

Stability in the Age of Cryptocurrencies: A Critical Review of Stablecoin Mechanisms and their Implications

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ABSTRACT

Cryptocurrencies have catalyzed financial innovation, with Bitcoin's emergence partly in response to the 2008 financial crisis, attracting both enthusiasts and skeptics. Initially, it functioned within a tight community, evolving into a global phenomenon after 2014. After the crypto market grew, investors faced the challenge of conversion risk as most liquid cryptos have high variability. Stablecoins, such as Tether, addressed volatility concerns and offered "crypto-fiat." Tether, the leading stablecoin, wielded influence over Bitcoin prices. Market data analysis revealed an inverse relationship between Tether and Bitcoin's price volatility. Tether's price stabilization is attributed to clearer backing policies post-2019. Research by Thanh et al. (2022) indicated USD-backed stablecoins' superior stability compared to algorithmic variants. Tether's negative correlation with other stablecoins positions it as a stable and solid choice. Larger market-cap stablecoins like USDT and USDC impact smaller ones. Additionally, USDT's trading volume increase positively correlates with heightened Bitcoin volatility, confirming prior findings. These dynamics continue shaping the evolving cryptocurrency landscape.

Introduction

Cryptocurrencies serve as financial tools that enable a form of anarcho-capitalism, which is a type of libertarian political and economic system. The key features of crypto anarchy include the free exchange of money through digital systems and across borders, devoid of government intervention. This freedom fosters greater individual liberty in other areas due to the reduced economic power wielded by governments. Austrian economist Friedrich A. Hayek argued in his paper "*The Denationalisation of Money*" (1976) that governments should not possess a monopoly on issuing money, citing its inflationary effects and disruptions to the business cycle. Bitcoin also adheres to the fundamental principle of dismantling the monopoly in money issuance and the control of payment systems maintained by central banks (Trautman, 2014).

Cryptocurrencies offer enhanced security due to their decentralized nature and robust encryption features. This is particularly significant in light of government actions that often lead to currency devaluation through artificial expansion of the monetary base, driven by political motives.

Trautman (2014) presents the following cryptocurrency definition: "a digital unit of exchange that is not backed by government-issued legal tender." One of the pioneering papers in cryptocurrency technology is David Chaum's (1982) "*Blind Signatures for Untraceable Payments*," in which he establishes a cryptographic protocol for payment systems utilizing two key digital signature systems: a private key and a public key, akin to how Bitcoin operates.

While evidence suggests that other cryptocurrencies existed prior to Bitcoin, it's plausible that Bitcoin achieved its remarkable level of success due to the profound disappointment and dissatisfaction with the financial system in the aftermath of the 2008-2009 financial crisis. Numerous individuals worldwide felt deceived by major banks and sought an alternative. This is the context in which cryptocurrencies emerged and coincided with Bitcoin's launch in 2008 (Tu & Meredith, 2015).

The inception of the cryptocurrency era is widely attributed to 2008 when the Bitcoin white paper was published by the enigmatic Satoshi Nakamoto, whose identity remains undisclosed to this day. The first transactions occurred among a few members of the cypherpunk community, used to order a pizza. By 2014, the daily trading volume of Bitcoin had surged to an average of \$575 million (Tu & Meredith, 2015). This newfound popularity led to established companies like Dell and Expedia recognizing it as a legitimate form of payment, solidifying its mainstream status (Knight, 2014).

As the Bitcoin ecosystem expanded, a range of associated service providers and business models entered the market. Notably, crypto exchanges, crypto banks (e.g., Signature Bank), crypto ATMs (e.g., Chivo in El Salvador), crypto wallets (e.g., Trezor), and payment services (e.g., Ripple - XRP) emerged. Simultaneously, the popularity of Bitcoin with its value reaching \$1200 USD by 2013 gave rise to other cryptocurrencies, often called "Altcoins". For example, Litecoin surfaced in 2011, followed by Ripple in 2012, and Ethereum in 2015.

The proliferation of cryptocurrencies escalated further after Ethereum introduced smart contracts within its blockchain, allowing numerous companies to launch their own cryptocurrencies without the need to create an entirely new blockchain. Amid the emergence of countless cryptocurrencies, diverse applications, and services were conceived for them. Bitcoin and Litecoin preserved their original purpose as stores of value, akin to virtual gold. Conversely, currencies like Ripple and Stellar prioritized cross-border payments, as the Bitcoin blockchain's proof-of-work (PoW) algorithm proved too sluggish. Privacy-oriented coins such as Monero, decentralized apps (also known as decentralized finance or DeFi) exemplified by Ethereum and EOS, and stablecoins like Tether USD or DAI each found their niche.

Criticism of Bitcoin

During Bitcoin's inception, the cryptocurrency functioned with a sense of autonomy, existing within a close-knit community of cypherpunks and hackers. As its user base expanded, it began to attract regulatory scrutiny due to its risk profile and several highly negative incidents, including the collapse of the initial major exchange, Mt. Gox, and the employment of an illicit drug distribution scheme in the online platform Silk Road. Bitcoin's central challenge stemmed from its inherent decentralization. Operating within a peer-to-peer network and devoid of any single private company or individual claiming ownership over its development, it proved exceedingly difficult to be subject to regulation (Trautman, 2014).

The animosity and encryption involved with cryptocurrency transactions allow for money to be laundered and practically vanish without any risk. This has led to virtual currencies being used as a transaction system for criminal and terrorist acts. Acts involving hired assassins, theft of intellectual property, generating and distributing malware, seizing bank accounts, child exploitation, corporate espionage, drugs, fake IDs and passports, investment schemes, sexual exploitation, and stolen credit cards (Trautman, 2014). Another major case was Liberty Reserve, a Costa Rica-based crypto payment platform that was shut down by the US government due to money laundering. It is estimated that financial resources coming from distinct illicit activities were laundered in the platform for an outstanding \$6 billion dollars.

Mythili Raman, Assistant Attorney General for the Criminal Division of the United States Department of Justice, asserts that criminals frequently become early adopters of emerging financial technologies, and virtual currencies prove to be no exception. Raman delineated two primary areas of law enforcement focus concerning virtual currencies within the Department of Justice (DOJ): (1) Prosecuting individuals who employ cryptocurrencies for var-

ious criminal activities, and (2) prosecuting cryptocurrency services and platforms that enable illicit actions, as outlined in the first point (Trautman, 2014). Tu and Meredith (2015) found that by March 2014 it was estimated that close to 800 thousand bitcoins worth approximately \$500 million had been stolen.

Certain nations adopted a favorable stance towards cryptocurrency regulation to foster financial innovation and inclusion (e.g. El Salvador), whereas others perceived it as a direct challenge to their sovereignty, resulting in outright bans (e.g. China). The struggle to regulate cryptocurrencies primarily stems from the intricate task of defining their nature. While some assert that cryptocurrencies qualify as a form of money (albeit not legal tender), others contend that they are more aptly categorized as financial assets. Nevertheless, their distinct attributes set them apart from traditional currencies, stocks, bonds, or financial derivatives.

Stablecoins

Investors encountered a significant challenge when opting for a buy-and-hold strategy in the cryptocurrency realm: conversion risk. Numerous regulated exchanges do not provide the complete spectrum of available cryptocurrencies or do not offer conversion from fiat. Consequently, investors often find themselves needing to convert their dollars or euros into a widely recognized crypto, such as Bitcoin or Ethereum, to subsequently engage in trading on prominent platforms like Binance or Coinbase. This multi-step process introduces two notable inconveniences. First, the imperative to convert leads to escalated transaction fees for investments. Second, investors grapple with substantial conversion risk due to the pronounced volatility of cryptocurrencies relative to conventional currencies.

Another hurdle faced by cryptocurrency users involves attempting to utilize certain cryptocurrencies, like Bitcoin, as a medium of exchange as transactions can extend to around 10 minutes due to the computational demands of the Proof-of-Work (PoW) algorithm. This inherent delay renders Bitcoin impractical for day-to-day purchases. This scenario underscores the significance of stablecoins, which furnish a stable store of value when juxtaposed with their volatile counterparts. Moreover, they function as a bulwark against exchange rate risk, effectively embodying the concept of "crypto-fiat." However, it's important to note that stablecoins can either be backed or unbacked. Prominent stablecoins like Tether USDT assert a one-on-one backing by the US dollar (Calcaterra and Rao, 2020).

Tether emerged as one of the earliest stablecoins, introduced in 2014, and others like BitShares and Nubits were also launched at the time. A stablecoin is a cryptocurrency tied to a fiat currency, such as the dollar or euro. Tether, notably, is pegged to the US dollar (Ante et al., 2021). By 2018, Tether's market capitalization exceeded \$2 billion (Wei, 2018). As of 2023, it has achieved a market cap of \$83 billion, positioning itself as the third-largest cryptocurrency in the entire crypto market.

Tether's ascent prompted the inception of various stablecoin projects. One such project is Libra, a stablecoin initiated by Facebook in 2020. The concept behind Libra involved creating a coin backed by a basket of currencies, including the euro, dollar, and Japanese yen, thereby enabling users to conduct transactions via platforms like WhatsApp, Messenger, and other Facebook-owned applications. However, this initiative was perceived as an existential threat by global banks. It raised concerns of being a potential tool for money laundering, susceptible to data misuse, and a hazard to financial stability. Furthermore, it was seen as an attempt to wrest control over currencies from governments. Due to Facebook's extensive user base, reaching 2.8 billion users by 2020, the coin possessed the potential to significantly influence the global financial system, potentially redirecting a substantial portion of financial activity towards it. Alongside this, apprehensions emerged regarding the security of users' data. The notion that Facebook could access and monitor all transactions, utilizing this data for marketing or other purposes, intensified concerns about the company's control over personal information.

Stablecoins necessitate backing with cash and cash equivalents, resembling the manner in which fiat currencies are upheld. A fundamental 1:1 reserve ratio implies that 1 dollar is reserved for each token of a stablecoin issued, aligning it with the value of the pegged currency. In contrast to cryptocurrencies like Bitcoin, stablecoins are not mined; rather, they are issued on a blockchain by the parent company. Take DAI as an example, issued on the

Ethereum blockchain and substantiated by Ethereum reserves within the blockchain. This particular variant of stablecoin is referred to as a crypto-collateralized stablecoin (Ante et al., 2021). Notably, DAI, much like Tether USDT, is pegged to the US dollar. Berentsen and Schär (2019) conducted an analysis scrutinizing the characteristics, benefits, and drawbacks of the three principal types of stablecoins: algorithmic, crypto-collateralized, and fiat-collateralized. Algorithmic stablecoins, distinct from the others, lack backing and instead utilize algorithms rooted in the quantitative theory of money to establish a fixed value relative to a specific currency. This is accomplished through the electronic minting or burning of tokens (e.g., Basis and Nubits) (Calcaterra et al., 2020).

Table 1.

Stablecoin Types and Reserves			
Peg	Stability mechanism	Type of collateral	Stablecoins
USD parity	Algorithmic	None	Basis
USD parity	Collateralised	On-Chain (e.g. Ether)	DAI
USD parity	Crypto-collateralised	Off-Chain (e.g. USD)	Tether USDT

Conversely, central banks have also opted to introduce their own stablecoins, referred to as Central Bank Digital Currencies (CBDCs).

As noted by Griffin and Shams (2020), Tether holds the distinction of being the largest stablecoin and currently wields significant influence over the prices of Bitcoin and other crypto assets. Numerous cryptocurrencies experienced adverse returns prior to the emergence of stablecoins in the market, which subsequently contributed to their stabilization (Ante et al., 2021). Tether USDT was introduced by Tether Limited in the autumn of 2014, with the assertion that this stablecoin is "100% backed by actual fiat currency." Nonetheless, concerns and speculations have arisen regarding the company's ability to maintain sufficient cash reserves in its accounts. It's worth noting, however, that Tether Limited also specifies that owners of Tether tokens do not possess a guarantee of being able to exchange their tokens for fiat currency at any given time.

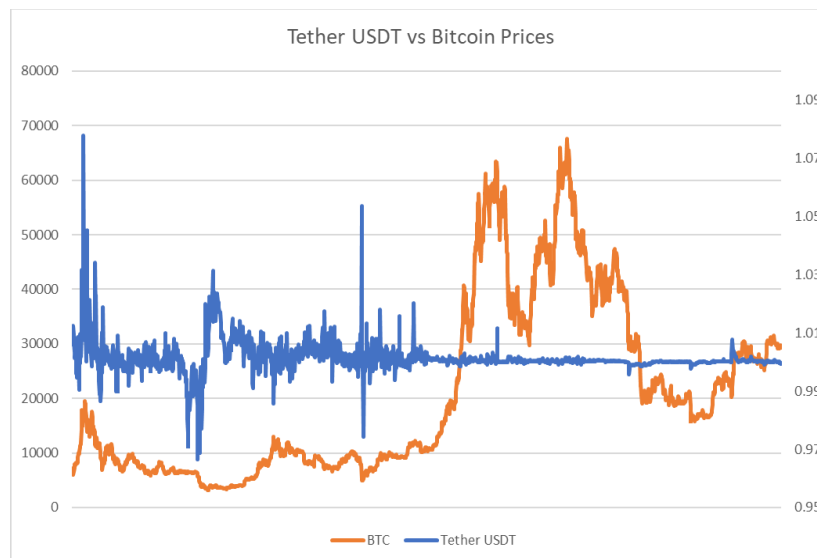


Figure 1. Daily price time series from Bitcoin price (BTC) and Tether USDT from November 2017 to August 2023. Bitcoin shows an inverse relationship to the variability of Tether USDT.

Figure 1 shows the daily prices of Tether USDT and Bitcoin from November 2017 to August 2023 on a graph, an inverse relationship in their price volatility becomes evident across the majority of the analyzed period. During times of heightened volatility in Tether, we observe relatively subdued fluctuations in Bitcoin prices. However, in the latter half of the examined time frame, this trend shifts; Bitcoin displays significantly greater volatility while Tether USDT stabilizes. According to Griffin and Shams (2020), the pronounced variance in Tether USDT's value before 2019 can be attributed to the release of multiple policies and guidelines related to reserve backing obligations during that period. These actions engendered uncertainty in investors regarding the stablecoin's future.

Starting in 2022 as observed in Figure 2, it appears that Tether has effectively impacted Bitcoin's volatility of returns by reducing it compared to preceding years. Notably, we observe that during instances of considerable variability in both BTC prices and returns, Tether USDT exhibits a notable "stability." This attribute aligns with what investors typically seek during periods of heightened volatility (Baur and Hoang, 2021). Nevertheless, Grobys and Huynh (2022) contend that there exists no consensus regarding whether USDT is genuinely manipulating Bitcoin prices, citing inconclusive evidence thus far. For instance, Kristoufek (2021) finds no substantiating evidence that stablecoins are positively inflating cryptocurrency prices. Instead, he concludes that the augmented demand for stablecoins stems from an amplified desire for crypto-fiat money, which reflects investors' increased interest in investing more in crypto assets.

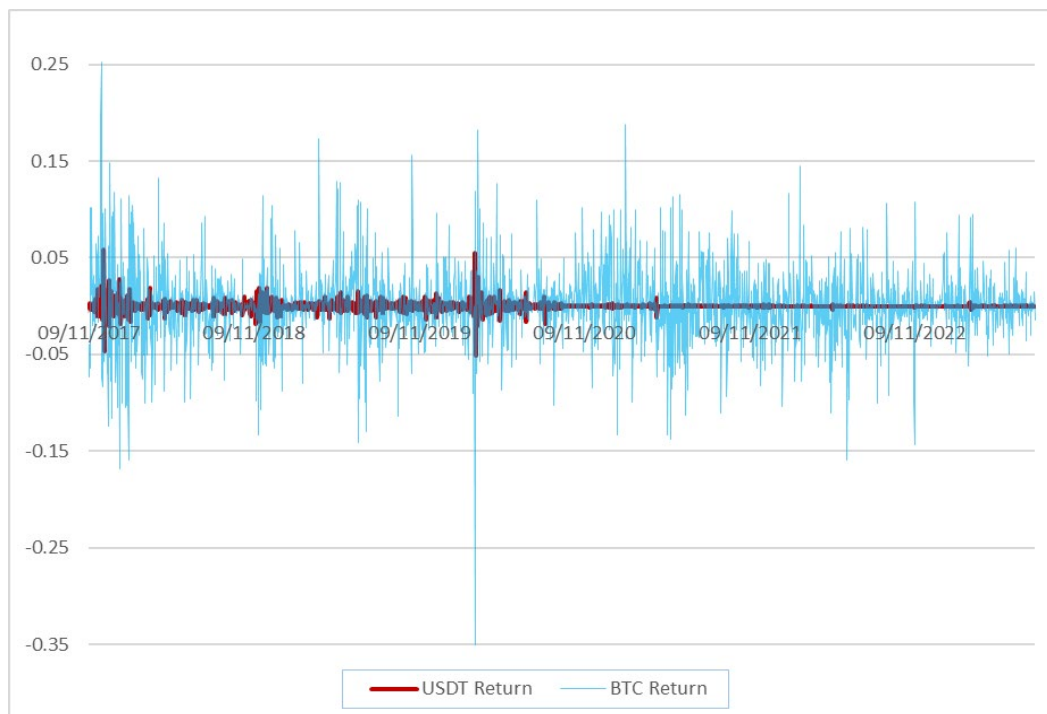


Figure 2. We graph Bitcoin and Tether USDT daily price returns for from November 2017 to August 2023. Contrary to the price graph, we now see a positive correlation in return spikes (downs and ups) until 2020. Afterward, as with the price graph, we observe that Tether USDT price returns stabilize and remain so until 2023. On the other hand, Bitcoin returns keep a similar trend during 2020 and 2021 but show a marked decrease from 2022 onward.

Both the price graph and the daily return graphs of Bitcoin versus Tether USDT reflect that from 2022 onward, Tether has had a stabilizing effect on Bitcoin variance. Apparently, Tether USDT provides a stable store of value and allows market participants to make transactions quickly and efficiently (Griffin and Shams, 2020).

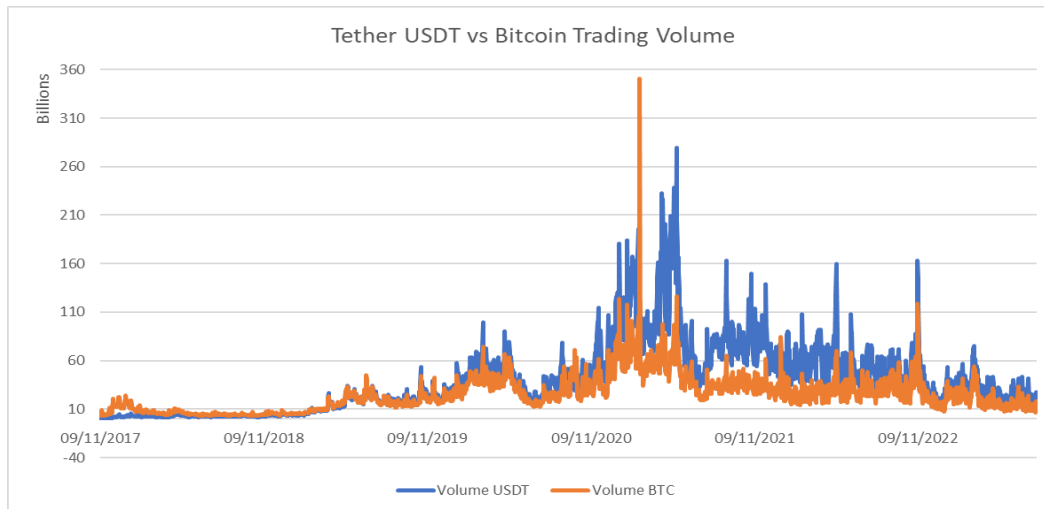


Figure 3. We graph the Bitcoin and Tether USDT daily trading volume from November 2017 to August 2023. There is a large positive correlation of ($\rho = .87$) between the trading volume of Tether USDT and BTC, showing investors are buying Tether USDT when they want to buy or sell Bitcoin as their medium of exchange between fiat money.

We hypothesize that the primary utility of Tether lies in its role as a facilitator for cross-exchange arbitrage, which helps to mitigate pricing disparities and exchange rate risk among various cryptocurrency exchanges. This is in line with Griffin and Sham's (2020) "pulled hypothesis" where they posit that Tether is driven by market demand and is appropriately backed by dollar reserves. This is demonstrated by both assets' trading volume extremely high correlation ($\rho = .87$). Our conclusion is the same as Griffin and Shams (2020), Tether USDT is being used to protect and inflate the market, and the effect of Tether transactions on Bitcoin prices seems to be stronger following negative Bitcoin returns. Along these lines, Grobys and Huynh (2022) performed a statistical analysis in a similar time period, from 2018 to 2021, to verify if USDT jumps have a strong effect on Bitcoin returns. The authors analyzed the effect of jumps in USDT equivalent to a daily 1% increase, and found that the next day Bitcoin returns were significantly negatively correlated, with returns ranging from -3.65% and -8.49%. Their conclusion is that large sales of BTC positions are exchanged by Tether USDT, causing the price jump and the selling pressure on Bitcoin activating stop loss orders which translate to a BTC price decrease.

Turbulence in the Stablecoin Market

During the first quarter of 2023 several stablecoins experienced a significant departure from their peg given the financial turbulence experienced in the banking sector with the crash of major banks like Silicon Valley Bank, First Republic, Signature Bank, and Credit Suisse. The credit rating agency Fitch Ratings reported that USD Coin (USDC), another stablecoin pegged to the US dollar like Tether, experienced a cash outflow of US \$14 billion during the first seven months of 2023 due to contagion effects. However, it seems that Tether absorbed plenty of USD Coin trading volume given its volume increase in the same period (Encila, 2023). By the second semester of 2023, USDC will be the second largest stablecoin in terms of market capitalization and trading volume after Tether USDT and the sixth largest overall according to Coinmarketcap data.

In a study conducted by Thanh et al. (2022), an examination was undertaken regarding the market price deviation from the nominal value of the five most pertinent stablecoins spanning the years 2019 to 2021. The research reveals that among the top five, DAI—the algorithmic stablecoin—exhibited the most significant departure, reaching 12.5% of its nominal value. This observation underscores that stablecoins pegged to the USD consistently manifest greater stability in comparison to their algorithmic counterparts. Furthermore, Thanh and their colleagues established

a negative correlation between Tether USDT and the other four stablecoins, suggesting that Tether is likely perceived as the most stable, secure, or least risky among them. Notably, the higher market-cap coins such as USDT and USDC wield an influence over the smaller market-cap stablecoins (Thanh et al., 2022). Lastly, the authors corroborated prior research conducted by other scholars by confirming that an escalation in trading volume of USDT correlates positively with an increase in Bitcoin volatility which is a similar assertion previous authors and ourselves have made.

Table 2

Variable	"Average 24-hour Trading Volume (in USD)"	"Average Market Capitalization (in USD)"
Bitcoin	17,484 million	512,442 million
Tether	27,233 million	82,800 million
USD Coin	4,155 million	25,899 million
True USD	2,577 million	2,741 million
Paxos Standard	2 million	507 million
Single_Collateral Dai	133 million	5,348 million

Trading volume and market capitalization data taken from CoinMarketCap.com

Discussion

As we have reviewed from the recent literature on stablecoins, there is no clear consensus on whether they have a significant influence on the price of Bitcoin and other major cryptocurrencies, or at least the magnitude of such influence. However, our findings align with those of other authors who assert that there is an inverse relationship between the volatility of Bitcoin returns and Tether USDT, reflecting they are effective in their “stabilization” effect. Furthermore, Tether USDT shows a particular behavior compared to the rest of stablecoins being the market dominant. There are signs that Tether's USDT trading volume has a negative correlation compared to small-cap stablecoins (e.g. USDT), reflecting its unique properties. Lastly, it is undeniable that stablecoins have been effective in reducing conversion risk for investors by being the “crypto-fiat” alternative.

Regarding regulation, due to distinctions among stablecoin types (backed vs unbacked) and their diverse applications, regulatory frameworks are largely pending across most countries. It's evident that stablecoins backed by appropriate reserves exhibit greater stability than their algorithmic counterparts. While some jurisdictions opt for lenient regulatory measures, others enact complete bans. Nonetheless, a prevailing pattern emerges wherein scarcely any country classifies stablecoins or other cryptocurrencies as legal tender. We hypothesize that governments are most likely to show opposition to their development and growth given their competitive nature and risks operating outside the financial system.

Acknowledgement

I would like to thank Mr. Samuel for guiding me and helping me find my passion and interest in this topic, stablecoins and cryptocurrencies, and financial innovation in general.

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