On Blockchains, cryptos, and media of exchange. Not there (yet).*

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Abstract

Ever since the inception of the Blockchain technology and bitcoin (Nakamoto, 2008), the first and foremost of so-called cryptocurrencies, the prospect within the 'crypto' community has been one of growing decentralization and an impending threat to traditional monetary policy and its legal monopoly. Here we discuss the potential use of bitcoin and other competing 'cryptos' as media of exchange and argue that we are still far from seeing a dethroning of major currencies, in spite of the undermining effect that cryptos might have on monetary policy and central banking.

Keywords: Blockchain; bitcoin; cryptos; money; decentralization

JEL classification: E59, E58

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1 Introduction

The literature on cryptos and the Blockchain is fast growing and giving birth to new ideas and synergies in a multitude of fields. However, with quantity comes dispersion and, understandably, a loss of focus on the very nature of what is being discussed. More often than not, we take things for granted with no shred of evidence to sustain such claims.

In this embryonic yet rapidly developing field, we find many instances where cryptos in general—or *cryptocurrencies*, a misnomer, as we will see—and bitcoin[1] in particular, are considered money (see Dwyer, 2015, for an early work). In this short note we contend that we are not there yet, even though the potential is absolutely huge. The reason is quite disruptive, namely, that the whole thing may turn into a speedy and efficient payment system which is, at the same time, money proper. Indeed, the different blockchains and the scores of cryptos in existence, with bitcoin at the forefront, can thus be seen as two sides of the same coin (no pun intended).

A blockchain can be defined as a distributed ledger—meaning a consensus-based highly decentralized peer-to-peer network on which transactions are safely recorded. In its origins, the technology was exclusively advocated as "an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party" (Nakamoto, 2008). But beyond this empowering effect on cryptos and tokens, the Blockchain has the potential to completely reshape the entrepreneurial landscape by allowing for new ways of raising funds, and also by developing, deploying, and spreading the newly created decentralized applications (Chen, 2018).[2]

In the wake of the 2007–08 financial collapse many questions were (and still are) left unanswered. At the microeconomic level, we might wonder whether firms will be resilient enough as to keep adding value in this fragile environment. Perhaps they can address many of the concerns, funding being probably the most demanding, through so-called ICOs (initial coin offerings)—these have revealed, in their short lifetime, a great potential and flexibility in articulating new and disruptive business needs (see Fisch, 2019). At the macroeconomic level, we might want to look at the root of the crisis and identify a possible chain of events. What was really behind it? Did governments, and especially central banks, do enough to prevent it? Was quantitative easing—another term for expansionary monetary policy—right on cue? Or maybe it was the other way around? Did governments and central banks

[1] Cryptos are also alluded to as digital currencies, yet another misnomer. Also, notice that bitcoin in lower case refers to the crypto while 'Bitcoin' with a capital B involves the underlying technology, namely, the public ledger (or blockchain), the P2P network, consensus rules, and the proof of work algorithm.

[2] Not surprisingly, Nakamoto (2008), or the 'paper that started it all', makes no explicit reference to the word Blockchain—not only was the technology rather unapproachable back then, but it certainly did not offer itself as the all-around disrupter that it has recently turned into with the growing numbers of Dapps (decentralized applications).

unknowingly pave the way for the last economic crisis (see the seminal work by Mises, 1912, for instance)?

Our contribution will deal with the latter set of questions, and is partly motivated by the global currency war underway and the resulting trade war. In particular, we argue that it is not only the dollar hegemony that is being under attack, but rather, the whole fiat money system and their institutions (e.g. central banks). However, and in spite of its huge potential, we are still skeptical about the undermining power of cryptos in today's economy. We suspect that its ultimate success in this direction will depend on an increasing awareness of the multiple uses that the Blockchain technology can offer in terms of adding value in the marketplace. Then, and only then, will cryptos pose as serious contenders in the currency race.

The paper is organized as follows. Section 2 goes over the nature of money and media of exchange in general, with a special focus on the origins of commodity money and how this could apply to the crypto ecosystem. Section 3 puts cryptos in context, both within the sector and as compared to other more traditional sectors. Section 4 discusses bitcoin's price, speculation, and its intrinsic value. Section 5 suggests a plausible explanation on the recent crisis and how cryptos might be seen as a natural reaction to it. Section 6 concludes.

2 What is money?

From time immemorial money has been many different things. Starting with barter in as early as 9,000 BC, the records suggest that men would barter their surplus goods for those they were in need of. From grain to cattle, and from salt to tobacco, societies have, throughout history, sought the most efficient way to conduct business. Eventually, people settled for the coinage of gold and silver in large numbers and of several denominations, mainly due to their general acceptability, portability, divisibility, durability, stability of value, and homogeneity. However, the most important feature underlying this historical process lies in its decentralized nature. Indeed, when gold and silver became the standards of their time, they had for long been identified as highly, if not the highest, marketable commodities—it was then natural for them to become widely accepted means of exchange; that is, money proper.

Hence we arrive to the first and perhaps most important feature money must possess, that of facilitating exchanges and improving what barter did. It improves barter by allowing for indirect exchanges (instead of direct ones) through the use of an objective reference like gold or silver. Employing a widely marketable commodity as a unique means of payment thus allows for a much more dynamic interaction between economic agents and, therefore, a faster rate of growth and development in general. In contrast to this natural process, paper or fiat money has been proposed in modern times as a way to circumvent the restrictions imposed by

commodity moneys and give free rein to governments, by means of a discretionary monetary policy. But therein lies the rub, as monetary discretion by a central authority has, in many an occasion, been identified with exacerbated and rather unpredictable booms and busts cycles (see Mises 1912, and Hayek, 1931, most prominently). We will take up this matter again in a later section.

Three direct corollaries stem from this first function of money as medium of exchange, namely, store of value, unit of account, and standard of deferred payment. Briefly, and respectively, they refer to, the quality of money as a repository of purchasing power over time, a measure of exchange value or 'common denominator', and a natural enabler for borrowing and lending. It is no overstatement to say that all three features are conditional on the first and most important attribute of money, although the reverse does not necessarily hold.[3]

To understand money's genesis it is interesting to briefly discuss Mises' regression theorem as applied to money and then cryptos (Mises, 1912). Under the so-called regression theorem, Mises proposes to apply the subjective theory of value to the purchasing power of commodity money,[4] or what is the same, its objective-exchange value. According to this analysis, the objective-exchange values of all goods and services are explained by the subjective theory of value in that these values can be traced to the ultimate subjective use values of marginal consumers, who base their subjective preferences on their objective-use values. However, this is not the case for money, the theorem states, as money is not consumed by its use and both its subjective and objective use values are equal to its objective-exchange value, which is the estimated value of goods for which it can be exchanged.

Tracing back the origin of the objective-use value of money (e.g. gold) to the point where the commodity was only valued for its non-monetary uses, Mises points out that its objective-exchange value (e.g. purchasing power) is explained by the theory of subjective value and marginal utility. In a nutshell, and following Murphy (2003), people trade away real goods for money because they have a higher marginal utility for it than for those goods—although the question still remains, why do people have a marginal utility for money? In answering this question, Mises suggests that we can trace the purchasing power of money back through time, until that moment when money first emerged from a barter economy. In the case of gold, for instance, people valued it for its own sake before it became money, and thus we can explain later developments such as its current market value by looking back at the point when gold was not a medium of exchange.[5]

[3] We can see how valuable paintings make for a good store of value, yet they cannot make for good media of exchange because of their limited marketability.

[4] For example, as with gold or silver—on the other hand, fiat money (e.g. paper money) derives its value by its official status as legal tender.

[5] Given that all fiat moneys have always emerged from commodity moneys, concludes Murphy (2003), we should be able to trace back their purchasing power until that point in time when they were redeemable in gold and silver, and from there we need only explain the purchasing power of the metals.

An interesting question at this point would address the applicability of Mises' regression theorem to bitcoin in particular, as it was the first crypto and still remains the most important one. Davidson and Block (2015) argue against such an exercise as the theorem is only relevant when a new medium of exchange arises out of a pure barter economy. Still, the theorem presents a consistent account of how money comes to be in a historical context and might thus help understand how cryptos could well follow a similar pattern (see Tucker, 2014). This is why in spite of such a critique we maintain, as in effect those authors do as well, that it will be through the increased awareness of bitcoin's objective-use value—it being a disruptive value-adding force that can potentially turn into money *and* a payment system at once—that it will become a generally accepted medium of exchange (e.g. commodity money). The little evidence presented in the next sections seems to point in the direction of this 'increased awareness', albeit the still negligible influence in the world economy at large.

3 Cryptos in context

The evolution of the crypto ecosystem may well be described by what happens with its market cap.[6] Topping all cryptos by a great margin, bitcoin remains, since its creation, the main driver behind the whole crypto market when it comes to market cap. Figure 1 describes bitcoin's market cap path in the past five years, while showcasing its peaks at the end of 2017-early 2018, and mid-2019, while figure 2 exhibits all major cryptos and their market caps. As it can be seen from both figures, the market cap indicator is very volatile in this context, essentially because prices are volatile too. Just to get an idea about its inherent volatility, the whole crypto ecosystem went from around USD 1.5 billion in April 2013 to roughly USD 200 billion in December 2019, an increase of more than 100 times in a bit more than six years.

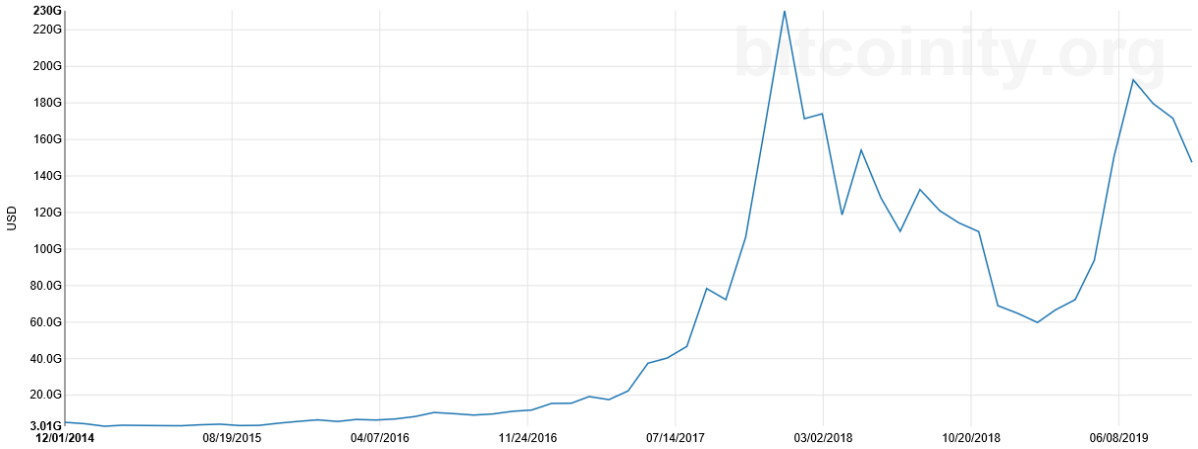
In spite of its recent tranquility, competition within the crypto realm has been hectic in the last couple of years, especially during the months leading to the first market cap peak at the end of 2017 and also right afterwards. As seen in figure 3, the second and third cryptos by this indicator, Ethereum and Ripple, were trailing bitcoin very closely during those frantic days. In more recent times, however, bitcoin seems to have recovered most of the lost ground as to become once again the dominant force in the market, with exactly two thirds of the total market cap by December of 2019.

We believe that this is part and parcel of competitive markets and the process of creative destruction and should thus be very welcome. It is precisely this wild-west competition at a very early stage what will imbue the surviving cryptos with the know-how and resiliency

[6] The market cap can be defined as the price times the circulating supply. Notice though that as 'crypto' prices are highly speculative so are their market caps.

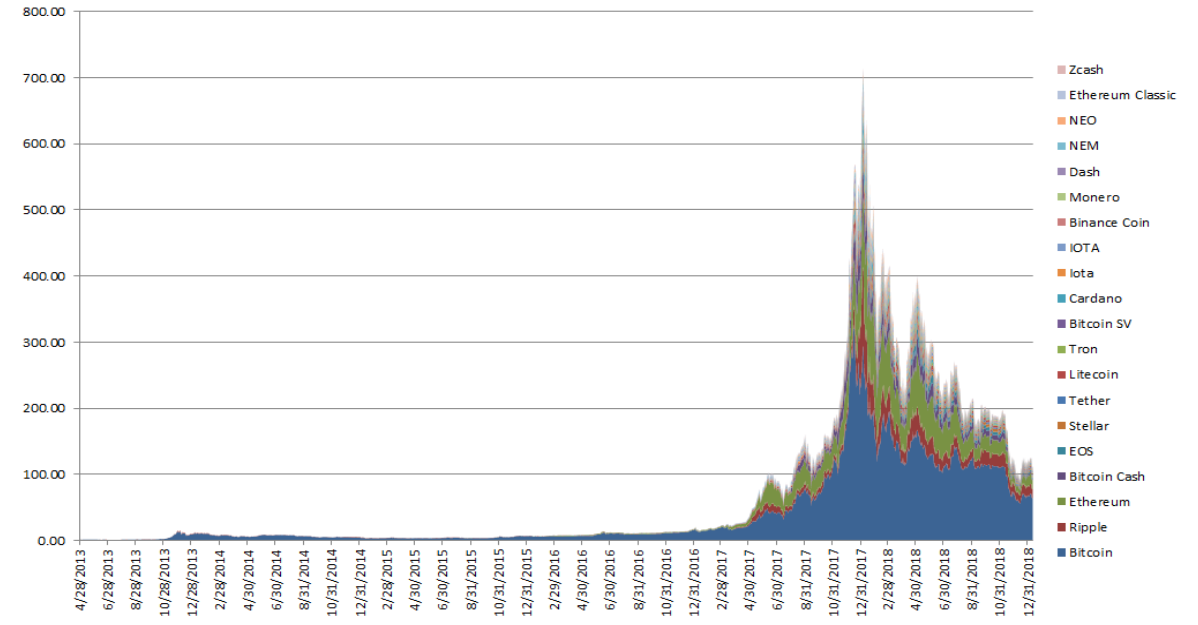
necessary to succeed in the coming years. In particular, bitcoin and its Blockchain nowadays feature better technical qualities than prior to the crypto peak of 2017–18.

Figure 1: Bitcoin market capitalization, USD bn.



Source: data.bitcoinity.org, November 2019.

Figure 2: Crypto market capitalization, USD bn.



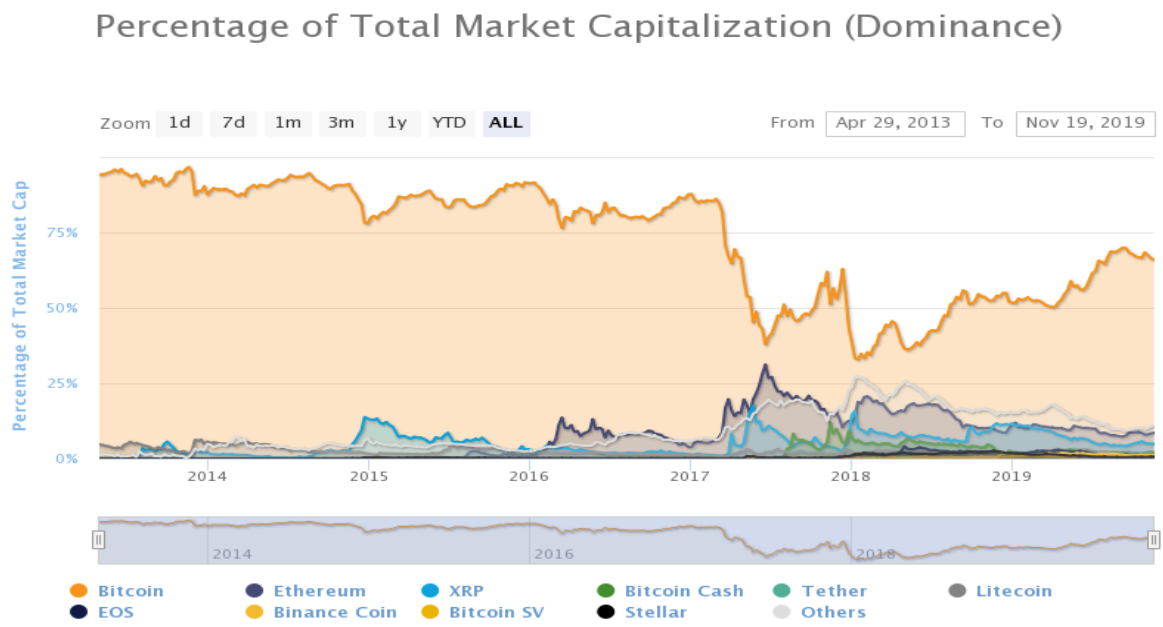
Source: Bluesky Capital, 2019.

But how does bitcoin, or all cryptos put together for that matter, stand against other more traditional financial assets and instruments? Moving from left to right in figure 4, we can see the crypto market in a global perspective. For instance, the whole crypto market, at about USD 200 bn., is worth double the personal fortune of the top five wealthiest individuals, at around USD 100 bn. each.[7] On the other hand, however, it amounts to less

[7] As of December 2019, this selected group of individuals includes Jeff Bezos (Amazon), Bill Gates

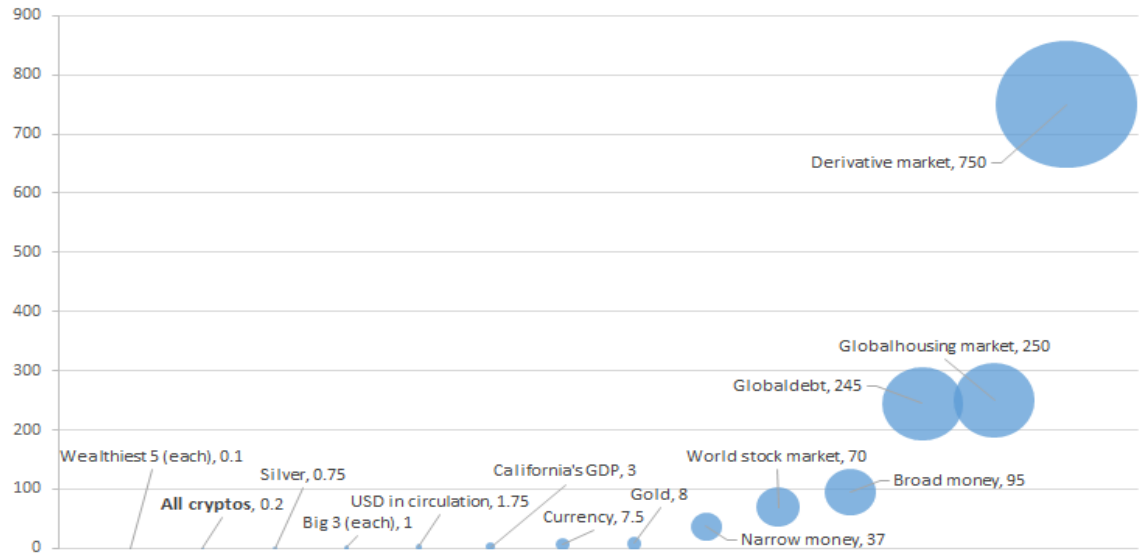
than a third the value of all above-ground silver stocks, around a fifth of each of the biggest three companies worldwide,[8] and a small fraction of all dollars in circulation (around 10%).

Figure 3: Market cap shares, major cryptos



Source: coinmarketcap.com, November 2019.

Figure 4: Crypto market cap in context, USD tn.



Source: various sources, rough estimates (2019).

(Microsoft), Bernard Arnault (LVMH), Warren Buffett (Berkshire Hathaway), and Mark Zuckerberg (Facebook).

[8] Microsoft, Amazon, and Apple, at around USD 1 tn. each.

Still farther to the right we can see how trivial the whole crypto market becomes as compared to such markets as gold (2.5%), the global stock market (around 0.3%), the global housing market (around 0.1%), and the seemingly unrelenting expanding derivative market (a trifling 0.03%). It is also worth mentioning how unimportant it looks when compared to global debt (around 0.1%), and money both narrowly and broadly defined (roughly 0.5% and 0.2%, respectively). In this respect, it is hard to see too much 'crypto interference' with monetary policy in the very short run (see the short note by Nelson, 2018, on this skepticism).

The previous evidence then raises the question of the real impact of all cryptos and blockchains on the global economy at large. Notwithstanding their potential, it is no exaggeration to say that, currently, the crypto world is a quantum leap short of having a major impact on society, especially in what concerns their role as media of exchange. There are still a few ongoing experiments worth mentioning, such as Tether (USDT) and Facebook's Libra, which have conscientiously strived in this direction from their beginnings.

In the case of Tether, for instance, it was originally designed by Tether Limited back in 2012 to always be equal to $1.00, by holding exactly $1.00 in reserves for each tether issued. This controversial crypto has so far failed to be successfully audited in what refers to its claimed backing reserves. Moreover, accusations have been thrown in relation to its alleged role in the manipulation of bitcoin in recent times. We do not think these setbacks are the death knell of this particular crypto—rather, we posit that the whole idea of a 'stablecoin' at this time of development seems a bit unsound.

The argument against Tether might go as follows: if cryptos are the natural reaction to monetary manipulation by a central authority, and as such, can be seen as a potential threat undermining these legal monopolies, why use the most traded (and arguably, one of the most manipulated) currency in the world? We submit that beyond the practical uses this crypto may have nowadays, mainly for its strong ties with the USD that make Tether a highly liquid crypto asset, it still misses the theoretical underpinnings of the genesis of money (as explained in the regression theorem above) and the potential genesis of cryptos as media of exchange. This will only come to happen when people start realizing about the many uses the Blockchain technology has to offer in many fields.

In the same vein, Libra's case, projected for release in 2020 after a few rudimentary experiments, seems to be lacking the same economic soundness with a few add-ons. First, its degree of dependency on the traditional financial and banking sectors will far exceed that of Tether, as Libra is expected to be backed by a basket of currencies and also by US Treasury securities. And second, having Facebook behind a currency might be tempting for a myriad of reasons, but it goes precisely against the spirit of a completely decentralized monetary policy, and thus, liable to manipulation and a strengthening of Facebook's monopolistic position—which might turn, under a state-backed crypto, into a legal monopoly, both

unsought and particularly harmful. Cryptos, if anything, work in the opposite direction, namely, the relentless undermining of traditional monetary policy and its legal monopoly.

Before turning our attention to monetary policy, and having discussed both the theoretical underpinnings of money and the current situation in the crypto sector, we now delve into a short account of bitcoin's price and the Blockchain's intrinsic use value. Beyond the speculative nature of crypto assets like bitcoin, there is their usefulness stemming from the decentralized nature of Blockchains, which can be employed to add value in multiple ways.

4 Price and (intrinsic) value

No doubt that price and value are two highly correlated and even interrelated concepts. However, they are not the same. Whereas the former is the direct and objective result of the interaction between demand and supply, the latter is more of a fleeting idea, and typically refers to the subjective and individual perceptions by different individuals. If anything, it will be value, among other things, which will give shape to demand and, hence, along with supply, to price in the aggregate.[9] But what is value when it comes to cryptos? Or, for that matter, what is value when it comes to money in general? In the end, what we are asking here is, what is the intrinsic value of money in general and of cryptos in particular, if any?

Let us further address these points. In the case of commodity moneys like gold and silver, intrinsic value comes from the commodity's use and its increasing marketability in time. In the case of fiat money (e.g. paper money), its value is arbitrarily determined by law. Finally, in the case of cryptos, their intrinsic values will be determined, if anything, like any other commodity money in the past. In a nutshell, their intrinsic values will depend on the population's understanding of the underlying technology, the Blockchain, or better yet, the different competing blockchains and their multiple uses.[10]

We thus contend, as others do (see Tucker, 2014, and Davidson and Block, 2015), that bitcoin's real value, and by extension that of other cryptos, stems from an understanding of the Blockchain technology. For example, bitcoin and the Blockchain are two inseparable sides of the same coin, with 'crypto money' on one side and the payment system network on the other. In the words of Tucker (2014) "the payment system is the source of value, while the accounting unit merely expresses that value in terms of price". However, such an ever-growing technology and the economics behind its rapid growth do pose a serious challenge for society at large, especially on account of its intangible nature and therefore on the difficulties in "getting the point across". Knowing the intrinsic features of the Blockchain can take time, but it is arguably the only enduring strategy for bitcoin and the crypto

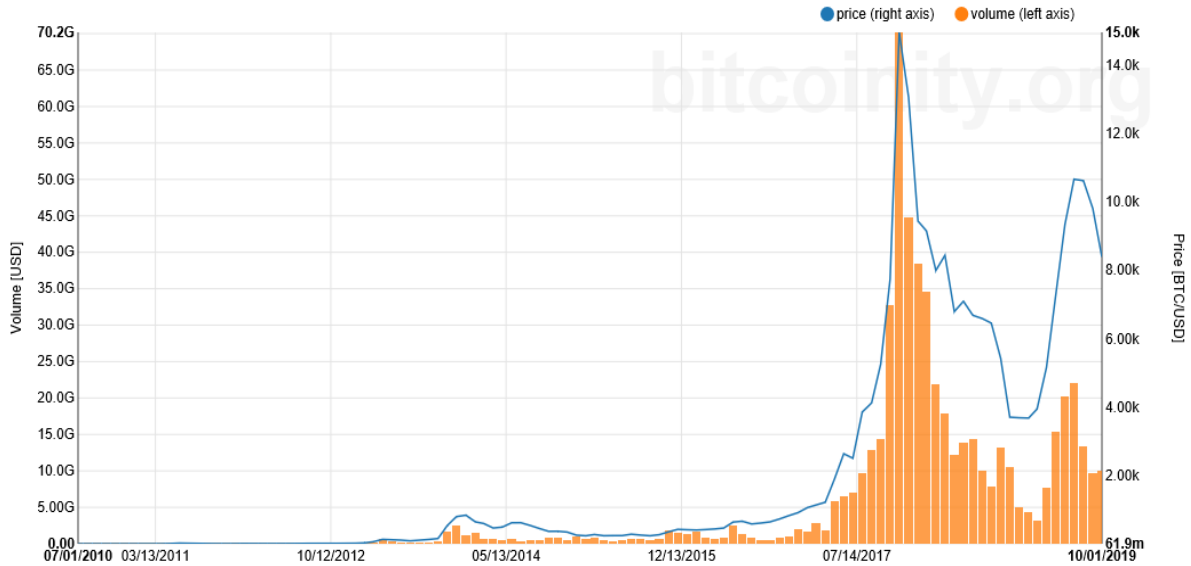
[9] Supply considerations will depend on whether we contend that bitcoin will trump all other cryptos or not, as different cryptos have different algorithms allowing for capped or uncapped supplies. In the case of bitcoin, supply will be capped at 21 million coins, to be reached by year 2,140 according to some estimates.

[10] This is generally referred to as 'use cases' in the crypto jargon.

community in general to transcend into money, just as gold and silver did in the past.

The price of bitcoin, then, can be a reference for our knowledge of the Blockchain, but it can also be the source of much speculation. Regardless, it is very unlikely that bitcoin's price will eventually hit zero (see Cheah and Fry, 2015, however), as new use cases for the Blockchain are found daily. Figure 5 shows the historical figures for price (right-hand axis) and traded volume (left-hand axis)—the latter as yet another proxy of the interest aroused by these new technologies. In particular, the correlation between these two is significantly high (0.88) during roughly the whole period since bitcoin's inception, although it has not been equally high for the whole period. For instance, the correlation was 0.96 until mid-2018, that is six months right after bitcoin's historical peak in December 2017, while the correlation has been 0.71 from that time on.

Figure 5: Bitcoin price and volume



Source: data.bitcoinity.org, November 2019, monthly basis.

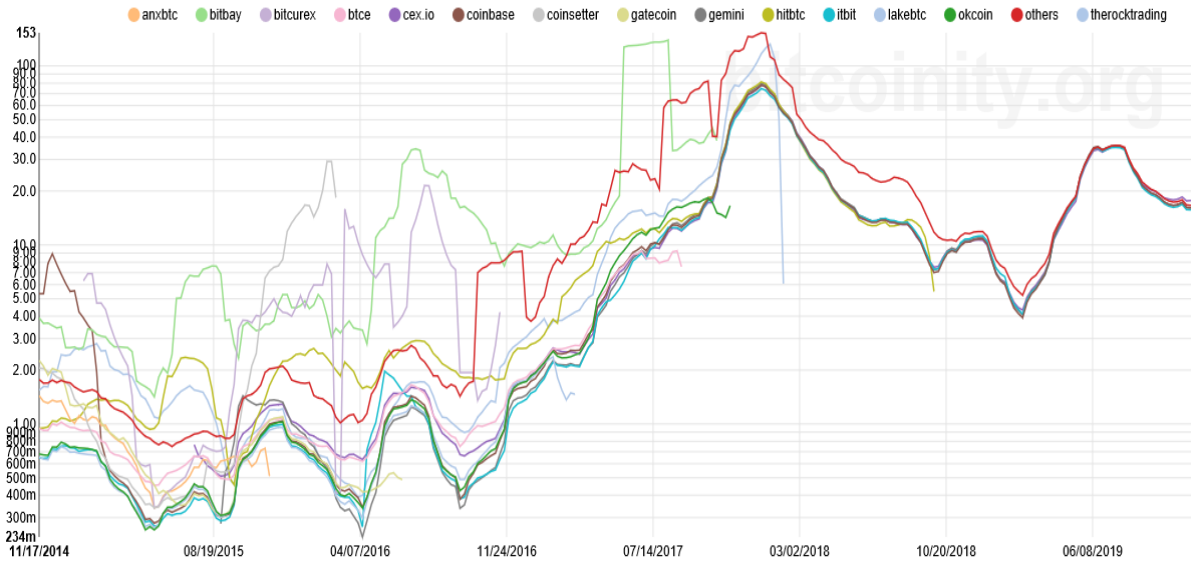
Price and volume becoming at least slightly disconnected might mean less speculation than in earlier times, as price is no longer driven by the number of exchanges but by more willingness to pay due to other factors.[11] We can only wonder whether a deeper understanding about bitcoin and cryptos in general, and especially about the Blockchain technology, might have recently led to less speculation and the resulting drop in traded volume and the change in prices. For instance, we do know that price volatility, as measured by the standard deviation from all market trades on major exchanges, seems to be heading on a downward trend in the past few years as shown in figure 6.

A reinforcing piece of evidence in line with less volatility in recent times comes from the number of trades per minute right after the 2017 peak. Figure 7 shows the tremendous

[11] A set of Granger tests (available on request) run on the two variables seems to suggests causality going from traded volume to price, and not the other way around.

plunge occurring in major exchanges around the world once the highly speculative bubble episode came to an abrupt end. Presumably, many so-called 'whales' (e.g. big crypto 'holders'[12] and investors) took advantage of the media buzz and started an speculative race with the following 'dumping' of cryptos once they reached an enticingly high price.[13] On a related note, recent findings have shown the increased efficiency of cryptos due to no significant momentum effects (Grobys and Sapkota, 2019) and high market liquidity (Wei, 2018).

Figure 6: Bitcoin price and volatility



Source: data.bitcoinity.org, November 2019, weekly basis.

As of 2019, according to coinmarketcap.com, there are approximately 850 working blockchains, providing the technological grounds for around 2,300 cryptos.[14] This might sound as a serious obstacle to any of these cryptos ever becoming a widely-used means of exchange, or perhaps not. If history is of any reference, then what is going on in the crypto ecosystem is no different from the decentralized and competitive market process that made gold, silver, and other such commodities, widely recognized media of exchange in the past.

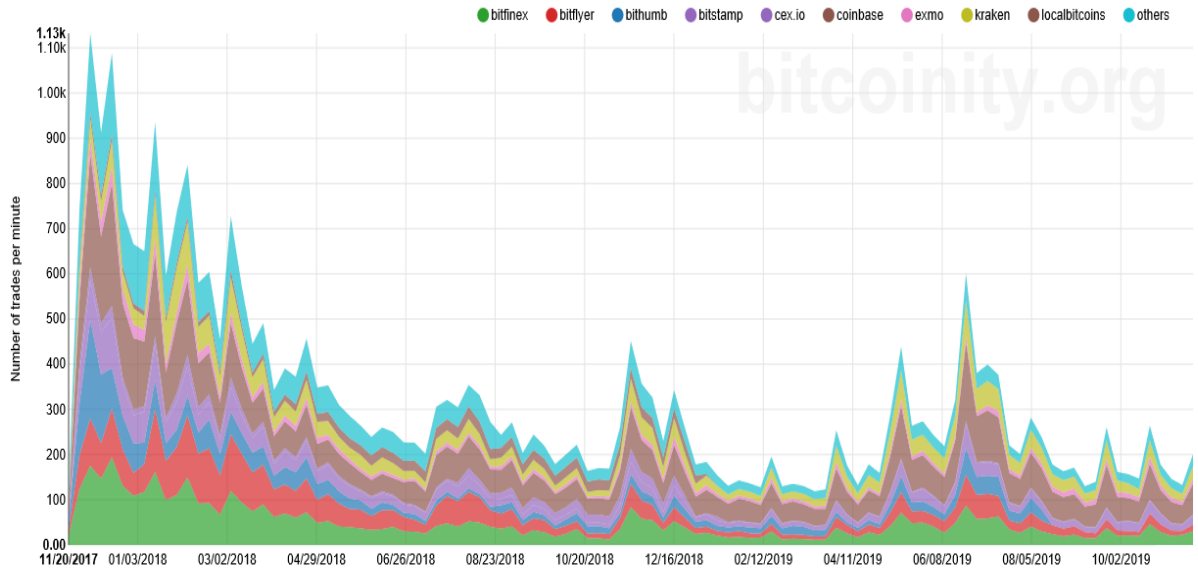
Arguably, the more people get to hear about the underlying technology allowing for all cryptos, that is the Blockchain, the more these cryptos will gain in the direction of becoming generalized media of exchange. Among the most promising uses the Blockchain can bring to the world economy are those related to business activities that can be easily decentralized—in other words, those activities where the existence of a central arbiter or authority can easily get by without.

[12] Or 'hodlers' in the crypto lingo.

[13] See, for instance, Gandal *et al.* (2018), for an account involving suspicious trading activity and price manipulation during bitcoin's early times.

[14] As of November 2019, the total listed by coinmarketcap.com is 2,355.

Figure 7: Bitcoin trades per minute



Source: data.bitcoinity.org, November 2019, weekly basis.

We should especially highlight those business activities involved in supply chain management and traceability, fundraising and ICOs, healthcare and medical history, notary services and fraud avoidance, food safety and contamination prevention, intellectual property and ownership record keeping, the energy market, real estate and transaction history, digital identity and privacy, and even voting and security. But let us now delve into the triggering cause that might have, in all likelihood, set in motion the crypto-Blockchain revolution some ten years ago.

5 Booms and busts cycles

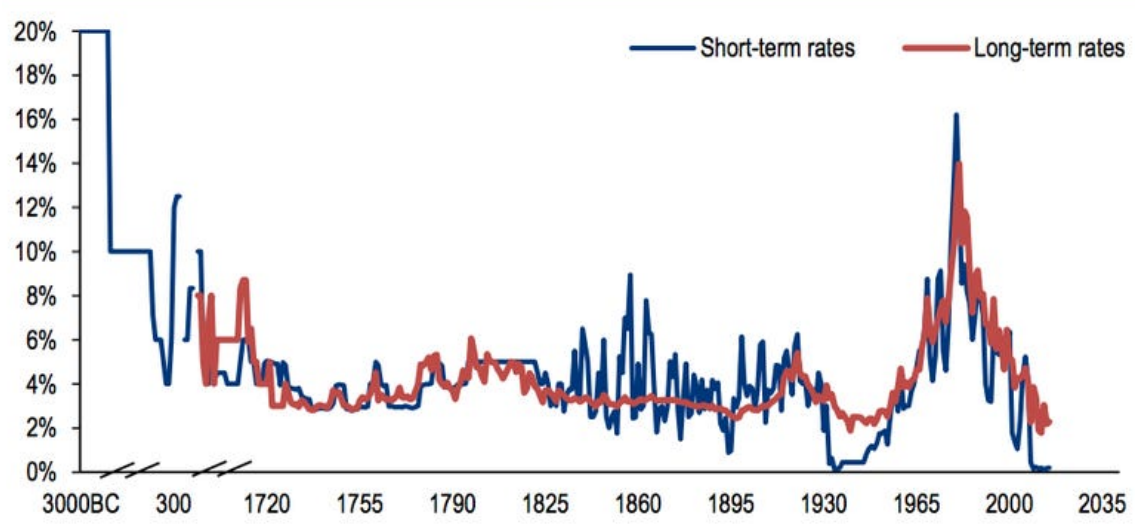
A plausible and not so far-fetched rationalization of bitcoin and its genesis can be found in the main tenets suggested by the Austrian business cycle theory.[15] In there, booms and busts cycles are set in motion by central banks keeping interest rates too low for too long by way of a monetary expansion—this in turn clears the way for higher asset and real estate prices that can lead to overall inflation. Low real interest rates, the argument goes, might divert resources into activities that would not have been targeted otherwise (e.g. housing), thus turning the situation into an artificial boom through what Austrians label 'malinvestment'.

An artificial boom will necessarily end with a hard landing bust, typically resulting from spiraling increases in house prices (e.g. housing bubble) combined with increases in home

[15] Austrian School references in relation to booms and busts cycles and monetary expansion are, most notably, Mises (1912), Hayek (1931), and Rothbard (1962), and more recently Huerta de Soto (1997). Other mainstream references echoing the Austrians' take on the recent crisis, but not necessarily in line with the more general Austrian view, can be found in Bordo and Landon-Lane (2013) and Calvo (2013), as well as the ones cited in the latter.

ownership and the corresponding unmet mortgage obligations. In line with the Austrian business cycle theory, a significant misallocation of resources is the natural result of very low (and even negative) real interest rates in recent times. Figure 8 shows the extremely low levels of the interest rate, even when seen in a long-range historical perspective.

Figure 8: Interest rate in history



Source: Bank of England, Global Financial Data, image by Bank of America Merrill Lynch.

The reverse side of the coin is showcased by the continuously depreciating trend in the purchasing power of major currencies, that fundamentally results from the unrestrained money printing in which central banks around the world have indulged into, especially during the last four decades. The debasing effect of the so-called quantitative easing can be seen in figure 9. For example, since the Fed's foundation back in 1913, the US dollar has lost more than 97% of its purchasing power—and this is not much different from what other major currencies have experienced as a result of money printing.

Take for instance the case of a major economy like Japan, which still is undergoing a slump of nearly three decades that a rather expansionary monetary policy has so far been unable to prevent. In particular, the central bank's balance sheet has swelled to more than 100 percent of the country's GDP, while government debt to GDP has risen to 236 percent and interest expenses amount to 22 percent of the budget—all this for stagnant real wages, a meager and dwindling growth, and possibly the worst growth prospects for 2020.[16]

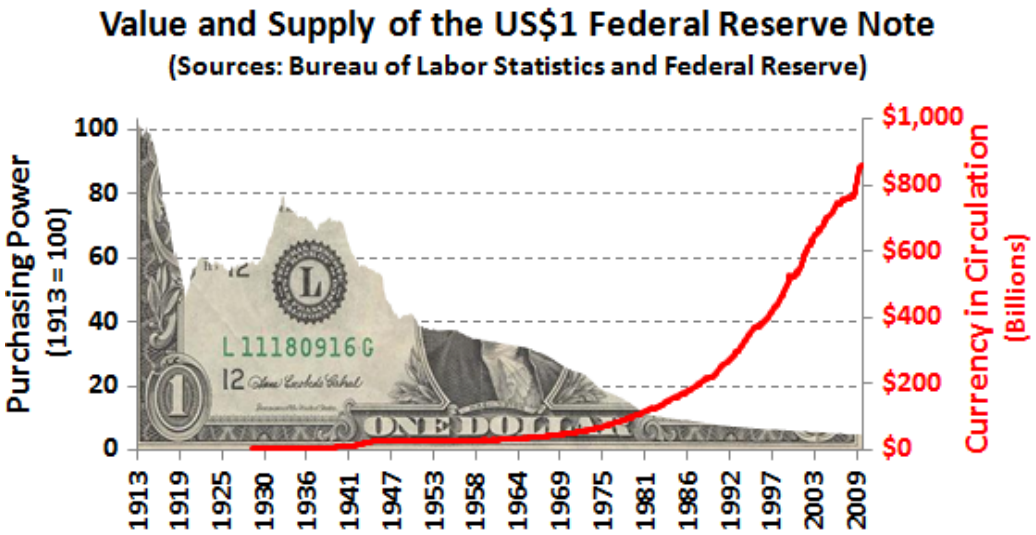
In the aftermath of the recent global recession of 2007–8, it is no surprise to see a surge in cryptos as a naive reaction to the prevailing consensus around money-supply manipulation.[17]

[16] See Daniel Lacalle's recent piece in *The Epoch Times*, from December 2, 2019, for a more comprehensive analysis.

[17] This proliferation in the number of cryptos can also be seen as a reaction to the first successful deployment of the bitcoin and its blockchain in 2009, after several decades of research.

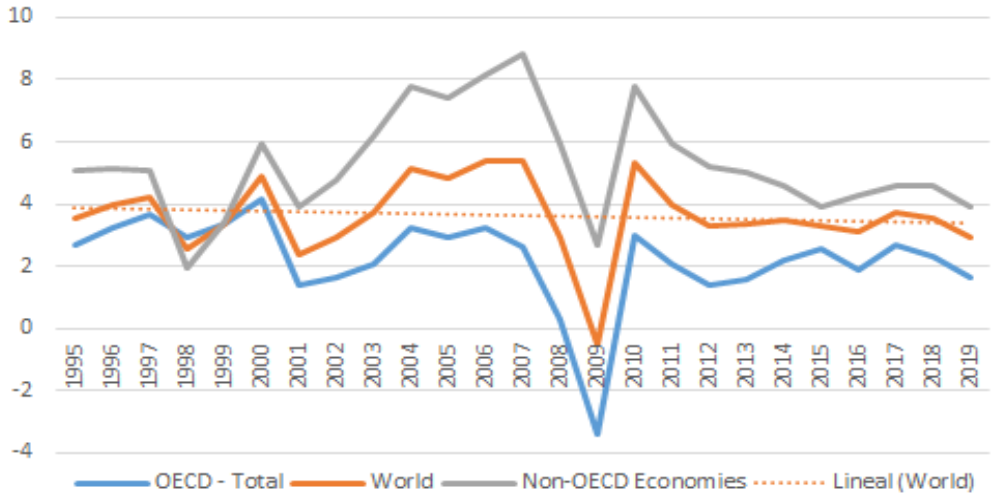
It is in the light of a relapse of the global economy into a sharp decline that cryptos can function as a counterbalancing check to a monetary policy that seems to be a bit out of sync with macroeconomic fundamentals and sound money. Figure 10 shows the downward trend in World GDP growth in recent times, which gives us an idea about the gloomy prospects waiting ahead.

Figure 9: Debasing effect of money printing



Note: image from dollardaze.org

Figure 10: Economic growth, a gloomy prospect



Source: own calculations based on OECD Economic Outlook 109 (2019).

6 Where are we headed?

Recent times have been witness to several financial, banking, debt, and currency crises. Government measures have proven to be ineffective in the best of possible scenarios, and more often than not, they have prevented a faster adjustment in the aftermath of crises by extending the boom-and-bust cycle referred to above. On the other hand, the myriad of cryptos springing up in the last ten years comes as a gust of fresh air that, deliberately or not, consciously or not, poses a potential undermining force to the central banks' long-held monopoly of money printing.

This leads to many questions, still unanswered, which will be certainly addressed in the coming years. More importantly, however, we suspect that if the crypto sector were to get some more traction and the Blockchain technology is given more media attention, then they might become functional for the maintenance of the checks and balances principle that so much good has brought to the free world—a principle that, in our view, has recently been eroded by central banks and a monetary policy that seems to be too much of a destabilizing factor.

In the context of an impending trade war between the US and other major economies like China and the EU, which is the natural result of a previous currency war started under a different administration,[18] cryptos can be held in higher esteem for their storage and privacy features. Notwithstanding their appeal and the unquestionable potential of the Blockchain technology, we are not yet dealing with a generalized medium of exchange—in other words, cryptos are not money proper, not yet. If cryptos brought something into the limelight it is the extreme inefficiency of so-called discretionary monetary measures, and along with it, the pervading idea that the future is open and the currency race is yet to be decided.

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