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World monies or money-worlds: A new perspective on cryptocurrencies and their moneyness

Adam Hayes
Hebrew University, Israel

Abstract

This essay makes the case that current debates about the 'moneyness' of Bitcoin and other cryptocurrencies are occurring at the incorrect scale. Rather than being some form of trans-national digital money to be used alongside or compete with national fiat currencies, I argue that, instead, each cryptocurrency represents its own self-contained 'money-world'. Put differently, a cryptocurrency is the uniquely specified unit of account and medium of exchange within the socio-technical bounds of its own blockchain. This new perspective can open new lines of intellectual dialogue and inform better policy choices for regulating cryptocurrencies.

Keywords

Bitcoin, cryptocurrency, money, blockchain

Introduction

Since its launch in 2009, the question of whether Bitcoin is, in fact, *money* (as well as other related cryptocurrencies) – either in terms of theory or practice – has been rehashed in the scholarly literature, the financial press, and across social media. The result has been a sort of entrenchment in two opposing camps: those who subscribe to the notion that not only is Bitcoin money, but it is the purest iteration of so-called 'hard money' (especially vis-à-vis money issued by fiat) (e.g., Ammous, 2018), and those who believe that not only is Bitcoin useless as money, it is essentially worthless (e.g., Yermack, 2015). Despite these contrary views, debates that addressed this issue in the decade following the advent of Bitcoin now seem to have largely moved on from the vexed 'money question'. So why revisit it? I do so in order to reframe the scope, conditions, and analytic scale of the question of, 'is Bitcoin money', and to open up new lines of intellectual dialogue and inform better policy choices for regulating cryptocurrencies.

Corresponding author:
Department of Sociology and Anthropology, The Hebrew University of Jerusalem, Mt. Scopus, Jerusalem 91905, Israel. Email: Adam.Hayes@mail.huji.ac.il. https://doi.org/10.2218/finsoc.v7i2.6629

I start by challenging the claim that Bitcoin and the cryptocurrencies that followed it are a form of digital 'world money', able to circulate freely around the globe, transcending the geopolitical and economic borders of nation states and their central banks (Ammous, 2018; Ciaian and Rajcaniova, 2016; Duque, 2020; Scharding, 2019; Seetharaman, et al., 2017). While Bitcoin and several of its predecessors have certainly garnered international attention, amassing a collective market value in excess of one trillion dollars, very few commercial or retail transactions occur using cryptocurrencies. And when they do, these digital tokens are often promptly converted into local currencies by merchants that would not want exposure to the volatility of the exchange rate risk witnessed over the past several years (Tasca et al., 2018). Person-to-person cross-border payments have still not materialised to any larger degree, with global payments company Adyen CEO, Pieter van der Does, telling financial news outlet CNBC in 2021 that it had no plans to add crypto payment methods and explaining that the volatility of cryptocurrencies, such as bitcoin, made it "more of an investment asset than a payment method" (see also Maurer et al., 2013; Swartz, 2018; Zimmer, 2017).[1]

If Bitcoin et al. are supposed to be global internet money, they are certainly not used as such. Instead, 'crypto' is mostly put to use as a speculative plaything or non-correlated asset that makes up an 'alternative investments' segment and expands the universe of assets available to a well-diversified portfolio. Of course, some early adopters have embraced an indeterminable buy-and-hold-forever strategy (known as 'HODLing' after a typo of 'holding' famously went viral among the Bitcoin community). But once again, money as we know it is not being used in this way either. Ordinary people do not usually hoard money, they spend it – with household savings rates across much of the developed world hovering at around 5%.[2] And, if people do have more money on hand than consumption demands, they tend to invest or lend it out, either directly or indirectly via bank deposits or fixed-income securities. Thus, money narrowly construed as a utilitarian medium of exchange requires that it be used for transacting. In this respect, Bitcoin falls short.

Abstracting beyond money's obvious use as a mode of exchange, thinkers going back to Simmel as well as more contemporary social scientists, like Maurer (2006), Graeber (2011), and Ingham (2004), grant theoretical primacy to money's function as 'unit of account' (or *numeraire*). If people agree to price things in dollars or euros, then those symbolic labels become the standard units of measure by which whatever the medium of exchange is transmits value. It is by virtue of having a 'euro' unit that there can be a euro banknote. Indeed, euros as functional *numeraire* predate the minting of actual currency by several years across the Eurozone in anticipation of the widespread switch (Zhao et al., 2008). As Simmel claimed (2004 [1900]), "the value of things is pure abstraction". Since consumer and commercial goods are not *generally and exclusively* priced in Bitcoins (nor any other cryptocurrency), they do not constitute a socially recognised and standard unit of account; hence these cannot be world 'money', if the nature of money arises from its function as unit of account (see Graeber, 2011; Ingham, 2004; Wray, 1998).

But perhaps people have been thinking about the moneyness of cryptocurrencies at entirely the wrong scale and scope. We must look to forms of social organization where cryptocurrencies *do* exist as the unit of account (and then by extension as medium of exchange). Rather than seeing Bitcoin and other cryptocurrencies as transnational world monies, they could instead be understood more properly as self-contained 'money worlds'.[3] Bitcoin could be money within the socio-technological bounds of the Bitcoin blockchain, as are other cryptocurrencies bound by their own blockchain. All economic activity carried out within these virtual spaces (albeit rudimentary in many cases) is priced in the unit of that blockchain; Bitcoin miners confirm and validate transactions and are remunerated in newly-minted

bitcoins (units denoted as BTC) (Nakamoto, 2008). Transactors who exchange digital tokens with one another internally across the Bitcoin network do so exclusively in BTC units (it cannot transmit dollars, etc.) and moreover pay miners transaction fees priced exclusively in BTC for their validation services. It is a simple one-commodity economy where everything is priced exclusively in BTC and where bitcoins are also the sole medium of exchange. It is, at present, the only place where bitcoin is the money of the land.

Using this perspective, we can better appreciate the unique economic topographies decentralised cryptocurrency systems seem to enjoy as well as the potential that such systems have in shaping economic activity in the future. In this way, Bitcoins and other cryptocurrencies do not so much compete with dollars or euros (and their associated central banks) on their turf, but instead sit alongside them as new entrants in foreign exchange – as autonomous money – worlds with their own unique economies, comparative advantages, and local currencies. This perspective also sidesteps debates around whether or how cryptocurrencies have (intrinsic) value (Bjerg, 2016; Dodd, 2018; Hayes, 2019; Yermack, 2015), whether it derives from its cost of money similar to commodity money or as a fiat claim digitally decreed by an algorithm, or whether it has any stand-alone value at all, is somewhat immaterial to the argument. All that is necessary is for a cryptocurrency system to maintain a uniquely specified unit of account on its own terms (global currencies market can reveal their perceived value, just as sovereign currency pairs do today, e.g., USD/EUR). This view is also compatible with both sides of the original moneyness debate: Bitcoin can be the purest and hardest money there is for blockchain denizens and simultaneously impractical for exchange among populations.

Identifying money-worlds

Consider the popular board game, *Monopoly*. Is Monopoly money, money? At first glance, the answer appears obvious that it is not. However, upon closer inspection, the true answer is *it depends*. Superficially, an official US dollar bill and a $1 Monopoly note are nearly identical in that they are small rectangular pieces of paper with denominations and other symbols printed on either side. Yet, if you went to a restaurant and attempted to settle the tab with Monopoly money, it will generate amused looks and it certainly would not be accepted in exchange. In restaurants, goods are priced in American dollars (food items for sale as well as employee salaries and tips, bills and expenses, supplies, etc.). And so, unless the money-thing used in exchange signifies and transmits that unit of account, it is no good.

But there is a locus where things *are* priced in Monopoly money – within the socio-technical boundaries of a game of Monopoly in play. Two to four players sit around a cardboard square and earn or spend *$M* by completing moves in the game. If a player lands on an available space that represents a fictional property, they can use *$M* to purchase it, but only if they have enough saved up to do so. If they happen to land on a space already owned by another player, they must pay 'rent' in *$M* to that player. If a player runs out of money, they are *bankrupt*, and it is game over for them. Try opening up your wallet and offer to pay for an expensive property with 'real' dollars or try to use 'real' money to buy your way back into the game after you have gone bankrupt and you will be accused of cheating. US dollars are no good inside of a game of Monopoly! The social norms and technical rules that define an instance of the game establish a local unit of account that lends moneyness to *$M* inside the game itself.

Thus, I identify a money-world as any bounded social and technical space where a uniquely specified money exists as both unit of account and medium of exchange.[4] Nation

states are prominent examples of such; it is not possible to purchase food at a restaurant in Europe or America with Japanese Yen. Table games like monopoly, but also video games that introduce internal economies with their own self-ascribed units, are another. Systems of company script are yet another. How can disparate money-worlds be compared? What matters most for this view is the fundamental usefulness of a token *within* its money-world, rather than its value or usefulness across or between them. In some cases, such comparisons are neither practical nor compatible; but in others, foreign exchange markets serve as the clearinghouse for reconciling currencies with one another.

Cryptocurrencies as money-worlds

Within the socio-technological boundaries of Bitcoin's blockchain, items are priced in bitcoins. Indeed, the entire Bitcoin 'mining' process, which is necessary to achieve secure, decentralised consensus, is incentivised by the prospect of receiving payment in bitcoins. So-called miners are pieces of hardware that do validation work on the Bitcoin blockchain and are compensated accordingly for that computational labor that is paid in (and only in) units of its native token. Bitcoin is undoubtedly the unit of account *inside* the Bitcoin blockchain, bounded by the economic activity taking place within that blockchain, whatever that may be. The Bitcoin system, composed of a secure ledger (i.e., *blockchain*), the mining process, and the native token make up essentially a simple single-commodity economy, where the only thing produced are more bitcoins.

Imagine that two digital denizens in some way inhabit the Bitcoin blockchain: Alice and Bob. Of course, a real human being cannot occupy the cyberspace formed by the Bitcoin protocol and network but let us instead think of these denizens as nodes in the network or scripts (elementary software programs) that run on and between these nodes. If Alice ever needs anything from Bob (e.g., computational processing for a checksum or to validate some call in another script), they will price their services rendered in BTC and exchange bitcoins peer-to-peer with one another.

Consider a more dynamic example of a blockchain that has arguably far more 'economic activity' taking place within its boundaries: *Ethereum*. Ethereum is presently the second largest and second most valuable blockchain after Bitcoin.[5] It was designed to create and run decentralised 'smart contracts', self-executing lines of computer code that are validated and processed by its mining network (Luu et al., 2016; Norta, 2015). Miners accordingly are paid in the system's native tokens called *ether* (ETH) in return for their computational labor (in very much the same way as with the Bitcoin miners). The key difference is that the introduction of smart contracts expands the economy well beyond that of a single good. So, while ETH is still the unit of account for the miners, all sorts of *other* transactions involving various digital goods and services that are not ether tokens also take place within the Ethereum network, each of which is still priced in and paid for using ETH.

According to its creators, Ethereum can be used to "codify, decentralise, secure and trade just about anything" (Buterin, 2015). To understand this sort of economy and the types of transactions that occur within it, it is helpful to briefly describe what smart contracts are in greater detail and provide a basic understanding of how they work. Since blockchains exist within computer networks, layers of code can naturally be added as small programs (scripts) that direct entries into the ledger one way or another depending on the script's logic and a set of contingencies. For instance, a script may order *A pays B, X units if Y occurs*. Known as smart contracts (Luu et al., 2016), these self-executing programs can be constructed in the manner of an actual contract (DeFilippi and Wright, 2018). There is no need for persons A and

B to sign a written document, and crucially there is no need to establish an institutional framework to monitor and enforce such a contract because the contract will be executed automatically (or not) depending on whether the terms of the script are met. A smart contract can thus be constructed as anything from a wager to a financial contract (such as a bond or call option) to an employment agreement (Hayes, 2019: 64).

Ethereum is a platform built explicitly for creating and applying such smart contracts, where the nodes in its mining network act collectively as a 'virtual machine' that validates and executes the instructions therein. Each node in the Ethereum virtual machine (EVM) evaluates in parallel the code for every smart contract and then reaches a consensus regarding the outcome of that contract based on proof-of-work and then executes it accordingly (Buterin, 2015). Processing these lines of code is computationally expensive since every node must evaluate each smart contract in sequential order. The system uses ETH to allocate the scarce resource that is the processing power of the EVM itself. Those seeking to use a smart contract must *pay for* the network's services by attaching some amount of ether to the contract. The more computationally intensive, the more ether must be paid. Similarly, as many smart contracts await evaluation by the EVM, more ether can be attached to a particular contract to advance its place in the queue. Thus, ether serves as the uniquely specified unit of account within the bounds of this socio-technical system as well as the medium of exchange. As soon as ether crosses that boundary, it is no longer recognised as such and must be translated (exchanged) into something else, such as euros (Hayes, 2019: 67-68).

Let us consider a more concrete example that utilises smart contracts to concoct a novel form of virtual property that solely exists and can only be exchanged within Ethereum's economic borders. *CryptoKitties* is a virtual trading card game established in 2017 where players collect, 'breed', buy, and sell different types of virtual cartoon cats on the Ethereum blockchain.[6] By virtue of existing on a blockchain, players can be sure that the virtual cats they own are unique and that property rights have been assigned to their sole and true owner. Moreover, the trading of *kitties* back and forth is valued in ETH units. Users can even earn additional ETH by putting kitties up for 'sire', where another player can pay to breed with a specific cat in order to produce unique kitties that may contain rare or valuable traits (called 'cattributes') in the eyes of other players (Serada, et al. 2020). This may all sound a bit like nonsense but there have already been several transactions involving CryptoKitties valued (in ETH terms) at equivalently more than US $140,000 apiece at the time of sale (Mala, 2018).

CryptoKitties provides but one empirical example that can be generalised to include all sorts of other economic activity that is wholly bounded by the Ethereum blockchain, where virtual property (i.e., 'kitties') and services (i.e. 'siring') use ETH as the socially recognised unit of account and medium of exchange. As Serada et al. (2020) point out, "CryptoKitties are valued and traded in ETH, and their principal market characteristics are shaped by the Ethereum platform".

Exchange between money-worlds

Bitcoin can therefore be construed as money but only inside of the money-world that is its blockchain, and Ether can also be construed as money but only inside of *its* own blockchain. Instead of understanding each cryptocurrency competing with one another to become a dominant world-money used around the globe for transacting in real national economies, we can instead consider each blockchain as its own unique and delimited economy. These systems are often optimised for particular sorts of economic activity with each blockchain-based cryptocurrency system lending itself to different types of users or for specific purposes.

Ethereum lends itself to the creation of smart contract-based property, compared to the *Namecoin* blockchain, for instance, which was created to serve as a decentralised domain-name registry (DNS) for internet addresses or *Storj*, a blockchain inaugurated for peer-to-peer file sharing and media streaming. Each blockchain has a unique specialization, a proprietary mining network, and native tokens (cryptocurrency) used as medium of exchange and unit of account. To download shared files on Storj, you will need to use Storj tokens, etc.

We can also begin to imagine 'cross-border' trade taking place *between* these systems, with various comparative advantages resulting in increased wealth across several blockchains. Indeed, the recent advent of so-called 'atomic swaps' allows for cross-chain interoperability and direct exchange between tokens of different blockchains, including non-monetary digital tokens (Miraz and Donald, 2019). This suggests that one could swap a *CryptoKitty* for a streaming movie rental, where the exchange rate between the two would vary based upon the relative conditions and advantages of both blockchains, just as Britain and Portugal were purported to have swapped wine for cloth at various ratios in Ricardo's (1891) analysis of international trade.[7] This, of course, may appear as an apples-to-oranges comparison, cross-blockchain exchanges being relatively negligible compared to the scale of international commerce. Again, this is a matter of resolving scope and scale.

The types of economic activity and the economic agents involved in blockchain-inscribed money-worlds will often not be human beings but 'things' (algorithms, gadgets, peripherals, smart devices, autonomous vehicles, and so on). The so-called 'internet of things' (IoT) is already becoming a reality with the development of smart homes and smart cities. When we envision a world where driverless cars are ubiquitous and must negotiate the flow of traffic entering and exiting congested highways, one solution that has been proposed is to allow autonomous vehicles to enter into real-time micro-auctions to bid for their place in the onramp queue (James et al., 2018; Smith, 2020). The winning bid from such auction would be merely a fraction of one cent, far too small to be worthwhile for traditional auctions but completely feasible via a traffic-specific cryptocurrency system that could interact directly with the cars' onboard computers.[8] As Lupton (2020: 10) argues, "social research needs to extend beyond the limited geographical range on which it [IoT scholarship] has focused thus far and on the rapidly growing uses and domains of IoT technologies".

Indeed, the concept of blockchain money-worlds allows for a re-thinking of economic geographies that transcend three-dimensional space and human perceptions of time. Micropayments are one such example. These involve sub-penny transfers carried out on the order of microseconds online to pay for computational and network resources but which do not make much sense for human beings. If somebody appears short a few cents to pay for an item, a store owner or clerk will simply write that small amount off, as it is effectively negligible. Amounts involving just a fraction of one cent are even less comprehensible for the mind. Szabo (1999), for instance, explains that the mental costs associated with micropayments usually exceed, even dwarf, computational costs. Human beings tend to fall back on social norms or conventions rather than engage in micropayments, such as giving another driver the right of way in lieu of charging them two-tenths of a cent in order to let them pass. While it may be overly taxing for an individual to keep account of a plethora of minute ledger entries, machines do not care, and micropayments enacted via blockchain-based smart contracts can maintain such a ledger with ease using their own native cryptocurrencies regardless of the amounts involved.

In some ways, the money-worlds concept appears to engage with Hayek's (1978) view of the denationalization of money into a free market for private currencies. These monies would have been issued by fiat through private corporations (mainly banks) and by process of

competition would result in a highly efficient monetary system where only stable currencies would co-exist (Hayek, 1978; Mikolajewicz-Wozniak and Scheibe, 2015). Rather than viewing the market for cryptocurrencies in such a manner, cryptocurrencies come to represent the economic activity that occurs within them, and not as some interchangeable monetary instrument. Put differently, Bitcoin is not money put into competition because people can choose to use it in place of dollars but because it is the uniquely specified unit of account and medium of exchange inside of the Bitcoin blockchain or perhaps as a sort of reserve cryptocurrency or universal settlement layer for other cryptocurrencies.

The moneyness of stablecoins and central-bank backed digital currencies

Before concluding, it is useful to frame the money-worlds argument in relation to new forms of digital currencies that are emerging but which are denominated in an external unit of account. These largely take on two forms: Stablecoins and central-bank-issued cryptocurrencies. Stablecoins are blockchain-based tokens that are pegged to the value of some external reference currency, such as US dollars or the dollar price of an ounce of gold (Lyons and Viswanath-Natraj, 2020). The stablecoin *Tether*, for instance, is pegged to the US dollar but, just like Bitcoin is issued onto a decentralised blockchain, transactions occurring in Tether are confirmed by its network of miners. Like 'dollarised' economies (e.g., Ecuador, which uses the US dollar), these blockchains do not maintain a unique unit of account. As a result, stablecoins like Tether simply become a complementary or parallel digital medium of exchange to US dollars. They are in effect US dollar tokens redeemable for dollars on demand, just as cheques drawn from a bank account in dollars are used to transmit that unit of account without actually existing as money.

It is because stablecoins are effectively an unsanctioned medium of exchange used to transmit some nation state's unit of account (e.g., US dollars) that this class of cryptocurrency is a more direct threat to existing fiat regimes. Indeed, the widespread use of stablecoins can undermine a central bank's autonomy in controlling its money supply and represent an encroachment into a recognized money world. While federal authorities in the United States have largely let individual state courts hash out the legal status of Bitcoin (et al.) as money, asset, or otherwise, in July of 2021, treasury secretary Janet Yellen pressed financial regulators to accelerate the adoption of new rules to police stablecoins in particular.[9]

Central-bank-backed digital currencies (CBDCs), on the other hand, involve national central banks that employ similar technology as Bitcoin, but on a permissioned basis, to issue official fiat money via digital media of exchange into citizens' mobile wallets. Like stablecoins, these tokens are already endowed with a unit of account. Unlike stablecoins, which are proxies for that unit of account in exchange, a CBDC would be an authorised unit of national currency and legal tender in that country. Thus, neither a stablecoin nor a CBDC would constitute a new or separate money-world. Rather, they should be understood as disruptions to or innovations within existing ones.

Conclusion

The question of whether cryptocurrencies are money may have been engaged at the wrong level of analysis. Rather than being transnational world-monies, cryptocurrencies can be thought of instead as self-contained money-worlds where these digital tokens function as the sole unit of account and medium of exchange bounded by the blockchain that they exist

within. This view can serve to inspire new avenues of future research and theorizing, along with a novel set of implications for regulators.

If we think of cryptocurrencies as unit of account and medium of exchange wholly confined by a particular socio-technical space, then what does it mean to be an owner or holder of cryptocurrencies? What does it mean to earn them or spend them inside of these spaces? Where do the boundaries between money-worlds and the 'real' economy intersect and blue (e.g., on darknet black markets where items are often denominated in cryptocurrency units)? How does the paradigm of money-worlds hold up or change if and when cryptocurrencies do become more useful and ubiquitous in cross-national exchange?

Finally, how might policymakers adjust their view of cryptocurrencies if they are no longer construed as an economic threat to monetary sovereignty or monetary control within a nation? Could the equivalent of tariffs or other trade barriers instead be erected to moderate the influence of blockchain economies on domestic economies? Or, would the equivalent of free trade agreements be struck between national governments and blockchain-based actors? These questions provoke the need for greater inquiry.

Notes

1. <https://www.cnbc.com/2021/02/11/adyen-says-it-has-no-interest-in-bitcoin-as-a-payment-method.html/>.
2. <https://data.oecd.org/hha/household-savings.htm/>.
3. This is not to be confused with the 'money worlds' concept put forth by Tatzel (2002: 103-104), who used the term to describe an individual's "attitudes toward money, material values, and price-related behaviors [that] encompass, respectively, the cognitive, motivational, and behavioral aspects of how money functions in the consumption experience".
4. Of course, these boundaries can be more or less porous and malleable. Monopoly money is only useful inside a game of Monopoly, while Yen are still useful in international trade with Japan or in exchange via forex markets.
5. <https://coinmarketcap.com/>.
6. <https://www.cryptokitties.co/blog/post/when-you-purchase-a-cryptokitty-you-get-both-the-kitty-and-its-art/>.
7. Today, most international trade among nation states relies on some reserve currency to reconcile the myriad transactions that occur among and between different nations. That reserve currency has been the US dollar over the past decades; but in the cryptocurrency space, Bitcoin may be thought to fill this role. Bitcoin is the most traded cryptocurrency versus national fiat monies, as well as the most common and liquid currency pair between different cryptocurrencies. So, returning to the conception of Bitcoin as a single-good economy, it does seem that bitcoin tokens fill more than a simple self-serving speculative purpose: that of reserve currency to the entirety of the various money-worlds by providing a standard reference unit of account and settlement layer.
8. These micro-auctions are thought to be highly efficient for machines but not for human beings who cannot comprehend the economic value of tiny fractions of a cent, and for whom it would be far too costly in 'transaction costs' to enter into such an auction. Humans instead rely on social norms (e.g., 'rules of the road') and legal frameworks (speed limits, etc.), which tend to be ill-suited for machines.
9. <https://www.bloomberg.com/news/articles/2021-07-19/yellen-tells-regulators-to-act-quickly-on-stablecoin-rules/>.

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