give it back to the person who gave it to you, because you [INAUDIBLE] in England, everyone panics. It's like, what is this? This does not look like a usual banknote. It is technically legal tender. But people go, ah! Don't want it.

GARY GENSLER: So it's not good north of a certain--

STUDENT: It's not good south--

GARY GENSLER: [INAUDIBLE] south of something.

STUDENT: I read that it's not legal tender in South-- but it's also not legal tender in Scotland. So you can use them in Scotland, as a matter of custom. That's a question I had. But as a technical legal matter, it's actually not-- it doesn't extinguish the debt, but somebody won't sue you.

GARY GENSLER: I believe Ross is right. But for those who don't know, Ross spent a career as a bankruptcy lawyer, as a partner of a firm, before he came back for a Sloan MBA. So I'll go with Ross on this one.

[LAUGHTER]

STUDENT: Moral of the story is, if you've got a Scottish banknote, just give it back. Because I don't want this.

GARY GENSLER: There you go. So stable value tokens. What's the moral on this, James? If you've got a stable value token, do you give it back?

STUDENT: Well, in theory, it's stable value. So you can exchange it for whatever it's tethered to.

STUDENT: [INAUDIBLE]

GARY GENSLER: So what are stable value tokens, and what value might they have? What pain point in the crypto space? Why did they come about? There was a reading on it, so maybe it was just--

STUDENT: [INAUDIBLE] off the volatility of the cryptocurrency in a way that it's backed by-- [INAUDIBLE] currency so that the [INAUDIBLE] volatility.

GARY GENSLER: Volatility. So ease to dampen the volatility. Why would somebody want a crypto asset but ease the volatility? What are the use cases for crypto without volatility?

STUDENT: Well they just mentioned like loans and savings accounts as an example. But the thing with the volatility is that it struggled as a store of value, because it's not stable and it just goes all over the place.

GARY GENSLER: So--

STUDENT: They use it a lot for trading.

GARY GENSLER: Trading. What type?

STUDENT: Different cryptocurrencies.

GARY GENSLER: Cryptocurrency trading.

STUDENT: You want to sell-- you're going back to the stable one, then going back to another cryptocurrency. You don't have to go into the banking system.

GARY GENSLER: All right. So maybe it's also being used for trading. So I've heard that it dampens volatility. I agree. It could be used for trading. Because you might go crypto to crypto to crypto, but you want to keep a better store of value and a stable token as well. And that's what it's been. I list four different approaches to it. These are design features. They are trying to do the same thing-- have a cryptocurrency that's not centralized, or at least not backed by a government. Not centralized that way-- it might be centralized that the algorithm in the software is centralized-- and four different design features.

And I think there was a reading on this if I remember. Does anybody want to say anything about tether? What-- basically backed by US dollars?

STUDENT: I think one of the big issues with it is that, if it were to be really adopted, you would need to have a ton of collateral to make it useful to people. And then the other issue is that you'd also probably need a central bank like the Fed to actually be there intervening. And that kind of goes against the purpose.

GARY GENSLER: Stephanie is saying, if it really took off, you'd need a ton of collateral. What if tether, or any Fiat collateralized currency, was not just a couple billion dollars but it was a trillion dollars or a couple of trillion? The whole US banking system is about \$16 trillion. There's \$13-ish trillion of deposits.

What if you had a coin that's 1 trillion of that?

STUDENT: If it's supposedly backed by-- if it's that large and it's supposedly backed by US dollars, you have two choices-- three choices, right? You either have a stack of \$100s for a trillion dollars. Physical--

GARY GENSLER: Paper. Linen.

STUDENT: Paper. Or you have bank deposits, which is what you're trying to get out of. Or you've got the money with the Federal Reserve, which you're also trying to get out of. So those are your only three choices for, where actually is the collateral? It has to be somewhere.

GARY GENSLER: But the reason to drill into this, this is part of the motivation of why central banks are looking at central bank digital currency. They've been watching not just Bitcoin and the whole crypto space, but then they've watched stable value tokens come along-- stable value tokens that are generally backed by some blockchain technology and blockchain initiative that, frankly, they don't have to be blockchain. I think you could build something without it.

STUDENT: Something-- if you have a Fiat collateralized stable coin like Heather, I can understand why there's a technological use case. Maybe you want to use it as [INAUDIBLE] trading, or you want to lock value on a blockchain that's not volatile. And there's also a business case where, if it does go above a dollar-- the coin goes above \$1 or below \$1, you can either issue more and keep the difference or buy that coin and keep the difference.

And you can potentially-- if it's small enough, you can invest that in a bank and you can get interest on the collateral.

But I do agree with you. The problem comes along when you have this huge scale of a trillion. Then at that point-- I don't know if it's a trillion, the \$10 trillion, a couple billion or whatever.

But when you run into the same type of scenario where the US dollar went off the gold reserve or we just became untethered to the reserves of the coin. Because it's so widespread and ubiquitous, that stability is now--

GARY GENSLER: So is your thought being that if it really grew and it was accepted in commerce that maybe it wouldn't have to be tethered to the Fiat currency, it would then become-- trust the trusted? The way that the paper currency became trusted. And Richard Nixon in 1971 could say, we're no longer going to follow Bretton Woods. Or in 1933 when FDR and our country said, we're going off the gold standard.

STUDENT: With that, you would probably need to create some kind of central authority that manages monetary policy [INAUDIBLE].

GARY GENSLER: I think you raise an interesting point. I think we're well, well before that. I think right now, though, the interesting thing is there's a lot of entrepreneurial activity in stable value tokens.

My observation is one of the leading reasons was stated right here. In the crypto exchange markets, which we'll talk about next Tuesday, in the crypto exchange markets, a lot of people want to go and trade crypto to crypto and not crypto to Fiat. And what are some of the regulatory or economic reasons they don't want to trade crypto to Fiat? Tom? Taxes? Anything else? That's another big thing that the government--

STUDENT: It could potentially be traced.

GARY GENSLER: It could potentially be maybe more readily traced.

STUDENT: KYC and AML.

GARY GENSLER: So KYC. You want to remind the class what those letters mean?

STUDENT: Know Your Customer and Anti-Money Laundering.

GARY GENSLER: So there's a whole regime around the world-- in the US, it's called the Bank Secrecy Act-- but around the world about knowing one's customer, tracking anti money laundering and so forth.

One of the dominant things in crypto that's going on-- maybe mistakenly, maybe just because it's an early stage-- is that some people who have crypto assets feel, I don't want to trade that for a Fiat asset. I don't want to trade it to euros or dollars or yen. Because then, it's more likely the official sector can track me for taxes.

I think there is a false notion that if I sell something crypto and I buy something else crypto, I do not have to report my gains or losses in my taxes. Now the US has clarified that you do. But

for a couple of years, people were going, well, maybe it's just what's called a like kind exchange, like selling one piece of real estate for another piece of real estate.

By the way, if you sold gold and bought silver-- gold for silver, that was not a like kind exchange under US tax law. But they were tax advisors going around saying, well, there's some ambiguity. Maybe you don't need to pay your taxes if you went from Bitcoin to ether.

The tax bill that was passed in December, that's called the Trump tax bill, that closed that window. One of the few things it closed.

But I think because of illicit activity, because of taxes, there's still a lot of people that would say, I'd just rather go crypto to crypto. But there's one other thing, the reason why people might want a stable value token about the payment system. We talked about it last week.

Do I see a hand up? Are you going to help me out?

STUDENT: I was going to say, it's quick and it's very cost efficient.

GARY GENSLER: So it's quick and it might be cost efficient. We talked about-- and I had a chart about using crypto as a bridge currency to move cross-border payments. If you're moving from US dollars to Mexican peso, that can take 2, 3, 4 days in correspondent banking systems and the like. But what if you use from US dollars to crypto to Mexican peso? Very legitimate use case that can lower your cross-border payment down to seconds rather than days.

Very legitimate use case that may be stable value tokens would be a good use case. So again, if anybody's interested in the different design characteristics, it's interesting, there's a professor over at Harvard that came to see. He teaches Harvard Business School, came to see me, that he's creating a non collateralized seigniorage based stable value token. So just even here in Cambridge there's a bunch of people looking at trying to create things and do things, and a lot of energy.

They're always asking me, what's a real blockchain use? Some of it's just in this area. Hugo, and then we'll move on.

STUDENT: One other thing that with a couple of the Fiat collateralized ones that you don't have up on there. So like Gemini, the exchange recently created one, and Circle created one that Coinbase adopted. And those are both on top of Ethereum.

And I think actually-- at least with Gemini. I'm not positive about that Circle one. Coded into the smart contract is the ability to freeze tokens. So you could say that's an AML type of thing, right?

If I see something weird with transactions with GUSD, then they could actually stop and seize tokens.

GARY GENSLER: So what's the mood of the class around stable value tokens that can be frozen right in the smart contract? Does that seem in the spirit of Satoshi Nakamoto? What's that Hugo? No? Ross?

STUDENT: I have a question. Who's they?

STUDENT: Gemini, whoever wrote the smart contract.

GARY GENSLER: Whoever controls the smart contract. In that case, that would be a crypto exchange run by-- who's Gemini run by?

STUDENT: Winklevoss brothers.

GARY GENSLER: A couple of identical twins. Not the Genslers. Well, the Genslers weren't in the movie and didn't make a lot of money on crypto. The Winklevoss twins, by the way, who were at the-- the wonderful story with Mark Zuckerberg at Harvard, if you remember the Winklevoss twins, and they're rowing, part of a rowing elite, too, have made a lot of money in crypto. And we'll talk a little bit about them next Tuesday.

So then central banks and cryptocurrencies. There was-- we talked about this the other day. There's four things they're really doing. They're monitoring and studying. Some are restricting the use, like the Central Bank of China, some are trying to do payment system experimentation. We talked about Singapore and Canada. Those are real blockchain initiatives, the payment systems.

School's still out as to whether they need to use the blockchain technology. But they are seriously leaning in, particularly in Singapore and Canada, saying there might be a more resilient payment system if we use a decentralized distributed blockchain technology based on Quorum or Quarta or Hyperledger Fabric.

I think we're a few years away from them sort of coming-- is there enough there? Enough

there there that it would be better than traditional databases? But they are definitely putting a lot of energy-- and even the European Central Bank, with the Bank of Japan, has an initiative as well.

But in the fourth category, central bank digital currency initiatives, I caution everybody. You don't necessarily need to use blockchain technology. This is the part of the course to say, this is something clearly inspired by Satoshi Nakamoto's innovation and inspired by stable value tokens. But when we talk about the bank of Sweden's initiative and some of these other initiatives, you'll find that, to my knowledge, they're not built on blockchain technology. That doesn't mean they couldn't be in the future, but I think they're important, because they're really important to blockchain and money and how central banks are thinking about this area right now,

We talked about this last week, the first wave of payments were all on Ethereum. And as I said, they've moved on from Ethereum. And the second wave of the payment system initiatives are all permission blockchains. And now they're looking at a third wave.

If there's further questions about how central banks are looking, I'll take them now, or we'll go on to the central bank digital currencies. Please.

STUDENT: What do central banks currently use to manage whose deposits are whose?

GARY GENSLER: Whose what?

STUDENT: Like if it's Morgan Stanley's deposits or Goldman Sachs' deposits, when they exchange deposits within the central bank, what do they currently use to manage--

GARY GENSLER: They use various forms of traditional databases, and I'm not going to pretend that I know exactly each of those databases. But usually, for interbank money, as you've talked about Morgan Stanley or Goldman Sachs, they would call it the Real Time Gross Settlement System, RTGS system. But the actual underlying database structure frankly probably goes back to batch processing. Most of them are still batch processing.

In the US, I think we'll roll out a faster payment structure in 2020. And Sriham who was visiting with us, was on a whole big advisory group to the Federal Reserve to do that. Does that help a little bit?

But the question really is, could blockchain technology inspire the next generation for the mid

2020s for any of these countries? To have 24 hour, seven days a week, but also no one central place where the ledger is kept, with multiple parties sharing the ledger.

And as Alin said, but wait a minute, wouldn't a central bank still want to have authority over the protocol? The protocol amongst 20 or 50 banks. And the answer is probably yes, but they're trying to explore what's the most resilient system.

So central bank digital currencies. Central banks, of course, already issue digital reserves. So the real question is this. Should access be given to others? Should it be expanded to the retail public?

And so these were the ones we chatted about. And we're just going to go through four of them quickly just to say-- you had a little reading on each of Ecuador, Senegal, Sweden and the Philippines.

These are the opportunities that the central bankers even talk about. Basically, in Sweden's perspective, they want to stay in the business of providing a means of payment. And the krona is so barely used. Nobody's here from Scandinavia? No. The krona is so barely used they want to keep it having some influence. I'm trying to think if I put that chart in.

I'm going to skip over a couple of things. No, I didn't put the chart in, so I apologize. So what challenges do you think are really there from our readings? Which of these challenges do you think scares the central banks the most? Is it financial stability? Is it changing the credit intermediation of banks? Is it monetary policy? Is it a payment structure? Or is it all of the above? Alin.

STUDENT: I guess financial stability.

GARY GENSLER: Financial stability. Basically, a run on the banks. I don't know. I would say that in my conversations-- and Robleh Ali has many more of them. But my conversations with central bankers, it's a mixture of the first one-- the one Alin did say.

And then, basically the third one. Credit allocation. That they feel like if we insert the central bank more directly into taking retail deposits, are we going to be inserting the central bank more into credit allocation? Or in essence, if we shrink the need for commercial banks, are we somehow shrinking the credit allocation in the economy?

So in normal times, they worry, in essence, about credit and the extension of credit. And in

crisis, they worry about being-- that it would destabilize the system. That's been my experience talking just in these eight months to central bankers. Isaac?

STUDENT: The central bank is taking the deposits, rather than the commercial bank. Wouldn't that just be reflected in a change of the interest rate? Because they would have the underlying funds. And so that might just flow back through. When the central bank is determining the federal funds rate, it would be adjusted. And so corporate borrowers would be able to borrow [INAUDIBLE].

GARY GENSLER: So what Isaac is saying is, couldn't you just address this as a central bank through interest rate policy and some differential interest rate and the pricing of money? And I think some would contend you could. But on the other side-- anybody want to take the other side?

The question really is is, does the central bank want to start making loans? Now the US central bank has a \$4.5 trillion balance sheet, as we talked about two days ago, and owns about \$2-- a little less than \$2 trillion, \$1.5 trillion of mortgages.

So in a sense, the central bank is already making a credit decision. They're lending to the mortgage market. But the question is, do you want to go even further and have the central bank picking individual companies or individual homeowners to lend to? And that's what-- if it got to any scale or size, they talk about.

Of course, they could just lend to the commercial bank system, and then the public would be lending to the central bank, and the central bank would be lending to the commercial banks.

So the design considerations-- and we didn't talk about these. These eight design considerations are all in the loop. Does everybody get it? Only a few people get it. It's a token or account and so forth.

This little money flower that Garrett has put out there-- and central banks talk about the money flower. Where is Bitcoin on this? Who wants to tell me where Bitcoin is? We'll bring it back to blockchain.

Eilon.

STUDENT: Private digital tokens, wholesale only.

GARY GENSLER: Wait, wait. So where am I pointing?

STUDENT: Blue and orange.

GARY GENSLER: Blue and orange. Oh, it's written there. You mean right there.

STUDENT: [INAUDIBLE] without the red.

GARY GENSLER: Without the red, right here. Private digital tokens, wholesale only? No.

[INTERPOSING VOICES]

GARY GENSLER: Tell me where you want me to point. So you're saying it's orange and what? And blue.

[INTERPOSING VOICES]

GARY GENSLER: It is widely acceptable. Bitcoin's widely accessible, meaning anybody can get it.

[INTERPOSING VOICES]

GARY GENSLER: I would say you can put any form of money into one of these little blocks-- government backed and not government backed. Where is stable value tokens?

Look at this. You're the closest, and I can't remember your name.

STUDENT: Connery.

GARY GENSLER: Connery, where's stable value tokens? It's not central bank issued. I'll give you a hint. So it's not in the green.

STUDENT: [INAUDIBLE] private digital?

GARY GENSLER: Yeah. It's private digital tokens. You could make it wholesale only, or you can make it widely accessible like this.

STUDENT: [INAUDIBLE] but they can be, and most of them are, central issued even if it's not central bank. I mean, I guess it depends on how you define central bank. It's not a sovereign central bank, but it's one entity that issues a token that's tethered to the US dollar. It holds the US dollar.

GARY GENSLER: So I think it's an excellent point. A stable value token that is backed by a Fiat currency is not central bank issue. I would say that it's not in the light green. But it's highly dependent on the central bank. It's highly dependent on putting deposits in commercial banks. Tether, which

purports to be a little over two \$2, \$2.5 billion crypto which is all backed by US dollars, at one point in time last year, they lost some of their commercial bank accounts. Meaning the commercial banks would not take their dollars.

The commercial banks in many countries said, forget it, I can't have you as a customer, I can't follow you for any money laundering and otherwise. And so in essence, you are highly dependent, if you're a custodial stable value, on the central bank. I agree with that.

But I think you're not not central bank. [INAUDIBLE] a little--

STUDENT: It's just central.

GARY GENSLER: It is central. Right. So there's a lot of paradoxes and irony in the blockchain crypto space as to how centralized something it is and how decentralized. And from Satoshi Nakamoto is a very decentralized way.

So we're going back to these. And so Ecuador. Anybody read the Ecuador thing? Want to tell us a little bit about-- Leonardo?

STUDENT: Well, I think it was a story of failure.

GARY GENSLER: A story of failure.

STUDENT: Because [INAUDIBLE] issue the [INAUDIBLE] money. It was backed by the central bank. But the central bank had no credibility or trust from the users. So it never took off. So the government of Ecuador had just defaulted a few years before they launched this. The economy was [INAUDIBLE]. So they issued something where people didn't really know whether it would still be there within a few years.

The usage was extremely disappointing compared with the initial expectations.

STUDENT: But another interesting point in that article was that financial institutions were not obliged to use it whatsoever. And I sort of wonder if there had been a minimum level of balance sheets at these institutions, where they were required to have a minimum level of the cryptocurrency, could that have helped it a little bit? I don't know.

STUDENT: That's [INAUDIBLE] they also failed to manage expectations. Because even in the first year, what they are saying, what they are claiming is, there are going to be 500,000 users or

something. [INAUDIBLE] turns out just 5,000 accounts or users came up.

So it's a great story of failure. [INAUDIBLE]

STUDENT: Bitcoin was also these matching benefits and costs that were associated with the project. They kind of [INAUDIBLE] calculations were made. The benefits were less than \$1 million compared to almost \$7 million [INAUDIBLE]

From the start, from the outset, the design wasn't conceived in an appropriate manner.

GARY GENSLER: And again, this is somewhat inspired by crypto finance. No blockchain technology involved in it. Which, by the way, is going to be true for the next three examples as well. But it's relevant. This is sort of also inspired by initiatives like [INAUDIBLE] and so forth. It's like, how do we get more inclusion and use dollars? Kelly, and then we'll go to--

STUDENT: I just feel like it was less of a-- I feel like it was less of an attempt to take some new digital currency initiative and more of an attempt to make profits. Because they said that basically the state had a monopoly on this.

And as Leonardo mentioned, there was previously hyper inflation. So once they discovered that it wasn't really getting them the profits they wanted [INAUDIBLE]

GARY GENSLER: [INAUDIBLE]

STUDENT: Right. So I'm sort of wondering-- the motivation I don't really think was to do a proper job on the technology side.

GARY GENSLER: And you're probably right about that. One good thing that came out of it, they finally sort of admitted that they shouldn't maybe be in the monopoly, and they let-- mobile phone payment alternatives were authorized for the phone companies. But I'm not close enough to Ecuador to know whether that was really done. Maybe it's now just a duopoly of a couple of phone companies doing it. So they might have just shifted some economic rents from the government to a couple of major companies that are friends of the government or something.

The Philippines. I think there was a reading on-- anybody want to say something about-- anybody from the Philippines? No. Anybody want to say something about what happened in the Philippines? And you're going to see something that's similar about this in Senegal.

There's a software provider called eCurrency Mint Limited in Ireland that is marketing around the globe to do digital Fiat currency.

I think they're careful and they call it digital Fiat currency rather than the central bank digital currency. But nonetheless, every time there's a press release, whether from the Philippines or Senegal or elsewhere, somewhere in the press release you see blockchain technology use for-- I've done my best to read everything I can on these two since last summer, when I stumbled upon them in July. I do not believe that either are using blockchain technology. But they're sort of using the gloss of the terminology.

But it's still-- Senegal, more than the Philippines, is something that central bankers are looking at. Importantly, it's issued by a commercial bank. It's not technically issued by the central bank. The central bank has actually put out a statement and saying, this is a test, and a learned thing, and a regulatory sandbox. The central bank is sort of saying, all right, we'll let-- this is a little bit more akin to private banknotes in the 19th century in the US.

And I'll flip to the Senegal one. This is in the West African economic and monetary union. So there is a monetary union, I think, of 14 countries all using a currency. It's called the Franc, I think. The F--

STUDENT: They call it the [INAUDIBLE].

GARY GENSLER: What is it?

STUDENT: [INAUDIBLE] They use [INAUDIBLE].

GARY GENSLER: [INAUDIBLE]. Have you ever used it? Do you know it?

STUDENT: [INAUDIBLE]

GARY GENSLER: So one country in a 14-nation block said, we can maybe get more financial inclusion. Good. I think there's a good motivation there. We can get more financial inclusion. We can put [INAUDIBLE]-- did I say it right? [INAUDIBLE] on an electronic platform. We'll use this software provider out of Ireland that keeps knocking on our door. And we'll see if we can push it out a little bit under some e-money regulations.

Technically, it's e-money under pre-existing regulations. But I would say a lot of central bankers are kind of-- elsewhere around the globe sort of watching, what does that do? What

does that mean? Does it increase financial inclusion?

And probably the most interesting one really is in Sweden. Sweden has said, these are the benefits. These are written in a document. They've written now the third document on this. It came out a couple of weeks ago. It was not assigned reading because it just came out, and it's 50 or 60 pages, if anybody wants to log through it.

They say, it's going to continue the public access to the risk free guaranteed means of payment. That's the key thing to them. You have cash in your pocket right now-- krona-- but very few people have it.

So few people have it that most retailers in Sweden are now saying, I will not accept krona. And it's not such a big country that a bunch of people want to own krona for a store of value. So the total outstanding-- is there a question?

STUDENT: Because like all the companies that are listed, they're listed in kronas in Stockholm. So how come it's not used at all but the stock markets use it widely?

GARY GENSLER: The stock market what?

STUDENT: Like the companies which are listed, they're listed in kronas.

GARY GENSLER: Correct.

STUDENT: So like how come it's not used at all?

GARY GENSLER: It's not used-- no krona is used digitally. I'm saying paper krona is not used. Paper krona. But they're saying, we maybe want to make sure that there's a government's direct relationship to electronic government money.

The properties. They've said-- they were willing to put a comprehensive range of services in, make it widely available. They've answered the design considerations. And they actually say that they're looking at putting interest rate on this. They think that putting an interest rate on it makes sense. And that it should have e-identification.

They say, it will be traceable. They've already said in their documents they're not going to go with totally anonymous e-money.

This is out of their report. But as you can see, the blue line is Sweden. That their total

outstanding cash-- this is physical, tokenized cash-- was 4% of their GDP. It's now less than 2% of their GDP.

The US and Europe would be the green line. We're up to about 10%. But as we talked about on Tuesday, 8 of those 10 points in the US are \$100 bills. And 4 or 5 of the 10 points in the US are outside of the US.

STUDENT: [INAUDIBLE] is part of this because bank deposits or reserves or what we would hold involves in dollars in the United States? The banks here are holding in Euros.

GARY GENSLER: No, this would be cash that's outside that the public holds. Or the public can--

STUDENT: Not held in banks.

GARY GENSLER: That is correct. So if it's-- if it's cash that JP Morgan is holding physically, just because they're putting it in that daily ATM machine, it might be included.

STUDENT: Or like the x number of dollars in everyone's bank accounts [INAUDIBLE] bank deposits.

GARY GENSLER: That's [INAUDIBLE] bank deposits.

STUDENT: [INAUDIBLE] M1.

GARY GENSLER: This is actually only about half of M1. This is the \$1.6 or \$1.7 trillion of-- it's about \$1.8 trillion. \$1.8 trillion in the US, of which \$1.6 trillion or \$1.5 trillion is \$100 bills.

There's only \$200 to \$300 billion of US currency, paper currency, that is not \$100 bills. And well over half of \$100 bills are outside of the US per Federal Reserve statistics. I think 57%.

How they trace that, that would be another story for another day. But Sweden doesn't have a bunch of people holding the equivalent of \$100 bills or 500 euro notes as a store of value. And so you see a decline of their paper. You see the retail merchants aren't taking it. People aren't using it. So Sweden feels compelled to say, I want to do something here.

Tuesday, we're going to be talking about crypto exchanges. It's a bit of a setup also for Thursday when we've got our outside speakers I keep chatting about. I think Talida-- Talida had to leave early today, but I think Talida is going to send you a message or put up on the website, Jeff Sprecher and Kelly sent a list of readings.

I guess they're used to being-- they're not actually used to doing-- they're doing this as a favor

for me. I got to know him very well when I was at the Commodity Futures Trading Commission. They're rolling out the-- both a crypto exchange and a payment alternative. And so they sent a bunch of things that they thought you might want to read.

So we put them up on the website midday today. I know that you've got a lot of other things to do, and it's getting to that time of year where there's fewer and fewer things you're reading. But what we're trying to do on Thursday is, I'm going to open up with a little fireside chat.

They want me to ask them a few questions for 10 or 15 minutes. And then we're going to open it up. It's all going to be your time. They're with us about an hour.

Now we might encourage them to stay till the end, but they're here from 2:30 to 3:30. Now I know we always start at 2:35. But if they're ready to go at 2:32 or 2:33, I might start with them and start the fireside chat. And then it's going to be you're asking them questions. So to the extent that you read the things that they sent around, better for you.

I will say this in advance, because one or two of you have already come saying, I want to see if I could go work for the company that owns the New York Stock Exchange and owns [INAUDIBLE] and everything. I will be glad to send whatever resumes or anything you want to Jeff and Kelly. I'll act as a clearinghouse and send it if that's your goal.

But in advance, I'm not going to give their private emails to you and everything like that. But I think that would be an interesting conversation next week.

So central banks play an important role in the economy. We already live in an electronic age. But they really are absolutely at the epicenter of money and how money's been defined for 300 or 400 years.

Payment systems and Fiat currencies have had challenges. I still continue to think blockchain-- I told you, I'm not a maximalist, but blockchain technology can be a catalyst for change. Central bank digital currencies is evidence of that, even if it's not based on blockchain technology. I think it's partly inspired and urged on by this. It doesn't solve what blockchain technology would do for it, but--

I think that central banks by and large are monitoring. They're exploring payment systems, and a handful are looking at the central bank digital currencies.

I think-- and this is my own prediction-- that with 180 countries, somebody, Sweden might be

the one to do it, will be there to do some central bank digital currency. Venezuela says they're doing one backed by oil. So it might be the other end.

Iran says they want to do one. They would avert sanctions. We didn't talk about that, but sanctioned countries are looking at ways to avert sanctions. So there could be countries in distress, countries looking to avert sanctions, or, you know, kind of first tier economic countries like Sweden that are looking at it. So I will see you next Tuesday.