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CAN CRYPTOCURRENCIES SUCCESSFULLY COMPETE IN THE MONEY MARKET?



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SUMMARY

The cryptocurrency revolution began with the introduction of Bitcoin in 2009 and the crypto movement has mushroomed so that there are now more than 4,000 cryptocurrencies. Bitcoin was the first and remains the largest with a market capitalization of over \$1 trillion.

While all these new digital entities are characterized as cryptocurrency, none actually circulate in general commerce. Commerce in the entire developed world is largely conducted using what is normally termed “money.” This money is based on the “legal tender” of the country and that “legal tender” is under the control of a nation’s central bank. That bank in the United States is the Federal Reserve.

Even though central banks have a monopoly on the production of legal tender, they do not have a monopoly on the production of “money.” Commerce is not in general conducted through the exchange of paper currency but rather by the exchange of titles to this currency. This exchange more often than not is done through the use of credit card, debit card or phone app. Large transactions are done through the exchange of titles to currency through written checks or electronic transfers.

In the United States only 10% of the M2 measure of the money stock is actual currency. The remainder is titles to currency privately produced by banks and other financial institutions. Most of our money is actually produced by private firms and not the Federal Reserve. In contrast to the many cryptocurrencies all the privately produced monies in use have one thing in common; they are convertible on demand into legal tender. Their value is always one dollar per unit. As such neither the buyer nor the seller in a transaction need financial expertise to make an exchange involving the existing privately produced money. They are simply exchanging titles to legal tender.

Cryptocurrencies as they are currently structured are not going to compete in the privately produced money market. They are however, positioned to compete in the precious metals market. They would be better described as crypto-gold.

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CAN CRYPTOCURRENCIES SUCCESSFULLY COMPETE IN THE MONEY MARKET?

INTRODUCTION

The rise of cryptocurrencies after the introduction of Bitcoin and Ethereum has raised the question of the future of current world currencies.¹ Will cryptocurrencies replace the money we use for transactions? Does the rise of cryptocurrencies threaten the money monopoly held by central banks?

Certainly, in the developed world much, indeed perhaps most, transactions are done with “legal tender” currency or the exchange of titles to “legal tender” currency.² In fact, the majority of these transactions that involve the transfer of titles to legal tender currency are done via credit card, debit card or phone app. In some sense then, most transactions use currency, either directly or by title transfer, issued by the central bank of the country of the transaction. Can or will cryptocurrencies ever become a private alternative to government approved legal tender currency in general commerce? Are they, or can they, be money?

The simplest definition of money is “money is what money does.” But what does money do? Most importantly money facilitates transactions and trades, between and among individuals and businesses. What must this thing, money, be like to perform this function? It must have two characteristics to succeed as a universal medium of exchange.

First, it must be readily recognizable in that when I have an item and want to trade it to someone else, they must immediately know what it is and that I own it. More than that, any individual or business must be readily willing to exchange this thing for whatever they want to trade. It must also be divisible into units small enough to be used in everyday transactions. While this small enough requirement seems simple, over the long history of monetary systems it has proven to be a major problem.³

Second, to be acceptable, something that is money must have a stable value. That is, when I accept it in trade and then present it the next day to someone else, its value must not have changed significantly. But, what makes something a store of value? To be a store of value requires that its supply be limited and that the demand for it not be overly volatile.

What currently is money in most countries of the world is the actual legal tender currency or titles to the legal tender currency of that country. Prices are expressed in units of legal tender currency and transactions of goods and services are conducted by exchanging titles to legal tender currency or legal tender currency itself. If cryptocurrencies are ever to replace, or circulate along-side current legal tender money, they must meet each of the two characteristics required to be a universally accepted medium of exchange. Importantly, however, it is not necessary that cryptocurrencies be money to have value.

¹ As of November 20, 2020 there are just under 4,000 crypto-currencies traded.

² *Legal tender* is defined as anything recognized by *law* as a means to settle a public or private debt. In almost all countries the national currency is legal tender.

³ See Sargent, Thomas J. and Francois R. Velde, *The Big Problem of Small Change*, Princeton University Press, 2001.

TRANSACTIONS USING “MONEY”

When any of us goes to the store or shops on-line, we are entering into an exchange with another individual or entity. We exchange something we own for something they own. Such exchanges require that the buyer has confidence that the seller owns what is being sold and that the seller has confidence that the buyer owns what is being exchanged. What the buyer offers in these exchanges is almost always what is referred to as “money.” Furthermore, this “money” is almost always based on the legal tender of the nation where the exchange is taking place. But more often than not the “money” that is exchanged is not physical legal tender currency but titles to that legal tender currency.

Most importantly, it is not even necessary for physical units of legal tender currency to actually exist. The checking accounts that all of us have do not contain any physical pieces of paper. When you shop and pay with a check, debit card, credit card or phone app all these instruments represent titles to the specified quantity of legal tender currency that you are transferring to the merchant. The underlying financial accounts are simply titles to currency that do not exist in any physical sense.

In fact, all the records of titles to legal tender could be in the cloud. For most countries, however, physical currency remains an important component of commerce. In fact, in the United States physical currency is still just over 10% of the broad M2 money stock. But that means that 90% of the M2 money stock is titles to currency, not currency itself. Importantly, these titles to currency are privately supplied by banks and other financial institutions. So, we are already in a world where most of our money is supplied not by central banks, but by the private market.

In general, commerce is conducted using what is commonly called “money.” Asking prices are expressed in terms of monetary units; dollars, euros, pounds or yen, for example. Both participants in a transaction using these monetary units know their value at the time the transaction is consummated. For this commerce to go smoothly, the value of these monetary units must be relatively stable. An individual setting out to shop must expect that on the way to the store the value of the money that will be exchanged will not change during the time of the trip. In the case of transactions for delivery in the future, a stable value of money is even more important.

The value of money units, whether these money units are physical pieces of paper or just entries in the cloud, depends on the supply of them and the public’s demand for them. In the simplest case, the demand for money depends on the quantity and value of transactions conducted using money. The value of a monetary unit will be directly related to the ratio of amount of such units compared to the aggregate of transactions in which it is used.⁴

Monetary systems have problems when the quantity of the legal tender units on which the monetary system is based relative to market transactions changes significantly. Historically significant changes in the quantity of money have occurred when governments have elected to finance themselves by using

⁴ The other two motives for holding assets fixed in monetary units are referred to “precautionary” and “speculative.” Both of these motives stem from uncertainty concerning the future. The first uncertainty concerning your consumption need and the second concerning your assessment of the future of other financial instruments.

their central bank to print money. Today Venezuela is just such an example. The supply of legal tender money in Venezuela is rising over 1,000% per year and the value of a unit of money is falling rapidly with an inflation rate of 6,500%.⁵ When these hyperinflations occur, some other form of transaction media always arises. Historically, the monetary unit that has replaced the local money has been the U.S. Dollar. Indeed, last year Venezuela legalized U.S. dollar-based transactions. These transactions do not have to entail the use of actual U.S. currency. Just as in the U.S., where most transactions are done by exchanging titles to U.S. currency, dollar-based transactions in Venezuela can be based on the exchange of titles to U.S. currency.

Once we solve the problem of a stable supply of monetary units, is it necessary to have a central bank as the monopoly supplier of these legal tender units? Clearly the answer is 'no' as 90% of the M2 money supply measure consists of titles to legal tender created in the private market. However, for money to have a stable value, the supply of money from whatever source relative to its uses must be stable.

But what are the uses of the money supply? First and foremost, having something that is money, makes transactions simpler because all traders will accept money. But trading does not require money. Indeed, in today's world, the internet makes it easier for individuals to trade with one another without that trade entailing the transfer of titles to legal tender. That said, however, the majority of trades are done by exchanging titles to legal tender, even internet trades.

One important reason why the majority of the world's commerce is conducted by the exchange of titles to legal tender is that the value of a unit of legal tender is relatively stable. But unlike titles to gold bars, the legal tender on which the titles are based does not have to physically exist. In fact, virtually all the assets underlying demand deposits, money market accounts and other instruments that are exchanged in commerce are not legal tender. These instruments of commerce are for all intents and purposes privately produced money. However, this privately produced money is convertible into actual physical legal tender on demand. Additionally, because these privately produced monies are convertible into legal tender on demand, the quantity of privately produced money influences the price level and as a result the value of legal tender.⁶

Only a small part of commerce is actually conducted using physical legal tender. In fact, we know that physical legal tender currency comprises only 10% of the M2 money stock.⁷ Clearly most of M2 money is privately supplied but importantly, the legal tender on which the privately supplied money is based and convertible into is supplied by the Federal Reserve. All convertible private money suppliers must maintain reserves, either on deposit with the Federal Reserve or as physical legal tender, to meet

⁵ Venezuela just announced that they were going to begin issuing 200,000, 500,000 and 1,000,000 bolivar notes. The 1,000,000 note is worth only \$0.53, 53 U.S. cents.

⁶ For a discussion of privately produced money and the price level see Saving, Thomas R., "Competitive Money Production and Price Level Determinacy," *Southern Economic Journal*, October 1976 and "A Theory of the Money Supply with Competitive Banking," *Journal of Monetary Economics*, July 1977.

⁷ M2 consists of: (1) currency outside the U.S. Treasury, Federal Reserve Banks, and the vaults of depository institutions; (2) traveler's checks of nonbank issuers; (3) demand deposits; (4) other checkable deposits, or negotiable order of withdrawal accounts at depository institutions and credit union share draft accounts; (5) savings deposits (including money market deposit accounts); (6) small-denomination time deposits (time deposits in amounts of less than \$100,000); and (7) balances in retail money market mutual funds.

variations in their customers demand for titles to legal tender. Thus, the total quantity of legal tender issued plus reserves held at the Federal Reserve affects the quantity of private money that will be issued. The total of physical legal tender and reserves at the Federal Reserve is referred to as the “monetary base.”

Does the fact that most of what we call money is produced by the private sector but is based on legal tender give the monopoly producer of legal tender the ability to control the money stock? Further even with total control of the supply of what is money, can we be assured that the value of money will be stable?

The issue is a simple one. The price of anything, including money, is determined by demand and supply. Changes in technology has resulted in both changes in who supplies financial instruments that become money and in the demand for what is money. But what is money? Money is what money does in the economy. Since most transactions are conducted through instruments that allow exchange of titles to legal tender, these instruments are money. The supply of money can be changed by the Federal Reserve increasing the underlying supply of legal tender through increases in the monetary base. But the money supply can also increase by the introduction of new financial instruments being used as transactions media. An example is the introduction in the 1980s of negotiable orders of withdrawal (NOW) accounts. These accounts were a new instrument to be used by the public to exchange titles to legal tender.

Just as with any product, the price of money, what a dollar is worth, is determined by supply and demand. Even with the supply of money fixed, changes in the demand for money will change the value of a unit of money. But how and why might the demand for a fixed quantity of money be changed? Any change in the available technology of transacting, has the potential to increase or reduce the demand for money. Let’s consider some changes that have occurred in the last half-century that have affected the demand for money and the supply of instruments that are used in commerce.

First, we have the rise in the consumer credit card as a way to consolidate monthly purchases. A credit card is not money but its use is a transfer of title to what is money. In its simplest form, the credit card did for everyone what having a monthly account at the store did for individuals in the pre-credit card world. Specifically, such an account reduced the average quantity of money held over a specific period of time. It potentially reduced it to the minutes from receiving a pay envelope to paying your monthly store bill times the size of your bill. The general use of credit cards allowed everyone to essentially have an account at every store that accepts these cards.

Second, recent changes in the ability of individuals to make sale or purchase information available has decreased the cost of finding trading partners. This technological change has at least two effects on the demand for money. One, as with credit cards, it can reduce the necessity of keeping a cache of cash on hand as uncertainty in the timing of transactions is reduced. Two, it increases the ease of making trades that do not involve what we usually term money. Both of these effects reduce the demand for money.

Third, debit cards and phone apps have replaced physical checks and have reduced the cost of using your checking account to transfer titles to legal tender in transactions. Debit cards on your phone instead of on a card would be crypto-currency and are in use in today’s commerce. But whether on a phone app or a card these transactions are still based on the transfer of titles to legal tender.

CAN CRYPTOCURRENCIES BE A VIABLE COMPETITOR IN THE MONEY INDUSTRY?

Now to the real question: Can cryptocurrencies become a major player in everyday commerce. There is no doubt that these assets can be exchanged between willing buyers and sellers, but that is true of any asset. Importantly, while most commerce is conducted using transfers of titles to legal tender, nothing precludes exchanges being conducted in other instruments. This is an important distinction since, unless outlawed by law, any commodity or financial instrument can, at least theoretically, be used in exchanges between willing individuals. When such a commodity or financial instrument becomes widely used in commerce it is for all practical purposes, money.⁸

In fact, currently most transactions are conducted using instruments that are not physical legal tender. That said, however, these transactions instruments are all convertible at par into legal tender. Thus, most transactions are conducted through the exchange of what are essentially titles to legal tender.

An important characteristic of physical currency is that proof of ownership is by possession only. Therefore, transfer of ownership only requires the physical transfer of the item serving as money from one possessor to the next, without interference from any outside authenticator. Therefore, such transfers are anonymous.⁹ But that said most commerce is not conducted using physical units of currency but by transferring titles to legal tender, i.e., titles to circulating money, and not circulating money itself.

The money supply measures recognize that commerce is largely conducted through the transfer of titles to physical units of money and not the actual physical money. However, all these non-physical currency components of the measures of money are convertible into physical currency on demand. The question is then: given that a central bank is the monopoly producer of legal tender, what conditions must a competitor supplier of a circulating media meet? Then, can the existing cryptocurrencies meet these conditions? Does the fact that cryptocurrencies do not represent the title to a real asset but only title to themselves preclude them from being money? The answer to this question is clearly no, as no current currency represents a title to anything other than itself.

Any new money competitor must meet conditions similar to current private money suppliers. First, a money competitor must be recognizable by all traders. Second, it must be easily transferable. Third, it must be relatively stable in value. When you leave home to shop, you want to be assured that the instrument to pay for purchases will be accepted by any store where you shop. Then you want some assurance of how much of the so-called money you will need when you get to the store. This relative stability in value is especially important in executing contracts when the payment is to be made at a future date.

⁸ Given that anything can be money, countries that desire to raise revenue through having their central bank just print currency must worry about substitute forms of money arising. Not surprisingly, when a government intends to use inflation financing, they first outlaw contracts in other than legal tender. Such contracts can still be written but if violated cannot be enforced in the legal system.

⁹ This possession as ownership aspect of currency or any other circulating media has resulted in efforts to control anonymity that usually fail. Further, it is this anonymity that is a principal driver of the rise of cryptocurrencies.

In general, when multiple monies circulate the successful non-legal tender currencies are convertible at a fixed rate into a legal tender currency. However, there are important conditions under which this fixed convertibility is not necessary. Almost always, when the legal tender issuer loses control of the currency issue, such as currently in Venezuela, the substitute for legal tender will not be convertible into the local legal tender at a fixed rate of exchange. In cases such as this, the US dollar is often the non-legal tender currency used. When this happens, stores could display two prices: one in legal tender currency and one in the alternative currency.¹⁰ However, when currencies are in distress the posting of alternative prices is usually illegal and occurs off the books, in what is essentially a black market.

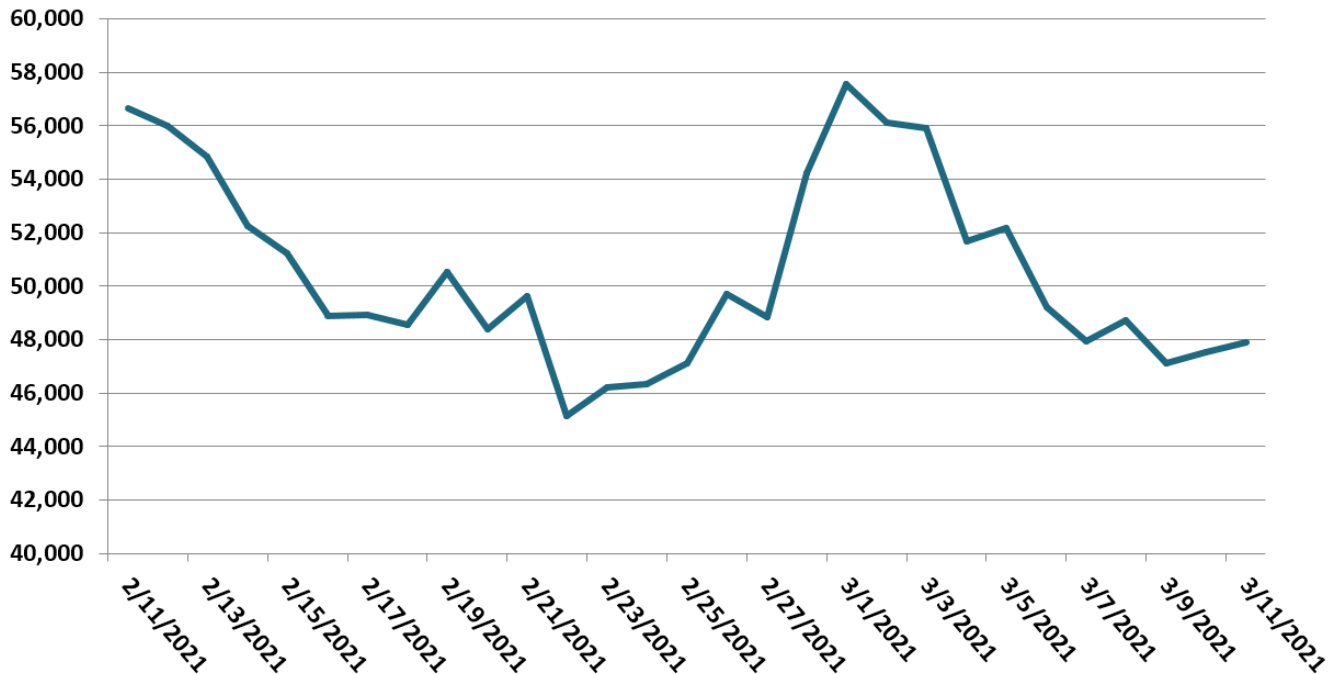
Future contracts are especially difficult when the legal tender currency value is in distress. Such contracts will at least informally be done in terms of some alternative but can only be done when both parties are known to be reliable. This joint reliability is required because a breach of contract in a restricted currency is not enforceable in the legal system.

Leaving aside substitute currencies that arise as a result of a legal tender that has become dysfunctional, what is required for non-legal tender money to circulate? The most important requirement is that the users must be assured that the value of the competitor money will be stable. The cheapest way to ensure this value stability is to make the substitute currency convertible into legal tender at a constant exchange rate. This convertibility allows contracts with future payment to be done by assuring that the value of the substitute currency will be the same as the legal tender currency into which it is convertible.

That a potential currency competitor can be converted to legal tender, while a requirement for circulation, is not sufficient to make the competitor money generally acceptable. All digital currencies are traded, as are other financial instruments such as stocks and bonds, and in that sense are redeemable into legal tender currencies. The catch is that the exchange rate between digital currencies and legal tender is anything but constant as the figure below of the value of a Bitcoin for the month of January 2021 shows

¹⁰ This display of multiple prices occurred during the Civil War when greenbacks and gold still circulated.

Figure 1. Bitcoin Closing Price - Daily 02/11/2021 – 03/11/2021



The fact that investors have become enchanted with trading in something with a zero yield that is a title to nothing except itself may seem strange. However, investors in precious metals are essentially doing the same thing and have to pay for storage. Thus, these metals have a negative yield. The potential gain is that precious metals are limited in quantity and may be a hedge against general inflation of the legal tender currency. In one sense then cryptocurrencies of today are perhaps better named crypto-gold. Given that an active market exists, investors should be most interested in what a Bitcoin will be worth tomorrow. If ultimately, the interest in this type of asset goes away, as long as you are not holding it when that happens, you suffer no harm. This is similar to the classic “bubble” experiments that repeatedly show that assets of this type can trade at values that far exceed their known final value, but then crash at some point.¹¹

With today’s technology, any financial asset with a continuous market could be used in transactions. You could conceivably take your ownership of a mutual fund to the store, shop, and at the close of the transaction, the store simply transfers the appropriate amount from your shares in that fund to the store’s shares in their fund. But even with today’s advanced technology, we are still a long way from this kind of transfer of funds being a cost-effective substitute for transfer of titles to currency. What does work in today’s world is the direct transfer of currency ownership using instruments such as debit and credit cards that transfer currency at fixed rates of exchange.

¹¹ This phenomenon is consistently demonstrated in simple economics experiments. See Lei, Vivien, Charles N. Nousseair and Charles R. Plott, “Non-Speculative Bubbles in Experimental Asset Markets: Lack of common Knowledge of Rationality vs. Actual Irrationality,” *Econometrica*, 2001, 69(4) 831-859.

HOW WILL WE KNOW WHEN A CRYPTOCURRENCY IS MONEY?

The question is when or if any of the many cryptocurrencies will make a significant entry into the money world. In one sense the answer is simple. We know that privately produced money makes up 90% of the M2 money stock. Also, well less than 20% of the private money component of the M2 money stock is produced by commercial banks that are members of the Federal Reserve. Thus, there is plenty of room for new competitors in the private money production business.

Since it is legal for contracts between individuals to be completed through the exchange of any specified asset, there will always be transactions that use what are now cryptocurrencies. On that front, Tesla has just announced that they will accept Bitcoin in new car transactions. This is not surprising in that large transactions are amenable to being conducted through the exchange of any financial asset. Historically, the problem of monetary systems has always been the transactions of every-day life. A successful money must be small enough and stable enough that grocery-store and department store transactions can be easily conducted.¹² Here, the everyday buyer and the seller's store clerk should not need to have sophisticated financial market backgrounds in order to make an exchange.

Given the history of successful entrants in the production of private money substitutes, it is apparent that new entrants will have one important characteristic - they will be convertible into legal tender on demand. On this front there are cryptocurrencies that claim to meet this condition, Tether for example. Such convertible cryptocurrencies are essentially banks. Banks take deposits in demand deposit accounts that are on demand convertible into legal tender. In order to be money, these titles to legal tender must be easily transferable. Then customers, depositors, use these titles to legal tender to conduct transactions. There are three mechanisms for these transfers. First, checks that assign a designated amount of legal tender to a recipient. Second, directing the bank to electronically transfer funds to a designated recipient. Third, using an app that electronically directs the transfer titles to legal tender in the specified amount from the user to a recipient.

Can any cryptocurrency – something that was once more akin to science fiction - actually compete with legal tender as a competing currency? That is, will most or all prices that are expressed in terms of legal tender also be expressed in terms of the new currency? Even in that instance, prices may also continue to be expressed in terms of whatever the traditional currency is as well. Current instances of multiple currency pricing are in border cities where prices are expressed both in terms of that country's legal tender and the bordering country's legal tender. Other potential instances of multiple country legal tender pricing occur when one country's currency is subject to what is often called runaway inflation. As of the time of this writing, Venezuela was such a country.¹³

In general, nations want to preserve the ability to retain the revenue generated by being a money producer by making the central bank the monopoly issuer of legal tender. To this end, competitive issuers must be eliminated either through taxation, as in the elimination of State Bank issued Notes, or

¹² An excellent piece on the value of small denominations of money is Sargent, Thomas J. and Francois Velde, *The Big Problem of Small Change*, Princeton University Press, 2001.

¹³ In fact, in the United States during the Civil War, both legal tender in the form of greenbacks and gold coins, both denominated in dollars, circulated and pricing in both was common. Here the greenback gold exchange rate would vary depending on the progress of the War.

in the elimination of the special government bonds that were required for the issue of National Bank Notes in the United States.

So, when will cryptocurrencies be real currencies? In the extreme, it will happen when prices are universally expressed in both legal tender and cryptocurrency. This is no more likely to happen than prices being expressed in shares of a mutual fund. In fact, once the first cryptocurrency declares itself to be convertible into legal tender at a fixed exchange rate it will, for all practical purposes, be legal tender. But then market exchanges will not be in terms of the cryptocurrency but in terms of titles to legal tender. These cryptocurrencies will in one sense be banks and the cryptocurrencies will be titles to legal tender. They will be privately issued money and become part of the M2 money stock.

But cryptocurrencies do not have to be money to be a viable competitor in the non-money financial world. They are well positioned to compete as repositories of wealth. In one sense they would be similar to keeping money under your mattress, but different in two important ways. First, unlike money under your mattress that is subject to theft, the blockchain technology of cryptocurrencies protects your ownership position. Second, the value of money under your mattress is subject to another form of theft, inflation. With appropriate controls on the cryptocurrency issue these cryptocurrencies have the potential to maintain their real value.

CRYPTOCURRENCY: ARE THEY A THREAT TO THE FEDERAL RESERVE'S MONEY MONOPOLY?

This is an odd question since 90% of the M2 measure of the money stock is privately supplied. But all of the components of this money stock promise convertibility into the legal tender supplied by the Federal Reserve. The Federal Reserve is the monopoly supplier of this legal tender but its monopoly profits are affected by private money suppliers. Additional new private money suppliers will reduce the Federal Reserve's profits. Competition in the money supply business affects the monopoly profits of the legal tender supplier.

The production cost of legal tender is zero relative to its value. For physical legal tender it is just the power to run the press and the cost of ink and paper. But most legal tender is in the form of titles to legal tender supplied. To simplify the discussion, let's begin by suggesting that the goal of the monopoly supplier of legal tender is to maintain the value of a unit of currency. Also, let's assume what is a fact for most nations; that legal tender is the unit of account for transactions. Furthermore, assume that any competing monies are convertible into legal tender on demand.

With these assumptions, the owners of the legal tender monopoly, (for most countries the owner is the government), receive assets equal in value to the issue of legal tender, both physical and held as reserves at the Federal Reserve. The flow from the assets when legal tender is created then accrues to the nation's Treasury.¹⁴

How does the existence and amount of competitive circulating media affect the value of the central bank and the flows it transfers to the Treasury? Importantly, all legal tender competitors must be

¹⁴ Federal Reserve net income, by law, must be transferred to the U.S. Treasury. In 2020 the Federal Reserve transferred \$88.5 billion to the Treasury.

convertible into legal tender at a fixed rate or at least instantly convertible at the current rate of exchange to be viable. Currently, there are two forms of central bank legal tender competitors, neither of which can be anonymous in transactions.

First, commercial banks are depositories of legal tender or titles to legal tender. Owners of these deposits can issue checks that transfer ownership of their deposits to others, but not without proof that the issuer of the check actually has title to an adequate quantity of legal tender on deposit at the bank. The banks that are members of the Federal Reserve are regulated by the central bank and must hold reserves of legal tender. Such reserve requirements could be viewed as a form of licensing fee for the privilege of competing with the monopoly legal tender issuer.

Second, other legal tender competitors are issuers of circulating media that are not licensees of the monopoly legal tender issuer. The necessity that these legal tender competitor instruments be convertible into legal tender on demand means that competitors must maintain a cache of legal tender even if not required to do so by the monopoly legal tender issuer. The level of required reserves may or may not be larger than these competitor issuers of money would hold for purposes of meeting a surge of redemptions of their money for legal tender.

How do these competitors affect the balance sheet of the central bank? The central bank controls the total issue of legal tender, but not the issue of competing monies. If the central bank does not control the competing issuers who does? Here, the answer is simple; it's the public who decides the form of money that they choose to use. What this means is that the public decides the composition of their money holdings in terms of the legal tender share of money holdings. The total demand for legal tender is the sum of the public's demand for legal tender plus the quantity of legal tender held by the competitor issuers of circulating media.

How does this competition affect the value of the central bank? Assume, for simplicity, that the cost of producing and maintaining the stock of legal tender is zero. Then, the value of the central bank is equal to the assets it acquires when it issues legal tender. When the public increases its use of competing money, it reduces the quantity of legal tender that can be issued, if the central bank wants to maintain the value of a unit of legal tender. Just as with any normal product and industry, market share matters.

This result does not depend on the assumption that the central bank wants to maintain the value of legal tender. All that is required is that the central bank acts to maintain a fixed rate of depreciation in the value of legal tender. The public's choice of circulating media still drives the bus. Thus, competition in the market to be money reduces the value of the central bank and reduces the transfers that the central bank makes to its owner, the Treasury.¹⁵

IS THERE A DIGITAL CURRENCY IN YOUR FUTURE?

Perhaps the name cryptocurrency is a total misnomer, or at least the currency part is misleading, at best. The crypto part is on target, but for something to be currency, it must circulate in a general way.

¹⁵ See for example, G.P Dwyer and Thomas R. Saving, "Government Revenue from Money Creation with Government and Private Money," *Journal of Monetary Economics*, March 1986, pp. 239-249.

But, what does it mean to circulate in a general way? Essentially, all traders on both sides of a transaction must be willing to accept the asset in payment. Legal tender currency has that attribute and other circulating media convertible at a fixed rate into legal tender currency do as well. But, what about other financial assets?

Most, if not all, financial assets represent titles to an income flow, bonds, shares in physical plants and equipment, stocks, or to a bank deposit that is convertible into legal tender. Then, there are titles to physical assets, such as precious metals or gems. Titles to precious metals are recorded so that transactions using precious metals titles are not anonymous. However, transactions using actual precious metals can be anonymous when the metals, rather than titles to them, are exchanged.

What would make a “thin air” digital entity become universally traded? The past equivalent of a digital currency was the development of pure paper money that was not convertible into anything real but only into itself. This description fits most, if not all, legal tender money in the world. The issue with paper money has always been controlling its quantity and rate of growth. The same issue will be and is true for digital currencies that are not convertible into either a real resource or a legal tender currency.

In one sense at least, the coming era of digital currencies is similar to the free banking era in the United States. Various state banks issued currency denominated on their face in dollars, the official currency of the United States. Just as with digital currency, the cost of producing notes relative to denominated value was minimal. When banks issued currency, they received real goods in return for currency. Each bank was identified on their notes so that bank notes that circulated had to control the value of the notes. That is, it had to convince the users that their bank was going to maintain the value of the notes issued. In equilibrium, that assurance was achieved by making the notes convertible into gold or silver coins.

Now, we come to the “free” digital currency era with a large and growing number of digital entities hoping to become successful as vehicles for wealth storage and perhaps even circulating currencies. Bitcoin controls the issue by the cost of solving the algorithm, referred to as mining, the solution of which generates a new Bitcoin. This mining cost is a natural control on the stock of cryptocurrencies just as gold mining costs control the world’s stock of gold. And just as new discoveries or new technology changed the marginal cost of increasing the gold stock, the same holds true for cryptocurrencies. But the cost of real gold mining is determined by the existence of gold deposits. The cost of cryptocurrency mining is in the digital world and subject to manipulation. Thus, non-convertible cryptocurrencies have the same problem as nonconvertible paper currency; namely, ultimately use and value depend on controlling the issue.

The fundamental issue is, in a world of competing digital currencies, how do you distinguish your digital currency from others? You distinguish your currency by ensuring against surprise increases in the quantity of your currency. In the early days of paper money, this was accomplished by making the paper notes convertible into a known resource, such as gold. Even this convertibility could only work so long as the issuer did not do a surprise cancel, called a suspension, of convertibility.

The world’s principal central banks have a comparative advantage in producing digital currency. That comparative advantage only holds if the digital currency that is not convertible. Once a digital currency becomes convertible, it becomes similar to a debit card or a demand deposit. Digital currency issuers

will have to hold reserves, although the level of these reserves will be a small fraction of the issue. As a result, any expansion in the use of digital currency will reduce the value of the central bank as an income source for the Treasury.

What is the nature of the comparative advantage of central banks, as new entrants in the world of digital currency? First, they have the long history of producing currency that is relatively stable in value. By this, I mean that, except in rare cases, they have resisted the temptation to introduce surprise increases in their currency to acquire resources from the public. Second, once one or more of the premiere central banks, US Federal Reserve, the European Central Bank, the Bank of England or the Bank of Japan, enter the digital currency world, all existing cryptocurrencies will have to be convertible into one of these dominant currencies to be competitive. This convertibility is the only way to ensure to their users that they will not water down their currency.

CONCLUSION

The rise of cryptocurrencies, such as Bitcoin, Ethereum and Ripple, has reopened an old debate concerning what constitutes money. The simplest definition of money is “money is what money does.” But what does money do? Well, it facilitates transactions, trades, between and among individuals and businesses. What attributes must money have in order to perform this function? It must first be readily recognizable in that when I have this item and want to trade it to someone else, they must immediately know what it is. More than that, any individual or business must be readily willing to exchange this currency for what-ever they want to trade. With these characteristics, whatever is money will be the unit of account, so that asset value will be expressed in terms units of money

While many odd things have served as money in a limited way, historically, it is survivorship that matters.¹⁶ Money must be easily recognizable as real, be portable and be a reasonable store of value. The fact that others will be as ready to accept this thing in trade makes you willing to accept it. It must also be a store of value, which requires that its supply be controlled and that the demand for it not be overly volatile.

Importantly, most of the money supply in the United States is privately produced. It consists of deposits in financial institutions, some but not all of which, are regulated by the Federal Reserve. Most of what we term as “commerce” is conducted using this privately produced money that is based on ownership of legal tender but not the physical legal tender itself. Essentially all this private money is based on titles to legal tender and transactions are completed via the transfer of these titles to legal tender.

All this brings us to the latest entry in the money industry, cryptocurrency. Does such “currency” meet the criterion for being money? In one aspect, it does in that the blockchain technology assures ownership so that possession is 100% of the law, just as it is with currencies that generally circulate. However, while ownership of a Bitcoin is not in dispute, Bitcoin has not exhibited stable value. So, if an

¹⁶ For an excellent survey of primitive monies, that is things that have served a limited role in relatively primitive societies with minimal transactions, see Einzig, Paul, *Primitive Money*, Pergamon Press (June 1966).

individual accepts Bitcoin in exchange for a product, they must first find its current dollar, euro, pound or yen value. Even then, if they hope to use it for a subsequent trade, will they know what it will be worth? Clearly not! The way for a receiver of Bitcoin to ensure the future is to immediately convert the Bitcoin into dollars, euros, pounds or yen through one of the exchanges that exist. In contrast, if the trade is made using dollars, euros, pounds or yen at the next trade, these currencies will have experienced very little or no change in value.

Historically, it is convertibility into an accepted medium that has been required for a currency to survive as a circulating medium of exchange. At least until the 1930s, this convertibility was in terms of gold. Even this hard standard could not ensure a stable value of any circulating medium of exchange since gold prices fluctuate, at times greatly so. Even so, the gold standard was more successful than relying on fiscal restraint at controlling monetary authorities from expanding the issue and creating inflation in prices expressed in terms of money. Indeed, when nations intended to expand government expenditures by running the money printing press, they suspended convertibility.

The bottom line is that the future of cryptocurrencies as money must be, and will be, convertibility into one of the major units of account, i.e., dollars, euros, pounds or yen. Only then will cryptocurrency begin to circulate in more than isolated transactions.

But this does not say that investments in Bitcoin or other cryptocurrencies are not wise, even if they never become a part of the transactions process. As structured, most are similar to holding precious metals, a long-standing investment vehicle. Perhaps Bit-gold, or more generally, crypto-gold, might be a better name. Crypto-gold, as the digital equivalent of a precious metals investment, should be touted as being a good hedge against inflation, especially in this time of rapid monetary expansion. Unfortunately, historically, gold at least has not proven to be a good inflation hedge over the long run. For example, over the period from 1560 to 1983, the purchasing power of gold rose 54.7% while the purchasing power of a security with a 1% real yield would have risen in purchasing power by 6,729%!¹⁷

¹⁷ See Thomas R. Saving, Gold and Gold Mining Stocks in Your Personal Investment Portfolio, *Precious Metals 1984*, Thomas Patrick Mohide, ed., International Precious Metals Institute, 1984, pp. 81-89.