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THE STAHL REPORT COMPENDIUM

December 2015

THE MOST VOLATILE ASSET CORRELATED WITH NOTHING

The most volatile asset in the world, I will assert, is correlated with nothing. That is the Bitcoin Investment Trust (GBTC), which is a closed-end fund of Bitcoins. As of late November, this closed-end fund trades at a 36% premium to the Bitcoins contained within it. Each share represents 0.0959 Bitcoins. Actually, in late October, this Bitcoin closed-end fund went to a discount of 1.2% for a brief period of time.

There will never be more than 21 million Bitcoins. As of July 31, 2015, there were 14,437,500 Bitcoins in circulation, and they are scheduled to be mined at a very slow rate. The last Bitcoin, by structure, will be mined on May 7, 2140, so clearly, the rate of increase in Bitcoins will not be great.

The United States Geological Survey estimated the sum of all the gold ever mined as of 2011 was 171,300 tons. One metric ton of gold equals 35,273.96 ounces, which means the total number of ounces ever mined is 6,042,429,348. Using a \$1,100 per ounce price of gold, the value of that gold would be roughly \$6.6 trillion.

If Bitcoin were to be accepted as a store of value and were to replace gold in, say, 20 years, presumably the roughly 14.5 million Bitcoins that exist today would be worth \$6.6 trillion. Then each Bitcoin could conceivably be worth \$455,172.41. At the time of this writing, one hundred shares of the Bitcoin closed-end fund, which costs \$4,700, contains 9.59 Bitcoins. So if Bitcoins ultimately were to be worth \$455,172 each, a \$4,700 investment today would amount to a \$4,365,099.48 investment in 20 years. The annualized rate of return would be 40.73% assuming that Bitcoins were equivalent to gold, and assuming the gold price does not increase.

If the gold price were to increase to \$2,000 an ounce, or to \$2,200 an ounce, obviously the final sum would be much larger. The worst that could possibly happen is that the Bitcoins ultimately prove to be worthless, in which case the loss would be, by definition, \$4,700. So in the world of indexation if someone is looking for an uncorrelated asset, this is it.

THE FIXED INCOME CONTRARIAN COMPENDIUM

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Facts & Figures

CRYPTOCURRENCIES: AN EMERGING ASSET CLASS

There are at least 600 cryptocurrencies in existence today, the biggest being Bitcoin, followed by Ripple and Litecoin.

One would think that the cryptocurrency with the best technology would be dominant but that is not the case. The competition between cryptocurrencies has perhaps surprisingly little, if anything, to do with technology. The whole idea of a cryptocurrency is that all the source code is open. Everyone can see everything. So, if a given currency were introduced with an intriguing feature, bigger cryptocurrencies whose users value that feature could incorporate it into their preferred cryptocurrency. Better technology does not change the balance.

At the moment, the aggregate market capitalization of the 20 leading cryptocurrencies that I was able to count is roughly \$7.4 billion. As Table 2 shows, Bitcoin has \$6.8 billion in market cap. The next leading currency, Ripple, has a market cap of \$210 million.

Table 2: Market Capitalizations of Leading Cryptocurrencies

Bitcoin	\$6,821,087,036
Ripple	210,427,648
Litecoin	159,919,640
Ethereum	69,319,607
Dash	15,529,603
Dogecoin	14,799,916
Peercoin	10,015,263
BitShares	9,151,969
Stellar	8,778,061
MaidSafe Coin	6,520,511
Namecoin	6,233,958
Nxt	6,197,772
Bytecoin	5,625,369
NuShares	5,073,980
Monero	5,041,813
GridCoin	3,379,506
Factom	2,630,911
Rubycoin	2,554,005
Clams	2,525,980
EmerCoin	2,402,984

Source: <http://coinmarketcap.com/>

One common theme in cryptocurrencies is that, in theory, there is no inflation, at least in the sense that the currency can't be debased by inflating the supply of it, as is the habit of central

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banks. In practice, with fractional banking, there might be a small amount but, because there is a fixed amount of each cryptocurrency, its issuance cannot increase above a certain level.

The existence of more than 600 cryptocurrencies reflects a great demand among many people to strip central banks of the power to create currency and control its value. It was never really possible to do so before: The central bank of a given nation had to have control of its money supply, and there was no alternative except for gold, and that had its own problems. Currencies were fixed in terms of their value in gold. Not cryptocurrencies. The supply of gold can increase or decrease but supplies of cryptocurrencies are fixed.

It will be very interesting to see how this concept develops. Within the next couple of years, cryptocurrency will probably become a legitimate asset class for investment, unless it fails in some way. With a market capitalization of roughly \$7 billion, cryptocurrency is not yet big enough to function as an asset class investable by institutions. Importantly, though, it is not correlated to anything and, in a year or two, it might be a viable asset class. It will be very hard to stop this movement, and it will not be easy for governments to suppress it.

Bitcoin is the largest cryptocurrency. There are 14.9 million Bitcoins outstanding and there can only be 21 million by 2140. At the current rate, 3,600 are created each day, with this creation rate to be cut in half by July 2016 and then cut in half again every four years after that. The reason Bitcoin is successful is that its distribution allows for it to be used as a store of value. It was designed to appreciate in value and to become harder to produce. Therefore, its intrinsic value is supposed to rise. One Bitcoin now is worth roughly \$430.

It is worth noting that there is no Bitcoin company. There is merely a protocol that is agreed upon by all who use Bitcoin. There is a not-for-profit Bitcoin foundation. One might compare it to Wikipedia: It is people getting together and using technology for a common good.

With Bitcoin's protocol, the so-called "miners," people who create the currency, get to vote on the rules. They call a rule change a "fork," and there's a hard fork and a soft fork. A hard fork means that, if you make a change and other miners do not accept it, they will not be able to participate in Bitcoin. They would not be able to validate the transactions on the general ledger. In a soft fork, which only requires 50% approval, it is possible for some people to not accept that change and the system can still function. Those are the basic rules of Bitcoin. Anybody who becomes a miner could, in theory, have a voice. There is no company that decides, "That's the way it is."

Ripple, whose currency is called XRP, was designed as a secure, peer-to-peer payment system; its use as a currency came second. Ripple is backed by Google, among other entities, and by banks. It was designed as a payment-system technology because banks are very threatened by the idea of peer-to-peer payments. If people can transact on a peer-to-peer system and do so with a sense of security—after all, there is a big ledger that, essentially, is universally distributed, everybody knows what it is, and the transaction can be verified—that poses a threat to the banking system.

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Furthermore, the Ripple XRP system is not limited to its own currency or even fiat currencies; all can be used, as well as other cryptocurrencies, like Bitcoin or Litecoin. People can trade a Bitcoin versus an XRP if they wanted to, or Bitcoin versus the euro, or Bitcoin versus the U.S. dollar. Ripple was designed as a frictionless market maker between currencies. It could also be a frictionless market maker for stocks, commodities, options, etc.

The most interesting distinguishing feature between Ripple and Bitcoin is the structure under which the Ripple XRP cryptocurrency is distributed. Ripple creators sought a way to distribute the currency so people have an incentive to use it. Ripple created 100 billion XRP at inception in 2012, with the idea that 80% would be distributed free of charge. Ripple's creators kept 20%, which is interesting, because if the currency proves to have value, 20% of a very big number is a lot of money. And 80% was supposed to be given to charities. Of the 80%, however, 67% is still with the original owners, so that as a medium of exchange, it has not been exchanged much so far; clearly, the issue of how to distribute the sum without destroying the value is not a trivial problem. One XRP is worth less than a penny; \$.006242, to be exact.

Some cryptocurrencies were designed for specific purposes, but basically they are intended as alternative currencies. Everyone realizes the ability of the central bank to destroy the value of somebody's bank account. Central banks say as much, that they intend to inflate, and interest rates are lower than the inflation rate. Keeping money in a bank is a guarantee of losing value over time, but there was no alternative for people not in a position to take risk with their money. That circumstance generated demand for an alternative. The current period, with interest rates just about at zero, is without precedent and was bound to bring forth a reaction. The creation of cryptocurrencies was the reaction.

Historically, technology did not allow for the possibility of an alternative currency, although in the United States, in the 19th century, most banks had the right to circulate their bank notes as money. You might think of those bank notes as the cryptocurrency of the era, so cryptocurrencies are not without precedent.

In theory, a cryptocurrency will hold its value against the fiat currencies. If that were to happen, however, that could mean big trouble for the central banking system. It could also be big trouble for the regular banking system. Banks exist on their ability to charge a fee for facilitating people's transactions with one another. The bank is the counterparty, the clearinghouse. You get a check from someone, and accept it as worth its equivalent because the bank guarantees payment. In the world of cryptocurrency, all the transactions are peer-to-peer, with no bank intermediary. Banks no longer acting as intermediaries would more or less signify the end of banking profitability as we know it today.

If that is the case, consider how many banks are in the indices and how many technology companies sell their products to banks so they can perform their functions. This cryptocurrency scenario could create a radically different stock market. This issue should not be ignored.

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Many unknowns remain, and we do not really have a good precedent for this. The best precedent is the rise of the Rothschilds in the early 19th century. During the Napoleonic Wars and the attendant difficulty of transporting gold, the Rothschilds took the risk of delivering gold, functioning as an intermediary. They would deposit the gold in vaults in London and give people tradeable gold receipts. The Rothschilds became trusted intermediaries who could always deliver your gold, or gold equivalent, when you made it to safety. Many aristocrats became émigrés during the French Revolution and the Napoleonic Wars, and needed access to their funds. London was an émigré center. You might say that the Rothschilds radically changed the payment system in the world, and something similar could happen again.

The whole idea behind cryptocurrencies is to bypass the banking system—cryptocurrency developers do not want the banking system making the rules—and to bypass the governments, because they do not want governments making the rules.

It will be hard for governments to stop this activity. One government could make a law to suppress a cryptocurrency, but, as long as only one country makes it legal, that action could easily demonetize that country's whole economy, because the money would flow to the country where it is legal. For the sake of argument, what if Cuba decided to allow Bitcoin, and every other country in the world barred it, but nevertheless people thought Bitcoin was really a store of value. The money would get to Cuba somehow, and there would be very little that the governments of the world could do, other than invade Cuba, which would be drastic. This subject is one that investors must pay attention to.

Cryptocurrencies are not just currency. They enable the exchange of anything. Something might be priced in terms of Bitcoins or in XRPs or in dollars. It would be a frictionless exchange worldwide. That could happen, and that would mean all the intermediaries would be essentially out of business.

It can also be thought of this way: You buy something at a store and pay using a Visa card. The store pays a 3% fee. Let us say the store is a Walmart and has a 3% profit margin. If it did not have to pay this Visa transaction fee, it would make a 6% profit margin not 3%. Walmart theoretically is sacrificing half its profits to allow people to use a credit card. Clearly, it is in Walmart's interest to have peer-to-peer transactions as it is in the interest of a great many companies.

This is a real threat to the established order. This is not a joke. It is serious business. When the stock market realizes what is going on, it will like this development, as a generalization; the possibilities for value-added uses and the scale on which these can take place can hardly be fully imagined yet. This is moving unbelievably rapidly, and there are now 100,000 merchants worldwide that accept Bitcoin, and more every day.

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March 2016

BITCOINS AND THE “UNBANKED”

According to the June 2013 FDIC Third National Survey of Unbanked and Under-Banked Households, there are 9.6 million households in the United States that are unbanked. In other words, they have no bank accounts. There are another 24.8 million households that are under-banked, which is a not insignificant portion of the population. Added together, that is 34.4 million households, of the approximately 110 million households in the United States.

Let us assume that 50% of this group, on average, purchases one Bitcoin. That would be 17.2 million Bitcoins, versus the 15.2 million Bitcoins outstanding. A Bitcoin right now is worth roughly \$440.

For people who remit money to family members, especially those residing outside the United States, there is a real incentive to use Bitcoins. Currently, the costs are high to do so, with fees often exceeding 10%. So, if that group alone and no one else on the planet were to decide to buy a Bitcoin, that would use the entire available supply, and then some. That is an important point, and one that we will continue to examine over time.

THE GLOBAL SPIN-OFF REPORT COMPENDIUM

June 2016

THE RISE OF THE ARTIFICIAL ASSET CLASS

The Limits of Idiosyncratic Risk Avoidance in Indexation

Modern asset allocation is practiced as if it were a science. The objective is to balance risk and reward in accordance with individual risk tolerance. Careful attention is paid to individual goals and time horizon. This is accomplished by investing in different genres of equity and fixed income, and even cash equivalents. Thus, the risk of U.S. large capitalization versus emerging market equities is considered. The system considers the risk/reward ratio of high yield versus U.S. Treasuries. One now commonly finds foreign currencies invested alongside U.S. dollar cash equivalents.

One result of this systematized approach to portfolio construction is the Robo-advisor, which makes these allocations via computer algorithms. Hence, in practice, Wall Street has achieved a self-driving portfolio before Google has achieved a self-driving car. In fact, Wall Street has achieved a self-driving portfolio before scientists at the MIT Artificial Intelligence Laboratory have invented a robot that will properly clean your home.

Is the “rule set” of portfolio construction far simpler than the “rule set” for driving an automobile? This is a good question, actually. In each case, the obvious problem is to map all possible idiosyncratic circumstances and program a proper response. In the case of driving an automobile, this is quite difficult, but there are definable conditions that precede accidents so that a sufficiently fast computer could undertake avoidance strategies. In contrast, in accordance with Modern Portfolio Theory, news of idiosyncratic circumstances such as earnings misstatements, corruption, terrorist attacks, oil spills, and many other calamities are assumed to be instantaneously reflected in stock prices. How can asset allocation programs react, since individual securities change the character of the asset class?

For instance, if Exxon had spilled oil into the Gulf of Mexico rather than British Petroleum, one could argue that the risk of holding the S&P 500 would be higher, given that Exxon is the third-largest position in the S&P 500. However, the S&P 500 portfolio beta would remain 1, by definition. Upon what basis, if any, could an asset allocation program react?

Indexation itself is designed to mitigate the idiosyncratic security risk problem by owning so many securities that no individual security, however idiosyncratic, can alter the volatility characteristics of the index. Indeed, at the moment, Exxon is only 2% of the S&P 500 Index.

Yet, as asset allocation becomes more specialized, there is a corresponding increase in specialized indexes used to craft just the right risk/reward balance. An example is the iShares U.S. Energy ETF (IYE), which holds in excess of \$1.2 billion in assets under management. Exxon is a 25.84% position in the index. Surely no one would care to defend the proposition that this index would be immune to the idiosyncratic aspects of Exxon if it were to become involved in a disaster similar to that which befell British Petroleum.

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It is extraordinarily difficult to create an index that is sufficiently liquid to accommodate trillions of dollars of investment without being dominated by the weight of a relatively small number of huge global multinational companies. The paradox is that the scope of operations of such firms is so vast across the globe that most idiosyncratic developments on the international stage have some bearing upon the potential profits of these giant enterprises.

The Rise of Artificial Asset Classes

Consequently, parallel to the development of indexation, there has been a movement to devise artificial cash-settled investment vehicles in which the outcome, positive or negative, rests upon the calculation of a completely transparent number. This is made possible in real time by enormous advances in computers, telecommunications, and semiconductor design.

An example of such an artificial index is the VIX Index. The VIX is merely a weighted average of near-term options on the S&P 500. VIX futures were first listed on March 26, 2004. The open interest is now 479,510 contracts with a contract multiplier of 1,000. This is no doubt a considerable sum of money. In any case, considered within the context of contemporary indexation, which accommodates trillions of dollars, VIX is a mere rounding error. Moreover, it is ultimately a derivative of the S&P 500 and, therefore, intrinsically contains individual security risk.

Given the direction of advances in computational power and the need for new asset classes, it was inevitable that a wholly artificial asset class would be created. In the case of the Satoshi white paper in 2008, that artificial asset class was Bitcoin. It is perhaps coincidental that all equity asset classes, all commodity classes, and many classes of fixed income securities simultaneously collapsed in value in 2008.

The basic idea of Bitcoin as an asset class, leaving aside the questions of Blockchain technology, is that it would be accepted as a store of value like money, with the singular difference that the units of money would be fixed so as not to exceed 21 million units. The rate of issuance until the maximum is reached is expressed by the following geometric series.

$$\sum_{n=0}^{\infty} \frac{210,000 \times 50}{2^n} = 210,000 \times 50 \times \frac{1}{1 - \frac{1}{2}} = 21,000,000$$

The 210,000 in the formula is the number of starting coins; the 50 quantity in the formula is the starting Bitcoin proof of work reward. This figure is halved every four years. It will be 12.5 Bitcoin on or about July 11, 2016 insofar as can be calculated. Ultimately, an issuance of 21 million will be attained.

This is structurally different from all other currencies, which are so-called fiat currencies. In the latter instance, the central banks, not infrequently under great pressure from the central government, expand the amount of currency to the degree considered necessary.

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The consequence is that money as a store of value—or even in many instances bank deposits, government bonds, and corporate bonds—generate negative real rates of return. This has not been true in the United States and most industrial developed nations since 1981 because interest rates declined. However, it may well become true in the foreseeable future due to the low level of bond rates as well as taxation of whatever little interest income is generated. In most nations of the world, fixed income securities or cash deposits have experienced negative rates of return in the past. As of April 30th, Tradeweb has reported that there are \$7.85 trillion of negative yielding sovereign debt in the world, including the majority of the debt of Switzerland, Japan, Germany, the Netherlands, Austria, France and Denmark.

In essence, Bitcoin is a permissionless instrument. In other words, it can function as money or a store of value if a sufficient number of people accept it as such. In principle, anything can be accepted as money. For example, in the Roman Republic, 20 sesterii, or 5 denarii, was legally equal to 18.22916 and two-third grains of gold. In the time of Nero, the denarius contained 99% silver. Under Trajan and the Antonines, the denarius first contained 5% copper, and eventually it contained 25% copper. Under the Emperor Severus, the denarius was 50% copper.¹

In history, accepted instruments of exchange and store of value have included barley in Mesopotamia, cowry shells in Aboriginal Australia, tobacco leaves, and other commodities. In post-World War II Germany, cigarettes assumed this function for several years. Of course, gold and silver have been used as money and stores of value.

The common feature of every medium of exchange or store of value used thus far throughout history has been that the supply would generally increase. Sometimes, this was within the ability of the government to control; sometimes, it was left to circumstance. For example, historians believe that the impact of the California Gold Rush of 1849 was such that, in effect, the supply of money was suddenly increased and this stimulated economies all over the world, not just in the United States. Some would argue that the Transcontinental Railroad was built, in part, by demand for transportation services stimulated by the Gold Rush.

On the other hand, the inflationary pressures of the 1970s were certainly responsible for the increase in the price of gold during that decade. This, in turn, stimulated exploration, which then enhanced supply. Eventually, the price of gold declined precipitously.

Bitcoin, in contradistinction, is fixed in supply. If it were accepted as an asset class and, therefore, as a store of value, why should not this store of value be equivalent in capitalization to other stores of value? *In other words, if supply is fixed, the only rationing mechanism remaining is price.*

It should be recognized that almost all serious students of central banking and national monetary policy consider Bitcoin to be something akin to a Ponzi scheme. However, as an instrument, Bitcoin offers no promise of profit, which is the animating element of a Ponzi scheme.

¹Norman Angell, *The Story of Money* (New York: Frederick A. Stokes, 1929) 110-112

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Bitcoin has a market capitalization of roughly \$9 billion as of this writing. On its World Debt Clock, *The Economist Magazine* calculates that the total global government debt that trades has a U.S. dollar value of \$58.891 trillion.² This is just government debt. What if Bitcoin were worth an amount equal to this ever-increasing sum? This would represent a coefficient expansion of 6,654x, or 665,400%.

It is perhaps worthy of note that in March of 2006, the Federal Reserve ceased publishing M3, the broadest money supply measure. It still publishes M2, which was about \$12.652 trillion in April 2016. In the first four months of 2016, U.S. M2 expanded by 2.61%, or an annualized rate of 8.04%. Should one add the value of M2 to world government debt as a somewhat better measure of store of value? If one were to do this, it would still be hopelessly inadequate as a calculation, since it does not account for all the other national M2 calculations.

In any event, if one merely added U.S. M2 and global government debt, the total is \$71.54 trillion, or 7,949x the current market value of Bitcoin. Euro M2 is another €10 trillion. Yen M2 is ¥934.765 trillion, or about \$8.5 trillion. No one has ever needed to calculate the worth of every instrumentality with a store of value function. It would surely be a huge number.

If the various stores of value in the world are engineered in such a manner as to generate negative real rates of return, surely the holders of such instruments would find this objectionable. Historically, if all central banks simultaneously enacted similar real purchasing power destruction policies, the investors had no recourse other than the political process.

Now there is an alternative that is accepted by very few and rejected by most investors. If the predilection of the majority of investors changes to be favorable to Bitcoin, a market capitalization of \$9 billion would hardly be adequate to express those preferences. Indeed, a market capitalization of \$1.227 trillion might not be adequate. After all, this figure is merely the aggregate market capitalization of the four “FANG” stocks: Facebook, Amazon, Netflix, and Google. If an artificial asset class such as a crypto-currency, of which Bitcoin is only one example, is accepted generally, this is a once-in-a-century event in terms of rate of return.

²www.economist.com/content/global_debt_

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Post-Musings

TECHNICAL PROBLEMS OF A FIXED MONEY SUPPLY

When the colony of Virginia made tobacco legal tender, the first problem was that the incentive was created to increase production. The second problem was the creation of very low-grade tobacco that some people refused to accept as payment. The policy ultimately created low tobacco prices for farmers. In 1682, there were riots and the tobacco crops of various farms were destroyed.

The non-uniformity of a currency (apart from paper) is a not a trivial problem. Throughout history, it has been a significant issue. In colonial Plymouth, Massachusetts, the Wampanoag Tribe's wampum was made legal tender at the rate of six white beads or three purple beads per penny. Unfortunately, supply of beads was limited. It was hard for prices to rise in the sense that the bead, as an instrumentality, was not divisible.³

Historically, therefore, the government really needed to take over responsibility for coinage. That created another problem. How does one prevent the government from abusing the privilege by basically destroying the value of the currency by issuance?

Enter Bitcoin. It is very hard to counterfeit since all Bitcoin in existence are always visible in the Blockchain ledger. Supply of Bitcoin is fixed; it is hardwired in the code. This is a possible revolution in currency design. If nothing else, it is a new asset class.

³Barry Eichengreen, *Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System* (New York: Oxford University Press, 2011), 9-10

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July 2016

Murray's Musings

THE QUESTION OF INTEREST RATES AND CRYPTOCURRENCY

On June 17, 2016, history recorded that the yields on 10-year Italian and Spanish government bonds were actually lower than the yield on 10-year U.S. Treasury bonds. Spanish government bonds yielded 1.55% and Italian government bonds yielded 1.51%. The U.S. Treasury 10-year bonds yielded 1.62%.⁴

Since most observers would agree that Spain and Italy are not better credits than the United States of America, one can immediately dismiss any notion of the efficient market at work. These yields merely represent the result of massive purchases by the European Central Bank. One of the many consequences of such policies is that the Swiss 10-year government bond yield is now negative 54 basis points.¹ In fact, in some countries apart from Switzerland, the so-called risk-free rate is negative.

The idea of a negative risk-free rate is a contradiction in terms, since it guarantees that the risk-free outcome results in a loss. However, in the highly abstruse world of modern financial theory, a guaranteed loss does not qualify as a risk. A risk is only an uncertain outcome that expresses itself as volatility.

Despite the rigorous mathematical treatment by financial orthodoxy, a small but nevertheless growing contingent rejects the notion that governments, central banks, and PhD economists should have the right to assure a person who saves not only of a loss in purchasing power but also of an actual loss in nominal value.

It is forgotten by the economists, central bankers, as well as financial journalists, that money existed long before there were financial journalists, central bankers, and economists. In other words, people used money long before there were mathematical models that purported to explain it. Archeologists will verify that cattle and grain were used as money or units of account at least 17,000 years ago and possibly as long as 19,000 years ago. It might be recalled by those conversant with the Bible that in Genesis 23, Abraham purchased the Cave of the Patriarchs, otherwise known as the Cave of Machpelah, for 400 shekels of silver. Note that the silver weight equivalent to 400 shekels was established before silver futures, organized exchanges, algorithmic trading, modern portfolio theory, and central banks, among other modern innovations.

Interestingly, archeologists reliably inform us that long before the Roman Republic, throughout the ancient world, a shekel was precisely defined in terms of a specific weight of barley. This should not surprise anyone. The British pound sterling was originally just a pound of silver; it was called the pound sterling and not the silver pound because sterling is an alloy of silver and copper containing 92.5% silver and 7.25% copper. It contains a few other ingredients, as well. In other words, sterling has a fineness of 0.925. The pre-modern

⁴ On July 6, 2016 U.S. Treasury 10-year bonds yielded 1.38%, Spain's 10-year government bonds yielded 1.18%, Italy's 1.24%, and Switzerland's -0.68%.

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July 2016

British did not choose to use fine silver, which is 99.9% pure silver, because they were practically oriented. Pure silver is too soft to use as a coin, which may be roughly handled. The coin needed to be sufficiently hard to retain its weight as it circulated in the economy.

This very abbreviated history should be sufficient to demonstrate that anything that human beings agree upon as a unit of account or money can actually be money. Since the central banks and governments of the world appear determined to lessen the purchasing power of money, it should not be surprising to learn that new forms of money are constantly evolving. A recently popular form of money is cryptocurrency. There are perhaps 660 cryptocurrencies in the world today; however, the dominant one is Bitcoin. According to CoinMarketCap.com, Bitcoin now has an 84% market share.

Bitcoin operates as an open ledger called a blockchain. The entire history of Bitcoin on a cumulative basis is contained on the blockchain. For example, as of this writing, according to blockchain.info, there are 15,671,550 bitcoins in existence. Every day, 3,600 Bitcoins are created; ergo, one year ago from the date of this writing, there were 14,357,550 Bitcoins (i.e., $365 \times 3,600$ or 1,314,000 fewer bitcoins were in existence). According to blockchain.info there were 3,595,936 Bitcoin wallets.

Bitcoin wallets store the private keys needed to execute transactions on the bitcoin network. At the time of this writing, there were a total of 7,657,584 Bitcoin wallets. In other words, 4,061,648 Bitcoin wallets were created at the same time as 1,314,000 Bitcoins were created. The system, on average, creates 0.3235 Bitcoins for every wallet created. Another way of expressing this phenomenon is to state that over the course of the past year, 11,127 Bitcoin wallets have been created on a daily basis in relation to 3,600 Bitcoins created each day. More recently, about 12,000 Bitcoin wallets are created on a daily basis.

On or about July 9, 2016, the daily creation amount of Bitcoins will decline to precisely 1,800 units.

Virtually all financial practitioners, including financial planners, and especially academic economists, are united in the belief that Bitcoin is a momentary fad that will soon pass. The portfolios of pension funds, insurance companies, and banks are replete with low-yielding—or, in many cases, negatively-yielding—government paper. These are considered the low risk assets.

In other words, a Swiss government bond with a negative yield and a 10-year maturity is considered a low-risk asset, even though a simple convexity calculation would easily demonstrate that if the Swiss government bond were to yield 3%, the holder of that instrument would experience a calamitous loss in terms of Swiss francs. Moreover, if Swiss yields were to increase less than the euro or dollar yields for some reason, there would be another loss in the value of the Swiss franc relative to these other currencies.

Is Bitcoin really more dangerous than these other accepted instrumentalities for use as a store of value? Is Bitcoin really so dangerous that a portfolio could not survive a 10 or 20 basis

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point exposure? None of these questions are ever posed, since the debate is framed in the context of government or central bank action.

On one hand, the deflationists argue quite convincingly that democratic societies cannot possibly inflate and destroy the value of the purchasing power of many millions of retirees and soon-to-be retirees. These people are politically active, so to inflate and destroy the purchasing power of pensions is simply political suicide. Even if a given politician or group of politicians were willing to commit political suicide in the national interest, the gesture would be quite futile because the pensioners have the political power to remove any inflation-minded government. Hence, this group argues that a German government 10-year bond that might yield 3 to 4 basis points on a good day is a good investment, since debt-induced deflation will lower prices, and the real value of such a bond will increase even if its nominal value will not.

The inflationists take the opposing view. They argue that it would be political suicide to allow deflation to run its course and thereby compel debtors of all sorts to repay loans in nominal dollars when prices and incomes are falling. In fact, it can be argued that government tax revenue would undoubtedly decline and, at least on the national level, governments would be compelled to monetize the debt by central bank purchases of that debt. Any effort at deflation is merely a prelude to inflation. In any case, the debtors have the power to remove from office any officials that are inclined to tolerate deflation. Ultimately, the power of the electorate is paramount in a democracy.

In the last 100 years of history, one can find plentiful examples to support each of these views. However, the more significant point is that the average person has neither the skill nor the inclination to judge which of these views is correct. The power to decide the value of money in terms of purchasing power is a weighty responsibility. It is almost always abused. It is difficult to think of a single instance in which such a power was used wisely, although there probably are such instances.

Perhaps as a consequence, the great financial innovations in terms of store of value were invented by people instead of governments. Trade bills of exchange evolved from commercial activities at medieval fairs. Fractional reserve banking was developed by goldsmiths, not by central bankers. In fact, fractional reserve banking predates the origin of central banks. Paper money was introduced in the Song Dynasty in China during the 11th century. Its origin was in the receipts of merchants who wished to avoid carrying metal coins. In fact, the Western world only learned of paper money through Marco Polo and the account of paper money is the subject of an entire chapter in the book *The Travels of Marco Polo*.

History records that anything that can attain a universal trust as to value can become money. Ultimately, anything that serves as money that is not trusted will not serve as a store of value, whatever the government or central bank might determine. By structure and common consent, Bitcoin has a fixed issuance of 21 million units, to be realized in the year 2140. Starting on July 10, 2016, daily issuance will be 1,800 units, or 657,000 per annum. More than 12,000 Bitcoin wallets are opened every 24 hours.

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If there were 76 million Bitcoin wallets instead of the current 7.6 million, this would be a tenfold increase, still representing only 1.1% of the individuals on the planet. Note that on the day this data was retrieved, the number of wallets was 7.6 million; tomorrow it will probably be 7.7 million. Moreover, the number of people on the planet is not a proper denominator, because there are countless businesses as well as other organizations that must deal in money, so the penetration rate is still less than one-tenth of 1%.

Consequently, if the inflation theory is alluring, one might consider the purchase of gold. If the deflation theory is alluring, one might consider the purchase of a 10-year Swiss government bond with a yield to maturity of -54 basis points per annum. However, these scenarios are too complex to be predicted accurately. If one knows no more about economics than an understanding of the laws of supply and demand, perhaps one should buy some Bitcoin.

BITCOIN WALLET GROWTH

According to blockchain.info, a year ago there were 3,601,449 Bitcoin wallets. Now there are 7,667,202, an increase of 4,065,753 wallets or an annual growth rate of 112.89%. This amounts to an increase in new wallets at the rate of 11,139 per day. Incidentally, this number does not correspond with the number cited earlier in this report, because the data was accessed at different times.

Subsequent to July 10, 2016, there will be only 1,800 bitcoins created on a daily basis, or 0.1616 new bitcoin for each Bitcoin wallet created. The average Bitcoin wallet now holds 2.0446 bitcoins.

This is clearly a supply/demand imbalance that cannot be rectified by increasing supply, since new issuance is fixed. Therefore, either demand could decline, which would rectify the imbalance, or the price could increase to ration the available supply.

As an aside, in the time it took to write this section alone, the Bitcoin wallet count increased to 7,667,751 from 7,667,202.

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Post-Musings

BITCOIN VS. VENEZUELA

How can it be prudent for a fund to include a 200-plus basis point position in Venezuelan debt that cannot possibly be repaid when default is imminent, and simultaneously be *imprudent* to place a 20 basis point position into Bitcoin? Admittedly, the 20 basis point Bitcoin position could end up being worthless. However, if 7.6 million Bitcoin wallets become 76 million Bitcoin wallets and Bitcoin is an accepted store of value, the return could be astronomical.

The reason is that prudence, by definition, is what the majority is doing. The majority finds it prudent to buy Venezuelan debt. The majority does not find it prudent to buy Bitcoin. By the time the majority accepts Bitcoin as a valid asset, it is probably going to be too late to purchase it.

From the Readers

BITCOIN HALVING DATE

Q: Why does the Bitcoin halving date keep moving?

A: It keeps moving because the number of bitcoins issued per two-week period of time is based on the Bitcoin mining difficulty. The Bitcoin mining difficulty refers to the probability of finding a random number with something like 42 consecutive zeros in it. When enough computing power is thrust at that problem, it takes less than 10 minutes to present proof of work to solve a block in the blockchain ledger and earn the current Bitcoin reward of 25 bitcoins. Therefore, at the end of two weeks, the algorithm automatically adjusts to make it harder to bring everything back into equilibrium. Recently, so much computer power has been thrust at the problem that the date is moving up because the computer processing power is moving faster than the difficulty rate.

Q: Is that a trend?

A: If it is a trend, it will not last long, because the algorithm was cleverly designed to be able to compensate for such a trend if it ever were to happen. If the block is solved in less time than 10 minutes, the algorithm becomes more complicated to solve, and the mining difficulty reverts back to equilibrium.

It is supposed to correct. Six months ago, if memory serves, the expected halving date was on or about July 22, 2016; as of this writing, it was July 10, 2016. As of this date, June 20, 2016, the halving date is July 9, 2016. We are almost to July so the halving point will not be far off from July 9, 2016, though it could be later or earlier.

Murray's Musings

INTEREST RATES, HEDGE FUNDS AND THE RISE OF THE ARTIFICIAL ASSET CLASS

The Problem(s)

Ultra-low interest rates have become a problem for hedge funds. Many hedge fund managers have little or no recollection of the short seller rebate. Nevertheless, there was a time when interest rates were 8% on the short end and a short seller could earn perhaps 75% of the interest generated by the proceeds of a short sale while the funds resided in the custody of the prime broker.

In the contemporary world, an easy-to-borrow equity for short sale purposes may be inexpensive to borrow but it is still a negative carry, as one must pay the dividend on these shares. In fact, as rates progress ever lower, such dividends become more valuable and the share prices progress ever higher. Such short sales of liquid shares are frequently generators of not insignificant losses.

Of course, there are smaller capitalization non-dividend paying stocks that do merit short sale. These, however, are generally hard to borrow and quite expensive when they can be borrowed.

A new risk for the short seller is that in a world of low interest rates, companies that become problematic due to excessive leverage are rescued by low interest rates. If the problems are caused by the incompetence of management, another company may borrow the funds necessary to acquire the problematic company, and do so inexpensively. If no company undertakes to act, the shares of the problematic company might still not decline to a proper valuation, given the circumstances, since it is always *possible* that some entity might act. There is always the possibility of acquisition by an activist investor, financed by borrowed capital. Finally, if none of the aforementioned would act, it is not uncommon that a private equity fund would.

Unfortunately, the problems of the hedge fund manager are not limited to equities. The problems are much the same with regard to currencies. Just as there are companies with profligate capital allocation policies, there are nations with profligate financial policies. Nations will borrow too much money, they can import more goods than can be paid for by productive resources of the nation, or social liabilities might weigh upon the nation. In any case, the temptation is very strong for the central bank to issue more money to fund the liabilities. This, of course, destroys the value of the currency. This theme appears frequently in the history of finance. Consequently, hedge funds might undertake to sell short a currency.

Unfortunately, at the current time, most nations create money to fund national liabilities. For instance, the creation of the European Union, the European Central Bank, and the euro were intended to prevent a repetition of the history of the Banca D'Italia funding the chronic

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deficits of the Republic of Italy with money creation and the endless depreciation of the Italian lire. Now the euro is in danger of resembling the Italian lire.

Other nations, such as the United States and Japan, have a similar problem. Which currency will remain stable? Similarly, one could sell short bonds on the theory that interest rates at this low level cannot possibly continue. Nevertheless, as of this writing, the 10-year German government bond yields 1½ basis points. The Japanese 10-year government bond yields 15 basis points. Even the 10-year U.S. Treasury yields only 1.63%.

Selling short bonds at low rates or even negative rates can be dangerous. The iShares International Treasury Bond ETF (IGOV) has only a 43 basis point yield to maturity. Its weighted average time to maturity is 9.75 years. One might well wonder how it is possible that interest rates could decline any further. In fact, this particular fund contains many bonds with negative yields to maturity. Unfortunately, at ultra-low interest rates, bonds possess incredible convexity characteristics. The IGOV ETF has YTD performance through June 9 of 10.86%. That means it is up 10.86%. Imagine: It is up 10.86% with a 43 basis point yield to maturity. That is incredible. Think of that degree of price volatility in the reverse.

The modern hedge fund must contend with another invisible adversary: The exchanges lease colocation space in their computer assemblages to any number of algorithmic traders. This group has the so-called “first look” at market activity. Thus, if there are hedge funds with brilliant ideas in the course of implementation, any trading patterns will be identified within nanoseconds and huge pools of capital will be deployed to trade in front of the investment managers with the brilliant ideas.

Hence, the hedge fund must contend with central banks that manipulate interest rates as well as exchange rates, prime brokers that charge not insignificant sums for securities lending, and exchanges that populate the trading cyberspace with advantageously-informed predatory traders.

If this were not enough, the prime broker is also a banker, in a sense, to hedge funds. In any meaningful market crisis, the prime brokers frequently reduce the margin available to funds. Many hedge fund managers are value investors. During market crises, these investors might discover bargains, but find that the maximum exposure available to them during a crisis is less than otherwise would be available. In a market crisis, the funds might provide some modicum of stabilizing effect, but that is the moment when margin is not easily available.

The great irony is that the governments, the prime brokers, and the exchanges are, in principle, the regulators of the system that is supposed to be fair to all market participants. Yet, if the so-called regulators regulate with regard to securing a certain outcome, however noble their intentions, that system can never be neutral to all participants.

A Response—A Simultaneously Long and Short Global Hedge

Consequently, it is only reasonable that some market participants would seek an investment environment free from regulation, which some would say is free from manipulation. Thus, modern computer science has made possible the artificial asset class. Only one example of

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this is Bitcoin, a cryptocurrency. Bitcoin, at the time of this writing, had a market capitalization of roughly \$9 billion. It might be \$11 billion now. Such increases can occur within days.

In principle, the world certainly has enough currencies. Yet if governments that issue currencies permit them to lose purchasing power continually, so the debtors of the world (which include the issuers of the currencies) can continue to borrow and spend as they see fit, people quite rightly will lose confidence in the currency.

Bitcoin, by contrast, offers a fixed number of units, which ultimately will be 21 million.

A purchase of Bitcoin, however small, is nothing other than a short sale of the currencies of the world. It should be obvious that if it were to gain the confidence of a meaningful number of investors, it would not trade at a market capitalization of \$9 billion.

If it were worth \$10 trillion, this would be equivalent only to the current value of government debt with a negative yield (which is one-sixth or one-seventh of all government debt in the world as calculated by economists). This is a nominal, or trading-price, negative yield. The quantity of global government debt with a real negative yield, which takes account of the inflation rate in those nations, is much greater. If Bitcoin were simply to be equal—to market demand—to the value of all government bonds with negative yields, the increase in value would be 1,111.11 times. This might even be an underestimate since the quantity of bonds with negative yields is constantly increasing.

If a portfolio having a 1% position experiences a 1,111.11 times appreciation in that position, the portfolio increases by .01 multiplied by 1,111.11, or 11.11 times. If this occurs over a five-year time period and if the price of every other position remains unchanged, this would be equivalent to a 64.68% annualized rate of return. But that's hardly impressive enough: if all the other investments were to become worthless during this hypothetical time period and no dividends or interest were collected on any position, this portfolio's rate of return would decline to 61.86%. Talk about a hedge!

Of course, the worst that could happen to Bitcoin would be a 100% loss, which would be a 100 basis point—or 1% point—loss to the portfolio. It should be obvious why a very small number of investors believe that Bitcoin is both a new asset class and a particularly effective hedge. It is a long position that is, in effect, a short position on world currencies.

Bitcoin is not the only cryptocurrency. There are aspirants to the status of digital currencies that have no fixed limit upon eventual issuance. An example of such is Ethereum. There are also alternative cryptocurrencies that might be termed social currencies, such as SolarCoin. It is given free to verified owners of solar power producing assets. It is essentially a rewards program that gives one SolarCoin, or SLR, for each megawatt hour of solar power produced. It has been calculated that 1 megawatt hour saves the creation of 1,500 pounds of CO₂.

The reward, granted by the SolarCoin Foundation, has a trading value of 1 SLR to 17.56 cents. Its price, interestingly, is ordinarily quoted in Bitcoin. On January 1, 2016, it was

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trading at 0.00003739 Bitcoin. On June 11, 2016, it was quoted trading at .00030116 Bitcoin, an eightfold increase in Bitcoin terms. It now trades at about 33,817 SLR per day. The market capitalization of the instrument is now \$6 million. The SolarCoin Foundation would like to issue \$4 billion worth of SolarCoin.

The essential point is that the worldwide spread of computer technology means that Blockchain as a technology—the transparent ledger of historical transactions underlying Bitcoin—and the basic idea of a commonly agreed upon store of value is very difficult to stop. Iceland has made Bitcoin illegal. Unknown computer experts, however, created an alternative to Bitcoin named Auroracoin. In March 2014, 50% of the Auroracoin was distributed to all 330,000 people in Iceland using the registry of the Iceland National ID system. This translated to 31.8 Auroracoins per person.

The creators unilaterally declared that each Auroracoin had the value of \$12.11 per coin. It was announced that more coins were to be issued and further issuance did take place. Of course, the market paid no attention to the “established” value of \$12.11 per coin. The initial trading value was low. It was quickly established that the trading value of Auroracoin was .001 Bitcoin. This was a time of Bitcoin weakness, and only about 24% of the Auroracoins issued were claimed by Icelanders. The issuers destroyed the unclaimed balance.

Auroracoin now trades at 0.004413 Bitcoin. Thus, it appreciated by more than 4x in Bitcoin terms since 2014, and Bitcoin itself has appreciated. The Icelandic government considered banning Auroracoin, but decided the only way to enforce such laws would be to become a police state. It will be recalled that Iceland has only 330,000 citizens.

Thus, new asset classes are being created. At least some people have come to the conclusion that if governments are determined to depreciate money as a store of value, they need not participate. Negative interest rates and excessive currency creation are instigating a reaction.

The Icelandic krona has lost about 5% of its value in relation to the U.S. dollar year to date. If the Icelandic government cannot control the money of 330,000 Icelanders, one-third of whom live in Reykjavik, it will be much more difficult for the world's governments to control the planet's 7.125 billion people. There might soon be many alternatives to the traditional asset classes.

Note: All the cryptocurrency exchange rates that are cited here are courtesy of coinmarketcap.com.

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Post Musings

BITCOIN V. AURORACOIN

In early June, Bitcoin had a \$10.166 billion market capitalization. With the world population at 7.15 billion, that means a per capita value per Bitcoin of \$1.42.

Auroracoin, the cryptocurrency for Iceland, has a \$2.09 million market capitalization. Iceland's population is 330,000, so the per capita value of Auroracoin was \$6.33. If Bitcoin merely were to have the same valuation characteristic as Auroracoin, it would appreciate 4.46x.

Any government can ban a cryptocurrency, as Iceland did with Bitcoin. As far as we can tell, though, that ban did not have any meaningful impact, since within a very short period of time Auroracoin was created. The only way to control cryptocurrencies is to control every computer in the country. Russia tried to control photocopy machines and that did not seem to work out too well.

Some of my Russian relatives informed me that in the Soviet Era, if you needed access to a copy machine for some purpose, you had to be selected as reliable enough to be entrusted. There were few copy machines available, for reasons that should be self-evident, so it was a big deal to have access to one. In spite of these efforts to control the copy machines, there was a black market for novels and other books that came from the West that were basically photocopied books. They would circulate and, though the authorities tried to stop it, they ultimately failed. However, if they caught you with one, you could be thrown in prison or a labor camp. In extremis, they could kill you, throw you in the insane asylum. Many suffered the latter fate.

Q: When it was illegal for Americans to own gold, was anyone tried or imprisoned for doing so?

A: In 1933, President Roosevelt restricted the ownership of gold, and that lasted until the end, or virtually the end, of the Nixon Administration. You could always get gold. You just could not trade gold in bullion form. It was perfectly acceptable to buy artwork that might have gold on it. Buying gold goblets was perfectly acceptable. You could own gold jewelry. It was acceptable to buy gold coins for numismatic collection purposes. You could buy Krugerrands (South African gold coins) and Canadian maple leaf gold coins. You could buy U.S. gold dollars, which they had stopped minting, but you could still buy them. They traded, however, at a premium to the actual gold value for a time.

In 1970s, there was high inflation, yet you could not trade bullion, so people started melting down jewelry to create bullion. Jewelry became very expensive. Plus, it was impossible to regulate the restriction of gold ownership; the government basically would have had to periodically search every home. I'm not aware of any cases in which a person was arrested for owning gold bullion. The government ended up lifting the restriction.

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The government set the gold price at roughly \$35 an ounce, but the real gold price, set by the market, was much higher. The government felt it had to back the currency with gold, but at the prevailing world market rate, it could not buy sufficient gold to back the currency, so the U.S. had to go off the gold standard. What the government wanted to do was to depreciate the dollar so it would stimulate U.S. exports. Of course, every other country had more or less the same idea so the strategy did not work very well.

Restrictions on gold were not the only early policies of the New Deal. The government felt high unemployment was caused by too much competition, so production was regulated. The National Recovery Administration was created to regulate the hours that businesses could operate, even retail establishments. They said a store cannot be opened more than X hours a day. If a store was open fewer hours, however, it became obvious after a while, that the policy did not increase employment; it decreased employment. It took some time for that consequence to become clear to the various policy makers who lived in the realm of theory but did not exist in the realm of practice.

Even in 1940, on the eve of the Second World War, the U.S. had a very high unemployment rate, and 90% of U.S. farms had no access to electrical power. Some might say the government ameliorated the worst of the Depression, and that might even be true. The Depression, however, did not end until the war came.

What happened then is a very interesting story. The war brought full employment, but all the great economists of the era predicted that when the war ended and 14 million mobilized soldiers came home, there would be huge unemployment, because so many could not be absorbed in the economy. Plus the government would be buying fewer goods and services. Thus, a depression would occur. Even famous economists like Paul Samuelson in 1945–1946 predicted that the war's end would restore depression conditions to the U.S. Reality did not work out that way. Another example of living in the realm of theory instead of practice.

It is very hard for regulators of an economy to achieve the result they want because you can never really get the information needed to make these decisions. The Soviet Union during the Stalinist era, for example, had a series of five-year plans in which the government controlled production levels: the number of tractors, white shirts, blue shirts, etc. This method of controlling production ignored consumer preferences which, in any event, would have been difficult to determine by a highly centralized government. The necessary information must come from people, but the motivation to report such information was not there.

For instance, is the manufacture of tractors good or bad? Do they break down or do they not? If they break down, is the breakdown due to factory defects or because the people who work the tractors don't know how to handle them? Your career and perhaps your life would depend on the answer to that question. Under Stalin's reign, they had an expression called "wrecking." If you were found to be wrecking the economy you were sabotaging the economy and you could be killed for that, or thrown in a labor camp, or be subjected to even more gruesome consequences.

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In the best of circumstances, it is hard to get objective information. Even if people think they are providing unbiased information, at the end of the day, it is an opinion, which might be right or wrong. There is no mechanism to correct it, and it is a big problem. Every time you try to get an outcome in a system as complex as the economy, you create the opportunity for unintended consequences. Sometimes you get inflation, sometimes you get deflation.

Mathematically, it should not be a problem. If all prices went up 10%, we'd just move the decimal point. The problem is that inflation is not uniform. In an inflationary economy, some people's income goes up fiftyfold; for others, income does rise at all but expenses do. It is the same problem with deflation; its effects are also non-uniform. When the government tries to enact some corrective policy, it is very hard to know how every participant in the economy will react to it and the results can be bizarre.

Q: Do you anticipate Bitcoin having practical transaction use as a medium of exchange for the purchase of goods and services, in addition to its function as a store of value?

A: In my opinion, while it would be very good if Bitcoin were adopted as a transactional currency, that outcome is not essential for its success. That's my opinion, and it could be wrong.

I do believe that it's not a good idea to allow governments to manipulate currencies, because the results are disastrous every time. In post-World War II Germany, cigarettes were a store of value, because they were accepted as such. You could buy virtually anything with cigarettes. However, the non-uniformity of a currency (apart from paper) is a not a trivial problem. Throughout history, it has been a significant issue. In colonial Virginia, they used leaves of tobacco. In colonial Massachusetts, the Wampanoag Tribe's wampum was made legal tender at the rate of six white beads or three purple beads per penny. Unfortunately, the supply of beads was limited. It was hard for prices to rise in the sense that the bead, as an instrumentality, was not divisible.⁵ In other societies, seashells have been used, as have copper, bronze, silver, and gold.

The challenge is to find a type of money of which the supply is relatively constant. Supply controls the value. But all the forms of money that were employed historically were either reproducible or could be counterfeited. It is not commonly known that in the 19th century, bank notes were legal tender. There were thousands of banks in the United States and you could present a bank note as legal tender and vendors, landlords, or whomever would have to accept it.

The problem was that it difficult to know if the bank could cover the note or even if the notes were counterfeit or not. Counterfeiting was a problem in addition to the question of the bank's solvency. People began to refuse to accept the bank notes. This problem became so

⁵Barry Eichengreen, *Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System* (New York: Oxford University Press, 2011), 9-10

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severe that at some point the government decided to have a monopoly on currency so that the only acceptable legal tender would be government issued.

For the first perhaps 60 or so years, the government was pretty faithful in keeping the supply of currency stable. By the end of the 19th century, though, the Democratic Party campaigned against that stability, which sparked a big debate between what was called the hard money side and the inflation side. Some felt that the government should inflate the currency to allow borrowers to repay their debt with inflated dollars.

It is hard to believe that in the United States, a politician would use the promise of inflation in a campaign for office. But that was a platform of William Jennings Bryan in the 1896 presidential election. He almost won the election. In one of the most famous speeches in American history, he said, "you shall not crucify mankind upon a cross of gold."⁶ Bryan eventually became United States Secretary of State. He was a distinguished person.

While other nations had a central bank, the United States always opposed the creation of a central bank, because those institutions could also print money. But an important function of central banks is to be a lender of last resort in economic crises. The United States didn't have it until the Federal Reserve Act in 1913. The country was so opposed to having a central bank that it adopted a decentralized central bank to prevent a concentration of power and called it the Federal Reserve, not the U.S. Central Bank. The system was decentralized into 12 district Banks that, in theory, operate independently. In reality, however, they do not. Nevertheless, the whole idea was to avoid having a central bank because it was felt that sooner or later the government would be tempted to print up money. And throughout history, it's been a serious problem.

Q: Is the supply of Bitcoin really fixed or is there a way to change the available amount?

A: In theory, the Bitcoin Foundation could say, "I want to increase the ultimate number of Bitcoin from 21 million to 50 million units," but that would destroy the reason people buy Bitcoin. No one would use Bitcoin if the supply were not fixed and a change like this were allowed. The unique feature of Bitcoin is that through the Blockchain technology, while the identity of the holder is encrypted, each Bitcoin on the planet can be tracked. The Blockchain follows every Bitcoin, where it is and where it came from, so it cannot be double-spent or counterfeit. It would be extraordinarily difficult to counterfeit Bitcoin. And, by design, there will be a fixed supply, which is an enormously attractive feature in a currency.

Q: The press has noted that many of the Bitcoin miners are located in China. Could the future supply of Bitcoin be concentrated in one particular region? Is that even a concern?

A: Not for me, because you can always create more miners. It is just a bunch of chips on a motherboard. That's all it is. There's nothing proprietary there.

⁶ Kazin, Michael (2006). *A Godly Hero: The Life of William Jennings Bryan*. New York: Alfred A. Knopf.

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Q: But if the miners have to vote and if 50% of them vote for a rule change, could that throw off Bitcoin, in which case maybe another digital currency—Ethereum, for example—could become dominant if Bitcoin is ruled by China?

A: It is not going to be ruled by China. There is no reason to believe that anybody is going to do anything to impact the value of something so lucrative. It is the same kind of logic as saying, well, the Chinese have the atomic bomb so how do we know they are not going to launch an attack against us right now? The reason is because if they were to do that, we would launch an attack against them, and it would wipe out the planet.

They will not try to manipulate the system, because any attempt to do so would lead to disaffection. People would stop using that currency and that would be the end of it. People would use a different currency. You cannot manipulate it even once. It would be like saying, yes, you can launch a few missiles at the United States and destroy the world. It is the same concept: mutually assured destruction. If people see any attempt at manipulation, they will not use it. Why would anybody use a currency that is being manipulated?

Q: What would happen if miners decided to increase the supply of Bitcoin?

A: People using Bitcoin use it for one reason and one reason alone: Because the supply is fixed. You want to increase it? Users will not like that. There are 660 cryptocurrencies and, take my word for it, one would say: Don't worry, we will gladly fix the currency.

In theory, within a handful of nanoseconds, everyone could go out and buy Auroracoin. Auroracoin is fixed, too. If somebody wants to do something to Bitcoin, we could all buy Auroracoin. It would not be a problem. Therefore, I do not believe anyone is going to try increasing the supply of Bitcoin. Why destroy your miner franchise? It would quickly disappear into nothingness.

Q: What do you think is the chance of China making this illegal?

A: In my estimation, it is not a factor. I have no idea if the Chinese government will make it illegal or not. I have limited knowledge of China, but I would guess that the Chinese government has no knowledge of what it will do. What good would it possibly do for China to make bitcoin illegal?

China wants its currency to depreciate. It is becoming ever more difficult to sell Chinese goods internationally because the currency is too expensive in relation to some other nations' currencies. But China does not want too much capital to leave the country because people with wealth will set up their establishments somewhere else. They do not want that, but they certainly do not want zero leakage of the currency either.

The number of Bitcoins is limited. The population of China is about 1.3 billion. At the moment, there are only 15.6 million Bitcoins, so every Chinese citizen, in theory, could buy one-tenth of a Bitcoin. Given the total amount of Bitcoin that exists right now, Chinese

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citizens cannot do much to remove currency from the country. Maybe if there were trillions of dollars' worth of bitcoin, more options would be available, but there's not a lot they can do right now.