

Bitcoin's value proposition: shorting expansionary monetary policies

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Abstract

Purpose – Professionals and academics alike hold polarized opinions about Bitcoin's purpose and its fundamental value. This paper aims to describe Bitcoin's unique features that make it such an intriguing asset and proposes a new way to consider Bitcoin and its underlying value.

Design/methodology/approach – In this paper the author discusses Bitcoin's defining features that make it a unique asset. The author argues that Bitcoin should not be considered as a single purpose asset only, but rather as a new digital financial asset serving several functions, at least partially. The author discusses the role of Bitcoin in the traditional financial system, contrasts Bitcoin to gold, considers the implications of the continuance of expansionary policies on Bitcoin and discusses the impact of the emergence of cryptocurrencies as a new asset class on public policies.

Findings – In addition to functioning as a means of payment (at least partially) and a diversification tool, part of Bitcoin's value proposition stems from its worth as a short position on modern expansionary monetary policies. Indeed, Bitcoin's value should rise if expansionary monetary policies are maintained, amounting to a tool to short these policies, which should be considered in future attempts to value Bitcoin.

Originality/value – The author adds a new layer to the ongoing thought process by arguing of a function played by Bitcoin unaccounted for thus far by the literature. Additionally, the author describes the features and mechanisms, allowing Bitcoin to play that role.

Keywords Bitcoin, Monetary policy, Cryptocurrency, Expansionary policies

Paper type Research paper

1. Introduction

After exploding to new highs (past US\$50,000 at the time of writing) and generating increasing institutional adoption, Bitcoin has dominated the news cycle. Despite this newfound attention, professionals and academics alike have expressed polarized opinions about Bitcoin. Past literature has investigated Bitcoin's suitability as a means of payment, its usefulness as a diversification tool and its performance as a speculative asset. However, there is still a wide range of opinions about Bitcoin's purpose and fundamental value.

In this paper, I argue that Bitcoin should not be considered as a single-purpose asset only, but rather as a new digital financial asset serving several functions at least partially. I contribute to the literature showing that one of these functions is to be used as a tool to bet against modern expansionary monetary policies, a view unaccounted for thus far. This potential use is an integral part of Bitcoin's value proposition, which should be considered by investors and researchers alike when attempting to value Bitcoin. To lay the groundwork for my argument, I discuss Bitcoin's key features, analyze the impact of the emergence of cryptocurrencies on legacy financial systems, contrast Bitcoin to gold, then proceed to detail Bitcoin's utilization as a tool to short expansionary monetary policies.

Early studies debated Bitcoin's usefulness, describing it as a mostly speculative asset as opposed to a potential currency (Glaser *et al.*, 2014; Yermack, 2015; Baur *et al.*, 2018a, 2018b;



Geuder *et al.*, 2019), with a limited to non-existent fundamental value (Kristoufek, 2013; Cheah and Fry, 2015). Perceptions of Bitcoin have evolved over time as blockchain technology became mainstream. After failing to find evidence of even weak-form efficiency over the first few years following Bitcoin's inception, recent literature shows that Bitcoin is becoming more efficient (Urquhart, 2016; Nadarajah and Chu, 2017; Tiwari *et al.*, 2018; Kinateder and Papavassiliou, 2021). Since then, studies have proposed to use Bitcoin's technical properties and marginal cost of production to determine its fundamental value (Dwyer, 2015; Pagnotta and Buraschi, 2018; Hayes, 2019).

After switching from an alternative currency to a speculative investment, the narrative progressively shifted toward considering Bitcoin as a store of value comparable to gold. Despite several studies attempting to address the question, there is still no consensus about how to classify Bitcoin. Dyhrberg (2016a, 2016b) considers Bitcoin as a hybrid of commodity currency (gold) and fiat currency (fiat). She argues that Bitcoin is a good hedge against equities and the dollar, and as such presents gold like hedging properties, allowing investors to hedge against market risk. In a follow-up study, Baur *et al.* (2018a, 2018b) disagree and argue that Bitcoin's characteristics are distinct from that of both gold and the dollar. More recently, Schilling and Uhlig (2019) describe Bitcoin as an intrinsically worthless medium of exchange that cannot be manipulated by central authorities.

Other studies proposed unique approaches to Bitcoin. Selgin (2015) makes the case for Bitcoin to be considered a “synthetic commodities money,” a new classification that combines the features of the traditional commodity-based monies and fiat monies. Kristoufek (2015) concludes that Bitcoin is a unique asset because it possesses characteristics of both a standard financial asset and a speculative one. Klein *et al.* (2018) observe that Bitcoin does not share any properties of gold and conclude that Bitcoin behaves unlike any other asset from an econometric perspective.

Bitcoin's meteoric rise – that some still maintain lacks any fundamental value – stands in direct contradiction with many early predictions of total collapse and mean reversion back to zero. The wide range of analyses of Bitcoin is not exclusive to academia (see *Figure 1* for a graphical representation), as several prominent public personalities and *Wall Street* figures have shared their opinion on the Bitcoin phenomenon in the financial press.

On the one hand, household names like Warren Buffet, Peter Schiff and Ray Dalio have voiced concerns about Bitcoin, which appear to be at least partially shared by professionals in an industry whose bread and butter is fundamental analysis [1]. On other hand, Paul Tudor Jones and Stanley Druckenmiller recently got on the Bitcoin action, albeit for speculative purposes [2]. Recently, Tesla's acquisition of US\$1.5bn worth of Bitcoins coupled with Elon Musk's public optimism about the future of cryptocurrencies presented a stark contrast with the more conservative views and might open the door for more institutional interest [3].

The wide range of opinions about Bitcoin coupled with its wild price swings begs the question of its true value. Is Bitcoin misunderstood? If so, what could justify its current valuation? Bitcoin (and to a larger extent cryptocurrencies) is still a fairly new asset trading in a quickly evolving marketplace (Urquhart, 2016; Nadarajah and Chu, 2017; Tiwari *et al.*, 2018; Kinateder and Papavassiliou, 2021). Therefore, it might be reductive to think about Bitcoin's value in traditional terms and to classify it as a single purpose asset. In this paper, I add a new layer to the ongoing thought process by arguing that in addition to functioning as a means of payment (at least partially); a store of value; a diversification tool, part of Bitcoin's value proposition stems from its worth as a short position on modern quasi-continuous expansionary monetary policies in vigor in many countries.

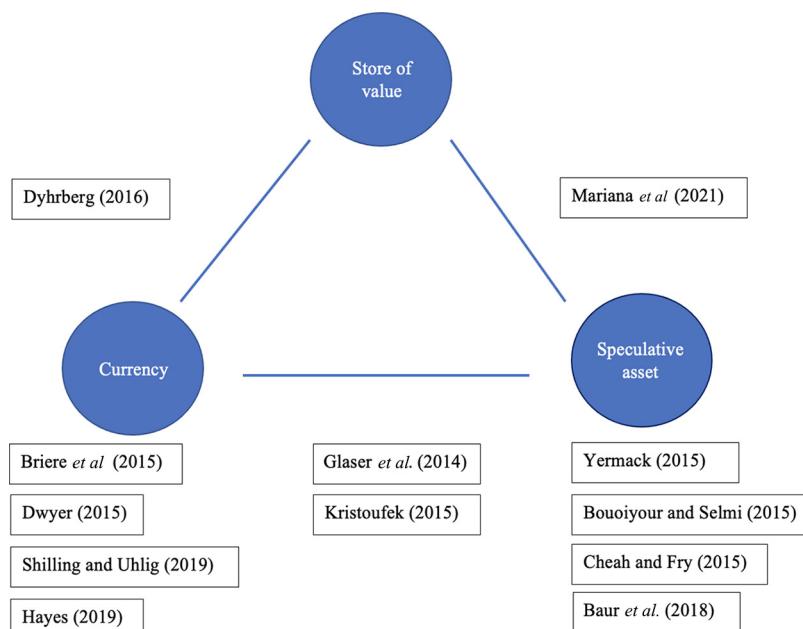


Figure 1. Bitcoin's value proposition

Notes: Figure 1 displays a graphical representation of past studies conclusions about Bitcoin's function(s) as store of value, a currency and a speculative asset

The remainder of the paper is organized as follows. Section 2 discusses why Bitcoin is more than a single-purpose asset. Section 3 describes the features that make Bitcoin unique. Section 4 discusses Bitcoin’s appeal compared to traditional financial systems. Section 5 details how Bitcoin allows investors to take a position against modern monetary policies. Section 6 discusses why Bitcoin’s embedded scarcity matters. Section 7 contrasts Bitcoin with gold. Section 8 contains a discussion of various implications for public policies. Section 9 concludes the paper.

2. What Bitcoin is not: a single-purpose asset

Our understanding of Bitcoin and its value evolves along with new developments in the marketplace. Observations made based on early data might be misleading because of the unparalleled growth Bitcoin has experienced, as well as the technological progress made in the entire crypto ecosystem. I argue that Bitcoin's value has evolved past that of a single-purpose asset. It can be demonstrated by looking at alternatives to Bitcoin that would be better suited to fill any singular function.

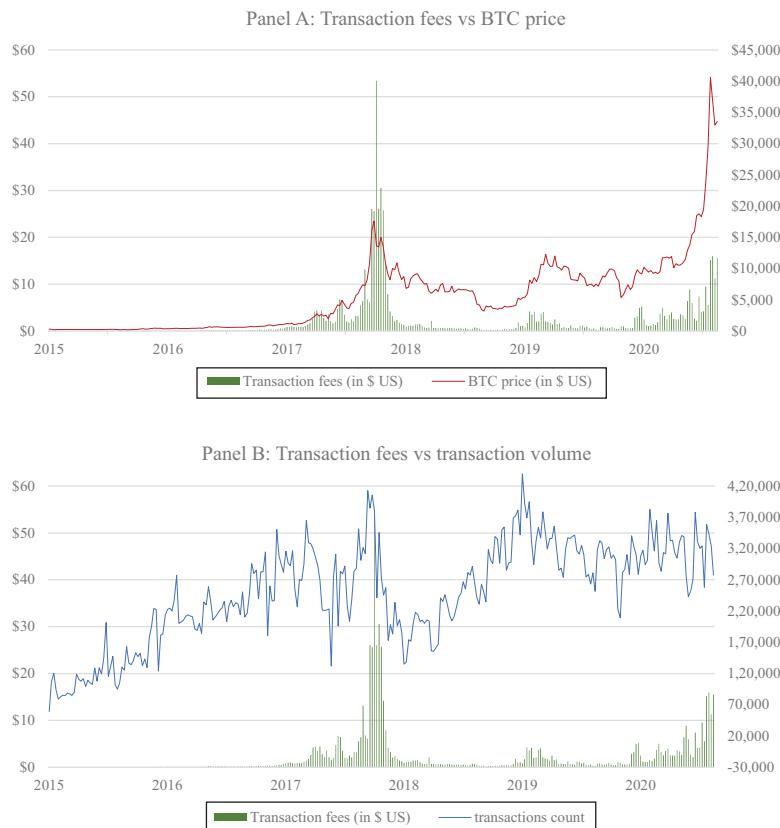
2.1 Bitcoin as a means of payment

Initially designed as a peer-to-peer electronic cash system [4], it is fair to question whether Bitcoin has fully succeeded in that aspect. Secretary of Treasury Janet Yellen recently described Bitcoin as “an extremely inefficient way of conducting transactions” due to its shortcomings on the global stage. Despite Bitcoin’s revolutionary mechanics, scalability remains a major hurdle preventing the widely touted worldwide acceptance

of Bitcoin as a means of payment. As of today, the Bitcoin network can process at best around seven transactions per second, a figure that pales in comparison to conventional payment solutions [5]. Although several technological upgrades promise to increase that throughput [6], Bitcoin's current inability to handle a larger volume of transactions translates into higher fees and a congested network in periods of peak usage.

Figure 2 displays the Bitcoin network's average fees per transaction over time and contrasts it with transaction volume and price [7]. Bitcoin's transaction processing capabilities are limited, and as the network congests miners rationally decide to process transactions with a higher fee first [8]. Bidding up sometimes leads to enormous increases in fees. As shown on the graph, fees for a single transaction climbed as high as US\$50 during

Bitcoin's value proposition



Notes: Panel A compares the average transaction fees on the Bitcoin network (green bars, left Y-axis) to Bitcoin's closing price (red line, right Y-axis) over time. Panel B compares the average transaction fees on the Bitcoin network (green bars, left Y-axis) to Bitcoin's transaction volume (blue line, right Y-axis) over time. For readability, the data is reported on a weekly basis

Figure 2.
Average transaction fees on the Bitcoin network

Bitcoin's 2017 bull run. These instances of periodic higher fees mechanically coincide with bull markets and large transaction volume.

Scalability is a major hurdle to Bitcoin's acceptance, as higher fees essentially render smaller transactions redundant. However, this is not to say that Bitcoin is useless as a means of payment. Despite these shortcomings, [Kim \(2017\)](#) finds that Bitcoin's transaction cost is lower than that of foreign retail market by 5% on average. Additionally, traditional automated clearing house (ACH) transfers often take 3–5 days to complete, whereas Bitcoin transactions usually take less than 3 min. Bitcoin, thus, does offer some value as a means of payment, especially for larger transactions that can stomach potential fee spikes and/or cross-border transactions. However, it is not ideally suited for everyday payments as it is objectively less practical than conventional payment solutions. Bitcoin still lacks widespread business acceptance, and its network is easily congested. Future upgrades might ease these concerns, but as of today, these hurdles limit Bitcoin's value as a means of payment.

If Bitcoin's sole purpose is to be a medium of exchange, there are other assets in its own ecosystem better suited to achieve this specific function. Without going into the technical characteristics of the many altcoins aiming to become the next global currency, one does not have to look any further than the Bitcoin-related Litecoin (LTC) and Bitcoin Cash (BCH) to find cryptocurrencies better suited for the single use of medium of exchange. Launched in 2011, Litecoin implemented technical changes to Bitcoin's source code such as the use of a new cryptography technology to allow for faster transaction processing along with significantly lower fees [\[9\]](#).

More recently, BCH was spun off the Bitcoin blockchain in August 2017 as a result of a hard fork [\[10\]](#). Similarly to Litecoin, the changes implemented to BCH's code were designed to enhance scalability by allowing for more transactions to be processed and to be more cost effective. Both Litecoin and BCH are clones of the original Bitcoin protocol, but with enhanced technical features designed to improve scalability and fulfill the goal of becoming a global digital mean of exchange.

Despite these improvements, neither has overtaken Bitcoin. This is not to say that these two cryptocurrencies have not had success. Indeed, they both enjoyed significant growth since inception, and at the time of writing, both are among the largest altcoins in terms of market capitalization (respectively 10th and 11th per [Coingecko.com](#)). Therefore, one can logically infer that investors do recognize the value of a cryptoasset as a potential medium of exchange, but that Bitcoin's value goes beyond that single purpose.

2.2 Bitcoin as a store of value

The same reasoning goes for the view that Bitcoin is a store of value/safe haven/hedge akin to gold [\[11\]](#). On the one hand, several studies confirm that Bitcoin possesses such properties. [Dyhrberg \(2016a, 2016b\)](#) finds that Bitcoin can be used to hedge market-specific risk. [Wang et al. \(2019\)](#) and [Bouri et al. \(2020\)](#) find evidence that Bitcoin can serve as a hedge against extreme events and economic uncertainty ([Demir et al., 2018; Kostika and Laopoulos, 2019](#)), exhibiting short-term safe haven properties ([Mariana et al., 2021](#)).

On the other hand, others question Bitcoin's ability to act as a safe haven during market swings ([Conlon et al., 2020](#)), arguing it correlates positively with downward moving markets ([Klein et al., 2018](#)). [Smales \(2019\)](#) argues that Bitcoin's less desirable traits such as elevated transaction fees and high volatility are likely to be magnified during crises. [Conlon and McGee \(2020\)](#) confirm these suspicions, finding that Bitcoin decreased in price in lockstep with the market during the recent COVID-19 crisis, substantially increasing portfolio downside risk. Many argue that Bitcoin's volatility hurts its potential as a store of value

(Briere *et al.*, 2015; Yermack, 2015; Baur *et al.*, 2018a, 2018b). Baur and Hoang (2021) even argue that given its extreme volatility, a safe haven is needed against Bitcoin and suggest stablecoins can play that role [12].

If Bitcoin's unique source of value is that of a store of value, then why not simply invest in gold? Evidence suggests precious metals – and gold in particular – are effective hedges against rising prices (Taylor, 1998; O'Connor *et al.*, 2015) and have both hedge and safe haven properties (Baur and Lucey, 2010; Hood and Malik, 2013; Kinrade *et al.*, 2021).

If investors want the thrill of novelty, the crypto ecosystem offers various stablecoins whose value is pegged to that of a tracked commodity, currency or precious metal. For example, Digix Gold (DGX) and PAX Gold (PAXG) aim to track the price movements of gold. Token emission is backed by the underlying physical commodity stored in vaults. Baur and Hoang (2021) find that Bitcoin investors tend to move their holdings to stablecoins during bear markets. Bitcoin's view as store of value and safe haven is very inconsistent with that behavior, suggesting investors see Bitcoin's value as more than just a store of value.

2.3 Bitcoin as a diversification tool

The wide range of opinions about Bitcoin as a tool to preserve value mostly hinges on its volatility, which is significantly higher than that of other asset classes (Bejaoui *et al.*, 2019; Miglietti *et al.*, 2019; Aliu *et al.*, 2020). The definition of a store of value is an asset that maintains its value as opposed to depreciating. Bitcoin did appreciate significantly over time, but that growth came at the cost of massive price swings. So, what to make of Bitcoin? Its use as a diversification tool is probably the least controversial. Not only do studies find evidence of hedging abilities (Dyrberg, 2016a, 2016b; Wang *et al.*, 2019; Bouri *et al.*, 2020; Demir *et al.*, 2018), they also suggest Bitcoin is mostly uncorrelated with traditional asset classes (Baur *et al.*, 2018a, 2018b), giving it value as a diversification tool.

3. Bitcoin's unique features

The view of Bitcoin as a speculative asset is an interesting although broad notion. The literature observed that Bitcoin displays characteristics typical of highly speculative assets. Cheah and Fry (2015) and Geuder *et al.* (2019) suggest that Bitcoin's price behavior is indicative of speculative bubble. Bouoiyour and Selmi (2015) describe Bitcoin as “speculative foolery.” More recently studies show that Bitcoin's price, trading volume and volatility are impacted by social media and the attention of retail traders (Kristoufek, 2013; Urquhart, 2018; Shen *et al.*, 2019; Aalborg *et al.*, 2019). So, how should we consider Bitcoin? To understand why valuation ranges are so large, we need to understand why Bitcoin is different from traditional assets.

Bitcoin is a new asset that is impossible to price using conventional methods due to the absence of quantifiable inflows. When investors value stocks and bonds, they discount the value of expected future cash flows over time, leading them to determine a price range they are comfortable paying to acquire a given asset. Bitcoin does not pay interest or dividends [13] nor does it grant the benefit of future cash flows to owners. Although often compared to gold, Bitcoin does not share gold's value as an industrial commodity. This is the reason why many deem it to be an asset “without intrinsic value.”

Another layer of complexity comes from the fact that as opposed to fixed income and equity markets, Bitcoin never stops trading (much like the international gold market). It has a globe-spanning market available 24 hours a day that is not impacted by boundaries. In fact, Bitcoin is even considered differently for fiscal purposes by governments across the globe. For example, in the USA, the Internal Revenue Service (IRS) considers Bitcoin as

property, whereas European and Japanese regulators classify it as a currency (Roman, 2014; Ficaglia, 2017).

Instead of easily quantifiable fundamentals, Bitcoin's value lies in the lines of codes enabling the protocol defined by Satoshi Nakamoto to operate. Without diving into technicalities, Bitcoin is the first application of blockchain technology whose groundbreaking mechanics helped secure a significant first-mover advantage. Its fixed supply ensures scarcity, a feature designed to replicate the deflationary properties of precious metals as opposed that of fiat currencies (detailed discussion in Section 5).

The circumstances of its creation further helped build trust in what is presented as a faceless, decentralized payment system that was not designed to benefit its creator (to this day, we still do not know who Satoshi Nakamoto is/are). Although many cryptocurrencies have tried to replicate Bitcoin's success, the mystique surrounding Bitcoin's inception and its now robust network of nodes [14] (over 10,000 active nodes) [15] make Bitcoin a truly unique digital financial asset.

The creation of Bitcoin introduced investors to an entirely new asset class whose success is akin to betting on modern monetary policies to continue their expansionary trend. In the next section, I propose to look at Bitcoin from a new angle by considering it as an option on traditional financial systems, more specifically as a tool to short modern monetary policies.

4. Bitcoin vs legacy financial systems

A common theme among Bitcoin enthusiasts is their overall distrust of the financial system and modern monetary policies (Wang *et al.*, 2019). To understand how investors value a novel financial asset such as Bitcoin, it is important to understand their thought process. Many crypto investors are vocal about their uncertainty surrounding the current financial and monetary system, with opinions often ranging from mistrust to outright rejection. The financial press covered at length the anti-institution mindset of many early adopters [16]. Even if the profile of Bitcoin investors has evolved over time, early adopters are more likely to own large amounts of Bitcoin because they invested at low prices. Consequently, it is important to keep in mind that a significant chunk of the Bitcoin supply is likely owned by a subset of the traditional "retail investor" category with a particular utility function.

A second element important to understand the value proposition of Bitcoin is the increasing appetite of retail investors for complex financial assets and their increasing willingness to make bets. Throughout the money markets, bond markets, equity markets and the accompanying derivative markets, investors have the opportunity to take positions on a multitude of potential outcomes. These range from the classic desire to bet on a given company's future performance through the acquisition of a share of its stock to complex strategies involving combinations of several derivative products. These possibilities allow to bet on a specific outcome. For example, during presidential election cycles, investors can bet on stocks they think are most likely to benefit in case one side wins the presidency (e.g. the oil and defense industry for one side, recreational drugs and clean energy for the other).

The staggering growth of crypto applications offering complex decentralized financial services (Defi) [17], including the most complex financial tools and derivatives, illustrates that trend. For example, derivatives liquidity protocol Synthetix (SNX) allows for the issuance of synthetic assets (various derivatives of commodities, crypto-indexes, fiat currencies, etc.), providing investors with a slew of new possibilities. It exploded during the most recent rally, growing roughly 3,800% in less than two years to become a top 30 crypto asset with a market capitalization nearing US\$4bn (per Coingecko.com). One in a slew of like-minded applications, the rise of Synthetix illustrates investors' appetite for complex financial tools.

Despite this broad range of options, until Bitcoin, no asset would allow an investor to bet against global expansionary monetary policies [18]. Indeed, there are only limited ways to take positions against monetary policies, especially if most countries are adopting similar stratagems. As such, I posit that part of Bitcoin's value proposition consists in the newfound possibility to wage a significant position against globally implemented expansionary policies. The nature of Bitcoin's fixed and predetermined supply is in stark contrast with that of most modern fiat currencies (see next section for a detailed discussion). The quasi-universal modern expansionary policies in vigor in most countries virtually guarantee the supply of the national currency will keep on growing, leading to fears of inflation and currency debasement.

As noted earlier, many in the Bitcoin ecosystem range from disenchanted to outright hostile to such policies over which they have not had any control, until now. I posit that Bitcoin's value comes (at least in part) from the fact that it represents a bet against inflationary policies and an overly centralized financial system. In fact, one could argue that if monetary policy malpractice (in the view of Bitcoin maximalists) was a traded stock, then Bitcoin is the ultimate short position. As such, I argue that a significant part of Bitcoin's value may stem not from its underlying technical or physical attributes, but rather from the possibility it offers to bet against a specific institutional practice through the acquisition of a digital asset whose immutable characteristics make it immune to expansionary policies.

5. The big short: Bitcoin vs modern monetary policies

5.1 Demand side

Bitcoin possess several features of great interest to investors that are uncertain or distrustful about the financial system. First, the level of decentralization allowed by the blockchain technology is very appealing to privacy-oriented investors as discussed in the previous section. Second, the fixed and predetermined supply of Bitcoins built in its source code creates artificial scarcity, an extremely attractive feature to monetary policy doubters (see below).

One essential assumption for the rest of this paper is that the future demand for Bitcoin will at least remain constant. Ultimately, the supply and demand of an asset determine its value on the marketplace, and thus, the embedded scarcity of an asset does not matter if the asset in question is not in demand. In the case of Bitcoin, there are reasons to think this assumption is realistic.

Studies suggest the Bitcoin market is driven by retail investors, as evidenced by the impact of social media mentions on price and volatility ([Kristoufek, 2013](#); [Urquhart, 2018](#); [Shen et al., 2019](#); [Aalborg et al., 2019](#)). Retail trading is exploding, democratized by zero fees trading platforms such as Robinhood. The recent Gamestop frenzy exemplifies the new trend of retail investors gathering and making collective bets. Younger investors have a notoriously more favorable opinion of cryptocurrencies. Over time, they will mechanically represent a larger share of investors, which bodes well for the crypto ecosystem. Lastly, the rise of institutional investors getting into the Bitcoin market ([Scharnowski, 2021](#)) suggests a positive outlook for Bitcoin demand. The demand spike for Grayscale's Bitcoin Trust [19] and the recent filings to create Bitcoin exchange-traded fund (ETFs) are causes of optimism for Bitcoin's future demand.

5.2 Supply side

Bitcoin's supply grows deterministically at a decreasing rate over time. There are 18.6 million Bitcoins in circulation at the time of writing, which represents 88.74% of the 21 million Bitcoins to ever be created [20]. The hard cap on Bitcoin's supply is of the essence because such a limit implies there are now very few new Bitcoins left to be "mined" into existence.

Indeed, to function the Bitcoin protocol relies on a network of “miners” who add transactions to Bitcoin’s public ledger in exchange for a reward. Each time a block is mined [21], miners receive newly created Bitcoins as a payment. This recompense is halved every 210,000 blocks, i.e. roughly every four years [22]. The mining process is the only way to create new Bitcoins, ensuring there will never be any unforeseen supply shock [23].

Bitcoin, thus, has built-in deflationary properties. Assuming at least constant demand levels, there will be a point where demand outpaces supply leading to rising prices. [Figure 3](#) graphically depicts the growth pattern of Bitcoin’s supply [24]. The logarithmic scale makes it easy to see that most of the supply is already in circulation, and that it will grow at a diminishing rate every year, with a growth rate decrease following each halving (every four years). Bitcoin’s atypical inception led to a large chunk of its supply to be mined early. In fact, over 75% of Bitcoin’s supply was mined within the first seven years of its existence, with the remainder scheduled to reach the market progressively through 2140. As discussed below, these unconventional supply properties are critical to understand Bitcoin’s value proposition.

One concern shared by many investors is the fear of the failure of modern monetary policies and the devaluation of national currencies as a direct consequence. Increases of the

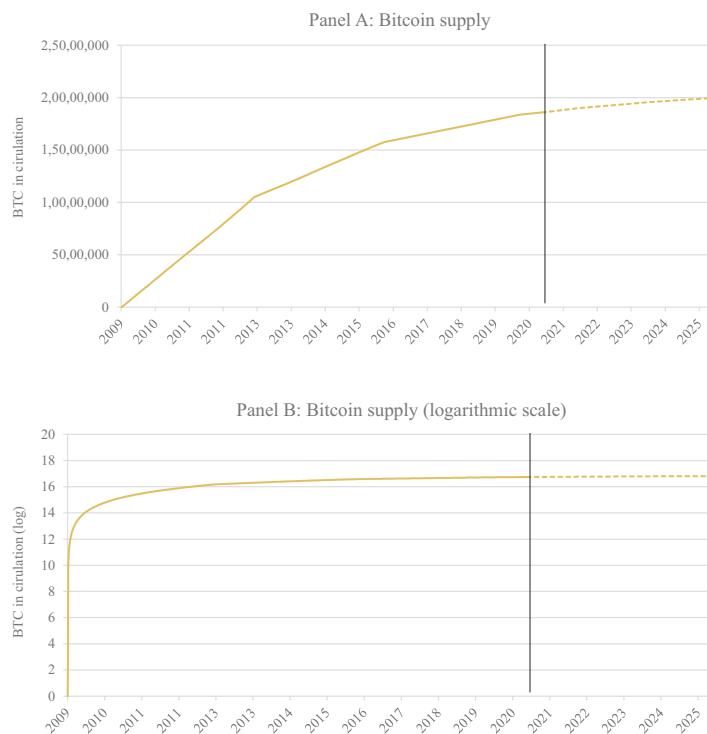


Figure 3.
Bitcoin supply

Notes: Panel A displays the evolution of Bitcoin’s supply over time (in number of BTC). Panel B displays the evolution of Bitcoin’s supply over time on a logarithmic scale

money supply (“money printing”), inflation and, more broadly, monetary policy decisions are common talking points in Bitcoin circles. There is palatable, widespread defiance *vis-a-vis* legacy institutions and the act of investing in Bitcoin presented as a way to avoid losing value to expansionary policies. To better understand this sentiment, [Figure 4](#) compares the supply of Bitcoin versus the M3 supply of major currencies since Bitcoin’s inception. The concave shape of Bitcoin’s supply stands out, as its mechanical and continuously decreasing growth rate is in stark contrast with the moderate to explosive growth all major currencies supply experienced over the past decade.

[Table 1](#) reports the historic supply growth rate of Bitcoin since its inception and compares it to the observed growth rates of every currency supply over the same period (2009–2020) [25]. Reaching 2.50% at the end of 2020, the rapidly decreasing growth rate of Bitcoin’s supply stands in stark contrast to the pattern exhibited by every other currency. It is important to understand that because of the built-in features in Bitcoin’s source code, the growth of Bitcoin’s supply will *never* reach that level again. Instead, it will keep on diminishing. Forecasts show Bitcoin’s supply will slowly decrease below 1.80% for each of the next few years, until the next halving in early 2024 where it will fall below 1% [26].

Central banks across the world almost unanimously injected liquidity in response to the COVID-19 crisis ([Hartley and Rebucci, 2020](#)), leading to significant increases of their respective money supply in 2020. The USA was particularly aggressive in its attempt to provide economic relief with roughly US\$4tn created in 2020 alone. To put this number into perspective, this liquidity injection represents a roughly 25% year-to-year increase. This means that as of today, a quarter of all dollars in circulation have been created in 2020 alone.

All currencies have seen their supply grow at different rates over the past decade. The Chinese yen (CNY) is the only currency that has seen its growth level decrease steadily, although starting from an elevated 16.55% growth rate at the end of 2009. Despite that trend, the CYN still has the highest average supply growth rate of all observed countries over the past decade [27]. Every other currency has seen its supply rise mostly steadily during the past decade, with most supplies exploding in 2020 in response to the COVID-19 pandemic. Over the past ten years, the average growth rate ranged from 3.06% (JPY) to 7.85% (US\$) for developed nations, and 12.76% for China.

These numbers are elevated from an historical perspective and are certainly impacted by various rounds of quantitative easing (QE) in the aftermath of the 2008 crisis ([Kiley, 2018](#); [Ronkainen and Sorsa, 2018](#); [Matousek et al., 2019](#)). The response to the COVID-19 crisis also played a role as the reported growth rates are at their highest levels in 2020 for every currency. However, the important lesson here is how much quicker the supply of every major currency grows compared to that of Bitcoin. While next year’s Bitcoin supply is forecasted to grow by less than 2%, for all major currencies, there are very few years across the board where the supply grew slower than that level over the past decade. In fact, in all cases, it rarely even dipped below 4%. [Figure 5](#) graphically depicts these trends. Ironically, the trend exhibited by Bitcoin almost mirrors that of the dollar but in the opposite direction. This visualization is helpful to understand why early Bitcoin adopters are so adamant about the implications of an asset with embedded scarcity.

[Table 2](#) reports Bitcoin’s scarcity ratios (SRs) over the past decade. SRs compare the supply of every currency to the supply of Bitcoin individually, helping determine the level of relative scarcity of Bitcoin in terms of another currency. An increase (decrease) of an SR implies that Bitcoin is becoming more (less) rare compared to a given currency. A preliminary look shows that all SRs have decreased significantly following Bitcoin’s

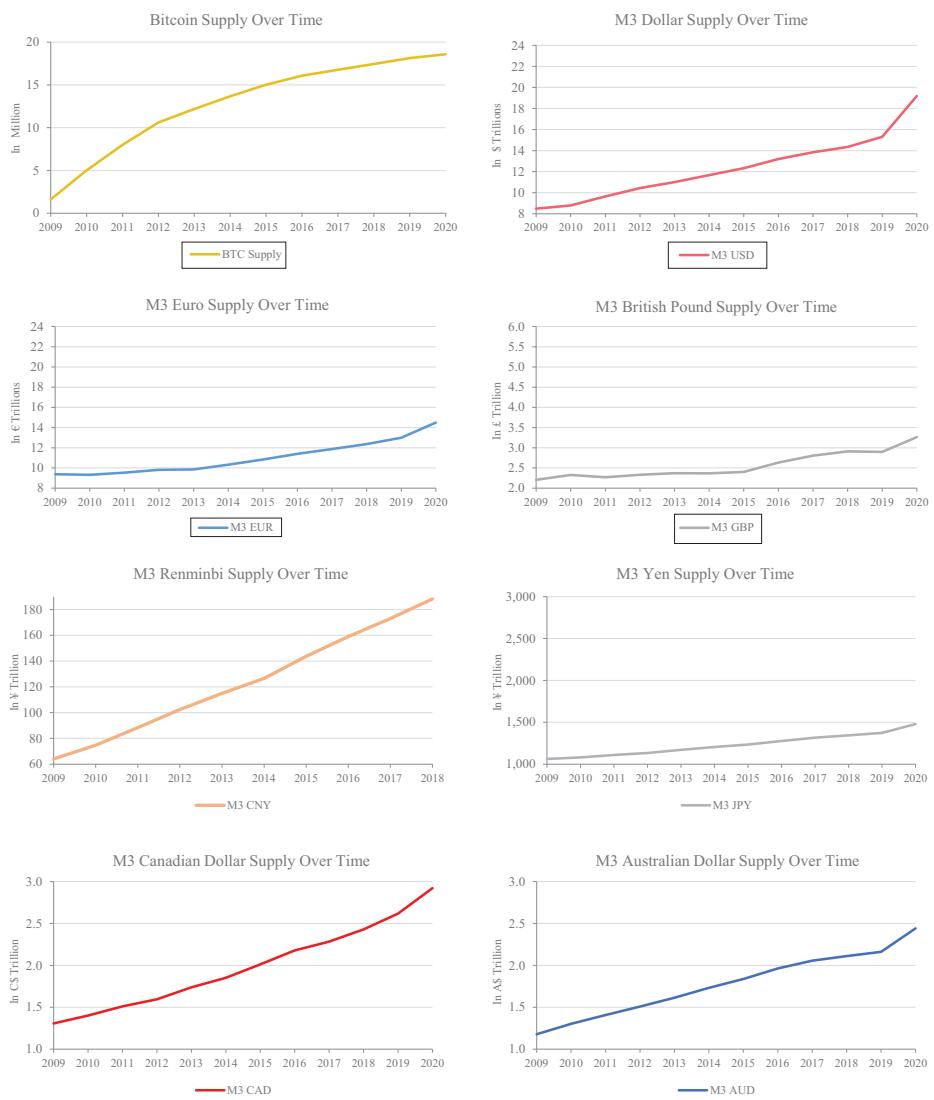


Figure 4.
BTC supply vs M3
supply of major
currencies

Notes: Figure 4 compares the supply of Bitcoin to the M3 supply of a basket of major currencies including the US dollar (US\$), the euro (EUR), the British pound (GBP), the renminbi (CNY), the Japanese yen (JPY), the Canadian dollar (CA\$) and the Australian dollar (AU\$). The vertical axis represents the number of units of each currency in circulation (in trillion) each year since the inception of Bitcoin. Bitcoin supply data is in million.

Source: FRED. Note that for the Chinese Renminbi, data is only available until 2018

Year	Growth BTC (%)	Growth US\$ (%)	Growth EUR (%)	Growth GBP (%)	Growth CNY (%)	Growth JPY (%)	Growth CA\$ (%)	Growth AU\$ (%)	Bitcoin's value proposition
2010	209.94	3.61	-0.66	5.42	16.55	1.81	7.25	10.51	
2011	59.48	9.81	2.30	-2.47	18.23	2.60	7.71	8.01	
2012	32.64	8.23	2.86	2.79	15.83	2.15	5.59	7.24	
2013	14.93	5.45	0.42	1.74	12.31	3.36	8.98	6.98	
2014	12.13	5.93	4.86	-0.28	10.10	2.86	6.57	7.29	
2015	9.95	5.67	4.93	1.45	13.53	2.48	8.64	6.08	
2016	6.94	7.05	5.12	9.81	10.68	3.35	8.24	6.91	
2017	4.36	4.82	4.20	6.33	8.78	3.07	4.86	4.71	
2018	4.07	3.73	4.15	3.81	8.81	2.11	6.37	2.62	
2019	3.88	6.66	5.11	-0.45		2.26	7.79	2.48	
2020	2.50	25.36	11.52	12.67		7.62	11.59	12.91	
Average		7.85	4.07	3.71	12.76	3.06	7.60	6.89	

Notes: Table 1 reports the growth rate of Bitcoin's supply versus that of a basket of major currencies since Bitcoin's inception. Currencies of interest include the US dollar (US\$), the euro (EUR), the British pound (GBP), the renminbi (CNY), the Japanese yen (JPY), the Canadian dollar (CA\$) and the Australian dollar (AU\$). The growth is reported on a calendar year basis

Source: FRED. Note that for the Chinese renminbi, data is only available until 2018

Table 1.
BTC growth vs
major currencies M3
supply growth

inception. It is to be expected given Bitcoin's source code commands a rapid expansion of the supply following inception. The major takeaway is that every supply ratio has now reached an inflection point over the past few years. The trend is now opposite for every pair as Bitcoin is slowly becoming scarcer in relative terms compared to every major currency.

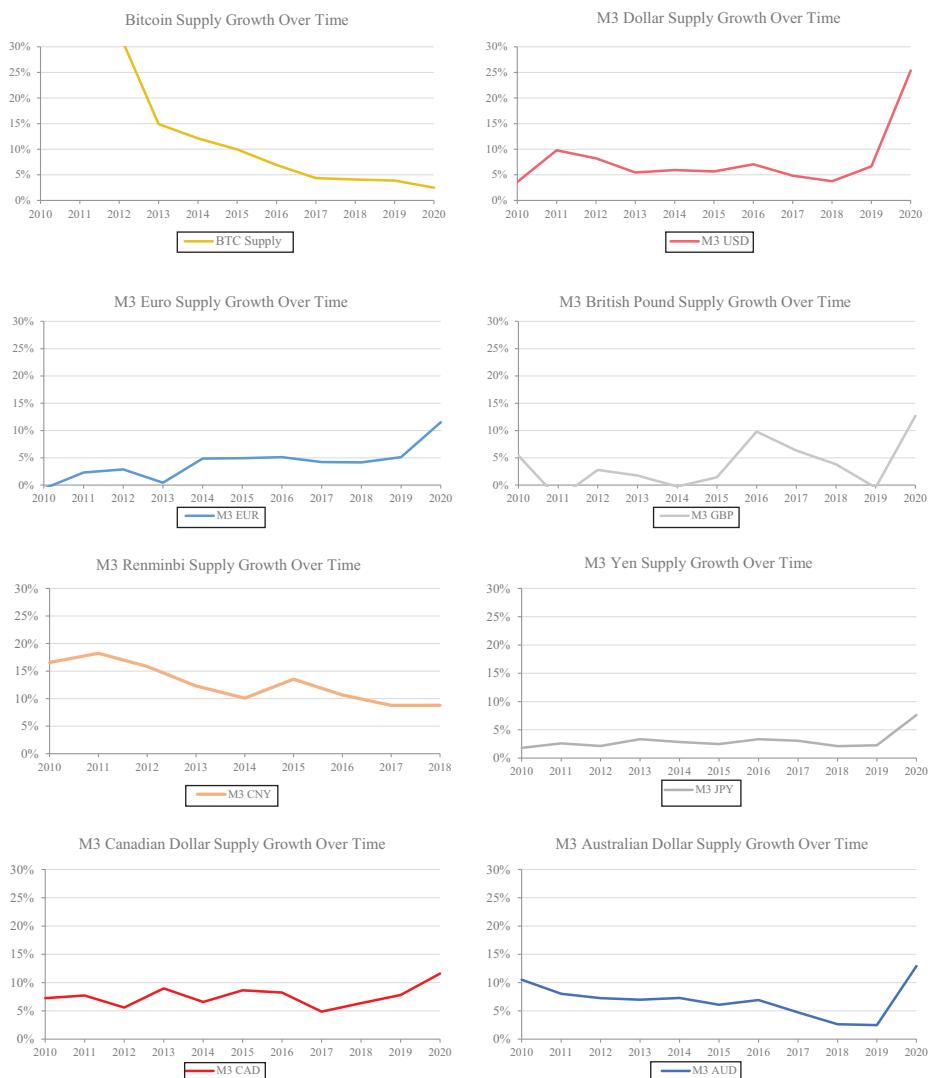
Figure 6 graphically depicts this phenomenon, allowing the reader to visualize the trend. Each graph intuitively mirrors that of Bitcoin's supply growth (Figure 5). Indeed, Bitcoin's supply growth rate is presently significantly below that of most currencies and will keep on diminishing. If current monetary policies are maintained, Bitcoin's SR will continue to increase relative to every other currency. It is of the essence to pay attention to Bitcoin's relative scarcity because this embedded deflationary feature is key to estimate Bitcoin's future value. Part of Bitcoin's value proposition is to offer an asset whose supply cannot be tampered with, to maintain scarcity and favor long-term value appreciation.

The following lemma defines Bitcoin SR's behavior:

$$\begin{cases} \text{if } g_{\text{BTC}} \leq g_C, \text{SR}'_{\text{BTC}/C} \geq 0 \\ \text{if } g_{\text{BTC}} > g_C, \text{SR}'_{\text{BTC}/C} < 0 \end{cases} \quad (1)$$

Where g_{BTC} is the growth rate of Bitcoin's supply, g_C is the growth rate of the supply of a currency of interest and $\text{SR}_{\text{BTC}/C}$ is the SR of Bitcoin compared to a currency of interest. As g_{BTC} is known due to Bitcoin's pre-determined supply algorithm, the only unknown is g_C , the growth rate of the supply of the currency it is compared to.

The reader needs to keep in mind that Bitcoin's supply will grow at a rate below 2% next year and will progressively trend toward zero over time. Its growth rate will never exceed that of the previous year. Therefore, the only way for Bitcoin to *not* become scarcer in relative terms is for a currency's supply to grow *slower* than Bitcoin's. The data reported in Table 1 illustrates how unlikely such a scenario is, especially over an extended period. Modern monetary policies have been generous in terms of providing liquidities, and many expect this trend to continue (Kiley, 2018; Ronkainen and Sorsa, 2018; Bartkiewicz, 2020), as such policies are addictive and



Notes: Figure 5 compares the supply growth of Bitcoin to the M3 supply of a basket of major currencies including the US dollar (US\$), the euro (EUR), the British pound (GBP), the renminbi (CNY), the Japanese yen (JPY), the Canadian dollar (CA\$) and the Australian dollar (AU\$). The vertical axis represents the growth of the M3 supply in circulation each year since the inception of Bitcoin

Source: FRED. Note that for the Chinese Renminbi, data is only available until 2018

Figure 5.
BTC supply growth
vs M3 supply growth
of major currencies

Year	$SR_{USD/BTC}$	$SR_{EUR/BTC}$	$SR_{GBP/BTC}$	$SR_{CNY/BTC}$	$SR_{JPY/BTC}$	$SR_{CAD/BTC}$	$SR_{AUD/BTC}$	Bitcoin's value proposition
2009	5.24	5.80	1.36	39.63	657.12	0.81	0.73	
2010	1.75	1.86	0.46	14.90	215.85	0.28	0.26	
2011	1.21	1.19	0.28	11.05	138.86	0.19	0.18	
2012	0.98	0.92	0.22	9.65	106.95	0.15	0.14	
2013	0.90	0.81	0.19	9.43	96.17	0.14	0.13	
2014	0.85	0.76	0.17	9.26	88.23	0.14	0.13	
2015	0.82	0.72	0.16	9.56	82.23	0.13	0.12	
2016	0.82	0.71	0.16	9.89	79.47	0.14	0.12	
2017	0.82	0.71	0.17	10.31	78.48	0.14	0.12	
2018	0.82	0.71	0.17	10.78	77.00	0.14	0.12	
2019	0.84	0.72	0.16	—	75.80	0.14	0.12	
2020	1.03	0.78	0.18	—	79.60	0.16	0.13	

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Notes: Table 2 reports Bitcoin's annual SRs computed as the ratio of a currency's M3 supply to Bitcoin's supply as of December each year since the inception of Bitcoin (January 3, 2009). Currencies of interest include the US dollar (US\$), the euro (EUR), the British pound (GBP), the renminbi (CNY), the Japanese yen (JPY), the Canadian dollar (CA\$) and the Australian dollar (AU\$). For readability, this ratio is displayed in million

Source: FRED. Note that for the Chinese renminbi, data is only available until 2018

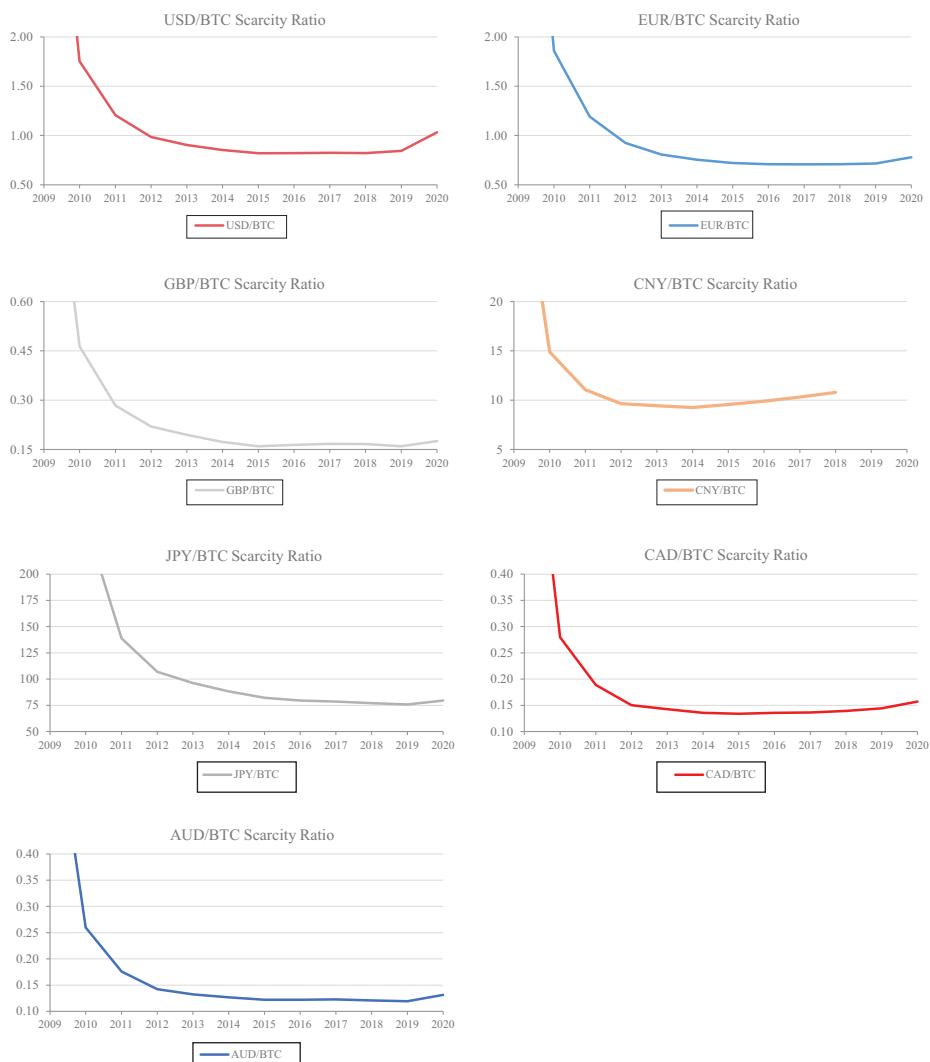
Table 2.
BTC/world currencies SRs

can be costly to exit (Fujiki and Tomura, 2017; Hayashi and Koeda, 2019; Karadi and Nakov, 2021). In essence, Bitcoin's relative scarcity would increase over time assuming historical values of g_o , and even more so if QE becomes “the new normal” (Kiley, 2018; Bartkiewicz, 2020).

Bitcoin is still a young asset and its most recent price explosion comes amidst the inflexion in SR curves described previously. We are witnessing a shift in the dynamics of every Bitcoin/currency pair. As Bitcoin's predetermined supply is known, its relative scarcity is a direct function of a given currency's supply, which by extension makes it a direct function of ongoing monetary policies. *As such, Bitcoin is in effect a tool available to investors to bet against modern monetary policies.* If governments are unable to soften expansionary policies, Bitcoin's relative scarcity will increase. Bitcoin investors bet that over time, this trend makes Bitcoin more valuable compared to major currencies *ceteris paribus*, leading to upward price pressure. I contend that *part of Bitcoin's value proposition is to allow investors to effectively short global expansionary monetary policies.*

On the topic of scarcity, several features of Bitcoin compound to stretch the gap with traditional currencies even further. First and foremost, Bitcoin's predetermined supply ensures it cannot experience supply shocks [28]. The same cannot be said for other currencies. Indeed, even if decision makers were to slow down money creation to levels on par with that of Bitcoin, any future downturn or economic hardship could possibly generate a response akin to that made to fight the COVID-19 crisis. This means that while it is not possible for Bitcoin to experience a future supply shock, it very much is for every other currency. In such a scenario, Bitcoin's relative scarcity would increase significantly, strengthening Bitcoin's value in the trading pair.

The second scarcity compounding feature is that part of Bitcoin's supply might be lost forever. Indeed, many investors have been locked out of their funds after losing access to their wallets. Another source of loss consists in investors that died without leaving instructions on how to access funds. It is estimated that as many as 20% of the existing Bitcoins are lost [29]. One of the main barriers to Bitcoin adoption is accessibility as wallet management is impractical. Digital wallets are ultimately lengthy strings of hexadecimal characters that are easy to lose or misplace. There is currently no recourse against these



Notes: Figure 6 displays Bitcoin's SRs relative to a basket of major currencies over time since Bitcoin's inception (January 3, 2009). The basket of currencies includes the US dollar (USD), the euro (EUR), the British pound (GBP), the renminbi (CNY), the Japanese yen (JPY), the Canadian dollar (CA\$) and the Australian dollar (AU\$). The SR of Bitcoin against a given currency is the ratio of the M3 supply of the currency of interest to the supply of Bitcoin. For readability, the ratio is expressed in million

Figure 6.
BTC/world
currencies' SRs

types of event, which effectively translates to an additional erosion of the supply in circulation. Note that although it is possible to lose or misplace traditional currencies, it is unlikely for the two afflictions to occur in equal proportion.

Bitcoin's value proposition

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6. Is Bitcoin really scarce?

A common criticism of Bitcoin and its embedded scarcity is the possibility to create new cryptocurrencies ad infinitum. In other words, even if Bitcoin's supply is itself finite, it is always possible to create "Bitcoin 2.0" to artificially expand this supply, may it stem from a new, enhanced version of the Bitcoin protocol or an outright completely new cryptocurrency. Although this is a technical possibility, there are two major flaws with this argument. The idea that any project can be created in a pinch and directly compete with Bitcoin ignores the technical difficulties associated with cryptocurrency creation and adoption. It ignores the fact that a myriad of projects have already entered the market, yet Bitcoin's dominance of cryptomarkets remains extremely high.

To detail the first flaw of the "Bitcoin 2.0" argument, we need to understand what made Bitcoin successful in the first place. Although dozens of projects are created every day, it is misleading to think of diving in the crypto business as a simple endeavor. First, not every project aims to compete with Bitcoin. For example, Ethereum is often presented as the first crypto alternative, yet its goal is very different from Bitcoin's as it aims is to enable developers to create distributed applications on Ethereum's blockchain through the use of smart contracts [30].

Since Bitcoin's inception, many new cryptocurrencies have emerged with specific purposes other than to be a simple means of payment. So many new projects are reaching the market every year that broad categories have been created to keep track of every new token's function in the crypto ecosystem. [Figure 7](#) displays the ten largest cryptocurrencies at the time of writing as well as the category they fall into [31].

The reader should note that only three of these projects are labeled as "basic" cryptocurrencies (Bitcoin, Dogecoin and Litecoin), and that all others have a different

#	Cryptocurrency	Market cap	Category
1	 Bitcoin (BTC)	~ \$1 Trillion	Cryptocurrency
2	 Ethereum (ETH)	~ \$250 Billion	Smart contract platform
3	 Binance Coin (BNB)	~ \$80 Billion	Exchange-based
4	 Tether (USDT)	~ \$50 Billion	Stablecoin
5	 Ripple (XRP)	~ \$50 Billion	Payment Settlement
6	 Cardano (ADA)	~ \$40 Billion	Smart contract platform
7	 Dogecoin (DOGE)	~ \$35 Billion	Cryptocurrency/Meme coin
8	 Polkadot (DOT)	~ \$30 Billion	Multichain network
9	 Uniswap (UNI)	~ \$30 Billion	Governance/DEX
10	 Litecoin (LTC)	~ \$30 Billion	Cryptocurrency

Notes: Table 3 displays the ten largest cryptocurrencies by market capitalization at the time of writing, including their name, ticker, market capitalization and respective categories

Figure 7.
Top ten largest cryptocurrencies

purpose. Without diving into technicalities, projects like Ethereum (ETH), Cardano (ADA) and Polkadot (DOT) are built to become smart contract platforms (and in the case of Polkadot, to facilitate transfer across blockchains). Tether (USDT) is a stablecoin: its goal is to maintain a value of US\$1.00 regardless of market conditions. Binance Coin (BNB) is an exchange-based coin; it is used among other things to facilitate transactions on the Binance platform. Finally, Uniswap (UNI) is a governance token that allows holders to vote on changes to the Uniswap protocol [32]. This short list offers a glimpse into the different projects in the ecosystem as cryptocurrencies could now be divided into dozens of categories. Bitcoin's success transcends these categories and is explained by its first-mover advantage and its many unique features.

Second, developing a crypto project is no easy task. It requires continuous development not only before inception, but throughout the life of a project. Every project encounters several hurdles that require time and skill to solve. For example, both Bitcoin and Ethereum are currently experiencing scalability issues as network fees (the fees paid by a sender to process a transaction) are spiking due to the high volume of transactions.

Third, for a decentralized project to work, it needs to have a solid network of nodes. Nodes are run by individuals willing and able to act as validators. The entire idea of a decentralized blockchain revolves around the ability to have enough independent and honest nodes participating. Bitcoin and Ethereum both have robust nodes networks with over 10,000 active nodes at the time of writing [33]. This is another technical hurdle to overcome for "Bitcoin 2.0." [34]

Fourth, part of the reason Bitcoin is complicated to forge is because of its costliness. For the Bitcoin ledger to be appended, miners need to be willing and able to participate as they are block creating agents. Part of what made Bitcoin so successful is the proof-of-work (POW) concept, which requires miner solve a cryptographic puzzle to "mine" a block. Much has been said about how energy-consuming Bitcoin mining is, but this costliness to produce is part of what makes Bitcoin valuable. Bitcoin's extremely high hashrate [35] is the result of years of adoption by miners and its extreme profitability. Mining is costly, and mass adoption requires for enough miners to be willing to spend their resources on a project as opposed to another (the opportunity cost of say, not mining Bitcoins instead).

Finally, trust in a network is key, and the mystique surrounding Satoshi Nakamoto gives Bitcoin another leg up. Any new project is ultimately carried by a development team and their incentives. Their objectives and stake in the project are always a source of concern. The unselfish nature of Satoshi Nakamoto's project is another important feature of Bitcoin, as the trust it inspires is very hard to replicate in an ecosystem striving for privacy and decentralization.

These first few points lead us to the second flaw in the "Bitcoin 2.0" argument: there are already thousands of new cryptocurrency projects, yet none has overtaken Bitcoin. In fact, Bitcoin's dominance index (the percentage of Bitcoin's market cap vs the entire crypto market) hovers around 60%, and even gets past 80% if we consider only coins designed to be used as a medium of exchange.

Moreover, as discussed in the previous section, several clones of Bitcoin have entered the market, a lot of them technically superior. To this day, over 100 forks of Bitcoin have been created, from *Bitcoin2* to *SuperBitcoin*. [36] Yet, the impact of these literal "Bitcoins 2.0" on the original project have been marginal at best. BCH is arguably the most successful of them all and stands at about 1% of the original Bitcoin's market cap. To conclude, although it is possible for "Bitcoin 2.0" fears to materialize, doomsday predictors often ignore the reality of the hurdles any new project faces.

7. What about gold?

7.1 Bitcoin vs gold

Bitcoin is often dubbed the “digital gold” because both assets have a restricted supply, and both are traded outside the traditional financial markets. However, studies have shown that Bitcoin and gold behave differently exhibiting little correlation (Yermack, 2015; Baur *et al.*, 2018a, 2018b). A natural question is then why investors would be interested in Bitcoin as a store of value or/and hedge against inflation if they can simply invest in gold, an asset proven to exhibit these characteristics (Taylor, 1998; Baur and Lucey, 2010)?

Studies show Bitcoin can complement to gold for diversification purposes (Briere *et al.*, 2015; Bouri *et al.*, 2020). However, Bitcoin’s volatility is much greater, making gold the likely preferred investment for risk averse investors (Dwyer, 2015; Smales, 2019; Mariana *et al.*, 2021). Another way to look at it is again through the prism of Bitcoin as a tool to short modern monetary policies. Although Bitcoin shares many of gold’s characteristics, some distinctions make Bitcoin a better bet against expansionary monetary policies.

First, Bitcoin is more portable as it can be sent quickly over the internet and does not require storage capacity [37]. This is certainly an advantage in the digital era as many younger investors are entering the market. Second, Bitcoin also does not suffer from the inconvenience of transaction costs associated with physical gold such as documenting transactions, warehousing the physical asset, associated insurance costs or providing security. Third, its market capitalization is over ten times smaller than gold’s, giving Bitcoin more leverage as a tool to hedge against modern monetary policies. Finally, the attractiveness of gold comes from a limited supply despite industrial uses. Although gold is used in various industries such as dentistry and electronics, these uses have been declining significantly, leaving jewelry as the main non-retail source of demand (O’Connor *et al.*, 2015). Gold’s supply grows at a very limited pace, an estimated 1.5%–2% a year, which is comparable to Bitcoin’s supply current growth rate (which we know will keep on diminishing). A key feature of Bitcoin is its known, depreciating supply. Investors know how it will decrease, and that it will eventually converge toward zero. Although limited, gold’s supply is still a function of the discovery of potential new sites and the development of new extraction techniques.

7.2 Stock to flow model

The recently proposed stock to flow model (S2F) presents a new way to value resources based on their abundance [38]. As such, the S2F model is easily applicable to commodities such as gold and precious metals, as well as to Bitcoin. To achieve its purpose, the S2F model takes the ratio of the total amount of reserves available of a given resource to its annual production. Higher S2F ratios imply lesser amounts of a resource entering the market every year, which theoretically helps retain value.

For instance, the annual worldwide gold production reached 3,200 metric tons in 2020 [39]. Although estimates vary, 197,576 tons of gold had been mined at the end of 2019 per the World Gold Council [40]. These figures imply an S2F ratio of 61.74 for gold ($197,576/3,200$), indicating it would take nearly 62 years of current production levels to double current gold stocks. Although S2F ratios can be computed for any resource, precious metals intuitively present the highest values, with gold topping the list.

Considering Bitcoin through the prism of the S2F model yields interesting insights. At the end of 2020, Bitcoin’s supply is at 18.6 million units and is scheduled to increase by 2.15% in 2021 (roughly 400,000 units). These values imply an S2F ratio of 46.5, which is slightly below gold’s, but higher than any other precious metal. Bitcoin enthusiasts have suggested regressing various commodities’ market values (including Bitcoin) on their S2F ratios and found them to be excellent predictors. Adapting the S2F to predict Bitcoin price

over time yields estimates interestingly consistent with observed price levels, giving credit to the model. For example, it predicted Bitcoin would reach US\$55,000 following the May 2020 halving, a milestone Bitcoin eventually reached in February 2021.

The goodness of fit of the S2F model is interesting, as it implies the rate of production of an asset (that is its supply's growth) is driving value increases rather than scarcity in absolute terms. This finding is particularly relevant to Bitcoin as its predetermined and decreasing supply growth imply ever increasing S2F ratios, and thus, by extension, ever-increasing prices. Specifically, per this model, Bitcoin halvings are key events that mechanically result in proportional increases in S2F ratios. For instance, Bitcoin's next halving (scheduled in 2024) will shrink the supply growth to around 1%, which implies an S2F ratio of 100. To put this into perspective, per the current calibration of the model, such an S2F ratio implies a BTC price of over US\$1m.

The S2F model remains experimental, and the inability to apply traditional valuation methods to Bitcoin led to wide discrepancies of opinions regarding its value. One of the goals of this paper is to shed light on another way to consider Bitcoin as a financial asset. Future attempts to value Bitcoin should at least consider its value as a hedge against modern monetary policies. Its characteristics make Bitcoin a unique financial asset, allowing investors to take strategic positions previously unavailable to them. It is important to note that some lessons learned from the early years of the Bitcoin experiment might not apply anymore because of how atypical and generally misunderstood Bitcoin's structural mechanisms are (particularly about its supply).

8. Implications for public financial policies

Although still in its infancy, the emergence of Bitcoin raises several questions about public policies. With a market cap peaking above US\$1tn at the time of writing, Bitcoin and to a larger extent cryptocurrencies are likely still not significant enough to elicit legislation beyond know your customer (KYC) rules in most developed nations. For comparison, US equities' total market value was worth over US\$50tn at the beginning of 2021. However, Bitcoin's rapid growth is already seen as a threat to monetary sovereignty by several countries. Algeria, Bolivia, China, India, Nigeria, Pakistan and Viet-Nam have implemented laws ranging from extra supervision to outright bans on cryptocurrencies.

If Bitcoin's value proposition does come at least in part from its potential as a hedge against expansionary monetary policies, it is conceivable that governments might take action against it if they deem it undermines the impact of their monetary toolbox and threaten financial stability. Possible actions from governments could take the form of additional taxation of cryptoinvestors, barriers to acquisition or outright ban proposals in an attempt to maintain control. This perspective adds a new type of regulatory risk that should be taken into account when valuing Bitcoin. However, for that to happen Bitcoin would have to grow enough so that it would be considered as an alternative to national currencies.

This proposition may seem iconoclastic because for most of modern history, monetary emission has been a state/government prerogative. National currencies constitute legal tenders and have never been challenged. However, this possibility has been considered by several economists who have contemplated and even for some advocated the possibility of a non-state-regulated currency. In his book *A program for monetary stability*, Milton Friedman (1960) details plans for a new monetary policy revolving around a constant increase of the money supply, irrespective of business cycles or other economic events. Friedman even suggested to replace the Federal Reserve by a computer, touting the possibility of humanless decision-making for monetary decisions (Friedman, 1993). Later, Friedrich Hayek (1976) discussed the establishment of privately issued forms of monies and

advocated for open competition between currencies in his seminal work on *denationalization of money*. Although likely not what either had in mind, the emergence of Bitcoin can be seen as a tool in the vein of what Hayek called for in his opposition to what he considered “the unrelieved calamity of government monopoly of the issue of money.”

In the context of an alternative currency, another valuable trait of Bitcoin is that a wide adoption could also act as a governance mechanism. The mass adoption of an asset whose scarcity and fixed supply are embedded in its source code would likely diminish the reach of expansionary policies. As a result, it would likely force monetary responsibility from traditional institutions to avoid greater depreciation against alternatives such as BTC.

9. Conclusion

Bitcoin’s recent extreme growth raises questions about its future as well as the pertinence of earlier views on its nature, purpose and valuation. In this paper, I argue that Bitcoin’s value goes beyond that of a single-purpose asset, and that its worth as an effective short position on modern, global, quasi-permanent expansionary monetary policies should be considered when attempting to understand the value investors place in this digital asset. Bitcoin’s fixed and predetermined supply presents a stark contrast with the inflationary nature of fiat currencies. Its induced scarcity and the mystique surrounding its creation make Bitcoin a unique tool: a digital asset trusted by investors looking for a way to escape inflationary policies by avoiding the traditional financial system and a way to preserve their capital over time. Bitcoin’s value comes from its ability to be used as a means of payment (preferably for large transactions), a diversification tool and a speculative option on the future of legacy financial systems and monetary policies. It is not to say that Bitcoin is a riskless asset. Mainly, its extreme volatility impedes acceptance from risk-averse investors and hurts its potential as a store of value.

The limitations of this study stem from its exploratory nature. I do not make any claim regarding Bitcoin’s status or future performance, nor do I propose a valuation method. Moreover, although mentioned, the technological upgrades potentially allowing Bitcoin to fulfill its promises as a universal method of payment are beyond the scope of this paper. It is left to future studies to incorporate elements discussed in this study to refine predictive models. When attempting to price Bitcoin, I believe it is important to understand its value proposition and its role as a tool to bet against expansionary policies.

Notes

1. Vigna, Paul. “Bitcoin’s value is all in the eye of the ‘bithodler.’” *The Wall Street Journal*, February 20, 2021.
2. Hirstenstein Anna and Paul Vigna. “Bitcoin trades again near record, driven by new group of buyer.” *The Wall Street Journal*, November 23, 2020.
3. Elliott, Rebecca and Caitlin Ostroff. “Tesla buys \$1.5 billion in Bitcoin.” *The Wall Street Journal*, February 8, 2021.
4. Maidenberg, Micah. “On twitter, Elon Musk has mused about Bitcoin.” *The Wall Street Journal*, February 8, 2021.
5. Nakamoto’s initial whitepaper is available here. Source: Nakamoto, Satoshi. *Bitcoin: A peer-to-peer electronic cash system*. <https://bitcoin.org/bitcoin.pdf>
6. For comparison, Visa processes roughly 1,700 transactions per second on average and claims its system could handle 24,000. PayPal handles over a 100 transactions per second on average.

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6. Notably, the Segwit soft fork and the implementation of the Lightning network promise to make Bitcoin more scalable, allowing significantly more transactions to be processed for lower fees.
 7. For readability, I focus on the 2015–2020 window as transaction volume, fees and overall acceptance of Bitcoin was minimal before that period.
 8. Senders choose the amount of the transaction fee they are willing to pay. Rationally, when volume increases and the network is congested, transactions take a longer time to process, incentivizing senders to increase fees to speed up the process, possibly triggering bid ups.
 9. Litecoin was created by Charlie Lee as a solution to Bitcoin's perceived technical limitations and potential long-term scalability problems. While Bitcoin uses the SHA-256 algorithm, Litecoin uses the newer Scrypt algorithm, which requires less processing power, making it more efficient. Consequently, Litecoin processes blocks about four times quicker than Bitcoin (every 2.5 vs 10 min). These technical changes allow for faster transaction processing and significantly lower fees, making Litecoin vastly more scalable.
 10. A hard fork is a software update on a blockchain that makes new transactions incompatible with the existing protocol, resulting in a split of the initial blockchain into two separate entities.
 11. A store of value is an asset that maintains its value over time. A hedge is an asset that is uncorrelated with stocks and bonds on average. A safe haven is an asset that is uncorrelated with stocks and bonds in a market crash (Baur *et al.*, 2010).
 12. Stablecoins are cryptocurrencies pegged to the value of a real or digital asset (commodities, fiat money, cryptoassets, etc.) to ensure price stability.
 13. Note that Defi solutions now allow Bitcoin holders to earn interest on their holdings. However, this is not a technical feature of Bitcoin but a possibility resulting from the development of applications in the crypto ecosystem. As Bitcoin “naturally” does not pay interest, I exclude it from the list of properties.
 14. A node is a computer connected to other computers in a network, following the same rules and sharing information. In the case of Bitcoin and cryptocurrencies, the concept of decentralization revolves around the ability for a network to develop and collaborate to process transactions, in direct opposition to the centralization of traditional financial systems.
 15. Source: <https://bitnodes.io/>.
 16. Wolf, Martin. “The libertarian fantasies of cryptocurrencies.” *The Financial Times*, February 12, 2019. Ostroff, Caitlin and Paul Vigna. “Bitcoin trades above \$50,000 for the first time.” *The Wall Street Journal*, February 16, 2021.
 17. Defi is an umbrella term that encompasses all applications looking to get passed third parties in financial transactions, directly linking investors and borrowers together without the need for a financial institution as an intermediary. Money locked in Defi protocols grew from less than US \$700m at the beginning of 2020 to spike over US\$43bn recently.
 18. The author acknowledges that it is possible to bet on the monetary policy of a specific country. For example, if an investor expects the currency of Country A to depreciate because of its monetary policy, then this investor can bet on the currency of Country B he expects to appreciate against that currency A. However, if several or most currencies of interest to the investor are engaging in similar monetary practices, the interest is greatly diminished. Moreover, currency trading comes with a slew of other considerations such as political and regulatory risks the investor might wish to avoid.
 19. The Grayscale Bitcoin Trust is the first vehicle to allow investors to invest in Bitcoin without having to buy it directly, allowing exposure without the technological hassle of dealing with technology.

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20. Bitcoin's hard cap (the maximum number of units to ever be in circulation) is set in its source code at an immutable 21 million units. The last Bitcoin to ever be created should be mined in 2140.
21. A “block” records the most recent Bitcoin transactions that have not been added to the blockchain yet. Each time miners mine a block, they append Bitcoin’s blockchain (essentially akin to writing a new entry on a public ledger) and receive some newly minted Bitcoins as a reward for their work.
22. After the last halving occurred in May 2020, miners now receive 6.25 BTC for each block mined.
23. While there will never be any shock expanding the supply of Bitcoins, it is conceivable some investors might lose access to their wallet, which could create an effective contractionary shock to the supply. However, in that direction, the shock would favor current Bitcoin holders and is therefore not considered a risk from their perspective.
24. Data source: blockchain.com.
25. Source: FRED.
26. The next halving is scheduled to occur in March 2024.
27. One caveat to this observation is that CNY supply data is available only through 2018. However, this observation is worth noting given how much faster than any other currency the CNY’s supply has grown during period with available data.
28. Critics argue that Bitcoin’s supply could experience “supply shocks” through the addition of new cryptoassets. They argue that the possibility of endless new entrants is equivalent to increasing Bitcoin’s supply ad infinitum artificially. This scenario would render Bitcoin’s deflationary properties useless in practice, as the market is flooded with new currencies. I tackle this argument in Section 6.
29. Popper, Nathaniel. “Lost passwords lock millionaires out of their Bitcoin fortunes.” *The New York Times*, January 12, 2021.
30. A smart contract is a digital agreement between two parties that automatically executes when a series of conditions are met.
31. The reader should note that cryptocurrencies are, by essence, very volatile and as a consequence, so is that list. Beyond Bitcoin and Ethereum, it is not uncommon to see a cryptocurrency’s position fluctuate in and out of the top ten regularly. However, this snapshot is meant to give the reader an idea of the structure of the ecosystem, and to illustrate Bitcoin’s dominance.
32. Uniswap is the largest decentralized exchange protocol, a pioneer of the liquidity pool mechanism and more broadly of the DeFi movement.
33. Bitcoin: <https://bitnodes.io/>. Ethereum: <https://www.ethernodes.org/>.
34. A competitor project could conceivably be built on an established blockchain such as Ethereum and therefore benefit from an existing network. This would, however, come with a different set of challenges as network-related problems would be out of the developer’s hands, which would hurt the attractiveness of a potential “Bitcoin 2.0.”
35. The hashrate represents the total computational power used to mine and process transactions on the Bitcoin network.
36. Source: <https://forkdrop.io/>
37. It is possible for investors anxious to hedge against monetary policies to invest in “paper gold” through ETFs for example, eliminating concerns about portability. However, this comes with another set of constraints due to the nature of the paper gold market and the trust it requires in middlemen and legacy institutions.
38. The original proposal on the S2F model by Twitter user *PlanB* can be found here.
39. Source: Statista.

Bitcoin’s value proposition

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40. Source: World Gold Council.
41. Data from *Cryptoquant*.
42. Source: FRED. Note that for the Chinese renminbi, data is only available until 2018.
43. Source: FRED. Note that for the Chinese renminbi, data is only available until 2018.
44. Source: FRED. Note that for the Chinese renminbi, data is only available until 2018.
45. Source: Coingecko. The reader should note that cryptocurrencies are by essence very volatile, and as a consequence, so is that list. Beyond Bitcoin and Ethereum, it is not uncommon to see a cryptocurrency's position fluctuate in and out of the top ten regularly. However, this snapshot is meant to give the reader an idea of the structure of the ecosystem and Bitcoin's dominance.

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