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CRYPTOCURRENCIES

FOOL'S GOLD OR THE FUTURE?

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> "[Virtual currencies] may hold long-term promise, particularly if the innovations promote a faster, more secure and more efficient payment system."
>
> – Ben Bernanke, ex-Chairman of the US Federal Reserve

INTRODUCTION

Eye-watering cryptocurrency price appreciation was the speculator's delight of 2017. Two of the major cryptocurrencies, Bitcoin and Ether,[1] rose by around 1,400% and 9,000%[2] respectively over the calendar year, while an index of leading cryptocurrencies rose by approximately 2,800%.[3] Rapid price appreciation, the proliferation of new coin launches (initial coin offerings, or ICOs) and widespread excitement around cryptocurrencies suggest the existence of a speculative bubble. In this paper, we outline the drivers of cryptocurrency enthusiasm and consider some of the challenges ahead for cryptocurrencies.

In summary, although the blockchain technology underlying cryptocurrencies holds significant promise in areas such as trade processing and settlement, cryptocurrencies have yet to prove that they offer much more than the benefit of anonymity and the potential for large price fluctuations. We do not view cryptocurrencies in their current form as an investable proposition.

[1] Ether is the cryptocurrency associated with the Ethereum network.

[2] WorldCoinIndex, available at https://www.worldcoinindex.com/coin/.

[3] CRIX — CRyptocurrency IndeX, a market-cap-weighted index of 75 leading cryptocurrencies, available at http://crix.hu-berlin.de/.

CRYPTOCURRENCIES AND BLOCKCHAIN

"Bitcoin is the beginning of something great: a currency without a government, something necessary and imperative."

– Nassim Taleb, author of The Black Swan: The Impact of the Highly Improbable

A cryptocurrency is a decentralized digital currency that uses cryptographical techniques to control the creation of new units of currency and to verify the transfer of funds; transactions are stored on the blockchain. With the major cryptocurrencies, new coins are created via a "mining" process whereby "miners" are rewarded with coins for solving cryptographical puzzles. Most cryptocurrencies are designed to gradually decrease production, with some placing an ultimate cap on the total amount of currency that will ever be in circulation, thus mimicking the finite supply of precious metals.[4]

The underlying transaction record for a cryptocurrency is the blockchain. The cryptographical puzzle solved by the miners is part of the process of validating transactions of the cryptocurrency. The puzzle is difficult enough that, so far, only trial and error works; this means that, theoretically, participants with the same amount of computing power have the same chance of forming the new block. Transactions are gathered to form these "blocks" and must be cryptographically packaged. The first miner to solve the puzzle and form the block is rewarded with a sum of freshly minted cryptocurrency, the "block reward," and the block is timestamped and added to the existing chain of blocks in a linear manner.

With the increased demand for transactions in the larger cryptocurrencies, and the limited number of transactions that can be placed inside a block, cryptocurrency holders looking to have their transactions processed quickly can specify voluntary additional fees to the miners as an incentive to prioritize their transactions.[5]

In a typical digital transaction, you, the counterparty, and your banking provider are aware of a transaction. In the blockchain, however, there would typically be thousands of "aware parties" keeping a record of such transactions (although they are usually less aware of your real-life identity than a banking provider would be). Because the blockchain

[4] For example, the total supply of Bitcoins is capped at 21 million (at the end of 2017, around 16.8 million Bitcoins had been created). It should be noted that cryptocurrencies can and do change over time, so it's possible that this feature could change at some point in the future. Ether, the coin of the Ethereum blockchain, has uncapped coin creation, although the inflation of its monetary base is expected to slow over the long term.

[5] In practice, these fees are now necessary with a large cryptocurrency like Bitcoin given the processing bottleneck in the system, meaning transaction requests arise at a higher speed than they can be quickly processed.

is usually stored on thousands of computers, it can't be tampered with by attacking an individual copy. Blockchain is, concisely put, a decentralized multicopy ledger of transactions that is invulnerable to tampering.

It's important to distinguish between blockchain technology and cryptocurrency. Blockchain is an infrastructure in which major players in the world of digital transactions have heavily invested, and applications are also being developed for nonfinancial sectors. One major consortium is the Enterprise Ethereum Alliance, which has more than 200 members, including companies such as Accenture, Microsoft, Cisco and J.P. Morgan.[6] Another example, R3, is a company backed by more than 100 global financial institutions, which has its own distributed ledger technology called Corda, which is blockchain-inspired. Blockchain is therefore an exciting development that could have a significant impact on the financial sector and wider economy over the coming decade.

"So it seems to me it [Bitcoin] ought to be outlawed. It doesn't serve any socially useful function."

– Joseph Stiglitz, Nobel Prize winner for Economics

[6] Current Enterprise Ethereum Alliance members are listed at https://entethalliance.org/members/.

CRYPTOCURRENCY HYPE

Cryptocurrencies have attracted a huge level of interest driven by a number of features that distinguish them from government-backed fiat currencies:

CRYPTOCURRENCIES AREN'T CONTROLLED BY CENTRAL BANKS

If a central authority cannot print large sums of the currency, it could potentially have more legitimacy as a store of value (some view cryptocurrencies as a form of digital gold). A motivator behind the introduction of the first cryptocurrency, Bitcoin (which has a limited supply of 21 million coins), was the large-scale quantitative easing programs being introduced after the Global Financial Crisis.[7] Cryptocurrencies are also viewed by proponents as being more democratic than fiat currencies, with an engaged user base that regularly votes on proposed changes.

CRYPTOCURRENCIES OFFER A DEGREE OF ANONYMITY

In May 2017, a piece of ransomware called WannaCry was released globally. For the unfortunate individuals and institutions whose computers were infected, this often meant they had to pay a ransom to remove the harmful program from their computers, and ransoms were paid in Bitcoin. The anonymity (or more correctly, pseudonymity) of Bitcoin in this case proved to be helpful to the extortionists behind the virus. Although there is a specific user who receives the Bitcoins, this user is identified by a pseudonym rather than by real-life identity (for example, the difference between Superman and Clark Kent). However, it's worth noting that transaction records are permanent and widely available, and cryptocurrency exchanges are largely aware of the real identities of their users.

Individuals are also able to make anonymous purchases for illegal items using cryptocurrencies. For example, just over a quarter of the UK's drug users have purchased banned substances on the dark web,[8] generally using cryptocurrencies such as Bitcoin to settle these purchases. To the extent that cryptocurrencies play a significant role in facilitating criminal activity, this is ultimately likely to attract government and regulatory intervention (discussed further below).

[7] The first or "genesis" block of Bitcoin contains a message, which was a headline of the (London) *Times* newspaper: "The Times 03/Jan/2009 Chancellor on brink of second bailout for banks."

[8] Global Drug Survey. *Global Drug Survey 2017*, available at https://www.globaldrugsurvey.com/gds2017-launch/results-released/.

RAPID PRICE APPRECIATION AND EXCITEMENT ON SOCIAL MEDIA

The interest and excitement around cryptocurrencies has been amplified by the effect of discussions and shared news reports on social media. As with any asset experiencing astronomical price increases, individuals seeking to avoid missing out on further increases (a phenomenon known as FOMO or "fear of missing out") are drawn to them. Enthusiasm for Bitcoin among its supporters has also been strong enough to survive several large price declines. Falls of 68%, 51% and 61% occurred between June 8 and 12 in 2011, August 17 and 19 in 2012 and on April 10, 2013.[9] Double-digit flash crashes have been a feature ever since, a recent example being the 35% decline in late December 2017.

[9] Lee T. "An Illustrated History of Bitcoin Crashes," available at https://www.forbes.com/sites/timothylee/2013/04/11/an-illustrated-history-of-bitcoin-crashes.

CHALLENGES FACING CRYPTOCURRENCIES

Cryptocurrencies face a number of significant challenges in attempting to establish themselves as serious alternatives to fiat currency or gold and therefore cannot be considered a suitable investment or store of value at this point in time:

HACKING/THEFT

In 2016, hackers managed to exploit a weakness in the coding of an online crowdfunding platform (The DAO), which used the cryptocurrency Ether, and stole approximately $50 million dollars in cryptocurrency. More recently, in January 2018, the cryptocurrency exchange Coincheck was hacked and $530 million in NEM cryptocoins stolen. Individuals have also been robbed of cryptocurrency at gunpoint. Thefts of cryptocurrency occur and are likely to reoccur. Even so, the blockchain itself is rarely, if ever, compromised. What this means is that hackers have so far managed exceptionally large robberies but have not fundamentally altered the viability of a cryptocurrency — for example, by forgery.

SURVIVORSHIP

There are well over a thousand different cryptocurrencies in circulation, and the field is widening with further ICOs. Forty-one cryptocurrencies have market capitalizations of more than $1 billion (Bitcoin leads the way at approximately $232 billion as of January 15, 2018).[10] Even most of the large players are likely to be in excess of requirements if and when a mature cryptocurrency payment framework emerges. It is therefore possible that many, if not all, cryptocurrencies with very high valuations today will be worth close to nothing at some point in the future. In this regard, the surging market capitalization in digital coins resembles the dotcom bubble of the late ’90s. At that time, any stock tangentially connected to the internet rose tremendously in value regardless of the business case. However, in the long run, most tech startups in the ’90s could not justify their valuations, and for every eBay, there were at least as many GeoCities and Pets.com.

[10] CoinMarketCap. “Cryptocurrency Market Capitalizations,” available at https://coinmarketcap.com/.

GOVERNMENT INTERVENTION

Governments can intervene to outlaw or regulate certain aspects of cryptocurrencies, and 2018 looks set to be a year in which cryptocurrencies come under increased government and regulatory scrutiny. For example, policymakers could make any or all of owning, mining or running an exchange for a cryptocurrency illegal and increase the KYC/AML[11] burden on exchanges. Some of these actions are harder to take than others. Although some exchanges have been shut down, it's difficult to eradicate ownership of cryptocurrency. Despite this, it would certainly be a large setback (and likely lead to a large fall in value) if a cryptocurrency was outlawed in a major territory. We already have examples of state intervention and their price effects. For example, at the end of March 2014, Bitcoin prices fell by 25% when the US Internal Revenue Service announced it would treat Bitcoin as a property rather than as a currency for tax purposes.[12] Governments can also create their own cryptocurrencies, as illustrated by the CryptoRuble project in Russia, the e-krona project in Sweden or emCash in Dubai. Cryptocurrencies are incredibly easy to clone and could thrive with an associated government "brand" and preferential regulatory support.

CONGESTION

The network of the predominant cryptocurrency, Bitcoin, isn't currently able to handle a large transaction volume, and payments would grind to a halt in the current state of the technology if there was widespread uptake of the system. With rising demand for transactions and no change in processing supply, the transaction fees get larger. So although early in the history of Bitcoin, transactions were seen as essentially free, the average transaction fee at the end of 2017 was $25.[13] With fees like that, Bitcoin cannot function as a high-throughput small-payments solution in the same way that credit cards do.[14]

[11] "KYC" refers to know-your-client requirements and "AML" refers to anti-money-laundering requirements.

[12] "A History of Major Bitcoin Crashes," *Startup Digest*, available at http://blog.startupdigest.com/2017/03/09/history-major-bitcoin-crashes/.

[13] BitInfoCharts, Bitcoin Average Transaction Fee Historical Chart, available at https://bitinfocharts.com/comparison/bitcoin-transactionfees.html.

[14] Although Bitcoin can handle up to seven transactions per second, Visa has a capacity of around 65,000 transactions per second.

FEES

As well as the fees due to the miners for validating transactions, cryptocurrency exchanges will take a spread on transactions. For example, on Coinbase, one of the major exchanges, spreads range from 0.25% to 1.0% for purchases of digital currencies.[15] Other fees can be incurred on transferring hard currency to and from exchange accounts, either by your traditional bank provider or the exchange. In practice, there can be a lot of hidden fees for an investor, and cryptocurrencies are, at present, a largely unregulated area.

SUSTAINABILITY

In terms of energy consumption, the Bitcoin network, for both mining and transacting, uses about the same amount of energy as Morocco.[16] Although some of the large cryptocurrency mining firms frequently use surplus hydroelectric power, this clearly makes it hard to see cryptocurrencies that involve mining as "green" investments. From a social perspective, the link to cybercrime, drugs and money laundering overshadows Bitcoin heavily. Bitcoin is the major currency on the dark web; however, others such as Monero, Ether and Zcash are gaining traction.[17]

[15] Coinbase Pricing & Fees Disclosures, available at https://support.coinbase.com/customer/portal/articles/2109597-buy-sell-bank-transfer-fees.

[16] Digiconomist. "Bitcoin Energy Consumption Index," available at https://digiconomist.net/bitcoin-energy-consumption.

[17] Europol. "Internet Organised Crime Threat Assessment (IOCTA) 2017," available at https://www.europol.europa.eu/activities-services/main-reports/internet-organised-crime-threat-assessment-iocta-2017.

WHERE NEXT FOR CRYPTOCURRENCIES?

"My best guess is that in the long run, the technology will thrive but the price of Bitcoin will collapse."

– Kenneth Rogoff, ex-IMF economist, authored influential work on the link between debt and GDP

The blockchain technology underlying cryptocurrencies clearly holds significant promise in areas such as trade processing and settlement, with many other potential applications under active development. However, cryptocurrencies have yet to prove that they offer much more than the benefit of anonymity and the potential for huge price fluctuations. Although some argue that cryptocurrencies can be considered a form of digital gold, the key difference is that physical gold has played a role in financial systems and been seen as a store of value for thousands of years. With no way of assessing the fair value or longevity of different cryptocurrencies, holders need to contemplate the very real possibility that many, if not all, cryptocoins may be close to worthless at some point in the future. It's possible that one or more cryptocurrencies might survive and even thrive as the underlying technology and unforeseen applications develop. It's also possible that cryptocurrencies may disappear altogether.

To be clear, we do not view cryptocurrencies in their current form as an investable proposition or store of value (either directly, via futures[18] or via hedge funds set up to speculate on cryptocurrency price movements). They offer no income to the passive holder of coins (that is, non-miners), and assessing fair value is close to impossible. In addition, the wave of cryptocurrency launches and the spectacular price increases seen over 2017 exhibit many of the hallmarks of a speculative bubble. We suggest that investors sit it out and marvel as the story unfolds.

[18] CBOE and CME now both offer Bitcoin futures.

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