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## The Future of Digital Fiat Currency

A Macro Musings Transcript

By [David Beckworth](#) Senior Research Fellow | Rohan Grey

(Audio recording link [here](#)).

**David Beckworth:** Our guest today is Rohan Grey. Rohan is a legal scholar and the research director of the Digital Fiat Currency Institute, and joins us today to discuss the case for digital legal tender. Rohan, welcome to the show.

**Rohan Grey:** Thanks for having me.

**David Beckworth:** Rohan, so we want to talk about digital fiat currency today, but before we do that, why don't you tell your listeners about your journey into digital fiat currency. How did you get there? What was your career path?

**Rohan Grey:** Yeah, sure, thanks. Well, I started off right at the beginning of my undergraduate degree studying political economy at the University of Sydney, and I did

international relations, and then when I moved to the United States about 10 years ago I sort of started reading a lot of blogs and came across a group of heterodox economists who go under the sort of name modern monetary theory, or MMT, and coming from a family of lawyers and sort of having a heterodox political economy background it made sense to me and spoke to some of the most important issues, and then when I went to law school it became very clear to me that a lot of the lawyers who were talking about money and economic concepts everyday in their legal classes were not really interrogating or thinking about the sort of macroeconomic monetary design angle of the economy, even though there were obviously a lot of legal issues about that.

**Rohan Grey:** And so I became more familiar with the movement known as legal realism, which is sort of critically evaluating the political and underlying social dynamics that influence legal institutions and legal processes, and that sort of way of thinking really jived with the way that MMT approaches the economy, questioning the kind of naturalization of money, of macroeconomic policy ideas, and looking at the institutional, legal, accounting, and power dynamics that shape money, the state, public policy making, markets and all of the various sort of institutions of the modern economy.

**Rohan Grey:** I also, probably my third major influence in addition to MMT and legal realism was the internet freedom movement, which mostly through a professor of mine at Columbia Law School named Eben Moglen who was this legal counsel for the free software movement for a number of years. My father was also formerly a scientist and worked in the Department of Communications on cable television legislation back in the 1980s in Australia and Southeast Asia, so I kind of had a family interest in technology, but the sort of world that we live in now has been shaped so profoundly by digital technology and the internet, and in many ways I think the economics of the internet and the social dynamics of a world in which everyone is connected to each other, is very, very different from prior eras.

**Rohan Grey:** And at the same time we're making a number of really, really important decisions in this generation right now about how that internet is gonna be structured, whether it's Facebook and all of the data issues around it or the economics of copyright and sharing

and things like that. So it seemed like a very important intersection of the monetary macroeconomic issues that I care about and the sort of state of the development of the world, to think about how digital technology and the internet would interact with those issues. And that led me naturally to digital fiat currency.

**David Beckworth:** Very interesting, and that does seem like a natural evolution. Tell us a bit more about MMT. So you mentioned MMT, legal realism, and the internet freedom movement, but help our listeners understand what MMT is. I'm sure some of them already know, but for those who don't, what is MMT and how is it different than mainstream macroeconomics?

**Rohan Grey:** Sure. Yeah. So I think MMT in many respects has its origins in a different set of foundations, in part that is questioning a lot of the formalist impulses that you're seeing in orthodox economics, but in part it's philosophical. So rather than starting from a presumption of equilibrium or a presumption of some natural market or a presumption of people who are coming together voluntarily it's sort of historical in the sense that it looks at the way that economies have evolved and particularly starting from that question of what money is and what makes monetary economies different from other economies. So the word modern in modern monetary theory is not modernist 20th century, it's modern in the sense of advanced civilizations where you have complex interactions that go beyond face to face.

**Rohan Grey:** So in that sense modern kind of goes ... it's a reference to Keynes' 'A Treatise on Money' when he says "the state comes in as the authority of law." That determines what ... it enforces contracts and also determines what can be used to pay contracts, and that has been true of all modern economies for the last 4000 years. So MMT looks at money as a creature of public law and public authority, and of power relationships, and then from there looks at the way that an entire monetary production economy, like we live in today, is shaped by the decisions around money.

**Rohan Grey:** In part that's looking at things like real production, so the relationship between monetary liabilities, whether they're taxes or fees or fines and the state of being unemployed, that is to say looking for money, that you're willing to depart with your labor power for and how

employment is intrinsically a monetary phenomenon. Partially it's looking at the way that financial institutions and monetary instruments are created and shaped, so looking at banking, looking at central banking in a lot of detail, but I think one of its benefits from a lawyer's perspective, and one of the reasons why I think it's found a very strong foothold in the legal academy, is that it is intrinsically able to sort of alternate between the concrete and the abstract. It can get very detailed about institutional dynamics and operations in accounting, but then also zoom out and think about how those are a reflection of deeper underlying power structures and social dynamics. So never kind of confusing the surface for the depth, but also being able to sort of see the relationship between form and substance in economic institutions.

**Rohan Grey:** I think it has a number of different parts. Some people kind of like to reduce it down to a slogan or a simple policy conclusion in one area ... and obviously its focus is mostly macroeconomic, but I think it actually is really an entirely alternative paradigm and set of founding assumptions in a kind of Kuhnian sense, in that it has a macroeconomic set of logic to it and it connects in with broader heterodox traditions. Post-Keynesian, institutionalist, Marxian, Straffian, and in that respect it's a sort of synthetic tradition that draws on a lot of those other areas even while bringing its own kind of unique lens and way of putting those different things together.

**David Beckworth:** Yeah, and it's something that has received a lot of attention since the crisis. There's different schools of thought that have become more popular or less popular since 2008, and MMT is one of them. And I know, as you mentioned, it tends to get simplified down to a slogan or a simple understanding and it's much richer than that for sure. But just for the sake of our listeners, wouldn't one of the policy implications be, so you know ... Let's step away from all the rich details that you just went through and I think we'll probably have a show on MMT in full at some point in the future. I really want to get someone on here to discuss it. But the policy implication would be that government can do a lot more to maintain full employment using different forms of fiscal policies. Is that fair?

**Rohan Grey:** Yeah, that's definitely a huge part of it. In part because I think unemployment and structural underproduction is a huge problem. I think it was Tobin who had that great line that it takes a lot of Harberger triangles to fill an Okun gap. So we can spend a lot of time thinking about market inefficiencies in a whole range of areas, but this huge amount of wasted potential left on the table, and when you think of the way that we're looking around the world right now with the rise of fascism and things, the failure to address that problem has had huge implications, and that's before you get to the planet burning and the need for a Green New Deal, which full employment policies obviously tie directly into.

**Rohan Grey:** But I think it goes just beyond sort of fiscal policy and a job guarantee, which is obviously a major highlight or emphasis, it goes into monetary and financial system designing. One of the big influences of a lot of the living MMT economists was Hyman Minsky, who I think as everyone now knows was a pretty sophisticated thinker about financial institutions, and whether it's things like advocating a permanent zero interest rate or proposing financial sector reforms, or thinking about the relationship between macro prudential regulation and monetary policy. There's a lot in the MMT paradigm that leads you to those different topics, and a lot of my thinking about how to sort of deal with financial regulatory questions-

**David Beckworth:** Sure.

**Rohan Grey:** ... come directly from that.

**David Beckworth:** Okay, well fair enough and we'll have to come back to MMT in the future. As you can tell there's a lot there to unpack and we will have to unpack more of that later. Let's move on, though, to the area that you've written several papers on and really the focus of the show, and that is digital fiat currencies, and there's a lot of reason to be talking about this now, and it isn't the fact you've written several papers on it. We will have a link up to them. One particular I found very enjoyable to read and very accessible for even a layperson was a paper you coauthored that was titled 'The Case of Digital Legal Tender,' and this is subtitled, 'The Macroeconomic Policy Implications of the Digital Fiat Currency.'

**David Beckworth:** This was a great read. You go through it, again very accessible, but let's talk about some of the motivations for why people are talking about this. Why you have this

paper out, why others do. And I guess the first thing I'd begin with is just this general interest in electronic forms of money, right? So probably one of the most obvious one would be the cryptocurrency, I'll call craze, because I think it has been a bit of a craze that we've seen. Bitcoin's price was like a bubble, close to \$19,000 a coin and down to \$3,000, and that's not really the focus of your paper but it shows its interest in it.

**David Beckworth:** There's been other proposals similar to yours, though I don't think exactly like yours, just a few that I'm familiar with and there's others. David Andolfatto of the St. Louis Fed wrote up a proposal for a Fed coin. I was at a conference recently with Michael Bordo and Andy Levin. They have an NBER working paper that was on this topic, it was titled 'Central Bank Digital Currency and the Future Monetary Policy.' Christine Lagarde, the IMF Managing Director, had a paper November 2018 titled 'The Winds of Change : The Case for New Digital Currency.' So there's a lot of discussion among economists, and then there's some countries actually tinkering with this. Ecuador I know tried it 2015 to 2018. The Swedish Riksbank is gonna introduce one another, so they're chatting about it. There's a lot of interesting conversations and some movement going on in that direction.

**David Beckworth:** You mentioned you're a listener of the show so you're probably familiar with Morgan Ricks, who was on here, as well as all the publicity his paper got with Fed accounts. So there's a lot of, I think, activity surrounding this. Do you want to speak to that?

**Rohan Grey:** Yeah, sure. I think first of all there's been a long-standing interest amongst the sort of privacy and cypherpunk community in digital currency going back to the 1980s, I think with David Chaum which was a recognition that as we move into the digital era either ... a lot of our financial and economic activity is going to be monitored and subject to some sort of master-server, master-client relationship in a way that other internet services nowadays are, or not. And so that was an early recognition amongst sort of technologically-advanced people this was gonna be important.

**Rohan Grey:** I think the 2008 crisis brought up a lot of resentment towards both the government and the traditional banking sector, and the emergence of Bitcoin and things were seen as an alternative to that, and driven in part by the sort of emerging internet culture that is

a sort of increasingly dominant part of our lives. At the same time, central banks and others were sort of late to that game, and I was always interested in the public currency side of things because of my understanding of money influenced by MMT and others that suggests that it is really the public legal authority's determination of what it accepts as money that serves as a sort of foundation for the rest of the kind of hierarchy of private moneys.

**Rohan Grey:** So even as the cryptocurrency craze was thinking about a world without the government and this sort of private money implications, I always thought that the way that whole craze was eventually gonna settle was in the public space, and we saw that even within the private currency space and move towards what we're now calling stable coins or tethered coins, and that's a reflection of the fact that whatever this technology does for payments, the underlying theory of money isn't necessarily changed as a result of these technologies, and that underlying theory of money historically always has a relationship with the state in some way or other.

**Rohan Grey:** And David Andolfatto who's a friend of mine, and Morgan, who's a friend of mine, I think David was kind of early, certainly from a central banker's side looking at these issues, and I've watched over the last couple of years the kind of chatter amongst central bankers around the world go from "this is an interesting idea but it's a long way away ;" to "this is an idea that's coming, we should start thinking about it ;" to "it's here right now what are we gonna do about?"

**Rohan Grey:** Certain countries are kind of more ahead of the curve on that. I was just in China for the launch of the Chinese sort of lab for the Digital Fiat Currency Institute, and the Chinese Central Bank is very forward thinking on this, even if they're doing things that I wouldn't recommend or agree with. The Swedish Central Bank is quite ahead on this issue. The Canadian Central Bank is quite ahead on this issue. Certain banks in the developing world, Kenya, Egypt, the Philippines, Indonesia are also quite forward looking on these questions.

**Rohan Grey:** I sort of see this as an issue who's time is sort of coming quite rapidly even if how it actually ends up being implemented might take a long time, you know in the same way

as I think we saw a rupture in the monetary policy consensus around 2008, and it's taken a while for that to materialize in day-to-day policymaking, but that that rupture sort of happened intellectually first. I think we're seeing that finally now in central banks.

**Rohan Grey:** And Morgan's proposal, which I fully support and agree is very, very important, is to provide central bank accounts for everybody and to sort of open up the Fed's balance sheet. I think that's complementary to the work of other people like Mehrsa Baradaran for public banks or postal bank accounts. I see my contribution as really in that cash space, and so I don't think these are competing, rather than complimentary ideas that a digital cash instrument serves an ultimately different function to a bank account or any kind of account. So the question isn't is this different to Ricks or is this different to bank accounts for all, as much as this is trying to digitize cash, separate to digitizing the bank account system.

**Rohan Grey:** And from my point of view, that's actually a more fundamental technical challenge and technical layer because if you have a digital cash instrument, a token or a bearer instrument, you can put them in the equivalent of safety deposit boxes and authorize intermediaries to access those safety deposit boxes and make transactions from them. And you can recreate the phenomenon of accounts, but you can't create the phenomenon of a cash instrument from an account base system. So if you have to build a technical layer first, I think the cash bearer instrument is the first layer, and then the account builds on top of that, at a technical level, even if conceptually, I think the account is a more coherent way of thinking about money.

**David Beckworth:** Well what I liked about your paper and your discussion about a digital coin or digital currency, where I think it is different, and again it appeals to people like me probably right of center, is that I think it really deals with the privacy issue head-on and it preserves privacy, and that's one of the big concerns today, right? With all the data issues, you mentioned Facebook earlier. While some of these other proposals I see the efficiency gains and some of the benefits they could bring, they raise in my mind privacy concerns. So cryptocurrencies or even Morgan's having a checking account at the Fed, at the end of the

day there's these back doors where the government can see what you're spending your money on, to whom are you giving funds?

**David Beckworth:** Where I think with your approach if I understand it correctly, it would effectively mimic what cash does today and let me ... Is that fair? Quick reply to that, is that fair?

**Rohan Grey:** Yes. Yes, and to clarify I wrote that why paper with Jonathan Dharmapalan, who's the CEO of eCurrency Mint, and I wrote as a consultant with them, but that was a sort of conceptual paper first and foremost. They sort of said to me, "Assume our technology works the way that we said it does-

**David Beckworth:** Okay.

**Rohan Grey:** ... and we brought security who are working on that, what should it look like?" And I got to write that paper kind of giving what I think is the best conceptual model. So if their technology doesn't meet that standard I have fidelity to the standard, not their technical model. ... and if the technology doesn't exist yet, my point is I think this is what it needs to look like. And I completely agree, I don't think civil liberties are a left-right issue. I think it's a top-down issue.

**David Beckworth:** Right.

**Rohan Grey:** And the thing that really scared me was my old law professor, Eben Moglen, from that internet freedom world ... He lost dozens of family members in the Holocaust and he said to me, "You know next time they come for my people they're gonna get every single one," because they're gonna know everywhere everybody is-

**David Beckworth:** Exactly.

**Rohan Grey:** ... and everybody everybody talks to, and we can have privacy rules and regulations about public databases, like with Social Security and things, and I think they're important but I don't think they're enough. I think we've got evidence from FISA courts sent from the NSA and things that they are willing to break financial cryptography when they feel the need to and I think we've got evidence that they're willing to lie to the public when they

need to, so I am not comfortable with relying on the government having a list of everybody everybody knows and every financial transaction they all do on the presumption that we can keep it honest. I think that's too much power to be concentrating and I think it's too risky in the event that those safeguards don't work. So I think anonymity of cash is a critical part of economic freedom, and that's not a left-right issue to me. I think that's something that needs to be taken more seriously than just we can pass a law.

**David Beckworth:** Yeah I completely agree, and like you said we've seen evidence of the state abusing that power already, the NSA, but even something as simple as the marijuana growers, right? At the state level here in the United States. States have legalized marijuana growing but the Federal Reserve and the federal government still looks down upon it and makes it hard for them to use the payment system. And there's other examples of it, Wikileaks also had some pressure applied to it. So if you do something that the state doesn't support or if you do something maybe that's not conventional, it just seems to me it's an open door.

**David Beckworth:** J. P. Koenig, who I know you're familiar with his work, he summed it up nicely with digital currencies, and again this is like more of like a Fed coin digital cryptocurrency, but he summed it up, "The state will issue digital currency that protects us from information snoops in the private sector on the condition that the government gets a backdoor."

**Rohan Grey:** Yeah.

**David Beckworth:** And that to me is unacceptable.

**Rohan Grey:** Yeah this is the Peoples Bank of China's approach, they're calling it managed anonymity. And I agree with you, I think it's completely insufficient. The example I provide on this is, if somebody said to you the government is gonna put a little computer chip in the base of the skull of every single human on the promise that it's never gonna press a red button that would activate those chips and, therefore, control your brain. Would you trust that? No. Well why would you do it with your wallet when your wallet has so much information about your life that I can essentially map half of what's going on in your brain just by looking at your bank statement. Why would you trust that that red button would never be pressed.

**David Beckworth:** Right.

**Rohan Grey:** Whatever your political views are I think that's a basic matter, and there was once upon a time where people across the political spectrum knew that if anybody comes and tries to torture you to give up information about other people, you don't do that. I think we've kind of lost that respect for privacy in this generation. J. P. Koenig has been one of the best advocates I think for the need for anonymity in the digital space. I think another person who's name deserves a mention there is Brett Scott, who's been an excellent public advocate for anonymity and talking about the war and cash as a war driven by the same data-mining motivations as we see with Facebook and Google and these other big tech giants.

**David Beckworth:** Yeah.

**Rohan Grey:** Is that they see the digitization space, whether it's mobile money in the global south or sort of digital narrow banks and things in the developed world, they see that as another opportunity to get their hands on a pot of data. And whatever protections we had in the past for banking data relative to other kinds of data I think are dying and are also not sufficient.

**David Beckworth:** Yeah, so I think your proposal is unique. It's not like ... what I see is kind of a two-standard proposal. So you have the Morgan Ricks proposal which would give you access to a checking account at the Federal Reserve, which is great in terms of safety but the Fed knows what you're doing, and then there's the cryptocurrency which also has the ability to be hacked or some backdoor entrance into it. So those seem to be the two main visions out there and you are addressing what I think is a totally different or untouched area. Has anyone else worked on the digital currency angle?

**Rohan Grey:** Not that I know of other than the group at eCurrency Mint.

**David Beckworth:** Okay.

**Rohan Grey:** And they're working ... which is why I coauthored that paper with their CEO. Their chief technology officer David Wen, who was the founder of the Digital Fiat Currency Institute, has also been serving as the chairman of the working group on standardizing digital

fiat currency regulations and technical standards for the International Telecommunications Union, which is the UN's IT agency. So he's working at the level of sort of ISO security standards and things like that to try and work out what the kind of standards for information delivery regarding digital fiat currency are gonna be like across central banks.

**Rohan Grey:** So there are other people who care about it and see it the same way as I do. I don't know how many have been writing on it, which was why I was interested in writing that paper with Jonathan, and partially I think it's a matter of most of the people who are interested in privacy don't have a working theory of money that leads them to think that the public money space is the best place to do it. So there are people who care about privacy and things, but they end up sort of looking at Zedcoin or Monero or something like that. Or if you are in that public money space you're probably a central banker, which means you're probably a macroeconomist, which means you're probably trained mostly in statistical modeling and data analysis, not in theories of privacy. And even if you are trained in theories of privacy, to make this issue the hill to die on within your institution is a pretty big risk because the government loves having more information. Why would it ever agree to voluntarily restrain its own hands unless the ACLU was outside protesting or something.

**David Beckworth:** Well in fairness to the Fed, I could understand also why they'd want more information. They could make better informed decisions, but the danger is when you get some bad players in there who abuse that privilege and-

**Rohan Grey:** Right. If you ask the police whether the ability to wiretap peoples' phones is useful, they can come up with a very long list of why it's very useful.

**David Beckworth:** Right.

**Rohan Grey:** Because it's not their job to consider what the potential risks are on the other side.

**David Beckworth:** Exactly. So I think it's great that you are touching on this area, this third option. Again, there's two other options out there, this is a nice third option, and I think maybe it could be a good compromise moving forward if there is gonna be a big conversation, and

particularly in light of things we've seen with Facebook. The differences in views of data privacy between the US and Europe for example. So I do think this is a very promising area and something I think is important to have a conversation about, and that's why you're on this show.

**Rohan Grey:** If I could just make one point.

**David Beckworth:** Sure.

**Rohan Grey:** I think that the thing for me is that I expect that most countries are not going to start with just offering free digital cash accounts to everybody, but as I said earlier you can recreate the phenomenon of accounts on top of this technical layer. So what's important to me at this stage of the game is to make sure that the global technical standards that are being developed are open and allow for this kind of-

**David Beckworth:** Okay.

**Rohan Grey:** ...fiat cash decentralized instruments. So that at the very least the door remains open in the future to anonymous cash if we ... If the decision is made at this point in time and I think it really is about this point in time that central bank accounts for all are sufficient, then it's gonna be very difficult 20 years down the track to reverse that decision and try to create a decentralized cash-based network once we've built single-data repositories in each central bank around the world.

**Rohan Grey:** Whereas if you build the technical layer that's open now, even if the first iteration of that looks like bank accounts and things like that, at least that conceptual opportunity or option of maintaining digital cash is still on the table.

**David Beckworth:** Okay. So we've been talking about your proposal and particularly how it relates to privacy. But let's jump into it, and talk about how this would actually work, how it would operate, and walk us through the different aspects of it. We've already mentioned it's like cash and so ... Tell us a little bit more how it would be like cash. We've talked on the privacy side, but what about transactions, supply cash, all those things. What would we see?

**Rohan Grey:** Sure. Yeah. So the first thing is that macroeconomically speaking it doesn't have any direct disruptive implications in the sense that this doesn't change fiscal policy calculations. It doesn't change even broader monetary policy other than that it might clarify a few things and make new possibilities better, but it doesn't require issuing more or issuing less than we currently do, and in the same way as cash right now, the quantity is essentially demand driven. It's a residual of how much people want to take out of their bank accounts or out of other forms of savings instruments.

**Rohan Grey:** So the digital fiat cash would sit along ... it'll layer, would sit alongside the other existing layers quite comfortably and to the extent that the amount that people wanted to hold fluctuated it could be accommodated within a standard macroeconomic paradigm. The way that the eCurrency folk have developed a technology for it and the way that seems to be the most promising to me, is to think about the security layers the same way as we think about a cash instrument, that is to say there are multiple layers. There's the watermark. There's the patented ink. There's the signature, et cetera, et cetera.

**Rohan Grey:** So when it comes to the instruments here, what we're talking about is a cryptographically-secure instrument that has a hardware component, it has a software component, it has a kind of physical protocol component to ensure that the number of units that get created is fixed. That doesn't mean it's static. It can be elastic.

**David Beckworth:** Sure.

**Rohan Grey:** But that essentially in the same way as with printed notes there's a theoretical list out there of every barcode that's ever been printed that hasn't been returned and burned, that there would be a list of every barcode of every dollar that was issued in this digital fiat currency. Now the interesting part comes at the part of transactions, because if you inject those notes or those digital coins into a wallet network, and then the wallet network is essentially a closed network, and by that I don't mean there's only ten nodes or something, but that the cash can't leave that network. So you could add more nodes, but the cash can only transfer from one node to another in that network.

**Rohan Grey:** The question then just becomes how to ensure you don't have double spending? And the way to do that is for the network to have a protocol in the same way as the internet has TCP/IP for example to send packets of data. Where every time two nodes in that network communicate with each other, what that communication is involving is the two basically mixing together their respective wallets, or their respective balances, and then creating two brand-new balances out of that mix that have different values. I'll explain what I mean by that, but to clarify, this is different from me having a bunch of notes and then sending some of those notes to you.

**Rohan Grey:** This is much more metaphorically similar to getting change for notes. So imagine I go to a bank and I've got a hundred dollar bill, and I ask for five \$20 bills. Right?

**David Beckworth:** Okay.

**Rohan Grey:** Those five \$20 bills have different barcodes on them than that original hundred dollar bill. So I could theoretically launder my money by just getting different barcodes for the same amount of dollars. Now imagine you and I together come up to the wallet network and you have a hundred dollars and I have a hundred dollars. We both give them the hundred dollars each and we say we want ten \$20 bills back. Again, that wallet protocol doesn't need to know who we are. It doesn't need to know which one of us gave which hundred dollar bill, all it needs to know is that it was given \$200 and it's giving out \$200.

**David Beckworth:** Okay.

**Rohan Grey:** And now we can see how transactions can work. Imagine you give a hundred dollars and I give a hundred dollars to the machine, but instead of getting a hundred dollars each back, I get \$120 and you get \$80 back. From the point of view of the machine, it's done the exact same transaction as if there was just one of us. It's had \$200, it's given back \$200. The question is how much each of us take back from that process, but crucially you and I are not actually transacting anything between each other. Right? There's no record of me sending something to you. There's a record of both of sending something into the system and the system sending something back to us.

**Rohan Grey:** Now thanks to recent developments in homomorphic encryption and double-blind encryption and things that go back decades, that wallet network doesn't even need to know who we are and it doesn't need to know how much we're asking to exchange. All it needs to know is that the amount it's getting in, is the same as the amount it's giving out. So if you imagine the metaphor, I have a bag of money. I put it on one side of the scale and then there's two bags of money on the other side of the scale. As long as those two equal each other, the scale doesn't actually need to know how much they weigh.

**David Beckworth:** Okay.

**Rohan Grey:** So the way that you ensure the anonymity here is that the wallet network or the protocol that is the glue between each node in the network does not want to know who we are and how much we're transacting. All it wants to know is that the quantity going in is identical to the quantity going out, and all of the other aspects of that transaction can remain private between the two of us.

**David Beckworth:** Very interesting.

**Rohan Grey:** The only thing that it's validating at the network level is the no-double-spending rule, and it's a very different ... In that sense it's a technically different thing than cash. Because with cash there is no central network validating the double-spending rule. That happens through anti-counterfeiting and the Secret Service and things like that.

**David Beckworth:** Yeah.

**Rohan Grey:** So in that sense there is this sort of invisible network layer that is built on top. It's not a perfect metaphor to call it digitizing cash, but it is cash in the sense that any true nodes in that network should be able to adopt that protocol and then send a message between each other and that does not need to be sent back to central headquarters.

**David Beckworth:** Yup.

**Rohan Grey:** As long as the protocol is ensuring that the two equal each other, the central bank knows it issued a certain amount of barcodes at the start and that the protocol has ensured that no new barcodes were created within the network.

**David Beckworth:** So this is the technology that preserves the privacy for the users of this digital fiat currency?

**Rohan Grey:** Yeah. If you think about email for example, and this is something I only learned in the last five years. Email operates through a set of protocols, so when you and I access a website there's a certain kind of packet that's being sent across the internet. When you and I send an email it's actually a different kind of packet. It goes to an email-receiving kind of software that recognizes that this is being sent through email protocol. So in that sense you can have a general internet data layer, but only something that is programmed to receive these digital fiat currency ... messages will be able to transact in this wallet network.

**Rohan Grey:** And it's in the standards for that protocol where the interesting kind of technical decision-making happens. In the same way as TCP/IP is only one form of protocol for sending data across the internet. And even email is only one form of messaging. So we have now XMPP which is a chat-messaging protocol. We have new forms like Matrix which is a new synapse protocol, which is a different kind of information transfer protocol. And so it's in that decision of for two nodes to recognize each other, they both have to have agreed to be adhering to this underlying protocol, in the same way as for two email servers to communicate with each other, they have to be agreeing to use a certain email protocol that you can enforce standards and technical soundness without a closed system.

**David Beckworth:** Okay. Well let's move from technology to how it's used by consumers and also by banks. So as a consumer, I would have a digital wallet, from what you've said earlier.

**Rohan Grey:** Yeah.

**David Beckworth:** And if, let's say I go to you, I wanna buy a used car from you. I'm in New York, I know you're in New York right now. I'm up there and you wanna get rid of your car, how would I actually do a transaction for the vehicle?

**Rohan Grey:** Yeah. So and the first thing just to clarify here is, it could be that certain commercial activities, certainly the activities of large companies or things, might have additional financial-reporting requirements beyond what happens at the payments layer.

**David Beckworth:** Okay.

**Rohan Grey:** The crucial thing here is that the instrument itself is dumb. So to give an example, we have a \$10,000 restriction on taking cash on a plane.

**David Beckworth:** Right.

**Rohan Grey:** But it's not like if you have \$20,000 in cash that the cash starts beeping or is gonna call the police on you.

**David Beckworth:** Right.

**Rohan Grey:** The cash itself is dumb, so we can put legal layers of supervision on top as long as the technological layer is not selling you out in the process. That's the critical step for me in terms of privacy respect.

**David Beckworth:** Okay. Yeah.

**Rohan Grey:** So in terms of the ... Yeah, sorry.

**David Beckworth:** Well speaking to your point here, this technology, digital fiat currency, the reason I think you bring this up is could be used by you and me in a transaction, but could also be used by a big institutional investor on Wall Street, so it has broad scale in terms of use.

**Rohan Grey:** That's right.

**David Beckworth:** But let's go back to the consumer or retail level use. How would it actually transpire?

**Rohan Grey:** Right. So you would have a wallet and you could manage it yourself. That is to say you could get a computer or a server or something and install an open ... free and open source software server that works like a digital wallet, and as long as that server was configured correctly to meet the standards of this protocol that was developed, it would then be able to talk to other nodes on that network. So you could run your own in the same way as people run their own email servers.

**Rohan Grey:** Or you could choose to essentially sign up to some intermediary that chose to be a wallet manager for you. So that could function like a Narrow Bank. It could function like a mobile money operator. It could function like, god forbid, Google or Apple or Facebook could offer you one. And you could theoretically have a public one, the government provides a kind of vanilla version of this, or you could have a thing where everybody has their own wallet that sits at home, but different companies provide a kind of client for you to use. So if you think about having a company email address or university email address, you might still use Microsoft Outlook or Thunderbird or some other mail client. So you could have your address be a fixed thing, but sort of shop around different alternatives for what is the best client-facing app that you would then give permission to access your account.

**Rohan Grey:** What would happen is you would go and you would make the purchase, and then when the time came to transact you would get their identity and the eCurrency folk and the folk at the International Telecommunications Union have been looking a lot at QR codes, which is how most transactions in countries like China work already. You just take a photo of somebody else's QR code and that's the equivalent of getting their-

**David Beckworth:** Okay.

**Rohan Grey:** ... their bank account details. So there's pictures I've seen or little videos I've seen of homeless people who've got a QR code in front of them, instead of a bowl to ask for money.

**David Beckworth:** Interesting.

**Rohan Grey:** And people just ... take a photo of that and send it to that address. And I've used WeChat and things in China that have QR codes embedded if you want to send someone money or something. You just put your phone up to their unique barcode identifier.

**David Beckworth:** So I would come to you in New York and you would have your code in front of me. I like that car and I would scan, or you would scan mine and funds would be transferred.

**Rohan Grey:** Right, and the funds would be transferred. What would happen is your wallet and my wallet would speak to each other and they would speak to each other in the language of this protocol. They would sort of send a message saying, "This is a Fiat Currency wallet protocol-consistent message." And the other one would receive it and say, "I've received that message. We've done a handshake. We now have a connection between these two wallets." And what the wallets would tell each other is, "I have balance X, you have balance Y. I've received a message from one side that's been validated by the other that says that we would like to turn  $X+Y$  into  $A+B$ ." And the wallets have talked to each other and determined what the numbers A and B are, and our job is to make  $X+Y$  equal  $A+B$  as long as they are the same quantity.

**Rohan Grey:** They would do a sort of weighing test on the encrypted numbers. They would say, "Okay they weigh the same," and then they would say, "Okay we can validate this transaction is legitimate across the protocol," and then the two wallets would then say, "Okay, I used to have a balance of a hundred, now I have a balance of twenty. You used to have a balance of a hundred, now you have a balance of 180." And then that would be it. So your wallet would dissolve and resolve instantly.

**David Beckworth:** Okay.

**Rohan Grey:** And then you would have a new set of barcodes, and those barcodes would not have a memory of who else they were part of but that the wallet network system would know that the original barcodes have been transformed, but that they have not been transformed in a way that increased any quantities. And that would be a real-time settlement. It would happen-

**David Beckworth:** Instantaneously, just like with cash.

**Rohan Grey:** That's right. Instantaneous and irrevocable in the sense that the transaction could not be recalled. Now you could imagine, again, an intermediary layer emerging on top that functioned in the way that credit cards functioned, to provide some sort of purchaser insurance and things like that.

**David Beckworth:** Okay.

**Rohan Grey:** But again, that would be being done through essentially taking on real risk. So the credit card company would be exposed if a billion dollar transaction did go through and then it turned out that it was the wrong person or it was fraudulent or something. So it wouldn't be a matter of you being able to recall that transaction, it would be a matter of you essentially ensuring that ... chase after somebody, et cetera, et cetera. So you could build those kinds of layers on top, but at the transactional level it would be instantaneous, single happening, irreversible. And there would not be a record of it anywhere.

**David Beckworth:** Okay, since we're on consumers, let's continue thinking about this. Let's think through scenarios where some people in society, maybe some other countries like let's say Zimbabwe. Zimbabwe has used the US Dollar as its currency because it can't trust the government to make a stable medium of exchange in this country. Could people in Zimbabwe theoretically be using dollar digital fiat currencies in the same fashion they're using physical cash today? Physical dollars today?

**Rohan Grey:** Yeah, I think that's a great example. You could try to restrict the hardware devices that can get onto this network. So you can start where only approved hardware devices can get on or something like that, and in that sense you could try to prevent it from being used outside the country or things like that. I think that would bring in a lot of problems in the same way as we talked about it earlier in terms of surveillance and control by authorities, but yes you could imagine that this would function essentially as digital balances, and to the extent that people can't stop money being exported from the US however much they try, this would function the same way.

**Rohan Grey:** Now I actually think one of the most interesting questions of this era, and one of the reasons why I'm doing my legal dissertation on these questions, is that in the past it was at least sort of physically a bit cumbersome to take huge slabs of cash-

**David Beckworth:** Right.

**Rohan Grey:** ... in a plane, drop it into Zimbabwe and things, but the point at which you can do it with a trillion dollars just as easy as you can do it with ten dollars.

**David Beckworth:** Interesting.

**Rohan Grey:** Then certain regulatory compromises may have to be rethought, and what I mean by that is right up until now the idea that cash can be used to facilitate terrorism or crime or things like that is something that law enforcement begrudgingly accepts as a risk associated with having that freedom of cash. But at the point at which suddenly you have a trillion dollars in a terrorist funding bank account or something like that, or if this is truly a dark system, then those kinds of concerns become a lot scarier, and I think we ... It really is almost a sort of socialism or barbarism moment in the sense that we either have to say, "Look, yes this technology is probably going to be misused to some degree. It will be used in black markets. It will be used in activities against the state, et cetera," but that's the price to pay for having a degree of freedom.

**Rohan Grey:** If the only alternative, when we really, really dig down into it, is system that is fully surveilled or that has backdoors in it where the risk there is genocide, then that's the price that we have to pay. We don't think that it's okay to put a computer chip in the base of everyone's skull to know what they're thinking at all times, even if that would probably prevent some more child abuse and some more terrorist activity, et cetera, because we acknowledge that there are other interests at play.

**David Beckworth:** Right. Yeah, we're making trade-offs for sure.

**Rohan Grey:** That's right, and I think the point here is that the trade-off becomes more stark. It's not where we can stop 80 percent of the terrorism, 80 percent of the time. We might actually genuinely face a loss relative to our current standard of law enforcement capacity.

**David Beckworth:** Yeah.

**Rohan Grey:** But if the choice is between that and a loss of privacy, I know where I fall.

**David Beckworth:** I do too, and I think there would be these stark losses, I think that's fair, but I think there would also be some stark gains.

**Rohan Grey:** Yes.

**David Beckworth:** And where I would see the gains is that the dollar, for better or for worse, currently serves as this global reserve currency, and I don't mean just for the financial system, which is true, but for people in developing countries who can't trust their own governments ... we call it dollarization. It's not just Zimbabwe and other places, and I think to some extent they rely on the dollar as a backup system of money, and to the extent the dollars could get there faster it might actually impose some discipline on these governments that have problems with controlling the amount of money creation they do domestically.

**David Beckworth:** I think it could make it easier for people in troubled places around the world to find a stable medium of exchange, which might be that plus ... measured on the scale against the stark increase in crime. But at the end of the day I also want that privacy, like you said.

**Rohan Grey:** Yeah and I completely agree. Estonia is the model that I think of here. They built basically a whole digital government and in part that was motivated by concerns that they could be invaded, and so they were kind of building an infrastructure for a country in exile, and if you have a digital cash that does really transcend state boundaries then people can almost vote with their wallets in terms of which economy they want to spend more time living in, even if they're physically constrained to live in their own country. I think it's an interesting ... it's gonna have interesting implications for the relationship between people and the ... territorial jurisdiction of states.

**David Beckworth:** This is very interesting, and again what I like about your papers are that they're touching an area that really hasn't been given a lot of consideration, a lot of thought. So hoping that all our listeners begin to chew on some of this, and again read the papers that we link to on the website for the podcast.

**David Beckworth:** Now we only have a little bit of time left, and there's so much more we could talk about including how the banking system will handle this and other considerations, but the time we do have left I want to talk about how we would make the transition to that. How would you get the public to start using these types of money?

**Rohan Grey:** Yeah, well this is a really big problem because Ecuador basically failed at this, right? This was their problem. They tried to introduce a mobile phone-based government currency and it just didn't get widespread adoption. So partially I think this is where MMT insights come into play.

**David Beckworth:** Okay.

**Rohan Grey:** Which is this idea that taxes drive a demand for money so that certain currencies have value when they're receivable in payment of taxes and fees and fines. So a classic example here I would say is things like public transport. If you make public transportation payable in this unit, and then you offer a very easy card, it could start out as a transportation card. And you saw this in places like Hong Kong where they had, I think it's called, an octopus card there. It started off as a card for using their metro system, but then they expanded it so that local retailers could use it for payments, and now it's basically a public payments card. I would start to think about very particular use cases, and expand out from those use cases.

**Rohan Grey:** It could also be things like paying your utilities bill and partially one way to do this would be to require certain things be payable in this instrument rather than other instruments. If you only make it a sort of option, then people might be content to stick with their existing system. Another part is, I think, a good PR strategy, a good propaganda campaign. Another part is, I think, as I mentioned earlier, separating out the client-facing aspect from the back-of-house aspect. I don't think that it's impossible for governments to do things well, obviously.

**Rohan Grey:** But I think that first of all you don't want to have an Obamacare website disaster, and second of all people are very, very diverse in their aesthetic practices. So you don't want to presume a one-size-fits-all client-facing app would be sufficient. So I think it's fine and great and definitely desirable to have a white label public option application for this for computers and phones and things, but that I would also encourage a whole market, God forbid I use that word, to develop around consumer-facing applications. In the same way as we have for email, Outlook, and Mail, and Thunderbird and all these different mail clients

even as the back-of-house email is managed by your company or your web provider or whatever else.

**Rohan Grey:** I would encourage for widespread adoption that we build an almost app store of wallets that people could pick and choose with different skins and different features that could provide additional banking services on top or not, et cetera, et cetera. I also say that one way to do this is to try and get as many different industries and sectors involved as possible. So yes banks, but also telecom and web services companies, Amazon and Apple and all these things, even though I don't like them, to the extent that they're providing web services this should be considered part of that, not just something exclusively for banks, and money transmitters and Narrow Banks, et cetera, and to think about it in those ways.

**Rohan Grey:** The other big rollout problem, and I've written on this as well in a paper recently that I gave at St. Louis Fed called “Banking Under a Digital Fiat Currency Regime” and this is actually, I would say, probably the biggest objection so far amongst central bankers, is the risk of deposit flight from the existing banking system. So one of the concerns is, what if it's too successful? What if everybody does switch over and then suddenly overnight the banking system is completely starved of deposits. Because even if the banks are the ones running these wallets for us, even if it was just Chase who's now offering a wallet, those balances could not be used to fund the bank's activities in the way that deposits provide a cheap source of liquid funds today. They would remain essentially ring-fenced in the way that my colleague Jonathan Greenacre has done a lot of work in the way that mobile money companies ring-fence their clients' funds and don't use them like deposits.

**Rohan Grey:** So the question of how we keep banking alive in the face of a mass deposit exodus gets us into some really interesting macroprudential questions and questions about the way that banks are franchisees of the public, full faith in credit at the central bank, et cetera. But I would say that's at the level of theory and of financial system design, one of the most crucial questions that's going to need to be answered before we could have a widespread shift to having a digital fiat currency system be the primary form of retail and wholesale payments.

**David Beckworth:** Yeah, and I would again encourage the listeners to read these two papers. We'll have them up on the website, and I will just add this. You do mention I believe in your first paper that banks could continue to do normal vanilla banking as well as being an intermediary providing a wallet, so they could still earn profits from both businesses or just even from one business if they had to, so it wouldn't be the end of the world to transition.

**Rohan Grey:** Yeah, and banks don't actually ... Banks don't lend out other people's deposits today.

**David Beckworth:** Right.

**Rohan Grey:** Banks make deposits when they make loans. What deposits are, are a cheap source of liquidity and funding that is generally cheaper than borrowing from the discount window, in addition to all the stigma from the discount window. So I follow Hyman Minsky in that I think actually greater reliance on the discount window is better for macroprudential stability, and if we're concerned about the funding cost of that I think that's a problem to address directly. I have other thoughts. I don't think that for example interest rates are a good aggregate demand stabilization tool. I would set interest rates at zero permanently, and if we did that then the banking system would have as many funds as they wanted. They wouldn't need deposits as a cheap source of funding 'cause funding would be at zero interest anyway.

**Rohan Grey:** But you don't need to have a permanent zero interest rate, you could just simply tweak the rate that ... the scope of rates that banks have to access for funding to be much lower than they are today to counteract the fact that they would be more reliant on discount window funding and less reliant on depositor funding.

**David Beckworth:** Okay. Well with that our time is up. Our guest today has been Rohan Grey. Rohan, thank you for coming on the show.

**Rohan Grey:** Yeah, thank you for having me.

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