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Murray's Musings

CRYPTOCURRENCY VERSUS FIAT MONEY

Fiat Currency—Some History of What We Own

As George Orwell wrote, language can corrupt thought. With that statement in mind, suppose one asks the following question: Is it conceivable that a cryptocurrency such as bitcoin, which is unregulated and backed by nothing, can ever displace established currencies such as the dollar, euro, pound, and yen, which are backed by governments that are responsible for such organized support? Surely the answer would be negative.

Now suppose the question is posed alternatively: Can inflationary currencies, such as the dollar, euro, pound, and yen, survive against competition from bitcoin, which is designed to maintain purchasing power? The response might be that inflationary currencies that lose purchasing power when manipulated by central banks have no future.

The problem is that something as ubiquitous as money generally commences with virtually unchallenged assumptions that are not necessarily valid. For example, money in every nation is issued and backed by a government. Money obviously existed long before government existed. According to the Bible, Abraham purchased the Cave of Machpelah, known as the Cave of Patriarchs, for 400 shekels of silver. This is clearly stated by Ephron in answer to Abraham, as found in Genesis 23:14-15. Historians of biblical text assume that Abraham actually existed and lived about 300 years from c. 1800 Before the Common Era (BCE) to circa 1500 BCE. Of course, this is not possible. However, the Masoretic text of Genesis is known to have appeared in the Ninth Century of the Common Era (CE) and readers clearly understood the concept of money. This was long before there were central banks and governments backing money. As a matter of fact, there might not even have been organized governments in the sense that we understand them today.

In any case, archeologists reliably inform us that obsidian was used as money in Sardinia 17,000 years ago. References to commodity money are to be found in Homer. Bronze money was used in China about 3,000 years ago. Money in the form of gold was minted and stamped by Greek city-states 2,500 years ago. This tradition was inherited by the Romans. Of course, the Roman emperors successively debased the currency, and historians agree that this debasement is one of the causes of the collapse of the empire. From about 400 CE to about the 13th century, there was no systematic government stamping and minting of money.

Paper money was first introduced to the world in the 11th century by the Song Dynasty in China. It is vividly described in *The Travels of Marco Polo*. It was emulated by Europeans in the form of so-called bank notes that were legal receipts for gold deposited for safety in the care of goldsmiths. These banknotes circulated as money. It was centuries before the governments of the world attempted to monopolize the issuance of money. The Bank of England did not obtain a monopoly

on issuing banknotes until 1694; however, the Bank of England was privately owned until 1977. The U.S. Federal Reserve was created in 1913. Prior to that date, money in the U.S. consisted of banknotes, not government-issued currency.

Consequently, so-called fiat money is really a recent innovation in the context of the broad sweep of history. In fact, until August 15, 1971, the value of the U.S. dollar was fixed to that of gold. The U.S. dollar only became a bona fide fiat currency subsequent to that date. The Canadian penny was mostly copper until 1996 and was removed from circulation in 2012 due to the cost of production relative to its purchasing power. Throughout the course of history, people generally have been loath to trust any government with the responsibility for a currency, and history records that this distrust is merited.

Although the U.S. dollar has consistently lost purchasing power for the past century, an investor did not necessarily lose purchasing power. This is because it was always possible to collect interest on a risk-free basis in U.S. Treasury bills (T-Bills) that generally resulted in a positive inflation-adjusted or real rate of return. In the past 90 years, there are two broad exceptions to this experience.

The first extended episode of negative real rates of return for T-Bills in the U.S. was the period from the Second World War to the Korean War. Between the rise of fascism and the advance of communism, the political climate of the world was so traumatic that investors accepted a negative real rate of return as the price to be paid for the safe haven of a nation with respect for property rights. The real rates of return of T-Bills on an inflation-adjusted basis from 1940 to 1951 are as follows.

Table 1: U.S. Treasury Bills Inflation-Adjusted Returns 1940-1951

1940	(0.94)%	1946	(15.06)%
1941	(8.80)%	1947	(7.80)%
1942	(8.25)%	1948	(1.85)%
1943	(2.73)%	1949	2.96%
1944	(1.74)%	1950	(4.34)%
1945	(1.88)%	1951	(4.14)%
		<i>Cumulative:</i>	(43.58)%

Source: Roger Ibbotson, et. al. 2016 SBB Yearbook: Stocks, Bonds, Bills, and Inflation (New York: John Wiley & Sons, 2016), 4-14.

The real rate of return was negative every year except for 1949, when it was 2.96%. For example, in 1941, the real rate of return was -8.80%. The cumulative rate of return in real dollars over the entire time period was -43.58%.

The other significant period of negative returns on T-Bills was 2009 to 2016.

Table 2: U.S. T- Bills Inflation-Adjusted Returns 2009-2015

2009	(2.56)%
2010	(1.35)%
2011	(2.84)%
2012	(1.65)%
2013	(1.45)%
2014	(0.73)%
2015	(1.15)%
<i>Cumulative:</i>	(11.17)%

Source: Ibbotson, et. al., 4-15.

The 2016 data is unavailable, since the Ibbotson 2017 SBBI Yearbook has yet to be published, but the real return on T-Bills for 2016 was unquestionably negative. It was probably on the order of -2%. In any case, the seven years covered in Table 2 produced a cumulative negative real return of -11.17%. If one assumes a -2% real return for 2016, the cumulative eight-year real return would be -12.95%. This return might even be acceptable from the standpoint of social policy, given the enormity of the crisis in 2008.

However, long term historical data demonstrates that investors do not generally tolerate negative real rates of return. Such returns do occur in periods of turmoil, like war, and investors have no alternative but to accept that reality. Yet, those returns generally result from large-magnitude events that usually do not recur. Data from Elroy Dimson's *Triumph of the Optimists*, in Table 3, makes this clear.

Table 3: Real Interest Rates Around the World 1900-2000

	<u>Geometric Mean</u> (annualized)	<u>Minimum</u> <u>Return</u>	<u>Year</u>
Australia	0.4%	(19.4)%	1951
Belgium	(0.3)%	(19.7)%	1920
Canada	1.7%	(12.5)%	1947
Denmark	2.8%	(16.6)%	1916
France	(3.3)%	(41.7)%	1946
Germany*	(0.6)%	(100.0)%	1923
Ireland	1.3%	(16.2)%	1915
Italy	(4.1)%	(76.6)%	1944
Japan	(2.0)%	(75.1)%	1946
The Netherlands	0.7%	(12.7)%	1918
South Africa	0.8%	(27.8)%	1920
Spain	0.4%	(23.8)%	1946
Sweden	2.0%	(21.2)%	1918
Switzerland	1.1%	(16.5)%	1918
United Kingdom	1.0%	(15.4)%	1915
United States	0.9%	(15.1)%	1946

*For Germany, the mean is based on 99 years, excluding 1922-23.

Source: Elroy Dimson, Paul Marsh, Mike Staunton, *Triumph of the Optimists* (Princeton: Princeton University Press, 2002), 71.

The geometric mean column shows the annualized real return on short-dated government bills or equivalents from 1900 to 2000, as well as the years with the worst negative real interest rate. Many nations experienced positive real interest rates. According to Dimson's data those with negative

interest rates experienced an enormously negative rate for a brief period that resulted in a 100-year overall negative return. For example, France, had a -3.3% real interest rate for the entire 100 years from 1900 to 2000, but a significant part of that result is governed by the -41.7% return in the year 1946. During that century, France had gone through a war, the aftermath of the war, scarcity of goods, inflation, and so on. Germany has a -0.6% real interest rate for the entire 100-year time period, but that is because the real rate of return was approximately -100% in 1923. Similarly, Italy had experienced a -4.1% real rate of return because the return in 1944 was -76.6%.

The negative real rate of return for Germany is obviously due in large measure to its hyperinflation in 1923. The negative real interest rate for Italy is due in large measure to the inflation brought about by the privation of war as battles raged in Italy in 1944 for control of the peninsula.

Bitcoin—A Contest For What We Might Own?

A negative real rate of return cannot be endured for long or people will lose confidence in the system and seek an alternative store of value. In this sense, the cryptocurrency movement is nothing new in history. There is always a reaction to a negative real rate of return. Sometimes refuge is sought in gold or diamonds; sometimes in collectibles, such as art. Sometimes in a democracy voters reject the policies of inflation-minded governments, as happened in the United States in the early 1950s or in the United Kingdom around the same time.

Bitcoin is merely one among many possible means of rejecting the politics of devaluation, which creates an involuntary transfer of wealth from saver to debtor. However, until 2009, the negative real rate of return problem had not been encountered for decades. It is generally believed that negative real rates occur during periods of high interest rates and not during periods of nearly zero interest rates. To the extent that data is available, it is viewed in a traditional manner, with this bias; certainly, one does not hear the term negative real interest rates mentioned in the financial news media—they are silent on this issue. The familiar reality is drawn from the Ibbotson data, which clearly show that for the bulk of U.S. history, interest rates have been positive, not negative, even in real terms.

As another example of reality supposed, as differentiated from the reality of available facts, even those who do not examine the actual data on bitcoin trading generally assume that trading in bitcoin is dominated by Chinese traders. The data to support this assertion can be found at bitcoinity.org, which reports that millions of bitcoin are traded on a daily basis by Chinese firms, such as Bitfinex and BTCChina.

The reality is somewhat different. There are only a little over 16 million bitcoins in existence. According to Blockchain.info, which is a blockchain explorer or data site, a typical bitcoin block might be about 990 kilobytes. A block of transactions is processed roughly every 10 minutes, which means about 144 blocks are processed a day.

Blocks are referred to by height on the blockchain, which is basically a reference number. For instance, Block Height 444504 on the Main Chain was processed at 0 hours, 14 minutes, 23 seconds on December 22, 2016. It included 2,526 transactions, with a bitcoin transaction volume of 1,790.52401202 bitcoins. It had an output total of 11,315.4088502 bitcoins, which is the number

of unspent bitcoins left subsequent to the completion of the transaction. This is important, as the blockchain maintains the integrity of the system in part by tracking unspent bitcoins.

One will also see, on the block, a number, an alphanumeric, known as a Merkle root, and a pure number, known as a nonce. The Merkle root is also known as a hash tree. At the risk of oversimplification, a hash tree is a concatenated cryptographic function used to identify both blocks and transactions within a block as unique and secure. A nonce, or a cryptographic nonce as it is called, is an arbitrary number used in an authentication protocol only once. This ensures that old communications or blocks cannot be used to attack the system.

On bitcoinity.org, one can see the bitcoin trading by trade in real time. It is not uncommon to see transactions in the tens of thousands of bitcoins over the course of several minutes with just one broker, such as Bitfinex. As this report was written, the Bitfinex bitcoin transaction price was USD901, with a very large spread of \$901 bid, \$910 ask. These transactions will not usually appear on the blockchain. Essentially, the Chinese investors are trading yuan versus bitcoins to buy bitcoins at a certain cross rate, and instantaneously trading bitcoins for U.S. dollars at the same cross rate. It is a way that the Chinese government allows citizens to obtain U.S. dollars. However, these are not usually blockchain trades. Bitcoin is used as a numeraire for a currency transaction. It is, of course, quite possible that some investors simply choose to take delivery of bitcoin to hold as an investment, but most of the activity with these bitcoin brokers is not blockchain-related.

The most popular cryptocurrency wallet is the Blockchain wallet, with 11,143,300 wallets, according to Blockchain.info, although because more wallets are created constantly, the number as of this the date this *Compendium* is published will be higher. It is believed by many that Blockchain has a 50% market share of wallets.

There are 45,757,561 unspent transaction outputs, or piles of bitcoins. There are 16,088,000 bitcoins. Thus, dividing the latter by the former, meaning 16,088,000 divided by 45,757,561, we see that each unspent transaction output, or pile, contains 0.351592 (roughly a third) of a bitcoin. This indicates that bitcoins are well distributed, with the average holder holding small amounts. As one can see on the “Number of Unspent Transaction Outputs” chart on Blockchain.info, the number of outputs is growing much more rapidly than the number of bitcoins. This indicates that the number of bitcoin owners is growing, but the average owner is holding bitcoins smaller amounts.

This is in accordance with Sir Thomas Gresham’s principle, now considered to be a law of economics, that bad money drives out good. This is why a 1955 Roosevelt dime, which is 90% silver and 10% copper, can be purchased for about \$16 if it is in good condition. They were supposedly taken out of circulation with the U.S. Coinage Act of 1965. They are in plentiful supply if one wishes to pay \$16 each. This works out to a 10.46% compound annual rate of return for a pedestrian silver dime. The Liberty dime, which has not been minted since 1945, can be had for about \$72 each. This is a rate of return of 9.71% per annum. If silver coins were an asset class, they would compare quite favorably with any type of fixed income investment and most forms of equity.

It is worth observing that the supply of silver is constantly increasing. The bitcoin rate of production is constantly decreasing and will reach a finite limit in 2141. Moreover, silver is currently at \$16.47 an ounce and it traded in excess of \$49 in 1980.

Gresham's law is one of the few in economics with universal validity. Unfortunately, there is no recognized asset class based upon Gresham's law. Perhaps one will come into existence.

Q: Does the recent drop of 20% in Bitcoin's value in two days damage its credibility, because who wants a store of value that can drop 20% in a very brief period of time?

A: Does the stock market ever drop 20% in a couple of days? It rarely happens, but it does occur. After it drops 20% in two days, what happens? Do investors abandon its use as a store of value? Can you think of any currency that loses 20% of its value in a day? I can think of many, but many people invest in them nevertheless.

This is a brand new currency, so I would not draw conclusions as to what happens now or what is going to happen when it is a fully distributed currency. Most people are not even aware of bitcoin, and even those who are aware of it have great misapprehensions about it. We should draw conclusions when it is being used in general commerce in large amounts. Conclusions are not meaningful right now. No reasonable person should expect that it will not be volatile. In any case, whatever its volatility, it is far less volatile than it was a brief couple of years ago.

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