

# THE FUTURE OF MONEY: DIGITAL CURRENCY

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## HEARING BEFORE THE SUBCOMMITTEE ON MONETARY POLICY AND TRADE OF THE COMMITTEE ON FINANCIAL SERVICES U.S. HOUSE OF REPRESENTATIVES ONE HUNDRED FIFTEENTH CONGRESS SECOND SESSION

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## **THE FUTURE OF MONEY: DIGITAL CURRENCY**

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**Wednesday, July 18, 2018**

U.S. HOUSE OF REPRESENTATIVES,  
SUBCOMMITTEE ON MONETARY  
POLICY AND TRADE,  
COMMITTEE ON FINANCIAL SERVICES,  
*Washington, D.C.*

The subcommittee met, pursuant to notice, at 2:05 p.m., in room 2128, Rayburn House Office Building, Hon. Andy Barr [chairman of the subcommittee] presiding.

Present: Representatives Barr, Williams, Huizenga, Hill, Moonney, Davidson, Foster, Sherman, Vargas, and Crist.

Chairman BARR. The committee will come to order. Without objection, the Chair is authorized to declare a recess of the committee at any time, and all Members will have 5 legislative days within which to submit extraneous materials to the Chair for inclusion in the record.

This hearing is entitled, “The Future of Money: Digital Currency.”

I now recognize myself for 5 minutes to give an opening statement.

Today, we will discuss the future of money and how digital currency may feature in it. When discussing the future of money, it is pertinent to have a firm understanding of its defining characteristics and history. Economists define money as anything that acts as a store of value, a unit of account, and a medium of exchange.

Various objects have been used as money, such as seashells, giant stone tablets, and cigarettes in prisoner-of-war camps. Commodities such as furs, rice, whiskey, tobacco, and corresponding warehouse receipts circulated as money on the American continent in the colonial period.

Prior to America’s independence, Americans imported gold and silver coins from European countries to use in trade, and the colonies issued their own specie before they and the continental Congress began experimenting with paper money. Even the U.S. dollar has evolved since it was declared the standard unit of currency with the passage of the Coinage Act in 1792.

It has undergone changes in dimensions, design, denominations, issuer, and backing, notably with the implementation and subsequent abandonment of the gold standard. In recent decades, money has been electronically stored in bank deposits and transferred with credit cards, mobile phones, and the internet.

Cryptocurrency, however, was designed to be something different. Cryptocurrency allows users to potentially store value in unlinked—store value unlinked from fiat currency on a decentralized ledger and securely transact directly from person to person across a peer-to-peer network of computers apart from a commercial or central bank.

The central question before us today is this: Are digital currencies simply a new way to hold and transfer value that will have a limited impact and niche appeal, or will it, or a derivative of it, have a far-reaching transformative effect that will change our economy forever?

Cryptocurrency has existed for a decade, since the appearance of Bitcoin in 2009, but has flown under the radar for most of its history. For years after its creation, it was worth little, had few users, and garnered sparse mainstream media attention. However, the media and consumers have been taking note. With a stark rise in value in 2017, Bitcoin grabbed headlines as it reached a valuation of around 20,000 USD last December.

Also reported are controversies such as Bitcoin's involvement in purchases on the online black market, The Silk Road, and donations funding WikiLeaks, the theft of hundreds of thousands of Bitcoins from the exchange Mt. Gox, and reports that hackers have stolen \$1.6 billion from cryptocurrency accounts over the last 7 years.

Congress must pay close attention to the developments in this space. The Capital Markets, Securities, and Investment Subcommittee held a hearing examining the cryptocurrencies and initial coin offering markets in March of this year, and the Terrorism and Illicit Finance Subcommittee held a hearing to discuss illicit use of virtual currency and the law enforcement response last month.

As Chairman of the Monetary Policy and Trade Subcommittee, I am particularly interested in any impact digital currency may have on monetary policy and the international financial system. We will discuss its use, both in the United States and abroad.

Thus far, some countries, like Vietnam and China, have banned or restricted it altogether; others, such as Switzerland and Malta, have fostered it with a mostly hands-off approach and regulatory guidance; and others have adopted it, including Tunisia and Ecuador, by issuing their own central bank digital currencies.

How ought the U.S. Government approach this new technology is of great importance. Some believe, as former Fed Chairman Ben Bernanke highlighted in a 2013 letter to Congress, that digital currency innovations, quote, “may hold long-term promise, particularly if the innovations promote a faster, more secure, and more efficient payment system,” unquote.

Some have suggested that cryptocurrency may be a catalyst for the elimination of physical currency, and a foundation for a move to a purely cashless society. Others say that cryptocurrencies are not suitable replacements for coins and bank notes, such as European Central Bank Executive Board Member, Benoit Coeure, and the Chair of the Bank for International Settlements Market Committee, Jacqueline Loh, who, in a joint article in the Financial



Times entitled, “Bitcoin Not the Answer to a Cashless Society” called cryptocurrencies, quote, “something of a mirage,” unquote.

Cryptocurrency has attracted advocates, critics, skeptics, entrepreneurs, investors, and attention from media, government agencies, and law enforcement. Today, there are well over 1,000 different cryptocurrencies with various characteristics together comprising over \$250 billion of total market capitalization.

Will cryptocurrency be the future of money? Are they in a bubble that will burst, or even just a passing fad? These are the sorts of questions we will attempt to address today with our witnesses.

The Chair now recognizes Mr. Foster for 5 minutes for an opening statement.

Mr. FOSTER. Thank you, Mr. Chairman.

And thank you to our witnesses.

I will be brief because I am actually very interested in this topic, have been for a while. I look forward to the testimony of the witnesses, and hope to hear about currencies that are not only pure crypto, but asset-backed crypto, and potentially digital fiat currencies, and most significantly, digital fiat currencies.

I am concerned that if a significant central bank could issue a digital currency, that it would have the potential to supplant the United States dollar now, for many transactions and even for—as the reserved currency around the world.

And despite the reports that they are exploring it, countries like Russia or Venezuela are not really credible economies that could issue fiat currencies that would supplant the dollar. But if, however, the ECB were to issue digital euros, then I think the entire world would very rapidly adopt that for many digital transactions which would have benefits to consumers and a number of risks associated with that as well.

And if there is really a credible threat that a digital foreign currency would supplant the dollar, we have to be prepared to respond to that threat.

I look forward to hearing from witnesses on the economic feasibility of another currency supplanting the dollar, and whether digitization could be a catalyst in such a transition. I also look forward to any thoughts the witnesses might have on some of the decision points that have to be made when you decide to create, for example, a fiat currency: Whether the currencies could be traceable or not; they could be traceable only with a court order; whether or not trades could be busted in the same sense that a credit card purchase can be broken if you convince some entity that the transaction was fraudulent; and who makes that call? Under what circumstances?

These are what I would say are the really important decisions that cannot be evaded when we design a digital currency. And so, the issue of anonymity is really crucial and at the heart of this, as well as what sort of authentication a person will have to present to transact that, anything.

So I look forward to this hearing very much and yield back.

Chairman BARR. The gentleman yields back.

And the Chair recognizes for the remainder of the time, Mr. Sherman, for an opening statement, 2–1/2 minutes.

Mr. SHERMAN. Thank you. IoT Chain is a good technology, but it can be used to track and transfer sovereign currency. There is nothing that can be done with cryptocurrency that cannot be done with sovereign currency that is meritorious and helpful to society.

The role of the U.S. dollar in an international financial system is a critical component of U.S. power. It brought Iran to the negotiating table, and then we argue about whether we got a good enough deal or not in the JCPOA. We would have nothing had it not been for the role of the dollar. We should prohibit U.S. persons from buying or mining cryptocurrencies. Mining alone uses electricity, which takes away from other needs and/or adds to the carbon footprint.

As a store—as a medium of exchange, cryptocurrency accomplishes nothing except facilitating narcotics trafficking, terrorism, and tax evasion. Some of its supporters delight in that, that if you can disempower the U.S. Government from being able to prevent terrorism, narcotics trafficking, and tax evasion, you have somehow struck a blow for liberty. That is reason enough to ban it.

But its role as an investment is at least as bad. We have certain animal spirits in our culture, a willingness to take a risk to place a bet. This could be harnessed by gambling casinos, which, at least pay very high local taxes and created a city of Las Vegas out of a desert.

We can better yet harness those animal spirits to get people to invest in risky stocks, startup enterprises, and provide the technologies and jobs of the future, or we can see those animal spirits spent doing nothing but helping create a market for tax evaders, narcoterrorists, and others who find that the U.S. dollar is not to their liking.

At a very minimum, we need investor protection if we are going to have people invest in cryptocurrencies and crypto-offering memoranda and crypto registrations would be considered outright fraud and reason for incarceration if they were issued by somebody selling stocks, bonds, or any other investment.

And finally, there is seigniorage, the money that we make as a country because we are the reserve currency, because we can issue a greenback that does not yield interest. There are people who are alive today because of the profits the U.S. Government makes on that, whether it be to fund defense or medical research. All of that gets diminished with cryptocurrency.

I yield back.

Chairman BARR. The gentleman's time is expired.

Today we welcome the testimony of Dr. Rodney Garratt, who holds the Maxwell C. and Mary Pellish Chair in Economics at the University of California Santa Barbara. He has served as a technical adviser to the Bank for International Settlements, a research adviser to the Bank of England, and is a former vice president of the Federal Reserve Bank of New York. During his time at the Federal Reserve Bank of New York, he co-led the virtual currency working group for the Federal Reserve system. After leaving the Federal Reserve Bank, he consulted for Payments Canada and R3 on Project Jasper, a proof of concept for a wholesale interbank payment system. Mr. Garratt received his Ph.D. from Cornell.

Dr. Norbert Michel, who is the Director of the Center for Data Analysis at The Heritage Foundation where he studies and writes about financial markets, cryptocurrencies, and monetary policy. Before rejoining Heritage in 2013, Michel was a tenured professor at Nicholls State University's College of Business teaching finance, economics, and statistics. Dr. Michel holds a doctoral degree in financial economics from the University of New Orleans.

Dr. Eswar Prasad is the Tolani Senior Professor of Trade Policy and Professor of Economics at Cornell University. He is also a Senior Fellow at the Brookings Institution where he holds the New Century Chair in International Trade and Economics, and a Research Associate at the National Bureau of Economic Research. He is a former head of the IMF's China division. His extensive publication record includes articles in numerous collected volumes as well as top academic journals. He has coauthored and edited numerous books, including on financial regulation and on China and India.

Finally, Mr. Alex Pollock is Distinguished Senior Fellow with the R Street Institute—welcome back to the committee, Mr. Pollock—providing thought and policy leadership on financial systems, cycles of booms and busts, financial crises, risk and uncertainty, Central Banking, and the politics of finance. Alex joined R Street in January 2016 from the American Enterprise Institute where he was a resident fellow from 2004 to 2015.

Previously, he was president and CEO of the Federal Home Loan Bank of Chicago from 1991 to 2004. Alex received his masters in philosophy from the University of Chicago and a masters of public administration degree in international affairs from Princeton University.

Each of you will be recognized for 5 minutes to give an oral presentation of your testimony.

Without objection, each of your written statements will be made part of the record.

Dr. Rodney Garratt, you are now recognized for 5 minutes.

#### **STATEMENT OF DR. RODNEY J. GARRATT**

Dr. GARRATT. Thank you, Chair Barr, Ranking Member Moore, and Members of the subcommittee. The convenience of electronic transfers has led to a decline worldwide in the use of cash. This is particularly true in countries where systems for transferring commercial bank deposits are more advanced. Sweden's mobile payment system, Swish, has been adopted by over 60 percent of the population, and cash use and transactions have fallen below 2 percent by value.

Countries around the world are introducing their own faster payment systems, including the recently launched real-time payments platform in the United States. At the same time, PayPal, Venmo, and other private mobile payment platforms continue to improve convenience and speed of person-to-person and retail payments by leveraging conventional financial market infrastructures.

It seems likely that the use of cash will continue to fall, and it is worth noting that there is a tipping point at which, even if consumers seek to use cash, businesses and banks will not want to deal with it. What happens then? One possibility is that people will be content to transact primarily in commercial bank deposits, and

things will be business as usual with a much smaller cash component to the monetary base.

Another possibility is that people will demand direct access to some form of digital central bank-issued money as a replacement for cash. And a third possibility is that people will turn to privately issued cryptocurrencies, like Bitcoin. These options are not mutually exclusive, nor are they independent.

The adoption rate of Bitcoin will depend not only on its performance as a money, but also on the alternative forms of digital money that the central bank provides. If consumers perceive that they have inadequate access to a cash-like medium of exchange, then they may be more inclined to turn to alternatives. On the other hand, if the central bank offers a digital form of central bank money to the public with sufficient cash-like properties, then, perhaps, this will appease those who miss cash.

Central banks are currently evaluating numerous options for digital currencies, not just in response to the shift away from cash, but also from meeting core objectives and the enhancement of financial market infrastructures. Ongoing proofs of concept by central banks and private partners consider the use of central bank cryptocurrencies in wholesale systems only. These applications are driven by efficiency and cost considerations, and have minimal monetary policy implications.

In these opening remarks, I will focus on the merits of a widely accessible, retail-oriented central bank cryptocurrency that could be used for person-to-person and retail transactions. As suggested in blogger J.P. Koning's Fedcoin proposal, a retail central bank cryptocurrency could transact like Bitcoin.

However, instead of having a fixed-money supply role, the Federal Reserve would control the creation and destruction of these coins. Crucially, there would be one-to-one convertibility with cash and reserves, and hence, a retail central bank cryptocurrency would not suffer from the high-price volatility that undermines the usefulness of Bitcoin as a store of value and medium of exchange.

The Fed could also choose to implement a cryptocurrency on a permissioned blockchain, which means transaction validation could be performed by vetted actors who are accountable for their actions without costly proof of work. Proposals to increase access to digital central bank money have been made before.

Nobel laureate James Tobin proposed giving the public access to deposited currency accounts at Federal Reserve banks over 3 decades ago. A number of things have changed since Tobin's proposal. As I mentioned, the use of cash has declined, a major financial crisis may have changed some people's attitudes toward commercial bank deposits, and technological advancements offer the potential for issuing digital central bank money in a new way with enhanced features.

I offer two examples: First, the peer-to-peer aspect of cryptocurrencies could allow central banks to provide a digital money with anonymity properties similar to those of cash. Whether or not the central bank would want to do this is a complicated issue that requires balancing legitimate demands for individual privacy against concerns related to tax evasion and other criminal activities.

Second, there is the potential to improve upon cash by creating what advocates of cryptocurrencies call programmable money. Programmable money allows trading partners to hardwire the terms and conditions of trades into their transactions so that they may be executed upon fulfillment of these conditions without relying on third parties. This is particularly useful for transactions that span multiple legal jurisdictions.

Any decision to implement a retail-oriented central bank cryptocurrency would have to balance potential benefits against potential risks. A common objection to expanding access to central bank money is that it could disintermediate banks. However, it is also plausible that it could produce healthy competition. The risk of excessive disintermediation would be mitigated by making any new form of central bank money more like cash and less like deposits.

Thank you. And I would be happy to answer any questions.

[The prepared statement of Dr. Garratt can be found on page 24 of the Appendix.]

Chairman BARR. Thank you.

Dr. Norbert Michel, you are now recognized for 5 minutes.

#### **STATEMENT OF DR. NORBERT MICHEL**

Dr. MICHEL. Chairman Barr, Brett Foster, Members of the committee, thank you for the opportunity to testify today. My name is Norbert Michel. I am the Director of the Center for Data Analysis at The Heritage Foundation, and the views that I express today are my own. They should not be construed as representing any official position of The Heritage Foundation.

Cryptocurrencies have rapidly expanded since the introduction of Bitcoin in 2008, and their underlying technology, a distributed database that allows digital assets to be transferred without a third-party intermediary, holds the potential to transform the financial industry. This innovation should be fostered, not smothered.

My remarks today will provide four specific points relating to the use of cryptocurrencies, cash, and other alternative forms of money. First, electronic means of payment have become more widespread as technology has changed, but paper currency, cash, is still widely—is still a widely used form of payment. The demise of cash has been widely and steadily predicted since at least the 1970's, yet it remains a preferred method of payment for many people.

Federal Reserve reports show that cash is still the most frequently used form of payment in the U.S., and that it plays a dominant role for small value transactions. It also remains the leading payment instrument for expenditure categories, such as person-to-person gift transfers, food and personal care supplies, and entertainment and transportation expenditures.

As the charts in my written testimony show, both the volume and value of currency in circulation in denominations, including one all the way from \$1 to \$100 bills have steadily increased since the 1990's. That is increased.

So retail establishments that prohibit customers from using cash, as was recently reported in a Washington Post story, do so at their own peril. But this danger, this threat of consumers using an alter-

native form of payment, possibly at an alternative place of business is exactly as it should be. Competitive processes should take place so that businesses and consumers can discover the best means of payment. The fact that cryptocurrency is a new option for making payments, though it is in its infant stages, should be embraced.

That brings me to my second point, which is that the Federal Government should not step in and tilt the playing field. It should treat cryptocurrency in all other forms of money neutrally. This means that it should not bestow any particular legal advantage on any particular alternative form of money, and that it should remove all legal barriers to using alternative forms of money.

Removing capital gains taxes from purchases with alternative currencies, including cryptocurrencies and foreign currencies, would be a major step toward leveling that playing field between alternative forms of payment. To further level the playing field, Congress should even consider allowing the U.S. Postal Service and other government agencies to accept these alternatives.

My third point is that these competitive forces are the forces that push entrepreneurs to innovate and improve products specifically to satisfy their customers. They also expose weaknesses and inefficiencies in existing products. These same competitive forces can and should be used to improve money.

The Federal Government's partial monopoly on money limits the extent to which competitive processes can strengthen money, and it exposes our money to the mistakes of a single government entity. Nothing can provide as powerful a check against the Federal debasement of money as a threat of competition from viable alternative forms of payment.

My final point is that centralizing cryptocurrencies within any government agency makes little sense. The technology promises potential benefits because of its decentralized nature. Centralizing the technology at a central bank offers no particular advantage over a more traditional electronic database. Furthermore, Congress and the administration should do all they possibly can to ensure that our central bank never offers retail bank accounts to the public, whether via a central bank-backed cryptocurrency or via a more traditional digital form of money.

Implementing such a policy would give the Federal Government a complete monopoly of money, and effectively nationalize all private credit markets. No private entity would be able to compete with the Federal Government for funds.

Even Ken Rogof, a staunch advocate for phasing out cash and forcing people to use only one type of digital money, admits that the biggest threat to the value of useful currency is often the government itself. That Rogof quote is, quite frankly, an understatement. Giving the government the power to directly take money from its citizens with a few computer key strokes in the name of some vague goal of stabilizing the economy simply amounts to the death of economic freedom, is a terrible idea, and it is Congress' duty to protect Americans from those sorts of tyrannical acts.

Thank you.

[The prepared statement of Dr. Michel can be found on page 30 of the Appendix.]

Chairman BARR. Thank you.

And now you, Dr. Prasad, you are recognized for 5 minutes.

**STATEMENT OF DR. ESWAR S. PRASAD**

Dr. PRASAD. Chairman Barr and Members of the committee, thank you for the opportunity to testify in front of you on the implications of digital currency broadly defined for the U.S. economy and financial system.

I should note that 2 years ago I faced an important choice one afternoon: Whether to spend that afternoon buying Bitcoin, which is not a trivial process, or to start working on a paper about Bitcoin and digital currencies. For better or worse, I chose the latter. So today I have no Bitcoin, but I do have a paper about the implications of digital currency.

It is useful to frame our discussion around three questions: One, should the government or the Federal Reserve provide services that the private sector can provide more efficiently? That is something that a cryptocurrency, for instance, could provide. Second, what are the implications for the Fed in terms of its monetary policy objectives of low inflation, high employment, and most importantly, financial stability if digital currencies become vitally prevalent? And third, what are the implications for the U.S. role in the global financial system?

As one looks at the landscape of cryptocurrencies, it is useful to keep one distinction in mind, that is, the distinction between central bank digital currencies, which could use the same cryptographic technology as something like Bitcoin, and the nonofficial cryptocurrencies, which are essentially created in the ether, are a digital asset with no backing behind them, unlike the U.S. dollar, which does have backing.

Now, there are many proponents of the U.S. and other economies moving their digital forms of fiat currencies, and I think there are some legitimate arguments about how that could reduce activity in the shadow economy, reduce illicit activities, improve the tax base, and, in some ways, even make monetary policy more efficient, even at the lower bound where the Fed may not be able to use interest rate policy anymore.

If all of us were to have noninterest-bearing deposit accounts with the Fed, which is fast becoming technologically feasible, and this is what Professor Tobin had suggested, this would make a certain aspect of monetary policy implementation a lot easier.

But it is worth thinking about money in a broader sense. Money is created by the central bank, but also, to a much greater extent, by commercial banks. And I think this is going to have a serious implication for money creation in the economy. Because as new technologies, new financial technologies more broadly eat away at the standard business model of banks, and as nonbank financial intermediaries start playing a major role in the financial system, the question remains, what role will banks play, because those are the institutions that the Fed has direct control over and that are responsible for creating loans, and therefore for creating deposits and a very important part of money.

The other aspect, in terms of thinking about the Federal Reserve's digital currency, or any central bank's digital currency, is what it does to the payment systems. Right now, the Fed has no

role in retail payment systems. It has a very important role in intermediating financial transactions among the major financial institutions in terms of clearing and settlement of the transactions.

With noninterest-bearing deposit accounts, one could well end up in a scenario where the Fed essentially starts managing a retail payment system as well. It is not obvious that this is the ideal solution, but it is worth thinking about the alternative.

If, in fact, we had a situation where both the retail payment systems and also the wholesale payment systems among banks are managed through distributed ledger technology, which might become feasible, then what happens in a time of crisis of confidence? In normal times, it actually might lead to significant gains in efficiency. Again, the private sector might do far more efficiently in the government, the management of these payment systems, but the issue of trust in the central bank, especially at a moment of crisis of confidence, becomes really important.

So if you look around the world and think about central banks like Sweden that are thinking about introducing a digital version of the fiat currency, the objective they have in mind is not to include, or reduce innovation, but, basically, to provide a backstop to the payment system to make sure that it is not all in the private sector and subject to a crisis of confidence.

There are other concerns related to regulatory arbitrage and the possibility of cross-border capital flows, again, illicit as well as licit that could be facilitated which would certainly improve efficiency, but also potentially make underground activities easier to execute.

And finally, on the issue of the U.S. dollar's role as a global reserve currency, there I worry less. I think it is possible that if other countries were to issue their own currencies in digital form, you could have the medium of exchange shifting toward nonofficial cryptocurrencies, toward other currencies.

But what preserves the U.S. dollar's role as the argument global safe haven is not just the—its role as a medium of exchange but its ability to serve as a safe haven, and that requires U.S. institutions, which I think are still pretty strong and are going to retain foreign investor's trust. So I think as store of value, the U.S. dollars will remain secure for now. Thank you.

[The prepared statement of Dr. Prasad can be found on page 44 of the Appendix.]

Chairman BARR. Thank you.

Mr. Pollock, you are recognized for 5 minutes.

#### STATEMENT OF ALEX J. POLLOCK

Mr. POLLOCK. Thank you, Mr. Chairman, Mr. Foster, and Members of the subcommittee.

This hearing poses really interesting questions, which, to answer, require some speculation and guessing—along with thinking, we hope. Among the intriguing question is whether Bitcoin or another cryptocurrency could become a successful, privately issued fiat currency. That would mean being widely accepted, constantly used in payments and settlements, used to denominate debt and other enforceable contracts, and people going around not asking what is the price of Bitcoin, but what is the price of other things in Bitcoin. We are a long way from that, but it is imaginable.



As the Chairman said, the history of money demonstrates a wide variety of moneys that have been used. There have been numerous historical examples of private currencies. But to my knowledge, there has never been a private fiat currency. Those are reserved for the power of governments.

For private currency, as an example, circulating notes of U.S. State-chartered banks were common in the 19th century. You might have carried, in those days, in your wallet, a \$5 bill from the Third State Bank of Skunk Creek, for example, or hundreds of others. But all such notes were backed by the loans and investments and capital of the issuing bank. They were not fiat money.

The dominant historical trend in money has been to create an ever more central bank monopoly of currency over several centuries of development. Will the new and ubiquitous computing power of our time reverse this trend and create more competition in currency?

With Dr. Michel and the famous economist, Friedrich Hayek, I think it might be a good idea, but I don't think it will happen. Bitcoin theorists imagine it will, but I believe it is easier to imagine moving in exactly the opposite direction, that is, toward even greater monopoly by the central bank through digital money.

Mr. Foster made the point it is not only our own central bank, but other powerful central banks we might think about in this context. And many central banks are, indeed, interested in having their own digital currency, so the general public, not only banks, could have deposit accounts with the central bank in addition to carrying around its paper currency, and the appeal of this idea to central banks is natural. It would greatly increase their size, role, and power.

With current technology, this would clearly be possible. The central bank could have tens of millions of accounts with individuals, businesses, associations, municipal governments, and anybody else. There is not much standing in the way of that in terms of pure financial technique. But would it be a good idea? No, it wouldn't. In such a scheme, the Federal Reserve would be in direct competition with all private banks, it would be a highly advantaged government competitor, and it would be regulating its competitors. That is what central bank evolution tried to develop out of.

In the American banking system there are about \$12 trillion in domestic deposits. Could a Federal Reserve digital deposit account system grab, say, half of them? Why not? That would be \$6 trillion which would expand its balance sheet to \$10 trillion.

Now, what is key in this is to remember that if you have deposits on one side of your balance sheet, you have something else on the other side. So what would the Fed do with this mountain of deposits? As my friend Dr. Michel said, it would have to make investments and loans. It would become, by this means, the overwhelming credit allocator in the American economic and financial system.

I think we can safely predict its credit allocation would unavoidably be highly politicized and that taxpayers would be on the hook for its credit losses. The risk would be directly in the central bank, as opposed to central bank support of somebody else.

So as Dr. Michel suggested, I think to have a central bank digital currency is one of the worst financial ideas of recent times. Still, it is quite conceivable to think of as a possibility, and it is good for us to think about it.

In conclusion, I think if we look at the money of the future, digitalization will continue, but I don't think the fundamental nature of money will change. It will probably continue as the monopoly issuance by a central bank. It might be a private currency backed by reliable assets. I don't think it will be a private fiat currency like Bitcoin. As we consider all this, an increase in the monopoly power of central banks, which already have too much, should be avoided. Thank you for being able to share these views.

[The prepared statement of Mr. Pollock can be found on page 39 of the Appendix.]

Chairman BARR. Thank you for your testimony.

And the Chair now recognizes himself for 5 minutes for questioning.

Let me just start with this idea of cryptocurrency potentially supplanting or displacing U.S. Federal Reserve notes as the world's reserve currency. And this is for anyone who wants to chime in. With greater use of electronic payments and the advent of digital currencies, do you think demand for U.S. Federal Reserve notes will decrease, and what implications does that have for the U.S. dollar?

Dr. MICHEL. I think if you look at why the U.S. dollar is as strong as it is and is in demand as it is, you have to look beyond just the fact that we have the Federal Reserve that prints Federal Reserve notes. We have an economy with strong property rights, especially relative to many other countries in the world. We have an incredibly developed—well-developed industrialized infrastructure here.

And as long as you combine those things and have a dynamic economy, then the assets of that economy, including the money that is predominantly used in that economy, are going to be sought after. So that is what you should focus on if you want people to want our money, if you want people to want to use our money.

And there is also a downside to being the world's reserve currency, and that is that we can basically continue the fiction that we can print as much as we want and lend as much as we want. And that is, frankly, not a good idea. So that is just not the way that I would think of those things.

Chairman BARR. Anybody else want to comment on that?

Mr. POLLOCK. Another way to think about that is that the United States does have—has had and continues to have, as my old friend, John Makin, used to say, a competitive advantage in “wealth storage services.” That is an advantage that arises out of social infrastructure, all the things that Norbert said, rule of law, enforcement of the contracts, a strong financial system, and, of course, a powerful government enforcing all of that. I think that will continue.

Concerning bank notes, U.S. dollar paper currency does circulate around the world, as we know. Nonetheless, I think the electronic forms of money, certainly in the wholesale markets, will become ever more dominant. This is despite the advantages that paper currency has, in some situations, like privacy.

Chairman BARR. Dr. Prasad, you wanted to—

Dr. PRASAD. It is difficult to see an asset that has no intrinsic value and no backing by the government maintaining value as a store of value. The initial promise of something like Bitcoin might become an effective medium of exchange, and that promise hasn't quite panned out because it turns out that it is very inefficient and very costly to transact using Bitcoins.

In fact, many of the nonofficial cryptocurrencies that are gaining more traction as mediums of exchange are, in fact, ones that are backed by fiat currencies or other forms of backing. So there is one called Tether, for instance, which is backed one-for-one with the U.S. dollar, and that is beginning to get traction as a medium of exchange. So ultimately, the U.S. dollar, as was just pointed out, is maintained in its dominant role to U.S. institutions and the trust in the Federal Reserve.

Chairman BARR. Let me follow up by basically—well, by starting with a more fundamental question. You talked about the volatility of digital currency, and maybe that is the principle reason why it is not the best medium of exchange right now or store of value. But at its very core, are cryptocurrencies money? And I invite anyone to chime in on this. And if not, if cryptocurrencies are not money, do they substitute as money? Do they function as money substitutes? Dr. Garratt.

Dr. GARRATT. Yes. On that point I would point to Hayek, who didn't like the word "money" as much as he liked the word "currency," arguing that that is a property, so a thing can have currency to a different extent.

And so is Bitcoin money? Well, for regulatory purposes, we may not want to define it that way. The IRS, CFTC have defined it as a commodity, because that is necessary for regulatory purposes. But in terms of the conceptual idea of is it money, it is to some extent, but it is not currently a very good one for the reasons that have been articulated. It is not very good as a medium of exchange because the price is so volatile. That means that—or a store of value, but as a medium of exchange, it is not good because if we think the price is going to go down, I don't want to receive it, and if I think the price is going to go up, I don't want to spend it. So this volatility undermines its features both as a store of value and as a medium of exchange.

Chairman BARR. My time is about ready to expire, but would its properties as money improve? Would its quality as money improve? Would its volatility decline based on adoption rate? Is adoption rate all that is required to improve its qualities to get to money? Dr. Garratt?

Dr. GARRATT. Well, yes, people have to start using it for transactions. If that happens then the price volatility might start to decline.

Dr. MICHEL. The adoption rate has a lot to do with it. The way Bitcoin itself is set up has a lot to do with its own volatility, but that is only one cryptocurrency. But, yes, so I would, just in general, say, yes, the adoption rate has a lot to do with it.

Chairman BARR. My time is more than expired.

I will now recognize Dr. Foster for 5 minutes.

Mr. FOSTER. Thank you. And thank our witnesses again.

Recently, there were reports in the press that estimates of about 20 percent of all Bitcoin have been lost, which strikes me as implying that whatever government or central bank issues digital fiat currency, if that was a representative number, it would be a tremendously profitable enterprise to be in, if 20 percent of your cash number came back to be redeemed. And that is in addition to the interest expense, if there is no interest paid on these digital instruments. And so it strikes me that whatever country starts doing this and becomes the de facto standard is going to have a permanent cash cow. And do you see anything wrong with that analysis?

Mr. POLLOCK. Congressman, I would say, for any issuer of currency, you like to have your currency lost or put away someplace. You remember American Express Travelers Checques, which were kind of currency—

Mr. FOSTER. Yep.

Mr. POLLOCK. —used to encourage you to put them in your attic and save them for the future, which was tremendously profitable for American Express.

Mr. FOSTER. Yes. And, on the other hand, there has been some concern here that somehow there would be a big, evil government monopoly taking over all banking functions. It seems to me it would be pretty self-limiting. If there was no interest paid on these things, the average person would maintain just a convenience level amount of this and not have all of their net worth and something that paid no interest. And, so, it seems like you would just have a reasonable fraction of everyone's net worth usable for short-term transactions, and then they would separately, in a very competitive banking and investment environment, allocate the main bulk of their investments elsewhere. Do you see anything wrong with that analysis? Yes, Dr. Prasad.

Mr. POLLOCK. Yes, I do. I think the Fed would pay interest, just as they do—I am sorry.

Chairman BARR. Yes. Well, as they don't on cash. Yes.

Dr. PRASAD. Just to be clear, the notion that is being floated right now is of noninterest-bearing deposit accounts. Right now this is not a clear proposal. There are different ways of thinking about how to set up a central bank digital currency. But the notion of deposit accounts is of noninterest-bearing deposit accounts, so the concerns that you could have this asset superseding other assets is highly unlikely because, again, it would be a zero nominal interest rate yield instrument just like cash currently is.

In regard to your concern about potential technological malfeasance, this goes back to the 7th century when paper currency was first printed, when counterfeiting was a concern and that remains to this day. One could argue that digital forms of fiat currency could reduce the concern about counterfeiting of paper currency, but they are—on the flip side, and in most issues here, there is a one side and the other side. The flip side here is that certainly they will make them very vulnerable to technological hacks, and this is why I think most central banks are very concerned about moving forward very aggressively with this because of technological vulnerabilities that are potentially out there.

Mr. FOSTER. Yes. And so the promise of blockchain is that it provides essentially a non-falsifiable ledger that would prevent a lot

of malfeasance. I think the kind that you still will, I think, forever be worried about is the business of authenticating the person that has access to move these balances around and operate that system, and that remains an unsolved problem in the digital world as how you really authenticate yourself for different levels of transactions.

Dr. Garratt, how does Sweden actually handle this issue in their proposal? For example, in the Swedish proposal, do swipe fees just disappear and that you can pay—how does Sweden deal with the problem if someone steals your cell phone or your identity somehow and proceeds to spend a bunch of money? Is there a mechanism to get your money back when a fraudulent transaction has taken it away from you?

Dr. GARRATT. I think if you are referring to the current Swish system, this is a system that is run by the central bank in cooperation with private banks. So these are still centralized accounts. So in the event that your cell phone was lost, you would still have access to go to the bank, reveal your identity, and get your account reinstated. Or you could probably just do that online.

So the—Sweden has issued something called an e-Krona report, where they are considering alternative new technologies to deal with the replacement of cash, but those are still just proposals. And among those technologies that they are considering is a stored value technology.

Mr. FOSTER. And in China, which has just massively apparently adopted digital transactions for consumers, at least, is that essentially an account balance with the two big players whose names I forgot, Alipay and whatever the other one is. So these are—essentially everyone has a balance on there, and I pay you by transferring some of my balance in Alipay to you, or is there some government operation behind it or central bank operation behind it?

Dr. PRASAD. So WeChat essentially is based on using the WeChat platform and the Alipay platform, but with balances that are already at your bank account, so you can link it to your bank account. What Sweden is considering is two options: The register-based system, where you have these electronic deposit accounts like I mentioned, or a value-based system that essentially download digital cash onto your electronic wallet which could be like a credit card. So those are the two options in Sweden that are being considered.

Mr. FOSTER. Thank you.

Chairman BARR. The gentleman's time is expired.

The Chair recognizes the Vice Chairman of the subcommittee, Mr. Williams from Texas.

Mr. WILLIAMS. Thank you, Mr. Chairman.

And thank all of you for today's hearing.

We are in the exciting first stages of the digital currency movement's adaption by mainstream stakeholders, and it has become apparent to many that blockchain and other new technologies is the digital currency space offer solutions to have the potential to drastically alter the financial sector that does business.

As Congress and regulators determine how best to treat these emerging products, we must be mindful of the impact our actions have on innovation, and the free enterprise. At the same time, however, it is important that policymakers keep in mind the legiti-

mate governmental interest in preventing the use of anonymous digital currency by those who wish to do us harm. I look forward to discussing with the experts today on the best path forward.

So my first question, Dr. Michel, is, you state in your testimony that Congress should work diligently to eliminate tax and other legal impediments to the development of alternative currencies as well as new applications for blockchain technologies. What are the impediments to development of alternative currencies, new applications for blockchain technologies, and what can Congress do about them?

Dr. MICHEL. Well, I think the main one, honestly, I do believe, is capital gains tax. The fact that you have to keep track of bases in every single transaction you would make, that is a major impediment to using anything other than the U.S. dollar for your transactions. So that is the biggest one.

Otherwise, on a regulatory side, I think if we look at BSA, Bank Secrecy Act, anti-money laundering laws, ensuring that nothing is treated differently. Yes, it is true that criminals have used Bitcoin, but criminals also have used airplanes, computers, and automobiles. We shouldn't criminalize any of those instruments simply because criminals use them. Those components, I believe, are the main barriers to using—to a more widespread adoptance of these things in the U.S.

Mr. WILLIAMS. OK. Thank you.

My next question is to Dr. Garratt. Your testimony presents three options for consumers in the event that cash is no longer available to them: No. 1, use commercial bank deposits for everyday transactions; No. 2, demand direct access to digital central bank issued money; and No. 3, turn to privately issued cryptocurrencies.

So what would cause consumers to choose options two and three when option one is an existing, familiar technology that is already becoming increasingly convenient as a payment method?

Dr. GARRATT. So, first of all, let me say that I agree with what you said at the end there. There is nothing wrong with our current banking system, and people have been very—and as I mentioned in my testimony, new means for transferring commercial bank deposits are constantly arising. It is increasing the ease with which we make not only person-to-business payments, but particularly peer-to-peer payments, person-to-person payments.

So in those scenarios I outlined, the first scenario is probably the most likely. But as cash actually disappears, that starts to create problems in a society. Sweden is currently dealing with this. And the Governor of the Riksbank recently wrote an opinion piece where he talked about some of the pain points that occur when physical cash really starts to disappear and when businesses stop receiving it.

And so, what I am really talking about is that future scenario. And at that point, the central bank has to decide if it wants to withdraw completely from providing a payment device for the general public, or whether it wants to offer some sort of digital alternative. And one of those digital alternatives could be, possibly down the road, some form of cryptocurrency that is offered by the central bank.

And the primary reasons for doing that, I think, one would be if you wanted to allow some type of privacy component within transactions of this currency, like is currently possible with cash, subject to limits and, as I said, balanced against the risks of tax evasion and criminal activity. These are the options that the central bank will ultimately face, and my argument is that these are something that the—that we should be prepared for.

Mr. WILLIAMS. OK. Let me—staying with you, Dr. Garratt, with the dozens of digital currencies out there, all the different attributes that make classifications difficult, what is the appropriate framework for us to use if Congress approaches legislation addressing the digital currency?

Dr. GARRATT. Well, that is a very difficult question.

Mr. WILLIAMS. That is why I asked it to you.

Dr. GARRATT. Well, there is—people have the ability to issue these private currencies and they are going to exist. And I think just like Dr. Michel said, one can't make something illegal just because it might be used for illegal purposes.

What I am arguing is that, I believe that the central bank does a good job at providing payment services and not only just at the InterBank level but also for small payments by the public. And I think the central bank should continue to provide the best possible product along those lines.

And what I am arguing is, is that in the future date, that best possible product might involve some of these new technologies but issued by the central banks to remain competitive with those payment devices as opposed to some of these private currencies, which are less able—we are less able to monitor and less able to—

Chairman BARR. The gentleman's time is expired.

The Chair recognizes the gentleman from California, Mr. Sherman.

Mr. SHERMAN. It seems like some think tanks demand, at every turn, that we do things that make the Federal Government less able to meet its financial obligations, and then they demand that we have an extensive and expensive foreign policy that costs well over \$1 trillion. There is no way to square that unless we abolish Social Security and Medicare.

We have moved from gold from 2,000 years ago to drafts and paper currency, symbolizing gold, to where the paper currency itself has value. And now, for many decades, what has value is paper that represents the paper. I pay my rent with a check which represents paper dollars, which, as recently as the 1930's, could be converted into gold but can no longer be.

And we now have an opportunity to disempower the Federal Government and to move that power to those hostile to it. We need a medium of exchange. We need a unit of value. The witnesses have demonstrated that the dollar is much better at that for honest citizens. But cryptocurrencies offer unparalleled advantages to nations that the U.S. Government wants to sanction for their terrorist activities, to tax evaders, and to criminals.

Mr. Pollock, this seems to be a solution looking for a problem. What can an honest citizen not do to store value to effectuate a transaction? I can be in the smallest hamlet in rural India and use my Visa card. I have never had a problem paying somebody, unless

I didn't have the money. So it is a good—we have pretty efficient, mostly digital transfers of dollars every day. What is the problem we are trying to solve, except for the problem that the narcotics dealers have?

Mr. POLLOCK. I think the proposal being made for private fiat currencies—which, as I said, Congressman, strikes me as an unlikely outcome, a private fiat currency as opposed to a convertible currency—is to give optional ways of settlement for anybody who—

Mr. SHERMAN. But, I have got a means of settlement called the dollar. What is the great failure?

Mr. POLLOCK. And you have another one called the euro and—

Mr. SHERMAN. I have many, many choices, 150 of them at least.

Mr. POLLOCK. —ounces of gold.

Mr. SHERMAN. So what problem do I have that they are trying to solve, unless I am a tax evader or a narco-terrorist?

Mr. POLLOCK. First of all, I am not pushing, as you know, this solution.

Mr. SHERMAN. I am trying to illustrate that it is a solution only to the problems of tax evaders, criminals, and terrorists.

Mr. POLLOCK. But my—excuse me. You might—

Mr. SHERMAN. It offers an opportunity for profit by speculators speculating on a currency whose sole value is to help the aforementioned ne'er-do-wells. Go ahead.

Mr. POLLOCK. You might argue that people should deserve, just as I think Dr. Michel did—and in my written testimony, there is a quote from Friedrich Hayek on this—the freedom to choose the denomination of the transactions they want to engage in.

Mr. SHERMAN. We should allow people to own guns in many circumstances. But if the sole advantage of a particular gun is that it has a special tape on it to prevent fingerprints from adhering, and you would say the honest citizen who wants to hunt wants to make sure that the deer cannot identify the fingerprints of the hunter, I would say the sole benefit of that particular tape on that particular gun is to facilitate criminals.

What, other than facilitating criminals and allowing people to place bets on the value of a criminal tool—we can speculate the value of burglar's tools—what does this do? What problem does it solve? Can you identify one? Because I can't.

Mr. POLLOCK. I don't know the extent to which cryptocurrencies are used in this criminal way. I suspect they are, to some extent, but so is cash. And as Dr. Michel says, so are a lot of things.

Mr. SHERMAN. Well, yes, but rifles are chiefly used for hunting. Rifles with design not to have fingerprints on them are predominantly used for crime.

Chairman BARR. The gentleman's time is expired.

And the bells signal that votes have been called on the House floor. We will recess for votes in a moment, but we will go to Mr. Hill for 5 minutes of questioning then we will recess and we will return. And for Members who have not had an opportunity, we will reconvene for the remainder of the hearing for your questions after votes.

At this time, we will ask Mr. Hill for his 5 minutes of questions.

Mr. HILL. Thank you, Chairman Barr. I appreciate the time today. Very interesting panel. I was at the U.S. chamber this morn-



ing talking about Fintech and the advantages of exploring how blockchain can change business economics and accounting and logistics. Very interesting topic.

Today, we are talking about something that has, the headline which is constant chatter about cryptocurrencies. And when I listen to your testimony, I just have flashbacks—not personally, of course—to the 1830's. I am thinking about Wildcat banking when we had no central bank, thanks to President Jackson's insistence that we didn't need that. And every State and every business and every town issued script or currency.

I have a book at my house of obsolete script and currency, that is a collector's guide, and it is very thick.

So help me, Mr. Pollock, understand why is this any different? I can't imagine that any one privately issued cryptocurrency could be any more accepted than another. In a big picture sense, why is it not like Wildcat banking of the 1830's?

Mr. POLLOCK. Congressman, I think it is exactly the same, as I tried to suggest in my testimony.

As I said in my written testimony, I have, in my collection, a nice copy of a \$3 bill issued by the Wisconsin Marine and Fire Insurance Company, which acted as a bank in the 1840's, in this period you are talking about. I think it is exactly the same, except those currencies did have a claim on the assets of the bank if the bank had good assets.

Mr. HILL. Thank you for that. And Dr. Michel, I think if I remember Article I right, coining money is an enumerated power of the Congress, not the Federal Reserve system. Yet, I am always—in fact, Chairman Powell got the question this morning. Chairman Powell can decide to do cryptocurrencies at the Fed.

Where is all this—this would still be pursuant, obviously, to Congress directing that we do this. And so tell me your views on that legally?

Dr. MICHEL. Legally, I hate to venture a guess because they seem to be able to do quite a bit without legislation.

Mr. HILL. This is no surprise from your testimony, yes, thank you.

Dr. Prasad, a question for you. You talked about potentially, because of blockchain, truly an innovative area, that potentially you would make some forms of money or credit, I would say, obsolete, like as an account payable receivables, for example. People wouldn't necessarily have as big a line of credit, so you are concerned about future credit creation and open market operations, I assume that is where you were coming from in your testimony.

Dr. PRASAD. That is part of it. If you think about the previous Congressman's question about what is the point of cryptocurrencies, there are many inefficiencies that lurk in the financial system, including one certain crisis. But also if you think about payments, either using your Visa, or if you think about cross-bar settlement of transactions, those are painfully slow, sometimes quite expensive. And these technologies and principles provide a way of getting around those issues—in principle, again, I emphasize that—could make transactions much easier to verify, to follow through. They could ensure finality of settlement of transactions and bring down the cost.

We are not quite there yet, but that is the prospect, and that could affect the traditional model of banking, especially as non-bank financial intermediaries. We talked about Alipay and Alibaba in China. They take over. And that could affect how the Fed thinks about financial stability and the transmission of monetary policy as well.

Mr. HILL. Thank you very much. In my time remaining, Mr. Chairman, since this is the Monetary Policy Committee, I have to commend to our viewing audience and to my colleagues, Mr. Pollock's recent writings on the 40th anniversary of the Humphrey-Hawkins Act, one of my personal favorite laws.

And we celebrated today quietly here as we had Chairman Powell testifying. And I always find the goals of Humphrey-Hawkins odd. You have full employment and price stability.

So I didn't get to ask my question, and I will let you have the last word, Mr. Pollock. How is price stability consistent with perpetual inflation, setting a 2 percent inflation target?

Mr. POLLOCK. It is not. That is one of the great mysteries of the Federal Reserve, how stable prices, which is actually the term in the Act, is consistent with their announced strategy of perpetual inflation.

Mr. HILL. Thank you. That is one of the great mysteries of finance.

I yield back.

Chairman BARR. The gentleman yields back from those good questions.

And I am informed that because this is going to be an extraordinarily long vote series on the House floor, we may be losing Members. And so I will reverse course and call on our colleague from Ohio for the last set of questions for the hearing. And that is Warren Davidson, who is now recognized for 5 minutes for the final question of the hearing.

Mr. DAVIDSON. Thanks for the bonus time, Mr. Chairman. And thank you all for being here.

I assume you are relieved a bit so you won't be waiting for us for 1-1/2 half or 2 to get back over here.

So thank you for your expertise in this. And I think just beginning with the nature of currency, what is our currency. And part of the stability of the U.S. dollar lies not just in the resources of the United States, but in the resources of the world. The petrol dollar.

Everyone has to settle their current account at some level in U.S. dollars because everyone uses crude oil. And so we have an effective monopoly on settlement there. And it dealt somewhat effectively with the problem of mercantilism involved in gold. So it prevented hoarding because the oil isn't hoarded.

Of course, Congress continues to tap the strategic petroleum reserves, so I assume eventually maybe we can find an end.

But in the background of that, what creates the stability of money? And I guess I want to get at in cryptocurrency, we use the word for everything. We use it for crypto-securities that are really nothing more than nonvoting shares in companies in some cases. This is what the SEC is trying to regulate.

We have established that numerous of these cryptocommodities are effectively commodities, but we are not quite sure that they are currencies.

Mr. Pollock, you summed it well by saying there is a big gap between how much is this in bitcoin. And so, I guess that is the question I would like the panel to explore.

Maybe Mr. Michel, would you like to pursue? Dr. Michel.

Dr. MICHEL. The question specifically being?

Mr. DAVIDSON. The nature of money in crypto. So what would make a cryptocurrency a currency, not just a commodity, not an asset? How do you move from, whether it is bitcoin or petrolcoin or Michelcoin—

Dr. MICHEL. I like the sound of that one. That was good. If we are talking about a medium of exchange, then what we have is either a currency or a substitute for currency or a substitute for money. If it is all digital, maybe we shouldn't call it currency, but the idea is what is the medium of exchange.

And my whole point is that people should be allowed to use whatever medium of exchange that they want to use. The fact that many people think that the Fed is great and the Fed is fine, and we should just stick to the central bank that we have, that is wonderful.

If nobody else ever believes that way and hardly anybody adopts any alternative form of money, then there is no problem. Nobody is going to use one, but if somebody comes up with something better, then we should allow that to take place, because—

Mr. DAVIDSON. You highlighted earlier, you highlighted earlier that the government shouldn't favor one or the other. Well, we clearly do. We coin the money. And we have the official money. We have the legal tender in the United States.

Mr. Pollock, how do you see migrating that path for something to really become a currency?

Mr. POLLOCK. To be a currency, as I tried to suggest in my remarks, you have to be readily accepted in settlement of payments and debts, and to be a unit, which is used to denominate contracts. That means that people in general believe that that currency is going to be available and accepted by other people, and they have to believe that other people accept that. And everybody else has to believe that other people will accept that as well.

It is a strange social creation, money, that comes out of belief backed up by sets of enforcement.

Mr. DAVIDSON. The great history, the history of money.

Dr. Garratt?

Mr. POLLOCK. It is curious to think about.

Dr. GARRATT. I will just build on that. I think what you are really getting at with your question is why does bitcoin have any value at all?

And as Mr. Pollock just said, for a currency to have value and to function as a currency, it simply has to be the case that you accept it from someone on the belief that someone down the road will accept it from you.

Mr. DAVIDSON. Right.

Dr. GARRATT. One of the interesting things that makes that work apparently with something like bitcoin is the currency supply rule.

There is a fixed rule for how the money increases over time, but that is known and fixed. And so you don't have to worry that the issuer of the currency will behave irresponsibly and devalue it.

So that is a fundamental aspect that gives bitcoin value once somehow that process has started, where people have started to believe in it. But it also is, it can be problematic because it means that you have a fixed rule and you are not able to provide currency in a way that might be beneficial in general for the economy.

Mr. DAVIDSON. Thank you so much. I am sorry I couldn't get to everyone. And frankly, I couldn't get to nearly all my questions.

But nearly universal liquidity, I think, is the defining characteristic, and then we can't get to the store value related to petrol. But thank you so much for your time. And thanks for your indulgence, Chairman.

Chairman BARR. Thank you for your questions and thank you for yielding back your time.

And I would like to thank all of our witnesses for their testimony today. Again, I apologize for the brevity of the hearing. I think we had a lot of Members with a lot of interests, but because of the interruption of votes, we will have to end this hearing a little bit early.

But given the fact that digital currencies and cryptocurrencies will continue to have a greater and greater impact on our financial system and the broader economy. I am sure we will be revisiting this issue and exploring this topic further in the future.

The Chair notes that some Members may have additional questions for this panel, which they may wish to submit in writing. Without objection, the hearing record will remain open for 5 legislative days for Members to submit written questions to these witnesses and to place their responses in the record. Also, without objection, Members will have 5 legislative days to submit extraneous materials to the Chair for inclusion in the record.

This hearing is adjourned.

[Whereupon, at 3:13 p.m., the subcommittee was adjourned.]

# **A P P E N D I X**

July 18, 2018

**The Future of Money: Digital Currency**

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Maxwell C. and Mary Pellish Chair in Economics  
University of California at Santa Barbara

Testimony to the Subcommittee on Monetary Policy and Trade  
Committee on Financial Services  
United States House of Representatives

July 18, 2018

Chair Barr, Ranking Member Moore, and Members of the Subcommittee on Monetary Policy and Trade, thank you for inviting me to testify at this hearing on “The Future of Money: Digital Currency.”

The convenience of electronic transfers has led to a decline in the use of cash relative to commercial bank deposits in many countries around the world.<sup>2</sup> This is particularly true in countries where systems for transferring commercial bank deposits are more advanced. Sweden is perhaps the best example of this. Its mobile payment system, Swish, has been adopted by over 60 percent of the population and the use of cash in transactions has fallen to 2% by value.<sup>3</sup> Countries around the world are introducing faster payment systems including the recently launched Real Time Payments platform by the Clearing House in the United States. At the same time Paypal, Venmo and other private mobile payment platforms continue to improve the convenience and speed of person-to-person and retail payments by leveraging conventional financial market institutions and infrastructures. It seems likely that the use of cash for transactions will continue to fall and it is worth noting that there is tipping point at which even if customers seek to use cash, businesses and banks will not want to deal with it.<sup>4</sup>

What happens then? One possibility is that people will be content to transact primarily in commercial bank deposits and things will be business as usual with a much smaller cash component to the monetary base.<sup>5</sup> Another possibility is that consumers will demand direct

<sup>1</sup> Former Vice President, Federal Reserve Bank of New York, 2013-2015.

<sup>2</sup> See E. Prasad, “Central banking in a digital age: stock-taking and preliminary thoughts,” Hutchins Center on Fiscal & Monetary Policy at Brookings, Apr. 2018.

<sup>3</sup> <https://www.instapay.today/tracker/sweden-swish/>, <https://www.worldpaymentsreport.com>

<sup>4</sup> The percentage of transactions using cash in the United States by value/volume fell from 14%/40% in 2012 to 8%/31% in 2016. See <https://www.frbsf.org/cash/publications/fcd-notes/2014/april/cash-consumer-spending-payment-diary/>.

<sup>5</sup> It is unlikely and it would be undesirable for cash to disappear completely in the near future. First, some people do not have access to a bank account, credit or debit cards or electronic payment platforms and

access to some form of digital central bank issued money as a replacement for cash. A third possibility is that consumers will turn to privately-issued cryptocurrencies. Privately-issued cryptocurrencies use decentralized networks of computers to facilitate remote peer-to-peer exchanges in the absence of trust between the parties and without the need for an intermediary. From the report on Digital Currencies from the Committee for Payments and Market Infrastructures:

Typically, a payer stores in a digital wallet his/her cryptographic keys that give him/her access to the value. The payer then uses these keys to initiate a transaction that transfers a specific amount of value to the payee. That transaction then goes through a confirmation process that validates the transaction and adds it to a unified ledger of which many copies are distributed across the peer-to-peer network.” (p. 5)<sup>6</sup>

In this regard, I use Bitcoin as the leading example. Other, so-called altcoins (eg Litecoin, Zcash, Monero) are captured by my remarks.<sup>7</sup>

These options are not mutually exclusive, nor are they independent. The adoption rate of bitcoin, will depend not only on its performance as a money, but also on the alternative forms of digital money (if any) that the central bank provides. If consumers perceive that they have inadequate access to a cash-like medium of exchange, then they may be more inclined to turn to alternatives. On the other hand, if the central bank offers a digital form of central bank money to the public with sufficient cash-like properties, then perhaps this will appease those who miss cash.

Central banks are currently evaluating numerous options for digital currencies, not just in response to the shift away from cash, but also for meeting core objectives and the enhancement of financial market infrastructures. Ongoing proofs-of-concept by central banks and private partners consider the use of central bank cryptocurrencies in wholesale systems only. These

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cash allows the only form of settlement that can occur during a power outage. Second, cash is the only form of payment that cannot be disrupted by a cyberattack. Finally, if there were no cash, then it would be unclear to the general public what commercial bank deposits represent, since there would be nothing for deposit account holders to convert them to. Ken Rogoff, who suggests eliminating high denomination notes in order to reduce crime and tax evasion, argues that eliminating cash altogether “could disrupt common social conventions for using money, possibly in unexpected ways.” See p. 451 of K. Rogoff, “Costs and benefits to phasing out paper currency,” *NBER Macroeconomics Annual* 29(1), 2015.

<sup>6</sup> Committee on Payments and Market Infrastructures, “Digital Currencies,” November 2015.

<sup>7</sup> These altcoins function similarly to bitcoin and some have enhanced privacy features. There are also cryptocurrencies whose primary purpose is not to provide a cash substitute, but rather to facilitate other operations over distributed ledger platforms. Ether is a cryptocurrency that is native to the Ethereum platform. Its primary purpose is to serve as “gas” that fuels the execution of smart contracts. These currencies can also perform functions of money.

applications are driven by efficiency and cost considerations and have minimal monetary policy implications.

In what follows, I will begin by focusing on the merits of a widely accessible, retail-oriented central bank cryptocurrency that could be used by the public for person-to-person and retail transactions. I will then return to a discussion of wholesale applications.<sup>8</sup>

The initial inspiration for a retail central bank cryptocurrency came from blog posts by JP Koning and Sina Motamedi.<sup>9</sup> A retail central bank cryptocurrency could transact like bitcoin. However, instead of having a fixed money-supply rule the Federal Reserve would control the creation and destruction of these coins. Crucially, there could be one-for-one convertibility with cash and reserves, and hence a retail central bank cryptocurrency would not suffer from the high price volatility that undermines the usefulness of bitcoin as a store of value and medium of exchange.<sup>10</sup>

The Federal Reserve could choose to implement a cryptocurrency on a permissioned blockchain, which means transaction verification could be performed by vetted actors who are accountable for their actions, without costly proof-of-work. This could mitigate the objection raised by Michael Bordo and Andrew Levin that transaction verification in “token-based” cryptocurrencies is inherently expensive and decentralized fixes (eg replacing “proof of work” with “proof of stake”) may be unacceptable.<sup>11</sup> Significant progress in this direction is reflected in the RSCoin mechanism proposed by George Danezis and Sarah Meiklejohn.<sup>12</sup> Another advantage of this hybrid approach, where trade is decentralized but validation is centralized, is that it provides settlement finality. Principle 8 of the Principles for Financial Market Infrastructures requires that “An FMI should provide clear and final settlement...” (p. 64)<sup>13</sup> Lack

<sup>8</sup> Payments economists divide payments into retail and wholesale. Retail payments are relatively low-value payments made by the general public. In contrast, wholesale payments are large-value and high-priority payments such as interbank payments. The distinction might become less relevant in a world with central bank cryptocurrencies. My usage here reflects the type of payments that the central bank cryptocurrency primarily targets. See the taxonomy of money provided in M. Bech and R. Garratt, “Central bank cryptocurrencies,” *BIS Quarterly Review*, September 2017.

<sup>9</sup> See J. P. Koning, “Fedcoin” blogpost, 2014 and S. Motamedi, “Will bitcoins ever become money? A path to decentralised central banking, blogpost, 2014. See also Koning, “Fedcoin: A central bank issued cryptocurrency,” R3 Reports, November 2016.

<sup>10</sup> Price volatility undermines an object’s usefulness as a medium of exchange in two ways. Volatility on the downside makes recipients less likely to accept it. While volatility of the upside, such as was experienced during the bitcoin price surge that occurred at the end of 2017, make people unwilling to spend it. See Bech and Garratt for an illustration of bitcoin’s price volatility.

<sup>11</sup> See M. Bordo and A. Levin, “Central bank digital currency and the future of monetary policy,” Economics Working Papers 17104, Hoover Institution, Stanford University, 2017.

<sup>12</sup> See G. Danezis and S. Meiklejohn, “Centrally banked cryptocurrencies,” 2016.

<sup>13</sup> See Committee on Payment and Settlement Systems, “Principles for financial market infrastructures,” April 2012.



of settlement finality in permissionless systems was one of the objections to bitcoin raised by the Bank for International Settlements in its 2018 Annual Economic Report.<sup>14</sup>

Proposals to increase access to digital central bank money are not new. Nobel Laureate James Tobin proposed giving the public access to “deposited currency accounts” at Federal Reserve banks over three decades ago.<sup>15</sup> Balances in deposited currency accounts would actually be central bank money, as opposed to commercial bank deposits which are redeemable for central bank money (currently in the form of cash). These accounts could be administered by the central bank or offered through commercial banks that hold these funds in segregated accounts.<sup>16</sup>

If deposited currency accounts were not considered to be a good idea in the 1980s, why might central bank cryptocurrencies be a good idea today (or at least in the future)? A number of things have changed since Tobin’s proposal. As I mentioned previously, cash use has declined. We have also been through a major financial crisis which may have changed some people’s attitudes toward commercial bank deposits. Finally, technological advancements offer the potential for issuing digital central bank money in a new way with enhanced features.

In regards to the last development, I offer two examples. First, the peer-to-peer aspect of cryptocurrencies could allow central banks to provide a digital money with anonymity properties similar to those of cash. Whether or not the central bank would want to do this is a complicated issue that requires balancing legitimate demands for individual privacy against concerns related to tax evasion and other criminal activities.<sup>17</sup> The potential for illegal behavior is not unequivocally increased by cryptocurrencies. Cryptocurrencies are easier to transact in large quantities than cash, but they are also more traceable. Second, there is the potential to improve upon cash by creating what advocates of cryptocurrencies call “programmable money.” Programmable money allows trading parties to hardwire the terms and conditions of trades into their transactions so that they may be executed upon fulfilment of the conditions without relying on third parties. This is particularly useful for transactions that span multiple legal jurisdictions.

Any decision to implement a retail-oriented central bank cryptocurrency would have to balance potential benefits against potential risks. A common objection to expanding access to

<sup>14</sup> See Bank for International Settlements, “Cryptocurrencies: looking beyond the hype” Annual Economic Report, 17 June 2018.

<sup>15</sup> See J. Tobin, “Financial innovation and deregulation in perspective,” *Bank of Japan Monetary and Economic Studies*, 3(2), 1985 and Tobin, “The case for preserving regulatory distinctions,” in Proceedings of the Economic Policy Symposium, Jackson Hole, Federal Reserve Bank of Kansas City, 1987.

<sup>16</sup> See Tobin, 1987 and B. Dyson and G. Hodgson, “Digital Cash: Why Central Banks Should Start Issuing Electronic Money,” 2017.

<sup>17</sup> Sweden’s Riksbank outlined options it is considering for an e-Krona and one of these, a stored value technology, allows transaction anonymity. See “The Riksbank’s eKrona Report”, Report 1, September 2017.

central bank money is that it could disintermediate banks, however it is also plausible that it could produce healthy competition. The risk of excessive disintermediation could be mitigated by making the central bank cryptocurrency more like cash and less like commercial bank deposits. In a 2016 speech Ben Broadbent, Deputy Governor for Monetary Policy at the Bank of England stated his opinion that if a central bank digital currency “bore no interest and came without any of the extra services we get with bank accounts – people would probably still want to keep most of their money in commercial banks.”<sup>18</sup>

I now return to the wholesale applications of central bank cryptocurrencies.<sup>19</sup> The motives for considering central bank cryptocurrencies in wholesale applications center around new applications of “distributed ledger technology.” The goal here is to leverage aspects of the decentralized structure underlying cryptocurrencies to enhance or reconfigure existing financial market infrastructures. Initial use cases were limited to large value payment systems, but work has since expanded to include cross-border payments, securities clearing and settlement and trade finance.<sup>20</sup> What is common to many of these applications is the need for a settlement token that is native to the platform. Principle 9 of the Principles for Financial Market Infrastructures states that “An FMI should conduct its money settlements in central bank money, where practical and available.” (p. 67) As such, proponents of these new systems would like to see the tokenization of central bank money. One possibility would be the creation of an entirely new form of restricted-use central bank money, a central bank issued token, that can only be traded by participants on these closed systems.<sup>21</sup> However, the Bank of Canada came up with an alternative concept that achieves the same outcome without adding a new component to the monetary base.

In Project Jasper, Canada’s proof of concept for a large value payment system on a distributed ledger, the project team utilized the concept of a *digital depository receipt* or DDR. The approach was to issue tokens on a distributed ledger platform that represented claims to participants’ settlement balances at the central bank. With the proper legal structure in place, transfers of the tokens on the ledger could represent a final and irrevocable transfer of central

<sup>18</sup> See B. Broadbent, “Central banks and digital currencies”, speech at the London School of Economics, March 2016.

<sup>19</sup> For a discussion on the distinction between retail and wholesale central bank cryptocurrencies see R. Garratt, “CAD-coin versus Fedcoin,” R3 Reports, November 2016.

<sup>20</sup> See D. Mills, K. Wang, B. Malone, A. Ravi, J. Marquardt, C. Chen, A. Badev, T. Brezinski, L. Fahy, K. Liao, V. Kargenian, M. Ellithorpe, W. Ng and M. Baird, “Distributed ledger technology in payments, clearing, and settlement,” Finance and Economics Discussion Series 2016-095. Board of Governors of the Federal Reserve System; European Securities Markets Authority, “The distributed ledger technology applied to securities markets”, Report 7 January 2017; and E. Benos, R. Garratt and P. Gurrola-Perez, “The economics of distributed ledger technologies for securities settlement”, Bank of England Staff Working Paper No. 670, August 2017.

<sup>21</sup> A precedent is the 1934 gold certificate issued by the Federal Reserve in the United States for the sole purpose of making interbank payments.

bank money. These tokens were passed from node to node in the system and at the end of the process the owners of the DDRs redeemed them at the central bank for an equivalent value in settlement account balances.

This idea can be implemented privately, in an almost equivalent fashion. Cooperating parties can set up a closed network in which members trade tokens representing claims on central bank money in an external private account. An example of a private collection of financial institutions that is attempting this type of arrangement is the group of six global banks behind Utility Settlement Coin.<sup>22</sup> By creating a special purpose 100% reserve bank or through the establishment of a special joint account the money backing the value represented on a distributed ledger can be free of credit risk.<sup>23</sup>

DDR schemes leverage advantages of decentralized trade, but they rely on special actors within the system, either a central bank, or a designated authority or group, who holds money off ledger and plays a significant role in the transaction verification process. Thus, these wholesale systems also avoid costly proof of work. So far, central banks have not seen significant added-value to these systems over conventional systems, however central banks continue to experiment with broader financial applications where prospects for added-value are greater.<sup>24</sup>

In conclusion, I believe that the Federal Reserve will, at some point in the future, need to respond to the disappearance of cash and I have given some reasons why it might consider offering some form of retail-oriented central bank cryptocurrency. There are, however, many issues related to the viability and security of this technology that need to be fully resolved before adoption. Moreover, a much deeper understanding of the monetary policy and financial stability issues is needed. On the wholesale side, the DDR concept allows financial market infrastructures to build clearing and settlement features onto distributed ledger platforms by leveraging conventional central bank accounts without introducing a new category of central bank money.

Thank you again for the opportunity to testify before you today. I would be happy to answer any questions.

<sup>22</sup> <https://www.ft.com/content/20c10d58-8d9c-11e7-a352-e46f43c5825d?mhq5j=e5>

<sup>23</sup> Joint Accounts currently offered to financial market infrastructures by the Federal Reserve could potentially be used for this purpose.

<sup>24</sup> Evaluations of proof-of-concepts for a large value payment systems are found in J. Chapman, R. Garratt, S. Hendry, A. McCormack and W. McMahon, "Project Jasper: Are Distributed Wholesale Payment Systems Feasible Yet?" Bank of Canada *Financial System Review*, June 2017 and Monetary Authority of Singapore, "Project Ubin Phase 2, Re-imagining Interbank Real-Time Gross Settlement System Using Distributed Ledger Technologies," November 2017.




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## CONGRESSIONAL TESTIMONY

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### **Central Bank Cryptocurrency and Retail Bank Accounts: Two Terrible Policy Ideas**

#### **Testimony before the Subcommittee on Monetary Policy and Trade, Committee on Financial Services**

U.S. House of Representatives

July 18, 2018

Norbert J. Michel, PhD  
Director, Center for Data Analysis  
The Heritage Foundation

My name is Norbert Michel. I am the Director of the Center for Data Analysis at The Heritage Foundation. The views I express in this testimony are my own and should not be construed as representing any official position of The Heritage Foundation.

Coin Market Cap lists nearly 1,600 cryptocurrencies, with a total market capitalization of almost \$250 billion as of June 28, 2018.<sup>1</sup> Given that the first successful cryptocurrency, Bitcoin, has only existed for one decade, these figures demonstrate rapid growth and interest in this new technology. Yet, the fact that just two cryptocurrencies—Bitcoin and Ethereum—account for nearly \$150 billion of this total market value highlights that (1) the technology remains in its infancy, and (2) cryptocurrencies are not all the same.

Even Bitcoin remains far from being a *generally accepted* medium of exchange, but all cryptocurrencies can—and many do—function as a money substitute. Many large companies, such as Microsoft, Dell, DISH Network, and Overstock.com, now accept cryptocurrencies as payment, and Coinbase recently estimated that more than 10 million people worldwide hold a material amount of Bitcoin.<sup>2</sup> Thus, it is possible that Bitcoin (or other cryptocurrencies) eventually will be widely accepted and recognized as money. It is certainly difficult to imagine a cryptocurrency replacing the U.S. dollar as long as the Federal Reserve acts as a moderately good steward of the national currency, but it is for this very reason that Congress should eliminate barriers that impede people from using their preferred medium of exchange. Competitive market forces can improve the means of payment in the same way that market forces improve virtually all goods and services, and Congress should not protect the Federal Reserve from those competitive forces.

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<sup>1</sup>Coin Market Cap, <https://coinmarketcap.com/all/views/all/> (accessed June 28, 2018).

<sup>2</sup>Kyle Torpey, "Report Estimates There Are More Than 10 Million Bitcoin Holders Worldwide," CoinJournal, January 11, 2017, <https://coinjournal.net/report-estimates-10-million-bitcoin-holders-worldwide/> (accessed July 11, 2018).

Worldwide, government's overall record of currency debasement highlights the importance of preserving citizens' ability to use whichever form of money they choose, and the underlying technology that drives cryptocurrencies—a distributed ledger known as a blockchain—could have effects far beyond purchases of goods and services. Blockchain technology could ultimately improve all sorts of processes that rely on time-stamped electronic records, such as digital passports, real estate title records, or even stock trades. These new applications are also in their infant stages, and Congress should allow the competitive process to unfold so that people discover the best ways to use blockchain technologies. There is no inherent reason that government agencies, including central banks, should avoid using these technologies if they produce cost savings or efficiency gains for their operations.<sup>3</sup> However, no government-imposed mandate should force people to use any particular cryptocurrency—or any other form of money—in place of another medium of exchange.

### **Cryptocurrency: A Solid Competitor for Cash?**

During the past few decades in the U.S., consumers have steadily shifted from using paper-based payments to electronic means of payment.<sup>4</sup> For instance, the percentage of U.S. consumer expenditures made with debit and credit cards (combined) was only 3 percent in 1986, but 25 percent in 2000.<sup>5</sup> In 1995, debit and credit cards (combined) accounted for less than 20 percent of all noncash payment transactions, but increased to more than 40 percent of this volume by 2003.<sup>6</sup> As of 2015, cards accounted for more than 65 percent of all noncash transactions.<sup>7</sup> More recently, smartphone-based payment services have rapidly gained importance as a noncash form of payment, “increasing from 0.3 billion payments in 2012 to 1.3 billion in 2015.”<sup>8</sup>

The success of smartphone-based payment applications, credit and debit cards, and cryptocurrencies have led many to predict the demise of cash,<sup>9</sup> but Federal Reserve data shows that “consumers choose to use cash more frequently than any other payment instrument, including debit or credit cards,” and that cash still plays “a dominant role for small-value transactions.”<sup>10</sup> Furthermore, consumers, particularly lower-income consumers, still use cash frequently for relatively large transactions. Cash is the leading payment instrument for several expenditure categories, such as (1) person-to-person gift transfers, (2) food and personal care supplies, and (3)

<sup>3</sup>The Fed's payment systems, for instance, could be improved via blockchain technology. Separately, blockchain technology could be used to implement a monetary policy rule. These possibilities are beyond the scope of this testimony. For more on blockchain and a monetary policy rule, see George Selgin, “Synthetic Commodity Money,” April 10, 2013, [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2000118](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2000118) (accessed July 13, 2018).

<sup>4</sup>The Federal Reserve Payments Study 2016: Recent Developments in Consumer and Business Payment Choices,” June 30, 2017, <https://www.federalreserve.gov/newsevents/pressreleases/files/2016-payments-study-recent-developments-20170630.pdf> (accessed July 11, 2018).

<sup>5</sup>James Lyon, “The Interchange Fee Debate: Issues and Economics,” Federal Reserve Bank of Minneapolis The Region, June 1, 2006, <https://minneapolisfed.org/publications/the-region/the-interchange-fee-debate-issues-and-economics> (accessed July 11, 2018).

<sup>6</sup>Ibid.

<sup>7</sup>Federal Reserve, 2016.

<sup>8</sup>Federal Reserve, 2016.

<sup>9</sup>David Wolman, “The Demise of Cash,” *Huffington Post*, October 22, 2012, [https://www.huffingtonpost.com/david-wolman/visa-demise-of-cash\\_b\\_2003284.html](https://www.huffingtonpost.com/david-wolman/visa-demise-of-cash_b_2003284.html) (accessed July 11, 2018), and Jon Norris, “The Disappearing Paper: Why Cash Is a Dying Payment Method,” *TransferWise*, December 7, 2016, <https://transferwise.com/us/blog/the-disappearing-paper-why-cash-is-a-dying-payment-method> (accessed July 11, 2018).

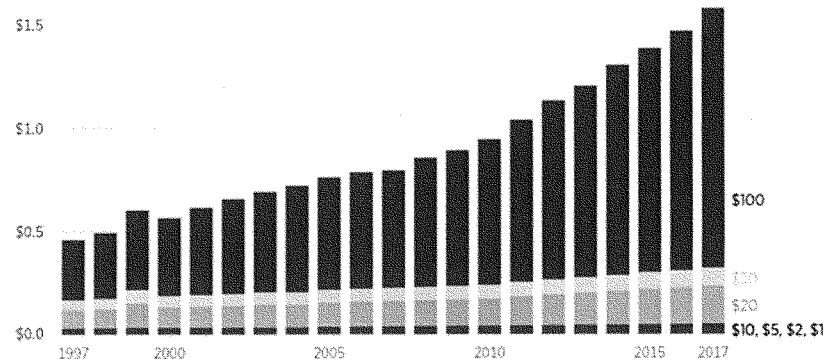
<sup>10</sup>B. Bennett, D. Conover, S. O'Brien, and R. Advincula, “Cash Continues to Play a Key Role in Consumer Spending: Evidence from the Diary of Consumer Payment Choice,” Federal Reserve Bank of San Francisco, April 2014, <https://www.frbsf.org/cash/publications/fed-notes/2014/april/cash-consumer-spending-payment-diary/> (accessed July 11, 2018).

entertainment and transportation expenditures.<sup>11</sup> As of 2012, cash accounted for roughly 40 percent of U.S. consumer transactions by volume and approximately 14 percent by value.<sup>12</sup> As Charts 1 and 2 show, both the volume and value of currency in circulation—in denominations from \$1 to \$100—have steadily increased for years.

CHART 1

### Currency in Circulation by Value

VALUE OF CURRENCY IN CIRCULATION, IN TRILLIONS OF DOLLARS AS OF DECEMBER 31 OF EACH YEAR



**NOTES:** Includes Federal Reserve notes, U.S. notes, and currency no longer issued, but does not include denominations larger than \$100.  
**SOURCE:** U.S. Federal Reserve, "Currency in Circulation: Value," [https://www.federalreserve.gov/paymentsystems/coin\\_currircvalue.htm](https://www.federalreserve.gov/paymentsystems/coin_currircvalue.htm) (accessed June 6, 2018).

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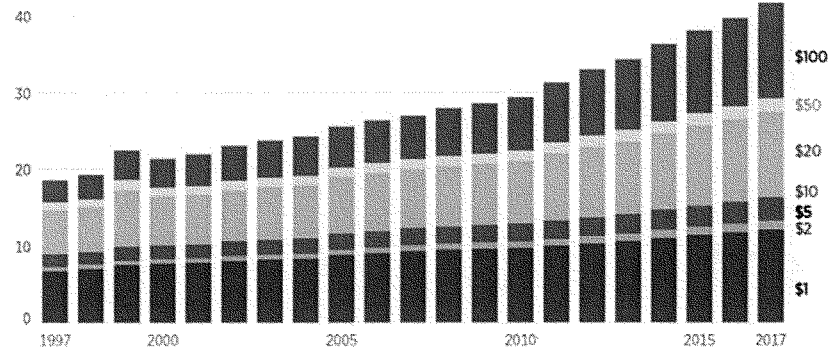
<sup>11</sup>Ibid.

<sup>12</sup>Ibid.

CHART 2

**Volume of Currency in Circulation**

IN BILLIONS OF NOTES, BY DENOMINATION, AS OF DECEMBER 31 OF EACH YEAR

**NOTES:** Includes Federal Reserve notes, U.S. notes, and currency no longer issued, but does not include denominations larger than \$100.**SOURCE:** U.S. Federal Reserve, "Currency in Circulation: Volume," [https://www.federalreserve.gov/paymentsystems/coin\\_currircvolume.htm](https://www.federalreserve.gov/paymentsystems/coin_currircvolume.htm) (accessed June 6, 2018).

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These statistics reveal healthy competition among various forms of money as technologies have changed through time. Policymakers should not mandate which forms of money consumers use, and they should remove all barriers that hinder these—and other—forms of monetary competition. Mutually beneficial exchange is a central element of economic freedom, and this centrality extends to the right to choose a preferred medium of exchange. Many people, even many economists, now assume that economic progress requires government provision of money, but economic theory and a wealth of experience indicate otherwise. It is easily forgotten, but money—and, more broadly, payment systems—often developed in private markets only to later be monopolized by government authorities.<sup>13</sup>

The U.S. government has a partial monopoly on the U.S. dollar, the world's reserve currency, and relatively few U.S. citizens use any other form of money to buy goods and services. The U.S. monetary system consists of two types of money: (1) *base money*, often referred to as outside money, is the ultimate means of payment in the economy, and it comes from outside the private sector (i.e., the government); and (2) *inside money*, often called credit money, consists of claims to the underlying base money, and it comes from inside the private sector. Private financial firms compete to provide various types of inside money, such as checkable deposits with bankcards, money market accounts, and travelers' checks. Few policymakers question whether they should actually provide money. However, the Federal Reserve is the monopoly provider of outside money, so the U.S. government ultimately determines the total amount—and type—of money that private

<sup>13</sup>For an overview of the international experience, see Benn Steil and Manuel Hinds, *Money, Markets, and Sovereignty* (New Haven, CT: Yale University Press, 2009), pp. 67–106.

firms can create.<sup>14</sup> Very few policymakers question whether anyone *other than* the federal government should provide this outside money, despite its fundamental economic importance. Broadly, few policymakers ever think about improving the quality of money with the same competitive market forces that improve other goods and services. Nonetheless, these forces push entrepreneurs to innovate and improve products to satisfy customers, and they expose weaknesses and inefficiencies in existing products, thus improving people's lives.

Economists generally acknowledge that private competitive markets produce such benefits but generally believe that these competitive forces do not (or should not) apply to money. Still, the federal government's existing monopoly on money necessarily limits the extent to which competitive processes can strengthen money, and exposes the means of payment for all goods and services to the mistakes of a single government entity. Ironically, even some of the scholars that argue for *increased* centralization and government control of money acknowledge that the "biggest threat to the value of the currency is often the government itself."<sup>15</sup> Such conflicting views are surprising because the government's actual record of monetary stewardship is so poor. That historical record, including recent monetary policy failures, highlights the importance of preserving citizens' ability to use whichever form of money they choose.<sup>16</sup> Nothing can provide as powerful a check on the government's ability to diminish the quality of money as allowing competitive private markets to provide it. Suppressing such competition, if history is any guide, only deprives citizens of beneficial innovations in the means of payments. Ultimately, the competitive process is the optimal approach to discovering what people view as the best means of payment.

Policyholders and those operating in the marketplace are likely to be able to make more informed decisions in a competitive currency environment. In a competitive currency environment, the relative price of the competing currencies will rapidly incorporate information about current market conditions and about the supply of, and demand for, the various currencies available for exchange.<sup>17</sup> Unsuccessful currencies will affect a few people a little, whereas successful ones—vetted by competitive processes—can affect many people in a more powerful manner. Government policy should, therefore, treat all forms of money in a neutral manner, ensuring that legal barriers do not hinder the development of alternative currencies or unduly influence the development of any single alternative. Congress should even consider allowing the U.S. Postal Service and other government agencies to accept cryptocurrencies and other alternative forms of payment. At a minimum, Congress should address the following anti-competitive issues:<sup>18</sup>

- **Legal tender laws.** Congress should amend legal tender laws because they allow courts to force acceptance of a certain amount of official currency to satisfy debts even if a contract calls for delivery in another means of payment.<sup>19</sup>
- **Capital gains taxes.** Since the Internal Revenue Service treats (effectively all) alternative currencies as assets, every such transaction is a taxable event and is reportable on Schedule D

<sup>14</sup>The Federal Reserve has control over the total amount of base money (currency plus reserves) because only it can change the total amount of reserves in the banking system. All Fed open-market purchases, for example, either increase the amount of reserves or U.S. currency in circulation.

<sup>15</sup>Kenneth Rogoff, *The Curse of Cash* (Princeton, NJ: Princeton University Press, 2016), p. 19.

<sup>16</sup>See Norbert J. Michel, "Improving Money Through Competition," Heritage Foundation *Issue Brief* No. 4730, July 7, 2017, <http://www.heritage.org/monetary-policy/report/improving-money-through-competition>, and Norbert J. Michel, "Monetary Policy Reforms for Main Street," Heritage Foundation *Backgrounder* No. 3237, July 27, 2017, <http://www.heritage.org/monetary-policy/report/monetary-policy-reforms-main-street>.

<sup>17</sup>Demand for a currency would be based on characteristics that make it more or less useful, expectations about future supply and its value, or other factors.

<sup>18</sup>For more on ensuring a level playing field, See Dwyer and Michel, "Bits and Pieces."

<sup>19</sup>See 31 U.S. Code § 5103.



of the taxpayers' Form 1040 (or, if a business, the analogous business tax form).<sup>20</sup> Congress should amend the Internal Revenue Code to provide that gains or losses attributable to the purchase or sale of alternative currencies are not taxable.<sup>21</sup>

- **Private coinage.** Congress should modify statutes concerning coinage to clarify that they do not prohibit the honest production of alternative monies for use in private transactions.<sup>22</sup>
- **Bank secrecy and anti-money laundering rules.** Congress should address bank secrecy and anti-money-laundering laws so that producers of alternative monies are not held to higher or lower standards than traditional financial companies.<sup>23</sup>

#### Central Bank Cryptocurrency: An Idea Counter to Basic Economic Freedom

Few policymakers have approached monetary competition in the manner described above. Instead, many have sought to either phase out or (at least partially) ban the use of paper currency and force consumers into a digital-currency-only means of payment.<sup>24</sup> One aspect of this campaign to phase out cash is to force all citizens to use some form of digital money—including, but not necessarily limited to, cryptocurrency—in an account at a central bank. Several versions of such a plan exist, and Sweden recently held (a failed) referendum to give its central bank exclusive control over money, thus removing the private sector's ability to create money.<sup>25</sup> A recent article in *The Economist* noted:

The main difficulty central banks face is how to facilitate the circulation of digital currency without routing everything through banks, as happens today. Blockchain technology, which underpins crypto-currencies, could be one way to avoid the banks. In such systems, balances and transactions are tracked on a distributed public ledger, secured with cryptography.<sup>26</sup>

It is true that blockchain technology could drastically change the banking industry—the technology provides an efficient/low-cost method of verifying financial transactions, a function that banks currently provide. Still, whether the technology actually helps to restructure the industry because banks' existing third-party verification function is inferior to blockchain technology is something which must be determined in a competitive process, one that has yet to unfold. There is no valid economic justification for a government agency to dictate that payments *must* be re-routed through a

<sup>20</sup>U.S. Department of the Treasury, Internal Revenue Service, "Schedule D (Form 1040) Capital Gains and Losses," <http://www.irs.gov/pub/irs-pdf/f1040sd.pdf> (accessed July 6, 2014).

<sup>21</sup>David R. Burton and Norbert J. Michel, "Removing Tax Barriers to Competitive Currencies," Heritage Foundation *Issue Brief* No. 4761, September 13, 2017, <https://www.heritage.org/sites/default/files/2017-09/IB4761.pdf>.

<sup>22</sup>See, for example, 18 U.S. Code, §§ 485, 486, 489, and 490.

<sup>23</sup>See Norbert J. Michel and David Burton, "Financial Privacy in a Free Society," Heritage Foundation *Backgrounder* No. 3157, September 23, 2016, <http://www.heritage.org/markets-and-finance/report/financial-privacy-free-society>.

<sup>24</sup>See William D. Lastrapes, "The Costs and Benefits of Eliminating Currency," *Cato Journal*, Vol. 38, No. 2 (Spring/Summer 2018), <https://object.cato.org/sites/cato.org/files/serials/files/cato-journal/2018/5/cj-v38n2-14.pdf> (accessed July 11, 2018); Norbert J. Michel, "Special Interest Politics Could Save Cash or Kill It," *Cato Journal*, Vol. 38, No. 2 (Spring/Summer 2018), <https://object.cato.org/sites/cato.org/files/serials/files/cato-journal/2018/5/cj-v38n2-13.pdf> (accessed July 11, 2018); and Lawrence H. White, "The Curse of the War on Cash," *Cato Journal*, Vol. 38, No. 2 (Spring/Summer 2018), <https://object.cato.org/sites/cato.org/files/serials/files/cato-journal/2018/5/cj-v38n2-12.pdf> (accessed July 11, 2018).

<sup>25</sup>Sam Meredith, "Switzerland Is Set To Vote on a Radical 'Sovereign Money' Plan: Here's What You Need To Know," CNBC, June 5, 2018, <https://www.cnbc.com/2018/06/05/switzerlands-sovereign-money-referendum-heres-what-you-need-to-know.html> (accessed July 13, 2018).

<sup>26</sup>"Central Banks Should Consider Offering Accounts to Everyone," *The Economist*, May 26, 2018, <https://www.economist.com/finance-and-economics/2018/05/26/central-banks-should-consider-offering-accounts-to-everyone> (accessed July 13, 2018).

different system, thus undertaking a complete redesign of a major portion of the economy.<sup>27</sup> Indeed, there is every reason to fear such a government redesign of the payment/financial system.

It is also clear that centralizing the control of a blockchain directly negates the benefits a distributed ledger offers over centrally controlled databases, and the pseudo anonymity of decentralized blockchains is completely counter to the U.S. governments' current treatment of all financial transactions. There is no apparent reason that a central bank—should it wish to offer digital accounts to the public—would better serve any of its constituents by offering a centrally controlled blockchain instead of offering more traditional digital accounts.<sup>28</sup> The vitally important policy question, though, is whether a central bank should offer the general public any type of digital bank account in the first place.<sup>29</sup> Scholars such as Morgan Ricks argue that central banks should provide retail accounts to the general public based on the notion that money is a public good and that providing such accounts would improve central banks' ability to conduct monetary policy.<sup>30</sup>

A major flaw in this reasoning is that private markets have clearly not failed to produce money, an unsurprising fact given that money does not fit the standard definition of a public good.<sup>31</sup> Regardless, the existence of a public good does not justify the government suppression of alternative forms of that good, even if that good is money or a money substitute. Furthermore, it is far from clear that modern monetary policy, conducted by central banks, has improved financial stability compared to the pre-central-bank era. For instance, though it is widely believed that the Federal Reserve's monetary policies have tamed business cycles and lowered macroeconomic volatility, a close look at the evidence suggests that the conventional view should be re-evaluated. Several studies suggest that data deficiencies caused key pre-Fed-era data to appear more volatile than their

<sup>27</sup>The Fed has already intervened to redesign/centralize large portions of the retail and wholesale payment systems in the U.S., but it is far from clear that any sort of market failure (or other valid economic justification) necessitated such interventions. See Jeffrey M. Lacker, Jeffrey D. Walker, and John A. Weinberg, "The Fed's Entry into Check Clearing Reconsidered," Federal Reserve Bank of Richmond *Economic Quarterly*, Vol. 85 No. 2 (Spring 1999), [https://www.richmondfed.org/-/media/richmondfedorg/publications/research/economic\\_quarterly/1999/spring/pdf/lacker.pdf](https://www.richmondfed.org/-/media/richmondfedorg/publications/research/economic_quarterly/1999/spring/pdf/lacker.pdf) (accessed July 13, 2018), and George Selgin, "Wholesale Payments: Questioning the Market-Failure Hypothesis," *International Review of Law and Economics*, Vol. 24 (2004), pp. 333–350.

<sup>28</sup>J. P. Koning, "Fedcoin: A Central Bank-Issued Cryptocurrency," November 15, 2016, pp. 25–36, <https://static1.squarespace.com/static/55f73743e4b051cfcc0b02cf/t/58c7f80c2e69cf24220d335e/1489500174018/R3+Report+Fedcoin.pdf> (accessed July 13, 2018).

<sup>29</sup>The experience in Ecuador provides a lesson in the limits of a government's ability to launch new forms of money when the public prefers existing forms and distrusts the government: Ecuador started the world's first central bank digital money in 2014 and officially ended the experiment in 2018. See Lawrence H. White, "The World's First Central Bank Electronic Money Has Come – And Gone: Ecuador, 2014–2018," *Alt-M*, March 29, 2018, <https://www.alt-m.org/2018/03/29/the-worlds-first-central-bank-electronic-money-has-come-and-gone-ecuador-2014-2018/> (accessed July 13, 2018).

<sup>30</sup>Morgan Ricks, John Crawford, and Lev Menand, "Central Banking for All: A Public Option for Bank Accounts," Great Democracy Initiative, June 2018, <https://greatdemocracyinitiative.org/wp-content/uploads/2018/06/FedAccountsGDI.pdf> (accessed July 13, 2018).

<sup>31</sup>The question of whether the monetary standard is a public good is separate from the question of whether actual hand-to-hand currency (including digital currency) is a public good. Similarly, the question of whether there should be a single monetary standard is separate from whether the production of money is a natural monopoly. See Lawrence H. White, "Competitive Money, Inside and Out," *Cato Journal*, Vol. 3, No. 1 (1983), pp. 289–298, <https://object.cato.org/sites/cato.org/files/serials/files/cato-journal/1983/5/cj3n1-16.pdf> (accessed July 13, 2018), and George Selgin, *The Theory of Free Banking: Money Supply under Competitive Note Issue* (Lanham, MD: Rowman & Littlefield, 1988), pp. 120–135, <http://oll.libertyfund.org/titles/selgin-the-theory-of-free-banking-money-supply-under-competitive-note-issue> (accessed July 13, 2018).

Fed-era counterparts, and there is even some evidence that the Fed era has included *more* economic instability than before the Fed's creation.<sup>32</sup>

Even granting the possibility that monetary policy could improve public welfare, giving the federal government a complete, iron-clad monopoly over money runs counter to the very principle of economic freedom. Any such proposal exhibits a common distrust of free markets and a desire to give bureaucrats more control over people. The main idea behind improving the central bank's ability to conduct monetary policy is simple: prevent people from escaping government-imposed fees on their idle money balances. In other words, force everyone to have retail accounts at a central bank—and eliminate the use of any other form of money—so that people are left with no way to stop the government from imposing taxes to induce more spending. If, for example, the Fed decided that aggregate spending was too low, the central bank could threaten to take individuals' money as a way to incentivize more spending. In central banking terms, the Fed would be able to impose negative interest rates on deposits as a penalty for holding too much cash rather than spending it. This extreme policy—a complete government monopoly of money—would leave all people wholly dependent on a government-controlled electronic network for conducting all transactions. It would endanger law-abiding citizens' privacy and subject them to the whims of both elected and unelected government officials.

### Conclusion

Globally, there has been a steady shift away from paper-based payments during the past few decades, but cash remains a widely preferred option. This shift has occurred as technology changed, thus making it easier to facilitate consumer exchanges electronically. If the federal government would simply allow these changes to take place, there would be no particularly unique problem—the trends toward a less-cash society would likely continue, and consumers would likely use various forms of money, including cash and cryptocurrencies. Criminals may find it more expedient to transfer money anonymously via the Internet, but they have surely found it easier to commit crimes with the advent of better automobiles, computers, and communication devices. None of these items should be criminalized.

The U.S. government should treat all forms of currency, even cryptocurrencies, in a neutral manner. It should remove legal barriers to using alternative forms of money, and it should avoid providing any single form of money with a legal advantage, thus allowing competitive market forces to expose weaknesses and inefficiencies in existing alternatives. The competitive process is the optimal approach to discovering what people view as the best means of payment, and allowing people to access such alternative means of payment is the best way to provide a powerful check on the government's ability to diminish the quality of money. The same concept—allowing competitive processes to work—applies equally to new applications of blockchain technologies: The federal government should not impose regulations that unduly hinder the development of these applications. Congress should work diligently to eliminate tax and other legal impediments to the development of alternative currencies as well as new applications for blockchain technologies.

The federal government currently has a partial monopoly on the production of money, and this monopoly necessarily limits the extent to which competitive processes can strengthen money. It

<sup>32</sup>George Selgin, William Lastrapes, and Lawrence White, "Has the Fed Been a Failure?" *Journal of Macroeconomics*, Vol. 34 (2012), pp. 569–596; Norbert J. Michel, "Federal Reserve Performance: Have Business Cycles Really Been Tamed?," Heritage Foundation *Backgrounders* No. 2965, October 24, 2014, [http://thf\\_media.s3.amazonaws.com/2014/pdf/BG2965.pdf](http://thf_media.s3.amazonaws.com/2014/pdf/BG2965.pdf); and Norbert J. Michel, "Federal Reserve Performance: What Is the Fed's Track Record on Inflation?," Heritage Foundation *Backgrounders* No. 2968, October 27, 2014, [http://thf\\_media.s3.amazonaws.com/2014/pdf/BG2968.pdf](http://thf_media.s3.amazonaws.com/2014/pdf/BG2968.pdf).

also exposes the means of payment for all goods and services to the mistakes of a single government entity. Congress should ensure that this monopoly is not extended via the use of federally mandated digital money, especially via retail digital accounts at the Federal Reserve (including a central-bank-backed cryptocurrency). Implementing any such policy would effectively nationalize private credit markets because no private company (or individual) would be able to compete with the federal government. Because people are so vulnerable to the abuse of money (including modern monetary policy errors), Congress should not interfere with citizens' ability to opt out of official currency.

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Testimony of  
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To the Subcommittee on Monetary Policy and Trade  
 Of the Committee on Financial Services  
 United States House of Representatives

Hearing on "The Future of Money: Digital Currency"  
 July 18, 2018

Digital Money: More Competition? Even More Central Bank Monopoly?

Mr. Chairman, Ranking Member Moore, and Members of the Subcommittee, thank you for the opportunity to be here today. I am Alex Pollock, a senior fellow at the R Street Institute, and these are my personal views. As part of my many years of work in banking and on financial policy issues, I have studied the history and various concepts of money, including the development of central banks and banking systems, and authored many articles, presentations and testimony on related subjects. Before joining R Street, I was a resident fellow at the American Enterprise Institute 2004-2015, and president and CEO of the Federal Home Loan Bank of Chicago 1991-2004.

Central Bank Monopoly or Privately-Issued Money?

As we think about the future of money, which grows ever more digital in its transactions and records, it helps to consider the varieties of money displayed by the past. Today we are accustomed to the Federal Reserve and other central banks having a monopoly on the issuance of each national money. A senior officer of the Bank of England has summed up the prevailing view:

"The distinctive feature of a central bank derives from its role as the *monopoly supplier* of outside money, [that is] notes and coin and commercial bank reserve deposits. These constitute the ultimate settlement asset for an economy and mean that the central bank has a *unique* ability to create or destroy liquidity." (Italics added.)

But do you have to have a central bank as the monopoly supplier of money? Historically, clearly not. For one thing, there have not always been central banks. The Bank of Canada, for example, dates only from 1934 and there was obviously money in Canada before that, as there was in the United States before the Federal Reserve was chartered in 1913 and subsequently developed its currency issuing

monopoly. Even with the Fed, there were other forms of U.S. currency existing until the 1960s—namely, silver certificates and United States notes. National banks issued their own currency until the 1930s, as authorized under the National Bank Act of 1863-64.

One of the intriguing questions posed by Bitcoin and other “cryptocurrencies” (hereafter “Bitcoin” for short) is whether today there can be a successful privately issued currency, which is widely accepted and constantly used in settlement of purchases and sales, and thus actually serves as money. This would be a money which is not issued by the government or its central bank, and is not backed by the force and power of compulsion of the federal government.

There have been numerous historical examples of private currencies, but to my knowledge there has never been a private fiat currency. They all were claims on some kind of assets, which Bitcoin and its siblings are explicitly not.

Consider a classic form of money: gold and silver coins. As the interesting book, *Money and the Nation State*, tells us, “Nothing about operating a mint requires the state rather than private enterprise to perform that function... Private mints operated in the United States until they were prohibited during the Civil War.” Such coins, unlike all currency today, were intrinsically valuable, whether minted privately or by governments.

A common form of private money in the American 19<sup>th</sup> century were the circulating notes of state-chartered banks. So you might have carried in your wallet a \$5 bill issued by something like the Third State Bank of Skunk Creek or hundreds of others. I had an acquaintance who had a huge collection of such banknotes—he gave me a copy of a \$3 bill issued by the Wisconsin Marine and Fire Insurance Company, a predecessor of one of my former employers, now a tiny part of today’s JPMorgan Chase. All such notes were backed by the loans, investments and capital of the issuing bank—they were not fiat money, as Bitcoin wishes it might become.

The “free banking” theory maintains that a monetary system is better when composed of competing currency issued by private banks, instead of a monopoly currency of the central bank. This is far from the dominant view, however.

Most money used in transactions today is in the form of deposits, already a kind of digital money, operated for the most part and settled electronically, in this country denominated in U.S. dollars. Deposits are also backed by the assets and capital of the issuing bank, as well as the guaranty of the federal government, which if its deposit insurance fund fails, can tax some people to make good the deposits of others. Deposits are thus a mix of private and government money.

Troubled financial times have given rise to experiments with currency. “In America’s first depression, 1819-1821,” we learn from economist Murray Rothbard, “four Western states (Tennessee, Kentucky, Illinois and Missouri) established [their own] state-owned banks, issuing fiat paper.” Unfortunately, this did not end well, as “the new paper depreciated rapidly.” In contrast, the strategy of the Federal Reserve today is to have its paper depreciate slowly and steadily.

During the great depression of the 1930s, many municipalities, including the financially desperate City of Detroit, issued their own currency, or "scrip," to make payrolls. They were out of U.S. dollars and could not borrow any more. The script could be used to pay property and other local taxes, which gave it some currency. It often traded at discounts to regular dollars, but still could be used to buy things locally. Says one history of this emergency experiment:

"Some sort of scrip was issued by several hundred municipalities, business associations, companies, banking organizations, barter and self-help cooperatives. ... Cash-strapped counties and cities across the country paid their employees with scrip issued against prospective tax receipts and good for current taxes and other public fees. In the early 1930s, 25 states revised their laws to authorize the issue of scrip."

These were interesting, but temporary expedients. They do not provide much support for the monetary hopes of Bitcoin enthusiasts.

Turning to theory as opposed to history, the great economist, Friedrich Hayek, in his essay, "Choice in Currency," provided a theory congenial to the libertarian strain of Bitcoin backers. Said Hayek:

"Why should we not let people choose freely what money they want to use? ... I have no objection to governments issuing money, but I believe their claim to a *monopoly*, or their power to *limit* the kinds of money in which contracts may be concluded within their territory, or to determine the *rates* at which monies can be exchanged, to be wholly harmful. ... I hope it will not be too long before complete freedom to deal in any money one likes will be regarded as the essential mark of a free country."

I sympathize with these ideas, but I think that Hayek's hope, expressed in 1975, will continue to be disappointed.

#### Heading Toward an Even Greater Monopoly?

Will the new and ubiquitous computing power of our time reverse the historical trend toward central bank monopoly of money and create more competition in currency? Bitcoin theorists imagine that it will, but it is easier to imagine digital currency moving us in exactly the opposite direction: toward even greater monopolization of money by the central bank.

Many central banks are interested in the idea of having their own digital currency. That means letting the general public, not only banks, have deposit accounts directly with the central bank, in addition to carrying around its paper currency. The appeal of this idea to central banks is natural: it would vastly increase their size, power and role in the economy.

In a digital age, it would clearly be possible for a central bank, in our case the Federal Reserve, to have tens of millions of accounts directly with individuals, businesses, associations, municipal governments and anybody else, which would be all-electronic. In terms of pure financial technique, there is nothing standing in the way. But would this be a good idea? Should Congress ever consider it?

In a recent article, “The Bank of Our Dreams,” Matthew Klein suggests that it would be a wonderful idea. “It is time for the largest U.S. bank to open its doors to the public,” he says. Citing the proposal of three law school professors, “A Public Option for Bank Accounts (Or Central Banking for All),” he summarizes:

“Their ‘public option for bank accounts’ would offer every American household and business a checking account [though presumably there would be no paper checks] at the Fed.” This would “create a frictionless system, like email.”

The Federal Reserve would be in direct competition with all private banks in such a scheme. It would certainly be a highly advantaged, government competitor. It could offer “risk free” accounts and pay a higher interest rate, if it liked, cross-subsidizing this business with the profits from its currency issuing monopoly. It would be regulating its competitors while shot through with conflicts of interest. It would put the evolution of central banks a hundred years into reverse.

There are in the American banking system about \$12 trillion in domestic deposits. Could the Federal Reserve grab half of them? Why not? That would be \$6 trillion, which would expand its balance sheet to \$10 trillion. A pretty interesting and unattractive vision of enhanced monopoly.

Says Klein: “Offering Federal Reserve accounts to the general public would also reduce the taxpayer subsidy for bank risk-taking.” Actually, it would do the opposite: vastly increase taxpayer risk by putting the risk into the Federal Reserve itself.

For the Federal Reserve would have to do something with mountain of deposits—namely make loans and make investments. It would automatically become the overwhelming credit allocator of the financial system. Its credit allocation would unavoidably be highly politicized. It would become merely a government commercial bank, with the taxpayers on the hook for its credit losses. The world’s experience with such politicized lenders makes a sad history.

In short, to have a central bank digital currency is a terrible idea—one of the worst financial ideas of recent times.

#### The Future of Money

There is no doubt that the digitalization of financial transactions, records, access to information, and communication will continue to increase, and that the electronic networks underlying the activity continue to grow more intense and omnipresent. But the fundamental nature of money, it seems to me, will not change. It will either be:

-The monopoly issuance of a fiat currency by the central bank as part of the government, backed by the power of the government. That the whole world operates on such currencies is a remarkable—and dangerous—invention of the 20<sup>th</sup> century.



-Or if private currencies do again develop, they will, as in the past, have to be based on a credible claim to reliable assets. With Hayek, we could hope (without much hope) that this might bring competition for government fiat money.

It is clear that having a fiat currency is far too precious and profitable for governments for them ever to go back to a government currency backed and convertible into actual assets, whether gold coins or otherwise.

Government fiat currencies will operate in increasingly digitalized forms. Still, paper money will retain its advantages of secure privacy, immediate settlement without intermediaries, and the ability to function when the electricity is shut down. Recently I was amazed to find that my younger son, an up-and-coming banking officer, was walking around with the total of one dollar in his wallet, but of course with a well-used debit card. As this generational difference indicates, doubtless our ideas of money will grow ever more dependent on having the electricity on at all times and everywhere.

Attempts at private fiat currencies, with no claim to any underlying assets, in my view have a very low probability of ever achieving widespread acceptance and functioning as money.

An increase of the monopoly power of central banks, which already have too much, should be avoided.

Thank you again for the chance to share these views.

**U.S. HOUSE OF REPRESENTATIVES: COMMITTEE ON FINANCIAL SERVICES**

**SUBCOMMITTEE ON MONETARY POLICY AND TRADE**

**HEARING ON “THE FUTURE OF MONEY: DIGITAL CURRENCY”**

**July 18, 2018**

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**I. Introduction**

Chairman Barr, Ranking Member Moore, and honorable members of the House Committee on Financial Services, thank you for the opportunity to share with you my views on the potential role of digital currencies in the U.S. economy and financial system.

In my remarks, I will focus on the implications of the evolution of new financial technologies, including but not limited to cryptocurrencies, for central banking. This testimony will accord particular attention to issues surrounding (i) the implementation and transmission of monetary policy and (ii) financial stability. I will also discuss the pros and cons of central bank digital currencies (CBDC).<sup>1</sup>

**II. Key Messages**

While the advent of decentralized cryptocurrencies such as Bitcoin has dominated the headlines, a broader set of changes wrought by advances in technology are likely to eventually have a more profound and lasting impact on central banks. It is premature to speak of disruption of traditional concepts of central banking, but it is worth considering if the looming changes to money, financial markets, and payments systems will have significant repercussions for the operation of central banks and their ability to deliver on key objectives such as low inflation and financial stability.

- There are many potential advantages to switching from physical to digital versions of central bank money, in terms of easing some constraints on

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<sup>1</sup> This testimony draws extensively from Eswar Prasad, “Central Banking in a Digital Age: Stock-taking and Preliminary Thoughts,” Brookings Institution Report, April 2018. <https://www.brookings.edu/events/digital-currencies-implications-for-central-banks/> Please see that report for a full set of references and sources.

traditional monetary policy and providing an official electronic payments system. The basic mechanics of monetary policy implementation will not be affected by a switch from physical currency to CBDCs. However, other technological changes that are likely to affect financial markets and institutions could have significant effects on monetary policy implementation and transmission.

- New financial technologies—including those underpinning nonofficial cryptocurrencies—herald broader access to the financial system, quicker and more easily verifiable settlement of transactions and payments, and lower transaction costs. Domestic and cross-border payment systems are on the threshold of major transformation, with significant gains in speed and lowering of transaction costs on the horizon. The efficiency gains in normal times from having decentralized payment and settlement systems needs to be balanced against their potential technological vulnerabilities and the repercussions of loss of confidence during periods of financial stress.
- Multiple payment systems could improve the stability of the overall payments mechanism in the economy and reduce the possibility of counterparty risk associated with the payment hubs themselves. However, multiple systems without official backing could be severely tested in times of crisis of confidence and serve as channels for risk transmission. Decentralized electronic payment systems are also exposed to technological vulnerabilities that could entail significant economic as well as financial damage. CBDCs could function as payment mechanisms that provide stability without necessarily limiting private fintech innovations.
- Financial institutions, especially banks, could face challenges to their business models, as new technologies facilitate the entry of institutions (or decentralized mechanisms) that can undertake financial intermediation and overcome information asymmetries. Banks will find it difficult to continue collecting economic rents on some activities that cross-subsidize other activities. The emergence of new institutions and mechanisms could improve financial intermediation but will pose significant challenges in terms of regulation and financial stability.
- New forms of money and new channels for moving funds within and between economies could also have implications for international capital flows and exchange rates. The proliferation of channels for cross-border capital flows will make it increasingly difficult for national authorities to control these flows. Emerging market economies will face particular challenges in managing the volatility of capital flows and exchange rates, and could be subject to greater monetary policy spillovers and contagion effects. These channels are also susceptible to exploitation for money laundering, illegal activities, and evasion of controls and reporting requirements related to cross-border capital flows.

### III. Concepts and Definitions

At the outset, it is worth laying out some relevant definitions for the purposes of this testimony and to clarify certain terms that are sometimes used interchangeably in popular discussions.

- *Fiat currency*: Currency issued by a national central bank, typically in the form of currency banknotes and coins (which will henceforth be referred to as *cash*). Generally issued by a government entity, although can also be issued by private institutions under the authority of the government.
- *Legal tender*: Form of payment that a creditor is legally obliged to accept from a debtor in order to extinguish a debt. Fiat currencies are typically legal tender. Not only must they be accepted as settlement for debt between private parties, but the government—which has the authority to levy taxes—can require that such tax obligations only be settled using the legal tender. Fiat currencies are, in principle and at least to a limited extent, backed by this authority of the government.
- *Digital currency*: Broad term that encompasses any form of currency that is not tangible.
- *Central Bank Digital Currencies*: Fiat currencies issued by central banks in place of, or as a complement to, physical currency (banknotes and coins).
  - *E-money*: A simple version of an electronic currency, wherein the central bank in effect manages a centralized payment system linked to electronic “wallets”. The payment system could be managed using blockchain or other versions of distributed ledger technology to verify transactions, with the verification process managed by the central bank rather than through a decentralized mechanism.
  - *Official cryptocurrencies*: Cryptocurrencies issued by a government entity, although not considered the equivalent of fiat currency; could in principle count as legal tender if the government were to decree this. Logically, government cryptocurrencies would be centralized, with verification of transactions provided by the government itself or its appointed agents rather than through a decentralized verification mechanism. Open question if this provides anonymity to transacting parties.
- *Nonofficial Cryptocurrencies*: Digital currencies that are virtual, typically not backed by a government, and do not constitute legal tender. Key characteristic is the ostensible anonymity of transactions conducted principally using blockchain technology (this aspect is similar to cash, but cryptocurrencies are easier to scale than cash and do not require physical transfers of currency notes). Cryptocurrencies can either be decentralized (wherein, for instance, any economic agent with enough computing power can verify transactions in return for a reward) or centralized (with verification undertaken by or limited to those

approved by a central authority).<sup>2</sup> Another relevant characteristic is whether the record of transactions is public or private (restricted to those who have permissioned access).

- *Fintech*: Broad term that refers to various technological developments that are relevant to financial markets. While there are many developments under this rubric that are not directly related to digital currencies, they could facilitate the use of such currencies since many of the relevant technologies, especially decentralized distributed ledgers, are relevant to both contexts.

These broad definitions need to be complemented by a range of other combinations of these underlying concepts, as well as some practical and legal considerations. The blockchain or Distributed Ledger Technology (DLT) underpinning Bitcoin allows for decentralized public verification of transactions and ensures immutability of those records. This technology clearly has applications beyond Bitcoin. A similar technological setup could be used to set up a CBDC, although the nature of verification of transactions (by the central bank itself, by a set of authorized agents, or by miners who get rewarded for this process in some fashion) and whether the system allows for true anonymity would have to be decided by the central bank.

This points to an important difference between official and nonofficial digital currencies. A fiat currency in a decentralized distributed ledger would in effect be an IOU, which would have to be backed up by a payment system to transfer the underlying financial asset (the currency). By contrast, for a nonofficial cryptocurrency, the entry on the public ledger is itself the digital asset, which is not backed in any way. The status of official cryptocurrencies is ambiguous—in principle, such a cryptocurrency could be backed by the government; if this backing was credible, this would be similar to other official digital currencies with the potential for anonymity being the distinguishing characteristic relative to electronic money.

Of course, as noted above, a CBDC could also be set up more simply as an electronic token on the government's payment network. It is now (or will soon be) technologically feasible for a central bank to set up electronic deposit accounts for all of a country's residents, with blockchain technology making it easy for the central bank to manage a multitude of such accounts. Presumably, these accounts would not normally be interest bearing and would be used for payments rather than as a channel for financial intermediation by the central bank.

While a CBDC might serve as a complement to a physical currency, there could be legal considerations involved since, in some countries, the definition of legal tender might not cover the issuance of a CBDC. A statutory remedy would then be required to ensure the equivalence of digital and physical versions of the fiat currency. CBDCs could be limited to wholesale transactions between financial institutions or expanded to retail transactions, in the latter case essentially functioning as a central bank-managed retail payment system.

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<sup>2</sup> In practice, the degree of centralization is not a binary choice.

Cryptocurrencies, which lack government or other backing, might appear to stand little chance of competing with fiat currencies. Moreover, with growing indications that cryptocurrencies such as Bitcoin do not truly guarantee anonymity, their roles as currencies rather than as just sophisticated payment systems have come under question. The natural market response has been the proliferation of cryptocurrencies that attempt to address one or more of these concerns. There are now close to 1600 cryptocurrencies that come in various flavors. Some of these are ostensibly backed in one form or another and are intended for a variety of purposes. For instance, the blockchain-based cryptocurrency Tether is in principle backed by and trades at par with the U.S. dollar (or, in its other incarnations, at par with other major currencies). Cryptocurrencies backed by a physical currency do not constitute new money creation and are in effect just a payments system. The value of some cryptocurrencies is backed by commodities or their prices are pegged to the prices of specific commodities.<sup>3</sup>

One of the initial attractions of unofficial cryptocurrencies, and the reason for official concerns about them, was the anonymity they provided. Bitcoin and Ethereum, two popular cryptocurrencies, are in fact not anonymous since the amounts as well as source and destination addresses associated with each transaction are public information (this could allow the parties to any transaction to be traced). By contrast, Monero and ZCash are considered truly anonymous in the sense that none of this information associated with a particular transaction is publicly available. However, researchers have raised questions about the non-traceability of transactions even in these cases. These findings have implications for security risks associated with CBDCs and especially for official cryptocurrencies that might purport to provide anonymity in a digital environment.

The proliferation of cryptocurrencies and their relationship to fiat currencies, whether physical or digital, is likely to ultimately hinge on how effectively each currency delivers on its intended functions. In this sense, by parceling out the various functions, the advent of cryptocurrencies has already changed the nature of money. Fiat money bundles together multiple functions as it serves as a unit of account, medium of exchange, and store of value. Now, with the advent of various forms of digital currencies, these functions can conceptually be separated. Moreover, whatever the future of cryptocurrencies, the DLT and related technologies underlying their creation could have major impacts in the realms of finance and central banking.

### *Money*

While the term money has no singular definition, it is popularly associated with currency banknotes and coins. Much of the above discussion about digital currencies is related to a narrow concept of money. Monetary aggregates that are more relevant for evaluating the

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<sup>3</sup> The U.K.'s Royal Mint has issued a cryptocurrency backed by its gold holdings. For other gold- or commodity-backed currencies, the verification mechanism for the backing seems to rely on audits by major auditing firms. Concerns have been raised about whether Tether is in fact fully backed by dollars as claimed by the issuers, who indicate that their reserve holdings are published daily and subject to frequent professional audits.

stance and outcomes of monetary policy are much broader and can be classified into two categories:

- Outside money: Fiat (unbacked) money issued by a central bank (or government entity) or backed by an asset that is not in zero net supply in the private sector (e.g., gold).
- Inside money: An asset representing or backed by any form of private credit; circulates as medium of exchange; in net zero supply in private sector.

These two concepts could become blurred as unbacked money that is privately issued (or created by a non-governmental entity) competes with government-issued fiat currency. This raises a number of analytical issues about the different roles played by various forms of money. It should also be noted that inside money, in the form of bank deposits, is arguably already mostly in electronic form.

The share of central bank money in overall monetary aggregates has declined in recent years in most economies. For instance, take Sweden, which has gained some attention as an economy that is fast moving towards becoming cashless. The ratio of currency (banknotes and coins) to the monetary aggregate M3, which includes currency as well as bank deposits of various maturities, fell from 7 percent in the early 2000s to 2 percent by 2016. A report from the Riksbank states that “the proportion of cash payments in the retail sector has fallen from close to 40 percent in 2010 to about 15 percent in 2016.”

The ratio of currency to M2—which typically includes currency as well as savings deposits, time deposits, and money market deposit accounts (although the precise definition varies from country to country)—ranges from close to 20 percent in Russia and Mexico, to about 10 percent in the India, Japan, Kenya, and the U.S., to under 5 percent in China, the U.K., and the Euro zone. In recent years, the ratio of currency to M2 has fallen in a number of advanced and emerging market countries, indicating the declining importance of outside money even within this narrow monetary aggregate. Since 2003, the ratio of currency to M2 has fallen by 5 percentage points in China, 7 percentage points in India, and 3 percentage points in the Euro zone.<sup>4</sup>

The implications of these crude calculations of the low and declining importance of currency are two-fold. First, the typical notion of money needs to be extended to consider broader concepts of money that are more relevant for economic activity and monetary policy. Second, when considering how technological developments could affect monetary policy, it is essential to examine the potential implications of these developments for financial institutions that play a critical role in creating inside money.

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<sup>4</sup> The ratio has held relatively steady in Japan, Switzerland, the U.K., and the U.S., all of which are, interestingly, reserve currency economies.

#### IV. Approaches Taken by Different Central Banks and Governments

The rapid rise of cryptocurrencies has elicited a range of responses from central banks and governments, from trying to co-opt the changes to their advantage to resisting certain developments for fear of stoking monetary and financial instability. For many central banks, the responses are driven by concerns about the rapidly declining usage of currency and the implications for both financial and macroeconomic stability if decentralized payment systems displace both cash and traditional payment systems managed by regulated financial institutions. For instance, Sweden's Riksbank is actively exploring the issuance of an e-krona, a digital complement to cash, with the objective of "promoting a safe and efficient payment system."

##### CBDC

A number of central banks are at various stages of looking into the feasibility and desirability of issuing CBDCs. The status of some key central banks is listed below.

- *In operation:* Tunisia issued the first CBDC, an e-Dinar designed as a virtual account, as early as 2010. It has now been superseded by a blockchain-based centralized digital currency (using the Monetas digital platform) that also functions as a payments system. In 2015, Ecuador introduced a centralized payment system backed by a digital currency but, since the system failed to attract a significant number of users or volume of payments, is deactivating the system in April 2018.
- *Preparation for implementation/groundwork in progress:* China has successfully tested a block-chain based digital notes transaction platform and is developing a digital currency known as the Digital Currency for Electronic Payment. A consortium of Japanese banks plans to introduce a digital currency (J Coin) in time for the 2020 Tokyo Olympics. This project has the approval of the Bank of Japan, which has indicated that it is not considering issuing a digital currency by itself. The Bank of Canada has a joint initiative with the national payment system operator to develop a DLT-based settlement asset for wholesale transactions (Project Jasper). The Monetary Authority of Singapore is developing a tokenized version of the Singapore dollar on an Ethereum-based blockchain (Project Ubin). Senegal intends to issue an electronic version of the eCFA that will co-exist with physical CFA. This will be issued by a regional bank and will not rely on blockchain technology.
- *Evaluating pros and cons, with no specific plans to issue digital currency:* None of the major advanced economy central banks have announced specific plans to issue CBDCs. Some officials of the Bank of Japan, Bank of Canada, Bank of England, European Central Bank, and the Federal Reserve have indicated they are evaluating the pros and cons of CBDCs, although none of them appear to be giving this serious consideration.



### *Cryptocurrencies*

The approaches of governments and central banks to permitting and/or regulating nonofficial cryptocurrencies span a wide spectrum, with individual countries often changing their positions back and forth in response to consumer demand and concerns about financial stability implications.

- *Active regulation:* Canada and Japan have explicit laws concerning the trading and use of cryptocurrencies. The U.S. considers Bitcoin and other cryptocurrencies as financial assets that are subject to tax laws as well as regulations concerning anti money laundering and combating of financing of terrorism (AML/CFT).
- *Soft/hard bans on cryptocurrencies:* India's central bank, the Reserve Bank of India (RBI), has not authorized any institution it regulates to trade in or conduct business using cryptocurrencies. In April 2018, the RBI prohibited banks, financial institutions, and other regulated entities from dealing in virtual currencies. Korea's regulators have taken a dim view of cryptocurrencies, although they have not banned them outright. China banned domestic Bitcoin exchanges when it was trying to restrict speculative capital outflows in 2017, and has subsequently blocked access to cryptocurrency exchanges. China has also recently banned domestic initial coin offerings (ICOs) and prohibited individuals and institutions from participating in them.
- *Passive tolerance:* A majority of countries are in this category, not banning cryptocurrencies but discouraging their use by financial institutions and, in many cases, not clarifying the legal status of such currencies even as means of payment.
- *Governments/central banks issuing their own cryptocurrencies:* Venezuela's government issued the first official cryptocurrency, the petro, in February 2018. In April 2018, Venezuela declared the petro to be legal tender. The petro's value is in principle backed by Venezuela's oil reserves and the cryptocurrency's issuance was intended to bolster public finances and evade financial sanctions imposed against Venezuela by the U.S. and other countries. Russia has indicated that it will issue a CryptoRuble, mainly for the latter reason. Cambodia, Estonia, and the Republic of the Marshall Islands have announced plans to issue official cryptocurrencies.

In short, there is no unified approach to regulation (or tolerance) of cryptocurrencies. However, as indicated by the recent G-20 statement, many countries are concerned about the potential problems posed by cryptocurrencies, especially the avenues they may provide for evasion of taxes and AML/CFT regulations.<sup>5</sup>

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<sup>5</sup> The March 2018 communiqué of the G-20 finance ministers and central bank governors states that "Crypto-assets do...raise issues with respect to consumer and investor protection, market

## V. Implications for Financial Institutions, Markets, and Stability

Recent technological developments have implications for the structure of financial markets as well as for banks and other financial institutions. These developments have the potential to increase the efficiency and stability of financial markets but could also create new risks and amplify them in certain circumstances. The structures of financial markets and institutions will also be affected, with even the viability of some traditional institutions coming into question.

### *Payment Systems*

The potential efficiency gains and welfare improvements from DLTs and other technologies underlying both CBDCs and cryptocurrencies could be significant. As the technology matures, it will confer a variety of benefits such as lower transaction costs as well as quicker and more easily verifiable settlement of transactions. It will become easier and cheaper to conduct even micro transactions using electronic payment systems. Such technologies can also help in broadening access to the formal financial system. An earlier fintech development, mobile banking, is already revolutionizing the very concept of banking in developing economies and giving much of the population—including rural and poor households—access to the formal financial system.

Many of these efficiency gains are related to improvements in payment systems, which have the potential to transform a variety of financial transactions. Both domestic and cross-border payment systems face disruption, with significant gains in speed and lowering of transaction costs on the horizon. Traditional messaging and payment/settlement systems across institutions (e.g., Fedwire and Clearing House Interbank Payments System (CHIPS) in the U.S., SWIFT for international transactions) could be displaced by cheaper and more efficient alternatives based on either decentralized or centralized monitoring. Payment systems and intermediaries such as Visa and Mastercard, which operate both within and across national borders, could also have their business models disrupted if their innovation does not keep pace.

These changes have obvious positive welfare implications. The proliferation of payment systems could increase financial stability by creating multiple levels of redundancies, so that the technological (or other forms of) failure of one payment system would not be harmful to the system. However, there are important considerations that could worsen instability. As has become abundantly clear in multiple contexts, electronic systems have considerable technological vulnerabilities. These vulnerabilities, in addition to the lack of official backing, could expose these systems to crises of confidence. If this happens at a time when official payment systems have been sidelined as a result of competitive forces, there could be dire financial and macroeconomic consequences. Fragmentation and lack of oversight of payment systems could also lead to pooling of counterparty risk in the payment hubs, further increasing their fragility at times of financial stress.

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integrity, tax evasion, money laundering and terrorist financing. Crypto-assets lack the key attributes of sovereign currencies. At some point they could have financial stability implications.”

### *Financial Institutions*

As noted earlier, banks play a crucial role in the creation of money. Hence, changes to the financial system that affect the relative importance, or even the viability of, traditional banks have implications not just for financial markets but also for economic activity and monetary policy.

The traditional roles of banks—intermediating between savers and borrowers by offering deposits and loans—could be upended by more direct intermediation channels. But issues of maturity transformation and information asymmetries, traditionally the main issues that gave banks advantages over other financial institutions, could still affect whether commercial banks may be displaced or simply switch to different roles.

Commercial banks' traditional advantages can no longer be taken for granted. For instance, relationship banking and other sources of information give banks an advantage over other financial institutions in dealing with information asymmetries between borrowers and lenders. However, as has already been demonstrated by Alibaba and Alipay in China, the use of big data and tracking of multiple attributes and economic activities of agents (including their purchase and payment histories) could provide even more effective credit scoring that reduces information asymmetries. Similarly, peer to peer lending and other direct intermediation channels between savers and borrowers are being facilitated by new technologies.

These alternative channels of financial intermediation have passed the proof of concept stage, but whether they can be scaled to the extent that they challenge commercial banks remains to be seen. Maturity transformation is an inherently risky activity for a financial institution and there may be a limit to which informal institutions can take on this task. At any rate, banks can no longer count on collecting economic rents on many intermediation activities that they had hitherto conducted inefficiently and charged high fees on, exploiting their oligopolistic power. Competitive pressures from nonbank institutions are likely to lead to a rapid erosion of such rents, which could cause financial pressures for banks that had been using profits on certain activities to cross-subsidize other activities.

The rise of new types of nonbank and informal financial institutions could help increase the efficiency of financial intermediation, including by creating new products for savers and borrowers. But as these institutions intrude on the business areas of traditional banks, they would also take on some of the financial fragilities associated with those activities. Hence, the structures of financial supervisory and regulatory frameworks will need to adapt since the risks might shift to the under-regulated parts of the financial system.

### *Financial Market Regulation*

The nature of regulation will change not just as new financial players emerge but also as the financial operations of existing players and the structures of financial markets are affected by the technological developments discussed in this note.

One of the key changes wrought by technology is that the cost of information acquisition and dispersion is falling. This should in principle engender greater financial stability since asymmetric and incomplete information are impediments to the smooth functioning of financial markets. However, a reduction in the cost of obtaining information, without commensurate improvements in reliable signal extraction mechanisms or the displacement of trusted signal interpreters, could actually lead to information overload. This in turn could lead to information cascades that worsen herding behavior and intensify contagion across financial markets. Bandwagon effects could intensify volatility in financial markets as more investors, including retail investors, can jump on more quickly and cheaply as they try to follow trends.

Informal financial institutions, which are outside the purview of regulators, could become increasingly important to the financial system. If the system does in fact efficiently disperse risk, then the outcome with a larger number of institutions due to the lower cost of entry might be a better one than present system. It has also been argued by some analysts that market discipline is often thwarted by government intervention or, worse, direct government involvement in the market. But will a decentralized system truly be subject to checks and balances in the absence of any oversight/regulation?

Decentralized payment processing and settlement systems could, in addition to increasing efficiency, level the playing field across small and large banks. The advantage of scale that large banks (and other large financial institutions) have would matter less as the costs of financial intermediation fall. However, regulators will need to be vigilant to avoid the risks of capture by large institutions. For instance, a set of large banks could set up a closed and centralized payment system that smaller banks do not have access to, making it harder for smaller banks that have access only to alternative decentralized systems to compete effectively.

Thus, while some aspects of financial regulation might become easier (because of better and quicker monitoring of digital transactions), the nature of financial regulation will have to keep pace with shifts in the structures of financial markets and institutions. For instance, while considerations such as too big to fail have been important in recent banking regulatory reforms, future regulation might also need to ensure that big banks do not use their size to cartelize the financial system by setting up restricted access payment and settlement systems outside the purview of the central bank or other regulatory authority.

#### *Fintech and Regulatory Sandboxes*

The challenge for regulators is to find a balance between regulation and providing space for financial innovation that does not pose systemic stability risks. By definition this is a difficult balancing act since the full scope of benefits as well as the full scale of risks associated with a particular innovation might not be clear in the early stages.

A number of central banks, recognizing the potential benefits of new technologies, have tried to allow some experimentation under controlled circumstances. Regulatory

sandboxes have proliferated as regulators try to take the measure of the new technologies and their potential without engendering systemic risks. The U.K. Financial Conduct Authority Regulatory notes that its sandbox “allows businesses to test innovative products, services, business models and delivery mechanisms in the real market, with real consumers.” The Monetary Authority of Singapore states that its regulatory sandbox enables financial institutions “...as well as FinTech players to experiment with innovative financial products or services in the production environment but within a well-defined space and duration. It shall also include appropriate safeguards to contain the consequences of failure and maintain the overall safety and soundness of the financial system.” The sandboxes allow regulators to observe the operation of new financial technologies as a precursor to designing suitable regulation as these activities scale up and move out of the sandboxes and into the broader financial system.

The list of countries that already have such financial regulatory sandboxes in operation includes a number of advanced and emerging market economies such as Australia, Canada, Denmark, Hong Kong, Malaysia, Thailand, Saudi Arabia, South Africa, Sweden, and the United Kingdom. The European Union recently set out proposals for an EU-wide regulatory sandbox.

The Federal Reserve has not initiated any proposals for such a sandbox or indicated any intention of doing so. Interestingly, in March 2018, Arizona enacted a new law establishing a fintech sandbox, making it the first U.S. state to do so.<sup>6</sup> The program is to be managed by the Attorney General’s office, is due to open for applications in late 2018, and is slated to run through July 2028. Applicants will be able to serve up to 10,000 Arizonian customers, and will have two years for testing. The press release notes that, while the idea of a regulatory fintech sandbox is “being discussed at the federal level, Congress is moving at a glacial pace.”

#### *Regulating Nonofficial Cryptocurrencies*

Cryptocurrencies themselves pose an additional set of challenges. The range of financial activities that are facilitated by cryptocurrencies and the potential for gaps in regulatory oversight as different regulators sort through jurisdictional issues is illustrated by the U.S. experience so far. The following summary is based on a recent CFTC document:<sup>7</sup>

U.S. law does not provide for direct, comprehensive Federal oversight of underlying Bitcoin or virtual currency spot markets. As a result, U.S. regulation of virtual currencies has evolved into a multifaceted, multi-regulatory approach:

<sup>6</sup> The official press release is available at: <https://www.azag.gov/press-release/arizona-becomes-first-state-us-offer-fintech-regulatory-sandbox>.

<sup>7</sup> “CFTC Backgrounder on Oversight of and Approach to Virtual Currency Futures Markets” CFTC Public Affairs Office, January 2018. [https://www.cftc.gov/sites/default/files/idc/groups/public/%40customerprotection/documents/file/backgrounder\\_virtualcurrency01.pdf](https://www.cftc.gov/sites/default/files/idc/groups/public/%40customerprotection/documents/file/backgrounder_virtualcurrency01.pdf)

- State banking regulators oversee certain U.S. and foreign virtual currency spot exchanges largely through state money transfer laws.
- The Internal Revenue Service (IRS) treats virtual currencies as property subject to capital gains tax.
- The Treasury's Financial Crimes Enforcement Network (FinCEN) monitors Bitcoin and other virtual currency transfers for anti-money laundering purposes.
- The Securities and Exchange Commission (SEC) has the authority to oversee initial coin offerings (ICOs) since they typically involve the offer and sale of securities.
- The CFTC has declared virtual currencies to be a "commodity" subject to oversight under its authority under the Commodity Exchange Act (CEA).

The document notes that the CFTC has "taken action against unregistered Bitcoin futures exchanges (BitFinex), enforced the laws prohibiting wash trading and prearranged trades on a derivatives platform, issued proposed guidance on what is a derivative market and what is a spot market in the virtual currency context, issued warnings about valuations and volatility in spot virtual currency markets, and addressed a virtual currency Ponzi scheme."

The complexity of regulations when secondary markets are involved is illustrated by the case of Bitcoin derivatives. As the price of Bitcoin surged towards \$20,000 near the end of 2017, derivatives exchanges sensed an opportunity to exploit the interest in products for speculating on Bitcoin prices. In December 2017, the Chicago Mercantile Exchange Inc. (CME) and the CBOE Futures Exchange (CFE) self-certified new contracts for bitcoin futures products, and the Cantor Exchange (Cantor) self-certified a new contract for bitcoin binary options.<sup>8</sup>

The CFTC claims jurisdiction when a virtual currency is used in a derivatives contract (or if there is fraud or manipulation involving a virtual currency traded in interstate commerce). However, the CFTC noted that, so long as the self-certification by the derivatives exchanges adhered to certain guidelines, it had no authority to even hold public hearings or seek public input before the new products were launched. In responding to concerns about the new products adding to the Bitcoin hype (and price volatility), CFTC Chairman Giancarlo acknowledged that "Bitcoin...is a commodity unlike any the Commission has dealt with in the past." The CFTC added that "In working with the Commission, CME, CFE and Cantor have set an appropriate standard for oversight over these bitcoin contracts given the CFTC's limited statutory ability to oversee the cash market for bitcoin."

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<sup>8</sup> See <https://www.cftc.gov/PressRoom/PressReleases/pr7654-17>. The CFE and CME Bitcoin futures began trading in December 2017, the Cantor exchange product has not yet been launched.

As Bitcoin and other cryptocurrencies, along with the technologies underpinning them, start playing a bigger role in financial markets, issues of regulatory jurisdiction and the potential for regulatory gaps/arbitrage take on greater significance. This discussion raises some important concerns in the context of the fragmented, overlapping, and inconsistent regulatory framework for U.S. financial markets that may have played a role in the global financial crisis and remains largely unchanged to this day.

Nonofficial cryptocurrencies may also require greater coordination and harmonization of regulatory efforts across national regulators. While some cryptocurrency exchanges are nominally domiciled in specific countries, the nature of these virtual currencies makes it difficult to subject them to national rules and regulations, especially in terms of investor protection. U.S. Securities and Exchange Commission Chairman Jay Clayton summarized this in a cautionary statement to the public: “Please...recognize that these markets span national borders and that significant trading may occur on systems and platforms outside the United States. Your invested funds may quickly travel overseas without your knowledge. As a result, risks can be amplified, including the risk that market regulators, such as the SEC, may not be able to effectively pursue bad actors or recover funds.”

## VI. Monetary Policy Implications

Central banks are likely to face technical and operational challenges to their core monetary policy mandates or, at a minimum, will need to adapt to the evolving financial technologies.<sup>9</sup>

### *Monetary Policy Implementation*

One obvious question is whether CBDCs will have an effect on monetary policy or other aspects of macroeconomic policies. CBDCs disseminated through electronic wallets would make it easier to implement monetary policy more effectively in two ways. First, the nominal zero lower bound, which became a binding constraint for traditional monetary policy in advanced economies during the worst of the global financial crisis, would no longer apply. The central bank could institute a negative nominal interest rate simply by reducing balances on these electronic wallets at a pre-announced rate. In an economy with physical cash, this should in principle not be possible since consumers (and firms) have the alternative of holding physical currency banknotes, a zero nominal interest rate instrument. In principle, negative nominal interest rates should encourage consumption by making it expensive for households to maintain cash positions.

Monetary policy could also be implemented through “helicopter drops” of money, once seen as just a theoretical possibility of increasing cash holdings in an economy in a non-

<sup>9</sup> See BIS, 2018, “Central Bank Digital Currencies.” Committee on Payments and Market Infrastructures, and Lael Brainard, 2018, “Cryptocurrencies, Digital Currencies, and Distributed Ledger Technologies: What Are We Learning?” Federal Reserve Board of Governors.

distortionary fashion by making lumpsum transfers to all households. This would be easy to implement if all citizens in an economy had official electronic wallets and the government could transfer central bank money into (or out of) those wallets. Channels for injecting outside money into an economy quickly and efficiently become important in circumstances of weak economic activity or looming crises, when banks might slow down or even terminate the creation of outside money.

Thus, a central bank could substantially reduce deflationary risks by resorting to such measures in order to escape the liquidity trap that results when it runs out of room to use traditional monetary policy tools in a physical cash-based economy.

There is an important asymmetry in this context that could become even more consequential if outside money were to have only a small role in the overall money supply. In that case, if banks were expanding outside money rapidly at a time of strong economic activity with rising inflationary risks, the central bank's ability to shrink electronic wallets holding CBDC might not do much to control the overall money supply. Although most advanced economy central banks now use price-based monetary policy measures (policy interest rates) rather than quantity-based monetary policy measures, this might be another reason for central banks to issue CBDCs rather than letting central bank money wither away if households were to use less and less cash.

There is, however, a flip-side to the ease with which a central bank can increase or decrease the supply of outside money. The ability to impose a haircut on CBDC holdings, or to increase them rapidly in case the government were to apply pressure on a central bank to monetize its budget deficit, could lead to substitution away from the CBDC. The reduction in nominal balances and the erosion in the real purchasing power of nominal balances through monetary injections would have similar effects—decreasing confidence in the currency as a safe asset that can hold its value, at least in nominal terms.

#### *Monetary Policy Transmission*

A number of banks and consortiums of banks are exploring the use of DLT for bilateral settlement of clearing balances without going through a trusted intermediary such as the central bank. DLTs, as discussed earlier, make it easier to track and verify transactions. If all participants in a closed pool can monitor such activities and if there is a permanent indelible transaction record that is tamper-proof, they may be able to use group monitoring as an alternative for a trusted central counterparty.

Will such developments dilute the ability of the central bank to affect interest rates in the economy through its control of very short-term policy interest rates (such as the discount rate and the Fed funds rate in the U.S.)? This gets to the crux of the question about whether central banks can maintain their influence over aggregate demand and inflation even if they are sidelined from some of their traditional roles—issuing (outside) money and providing payment and settlement services for major financial institutions.



If banks and other major financial institutions do create such settlement mechanisms among themselves (both bilaterally and across members in the group), and are also able to more effectively manage their liquidity positions and overnight balances, then settlement and liquidity management through the central bank might play a less important role. Of course, the ability to observe such transactions (or even to observe that such transactions are taking place between certain participants in the system) conveys important information that banks might not want to reveal to their competitors. Thus, competitive forces might limit the use of DLTs as an alternative for a trusted third party such as a central bank to provide settlement services while maintaining the confidentiality of those transactions. In short, significant technological as well as conceptual hurdles will need to be overcome before commercial banks sideline the central bank.

If these challenges are overcome, one possibility is that the central bank eventually becomes a liquidity provider of last resort in times of crises but, otherwise, commercial banks route their settlement and liquidity management operations through direct channels among themselves.

A related issue is whether nonbank and informal financial institutions are less sensitive to policy interest rate changes than traditional commercial banks. If these institutions do not rely on wholesale funding and have other ways of intermediating between savers and borrowers, then the central bank might face significant challenges to the effectiveness of monetary policy transmission. This might also prove to be only a long-term challenge for advanced economies if and when the relative importance of traditional commercial banks declines, although in developing economies informal financial institutions already play a significant role. Despite the proliferation of nonbank financial institutions and more direct intermediation channels, it is far from obvious that these can be scaled up such that they displace (rather than erode the prominence of) commercial banks.

#### *Capital Controls and Exchange Rates*

Financial globalization has increased as a result of greater pressures for capital to flow across national borders, in search of either or both yield and safety, and the spread of financial institutions with a global footprint. This has led to rising de facto financial openness of all economies, including emerging market economies such as China and India that maintain de jure capital controls. In the case of China, for instance, its large banks now have a global presence and provide channels for moving money into and out of the country more easily than when the operations of these banks were mostly domestic. In addition, rising trade volumes have created opportunities for evading capital controls through trade misinvoicing.

New channels for transmitting payments across borders more quickly and cheaply are likely to make it more difficult to regulate and control capital flows. Such changes are hardly imminent since cross-border payment systems are still in their infancy. But China's recent experience provides a cautionary tale. When the government was trying to control capital outflows in order to manage pressure on the currency, Bitcoin demand emanating from China surged. It is not possible to establish a clear connection between

these developments, but there was enough circumstantial evidence that the government banned Bitcoin trading mainly to tamp down on capital flight through this channel.

#### *Other Considerations*

Paper currency is vulnerable to counterfeiting, a challenge that governments have faced since the very introduction of paper currency by the Tang Dynasty in China in the 7<sup>th</sup> century. CBDCs could in principle reduce this risk, although the risk of electronic counterfeiting on an even more massive scale through hacking is a major concern for governments that intend to take this route.

A potential advantage of a CBDC is that it would discourage illicit activity and rein in the shadow economy by reducing the anonymity of transactions now provided by the use of currency banknotes, a point made forcefully by Rogoff (2016), especially in the context of high-denomination banknotes. This would also affect tax revenues, both by bringing more activities out of the shadows and into the tax net and also by enhancing the government's ability to collect tax revenues more efficiently.

An argument in favor of preserving physical cash is that the level of access to the formal financial system is limited among poorer households. Hence, cash is crucial for financial intermediation and, in developing economies, even as a more secure form of savings. This argument is being undercut rapidly by technologies such as mobile banking and the falling cost of digital transactions. Moreover, the introduction of CBDCs does not necessarily entail the immediate elimination of physical cash. The two could co-exist during a transition period or even indefinitely.

Would the proliferation of digital currencies affect the seigniorage revenues that accrue to central banks when they issue cash? These revenues are the difference between the worth of the cash issued (in terms of goods and services it can procure) and the cost of producing and distributing it. The cost of printing paper currency and its lack of durability reduce direct seigniorage revenues. Hence, a CBDC could, all else unchanged, increase seigniorage revenues. However, the demand for central bank issued currency, either in physical or digital form, could be lower if it is displaced as a medium of exchange. Hence, the net effect on seigniorage revenues depends on how technological developments affect the demand for central bank money. In any event, seigniorage revenues tend to be modest for most central banks although, for ones such as the Federal Reserve and ECB that issue a major reserve currency, the revenues are hardly trivial.

Ensuring compliance with AML/CFT regulations has been a major challenge for government authorities. The elimination of physical cash could assist in these efforts, although the likely shifting of illicit fund transfers to decentralized payment systems and intermediated through anonymous, decentralized cryptocurrencies could vitiate this progress. This is one reason why central banks might seriously consider issuing CBDCs so they can retain control of or at least oversight over payment systems that could as easily be used for illicit as for licit purposes.

## VII. Implications for the Dollar's Role in Global Finance

The advent of CBDCs and cryptocurrencies could have implications over the long run for certain elements of the international monetary system, but these are not likely to be revolutionary. Some changes could occur even earlier, although their effects on global finance will mostly be limited to the structure of financial markets themselves.

One of the major benefits of improved electronic payment and settlement systems that would go with the proliferation of digital currencies is the increase in speed and security of transactions, along with a reduction in their costs. This would mark a substantial improvement for settlement of trade-related transactions as well as remittances. Even cross-border settlement of other types of financial transactions could benefit from these developments. DLTs offer the potential for reliable tracking of different stages of trade and financial transactions, reducing one of the frictions associated with such transactions. Such changes might simply increase the efficiency and lower the cost of transactions routed through banks and other traditional financial institutions rather than displacing such institutions.

International payment messaging systems such as SWIFT are vulnerable to being replaced by alternatives that have the benefits of security and verifiability, but at a lower cost. SWIFT has the major initial advantage of a standardized communication protocol but it is difficult to imagine that that advantage is sufficient as a business model. Indeed, many countries such as China and Russia are setting up their own payment systems so as to reduce their reliance on foreign payment systems and also as a gateway to the international payment system. In other words, such countries could conceivably link their payment systems, routing bilateral international transactions through their own payment systems rather than relying on SWIFT and the payment systems that use it for messaging.

A longer-term and perhaps less likely outcome is the advent of cryptocurrencies, or at least decentralized payment systems, that function as mediums of exchange in international transactions. This would in effect create new channels for cross-border capital flows that are more difficult for a government to control through either macroprudential regulations or explicit capital controls.

### *Financial and Real Spillovers*

Both banks and nonbank financial institutions could expand the geographical scope of their operations across national borders using the new technologies. This entails new challenges for supervision and regulation. One complication is the lack of clarity about the domicile of informal financial institutions and the geographical locus of the supervisory authority of national regulators. The second is the potential accentuation of cross-border financial stability risks as more institutions operate across national borders. Some of these challenges could be overcome by the greater transparency of transactions if they are conducted using a public DLT or if the regulator has access to the relevant private ledgers. New channels for capital flows could also transmit financial market volatility more rapidly across countries.

*The Dollar's Role as a Reserve Currency*

The demand for Bitcoin as a store of value rather than as a medium of exchange has stoked discussion about whether such cryptocurrencies could challenge that role of traditional reserve currencies. It is more likely that, as the underlying technologies become more stable and as more efficient verification mechanisms are developed, such decentralized nonofficial cryptocurrencies will start playing a bigger role as mediums of exchange. Even that proposition is a tenuous one given the high levels of price volatility experienced by such currencies recently. Nevertheless, this shift could occur over time as the utilitarian functions of cryptocurrencies and the underlying payment verification and transfer systems take precedence over the speculative interest in them.

The decline in transaction costs and easier settlement of transactions across currency pairs could have a more direct and immediate impact—a decline in the role of vehicle currencies such as the U.S. dollar that are used to intermediate transactions across pairs of other currencies. The dominance of the dollar as a vehicle currency, followed by the euro, is related to the depth and liquidity of most currency pairs with the dollar (and the euro), which reduces the associated transaction costs. This dominance is unlikely to persist and could even result in an erosion of the dollar's role as a unit of account. For instance, the denomination of all oil contracts in dollars could easily give away to denomination and settlement of contracts for oil and other commodities in other currencies, perhaps even emerging market currencies such as the renminbi.

Notwithstanding any such changes, the role of reserve currencies as stores of value are not likely to be affected. Safe financial assets—assets that are perceived as maintaining most of their principal value even in terms of extreme national or global financial stress—have many attributes that cannot be matched by nonofficial cryptocurrencies.

The key technical attributes include liquidity and depth of the relevant financial instruments denominated in these currencies, such as U.S. Treasuries. More importantly, both domestic and foreign investors tend to place their trust in such currencies during times of financial crisis since they are backed by a powerful institutional framework. The elements of such a framework include an institutionalized system of checks and balances, the rule of law, and a trusted central bank. These elements provide a security blanket to investors that the value of those investments will be largely protected and that investors, both domestic and foreign, will be treated fairly.

While reserve currencies might not be challenged as stores of value, digital versions of extant reserve currencies and improved cross-border transaction channels could intensify competition among reserve currencies themselves. In short, the finance-related technological developments that are on the horizon portend important changes to domestic and international financial markets but a revolution in the international monetary system is not quite on the cards for the foreseeable future.

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