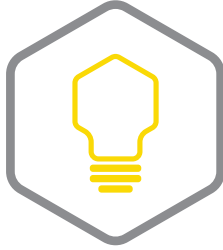# INTRODUCTION TO STABLECOINS

Providing Price Stability in Decentralized Financial Systems

Alyze Sam, Koosha Azim, and Adam Alonzi
Women in Blockchain International, Africa Blockchain University, and Global Art Gallery

January 2021

Realizing the new promise of the digital economy

In 1994, Don Tapscott coined the phrase, "the digital economy," with his book of that title. It discussed how the Web and the Internet of information would bring important changes in business and society. Today the Internet of value creates profound new possibilities.

Don and Alex Tapscott launched the Blockchain Research Institute to help realize the new promise of the digital economy. We research the strategic implications of blockchain technology and produce practical insights that will guide our members in achieving success.

Our global team of blockchain experts is dedicated to exploring, understanding, documenting, and informing leaders of the strategies, market opportunities, and implementation challenges of this nascent technology. Research projects are underway in the areas of financial services, manufacturing, retail, energy and resources, technology, media, telecommunications, healthcare, and government as well as in the management of organizations and the transformation of the corporation.

Our findings, conclusions, and recommendations are initially proprietary to our members and are ultimately released under a Creative Commons license to help achieve our mission. Each research publication includes a video introduction by Don and an infographic for members' use in communicating these ideas throughout their organizations. To find out more, please visit www.blockchainresearchinstitute.org.

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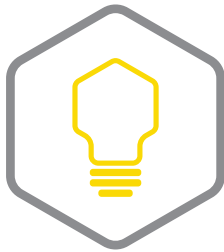
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Foreword

In *Blockchain Revolution*, Don Tapscott and I describe bitcoin, ether, and their potential impact on financial services and the medium of commerce. We also predicted that, like all areas of blockchain, the types and capabilities of coins will continue to evolve and improve. While several of our research projects have covered *stablecoins*— cryptocurrencies whose value is pegged to a basket of traditional currencies and is therefore less volatile than bitcoin—we believe that members will enjoy this panorama of the stablecoin space.

This project has several purposes. First, it puts this type of cryptocurrency into context. Second, it describes categories of stablecoins. Finally, it surveys the landscape of coins within those categories with briefs on their advantages and disadvantages.

A committed team of enthusiasts delivered this sweeping research. Project leader Alyze Sam is a well-known blockchain advocate. She is the co-founder of GIVE Nation, a nonprofit children's financial literacy, artificial intelligence, and blockchain project. She is also the founder and community director of Women in Blockchain International. She is involved at a leadership level with such innovative groups as Blockchance.eu, Women in Blockchain Foundation, World Data Forum, and the Alliance of Blockchain Professionals. Her co-authors are Adam Alonzi and Koosha Azim. Tommy Austin, Jean-Phillipe Beaudet, and Patrick Devereaux all contributed to the project. This group of blockchain experts brings to Blockchain Research Institute members a diverse portfolio of skills ranging from biotechnology to operational longevity.

DON TAPSCOTT
Co-Founder and Executive Chairman
Blockchain Research Institute

Idea in brief

» Invented to support more everyday use cases and attract more users, stablecoins are digital money with many of the benefits of cryptocurrencies like bitcoin and without their drawbacks such as price volatility. But great are the technical challenges of developing a stablecoin system strong enough to weather market turbulence.

» There are several types of stablecoins: those backed by well-known assets such as fiat currency, precious metals, or other cryptoassets (asset-collaterized), those backed by no asset (non-collaterized, aka seigniorage supply or algorithmic stablecoins), and hybrids that combine collateral and algorithms to manage supply and price. For stability, their value is often pegged to a well-known asset with a steady price like US dollars or gold.

» The top ten stablecoins by market capitalization have some features in common. For example, all are distributed applications running on top of a blockchain rather than native tokens to that blockchain, and many are ERC-20 tokens running on the Ethereum network. Several have distinct features, such as reserves held by third parties (e.g., financial institutions) and audited by independent accountants, to increase user trust.

» The use cases for stablecoins are as numerous as the use cases for fiat currency with stable value, but mass adoption will take time. Implementation challenges are well known in terms of user understanding and experience, scalability, and interoperability of systems. In the meanwhile, the authors suggest additional uses in shoring up losses when the cryptocurrency market is volatile, making a profit when the market declines, and protecting cryptoasset value in general.

Great are the technical challenges of developing a stablecoin system strong enough to weather market turbulence.

The context for stablecoins

While Satoshi Nakamoto proposed bitcoin (BTC) as "a purely peer-to-peer version of electronic cash [that] would allow online payments to be sent directly from one party to another without going through a financial institution," BTC is rarely used as a medium of exchange.[1] Price volatility and high transaction fees make many BTC and other cryptocurrencies impractical for daily transactions. Instead, people buy and hold them as electronic stores of value rather than use them as digital money.

In 2014, Vitalik Buterin wrote, "Given the high level of interest in 'blockchain technology' coupled with disinterest in 'bitcoin the currency' that we see among so many in the mainstream world, perhaps the time is ripe for stable-currency or multi-currency systems to take over."[2] He suggested three categories, "Stable assets

Price volatility and high transaction fees make many bitcoin and other cryptocurrencies impractical for daily transactions.

for trading, speculative assets for investment, and bitcoin itself may well serve as a unique Schelling point for a universal fallback asset, similar to the current and historical functioning of gold."[3]

The stablecoin concept first appeared in J.R. Willett's 2012 white paper, "The Second Bitcoin White Paper," where he described a Mastercoin protocol that would "improve the stability of Bitcoin."[4] In 2013, Dan Larimer, Charles Hoskinson, and Stan Larimer published a white paper on BitShares, a digital asset exchange designed "to embrace the innovations divined from bitcoin while … addressing both volatility and illiquidity without introducing the need for trust … ."[5] On the BitShares exchange, digital assets could "track the value of gold, silver, dollars or other currencies while paying dividends to holders and avoiding all counterparty risk."[6]

The idea behind BitShares was to create a digital currency backed by another cryptocurrency and pegged to precious metals or fiat money.

The associated coin, bitUSD, was defined as a collateralized asset that would be "highly correlated by self-enforcing market feedback to the value of USD and backed by BitShares."[7] So the idea was to create a digital currency backed by another cryptocurrency and pegged to precious metals or *fiat money*, that is, "government-issued currency that is not backed by a physical commodity, such as gold or silver, but rather by the government that issued it."[8]

That's essentially what a *stablecoin* is: a cryptocurrency with some of the benefits of BTC—such as cryptographic security, distributed rather than centralized governance, transparent and publicly auditable, peer-to-peer (P2P) digital asset exchange, and speedy settlement of transactions—but without the price volatility of BTC because the value is pegged to asset with an established and fairly steady value like gold, corn, oil, sugar, diamonds, wheat, fiat currency or other *fungible* asset, meaning an asset that is interchangeable, substitutable, or uniform with other assets.

In-Field Soybean Research *by United Soybean Board, 2008, used under CC BY 2.0, accessed 21 Dec. 2020.*

A cryptocurrency that's backed by a stable asset and pegged to a well-understood unit of value such as the US dollar makes it more understandable and acceptable.

When two commodities are considered fungible, they are identical in specification, and we can substitute one unit for another.

A cryptocurrency that's backed by a stable asset and pegged to a well-understood unit of value such as the US dollar makes it more understandable and acceptable for everyday transactions and recurring payments, from credit cards and mortgages to rent and subscriptions. The most cited use cases for stablecoins—as for BTC itself—include

» Dealing with hyperinflation in countries such as Argentina, where governments restrict residents' use of cash and citizens want to hold assets of more stable value

» Banking the unbanked or under-banked people who lack the official paperwork or minimum required balances to open bank accounts

» Transferring remittances cheaply, securely, and easily between countries

» Converting from crypto to locally acceptable currencies as easily as possible.[9]

Table 1: Types of stablecoins

Category	Type	Characteristics
Asset collateralized	Fiat-collateralized	› Centralized; backed by government currency, ensuring its store of value › Convenient, fast, and secure conversions › Easily understood by the average consumer
	Crypto-collateralized	› Decentralized; backed by another cryptocurrency, not a central government › Convenient, fast, and secure conversions › Easily used in leveraged or margin trading related to over-collateralization › Transparent; with transactions recorded on a public ledger
	Metal- or commodity-collateralized	› Backed by real-world asset or tangible commodity › Convenient, fast, and secure conversions › Greater liquidity to commodity markets › Easier price discovery › Easily understood by the average consumer
Non-collateralized	Seigniorage supply (algorithmic)	› Absence of collateral; no tangible asset required › Autonomous; not influenced by outside markets › Decentralized; benefits of cryptocurrency › Stable; automatic value adjustments based on the market › Transparent; transactions recorded on public blockchain
Hybrid	Mixed	› Characteristics of both categories above › Meets the needs of a variety of users

But start-ups are getting creative in stablecoin usage. For example, Blockimmo, a real estate company focused on tokenizing real estate, initiated an online property sale where investors could buy a piece of the building.[10] Blockimmo used XCHF, a stablecoin tied to the Swiss Franc (CHF) as a payment option, keeping the price steady during the entire transaction process. The XCHF is pegged 1:1 to CHF. Use cases for stablecoins will likely multiply as the public becomes more aware of them.

Tyler and Cameron Winklevoss, co-founders of the cryptocurrency trading platform Gemini, told *Fortune* that "stablecoins amount to 'dollars on the blockchain'" and are a "bright spot" in the crypto space.[11] To summarize, a stablecoin attempts to:

» Facilitate the adoption and use of digital currencies.

» Support effortless transactions like traditional currencies.

» Contribute to a new decentralized financial ecosystem.

» Create stability among cryptocurrency trading pairs in foreign exchange-style trades.

» Reduce risk and diversify portfolios during critical junctures.

» Assist in investment predictions by increasing transparency and minimizing market volatility.

» Provide global access to a stable currency, protecting nations plagued by hyperinflation.

The economics behind the protocols

Satoshi constructed a digital system for making impervious money and payment transactions feasible to all, despite location. In Satoshi's vision, the cryptocurrency community saw the potential for *decentralized financ*e (DeFi), also described as "open finance." The Ethereum blockchain breathed life into this future of finance with its easily integrable smart contract system. The community imagined a world of programmable money, where independent people could effortlessly log into an open alternative to every financial service available today: not just payments but savings, insurance, loans, and more.

The community imagined a world of programmable money, where independent people could effortlessly log into an open alternative to every financial service available today.

According to *BlockGeeks.com*, "a *smart contract* is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties."[12] A smart contract program operating on a blockchain can execute transactions automatically when coded conditions are met. This system lets developers construct functions that go well beyond digital assets. These programs are termed *Dapps*, or decentralized applications. Dapps are applications built on a decentralized technology rather than built and controlled by a centralized entity.

The authors of many a stablecoin white paper claim that they were inspired by the quantity theory of money.

Technologists and economists imagined the future operating effortlessly with protocols like these, but it is no longer relegated to the realms of science fiction. The authors of many a stablecoin white paper claim that they were inspired by the quantity theory of money—that is, the monetarist's hypothesis that "changes in the general level of commodity prices are determined primarily by changes in the quantity of money in circulation."[13] Early in the twentieth century, economist Irving Fisher developed an equation of exchange to represent this mid-sixteenth century idea:

$$M*V = P*T$$

where M is the supply of money, V is the velocity of circulation,

P is the level of price, and T is the volume of market transactions[14]

In theory, if M doubles while V and T remain constant, then P should double, cutting the value of each individual unit of currency in half. In practice, central bankers try to stabilize prices (i.e., minimize inflation) by controlling the amount of fiat currency in circulation.[15] Charles Kim, co-founder and chief operating officer of Decon, a blockchain technology advisory firm in South Korea, gave this Korean Republic won (KRW) example: "In the long run, currency value, like commodities, can change in accordance with supply. If the exchange rate today is $1 = ₩2000 (weaker KRW), the exchange rate could become $1 = ₩1000 (KRW appreciates) by decreasing circulating KRW by half."[16]

Night at Jagalchi, Busan, South Korea *by johnlsl, 2016, used under CC BY-NC-ND 2.0, accessed 22 Dec. 2020.*

Many economists accept the Fisher equation as valid.[17] This model suggests stablecoins could be programmed to keep drastic price swings at bay by adjusting units in circulation. If a stablecoin's value dropped below a certain price point, the smart contract would curb the total number of tokens circulating and stabilize its value. If the token's value rose beyond a certain price point, the smart contract could incorporate more supply to keep cryptocurrency at desired market value.

Blockchain technology is still in its infancy, and cryptocurrency projects are rapidly changing; therefore, we cannot easily calculate token velocity and transaction volume, let alone make any assumptions about constancy.

Most economic models are imperfect. This model assumes that the velocity of circulation and the volume of transactions are proportional. Blockchain technology is still in its infancy, and cryptocurrency projects are rapidly changing; therefore, we cannot easily calculate token velocity and transaction volume, let alone make any assumptions about constancy. Considering *V* and *T*, we may want to add more variables to the equation.

For example, with BitShares, Dan Larimer was trying to solve for the hidden costs of securing the Bitcoin blockchain through hash power. He suggested that BTC advocates were ignoring *marginal utility*, the economic theory that "the value of a good or service decreases as the quantity consumed or available increases. … Unfortunately, each additional unit of security provides less value and costs more money."[18] He estimated that BTC holders were paying about 10 percent of their BTC savings each year to protect BTC's market capitalization.

Larimer asked prospective users to "think of a cryptocurrency as shares in a decentralized autonomous corporation (DAC) where the source code defines the bylaws."[19] The BitShares DAC's code would pay for security but only the necessary amount to maximize shareholder value. Larimer believed that, instead of distributing coins solely to miners, "paying shareholders dividends will result in a better long-term viral marketing campaign and increase the demand for shares of the DAC. This increase in demand will bid up prices beyond competing DACs that do not offer dividends. As a result, miners make more money despite having a smaller share of the pie."[20]

Controversy has stirred in the crypto communities over stablecoin design.

In its survey of stablecoins, BitMEX Research concluded that stablecoin innovators often miscalculate the technical challenges of creating a stablecoin system "robust enough to withstand cycles or the turbulence and volatility linked to financial markets."[21] They pointed out that "most forms of fiat money, even the US dollar itself, have not even achieved that, with credit cycles putting US dollar bank deposits at risk." BitMEX's takeaway: a stablecoin system built on USD may never be more reliable than the current banking system.

Governance of stablecoins

Controversy has stirred in the crypto communities over stablecoin design. Some have questioned the logic of pegging and using an algorithm to adjust pricing. "Fiat-world examples of pegged assets form an object lesson in why you don't try to peg currencies:

Most stablecoin developers have built their projects on Ethereum using Solidity, a programming language that makes the resulting smart contracts more difficult to verify.

because you are unable to hold the peg any longer than you can afford to subsidize your differences of opinion with the market," wrote Preston Byrne, co-founder of enterprise blockchain start-up Monax.[22] He later blogged that stablecoins were "the techno-magical idea that a cryptocurrency can tell the market what its price should be, rather than the market determining what a cryptocurrency's price should be."[23] He put it another way in an e-mail to *Technology Review*: "Price is determined by a meeting of the minds of a buyer and seller, not by an algorithm. … All that is required for these systems to fail is for people not to buy the product."[24]

Not all stablecoin projects are transparent and decentrally governed. Adam Back, known for the Hashcash "proof of work" system, said that stablecoins intrinsically fall short of BTC because of their custody risk. He believed existing stablecoins lacked the self-sovereignty properties of BTC and expected central government-operated ones in the future similarly to lack in self-sovereignty.[25] Finally, he added, publicly auditable blockchains provide more value.[26] According to PricewaterhouseCoopers, most stablecoin developers have built their projects on Ethereum using Solidity, a programming language that makes the resulting smart contracts more difficult to verify.[27]

BitMEX Research distinguished distributed stablecoin systems "from tokens such as Tether, where one entity controls a pool of USD collateral, ultimately making the system centralized and thus susceptible to being shut down by the authorities."[28]

Table 2: A look at stablecoins in general

Advantages	Disadvantages
› Easier to understand for fiat and digital currency users	› In some countries, users must buy stablecoins through their bank accounts
› An acceptable bridge from fiat to cryptocurrency	› Custody risk in projects controlled by a single entity or backed by centrally managed assets; requires trust in a third party
› Potentially low-fee, secure, and partially or completely anonymous digital transactions peer to peer	› External audits needed to ensure that entity is holding stated amount of assets
› Censorship resistant	› Pegging to a fiat currency that faces inflation or other shock to its value
› Potentially strong governance with transparency and accountability	› Over time new markets tend to decrease in price volatility; if BTC value stays relatively stable, then demand for stablecoins may decrease
› Use of in-Dapp purchases over utility tokens when token volume is low, volatile in price, or a combination of both	› New technology takes time to mass adoption
› Offers a hedge against fiat currency in countries with challenging economic conditions	› Reduced return on investment; traders look to other means for financial gain
› Use of smart contracts to protect all parties with interest in investments	› Likely regulation could increase costs and reduce user anonymity; in some countries, users must buy stablecoins through their bank accounts
› Asset-backed, potentially reducing market fluctuations	
› Likely regulated to protect users	
› Potential to transform remittance transactions	

In 2017, rumors surfaced about Tether's not being fully backed 1:1 by the USD as Tether had claimed. Tether representatives eventually admitted that Tether was backing only 74 percent of its coin by USD, making it a fractional reserve stablecoin. Bitfinex, which shares a parent company with Tether, reported an $850 million loss in Tether funds that it planned to supplement with its new asset exchange token, LEO.[29]

In 2017, rumors surfaced about Tether's not being fully backed 1:1 by the USD as Tether had claimed.

In the fourth quarter of 2019, two members of the US House of Representatives Financial Services Committee, Rep. Sylvia Garcia (D-Texas) and Rep. Lance Gooden (R-Texas), proposed the Managed Stablecoins are Securities Act of 2019 on the day of a committee hearing on the role of big data in financial services.[30]

Rep. Garcia said managed stablecoins "are clearly securities under existing law. … Bringing clarity to the regulatory structure of these digital assets protects consumers and ensures proper government oversight going forward."[31] Rep. Gooden brought to light the necessity of the bill in helping consumers understand the financial assets they were buying:

> *In what are called "managed stablecoins," we have trusted brands marketing digital assets to consumers as secure and stable … . Everyday investors need to know they can trust the issuers behind their financial assets. This bill would bring them the security they deserve by applying the laws we use to regulate financial securities to this new breed of digital currencies.[32]*

Gold or bitcoin, a stable commodity?

The goal of monetary policy is to prevent not only inflation but deflation as well, while promoting a stable monetary environment. In the nineteenth and twentieth centuries, governments adopted the "gold standard" for their monetary systems, in which their standard economic units of account derived from a fixed quantity of gold.[33] The gold standard appealed because it moved control from human beings to market forces. The physical quantity of gold acted as a limit to currency issuance, thus curtailing inflation. Most nations abandoned the gold standard in the 1930s, although many still hold substantial gold reserves.[34] By the 1930s, gold coins were no longer a circulating currency, and the world abandoned the gold standard.

Practical uses aside, gold has kept its value largely related to tradition—that is, its perceived scarcity and the difficulty of mining it.[35] Many believe that, during times of economic downfalls, gold is still a safer investment, provided that no majority owner or block of owners can control the market. For example, King Mansa Musa of the Mali Empire (1312–1337 CE) spent so much gold in the markets of Cairo that the value of the precious metal plummeted by 20 percent.[36]

Market in Cairo, Egypt *by Alex Azabache, 2019, used under Unsplash license, accessed 22 Dec. 2020. Cropped.*

Ranked as the twelfth richest man ever to walk the earth, Mansa Musa had hauled over 16 tons of gold with him on his annual pilgrimage from Timbuktu to Mecca. It was on his return trip to Mali through Egypt that he stopped to shop, and his Cairene shopping spree triggered an economic downturn in the Middle East.

Notwithstanding this example to the contrary, humankind has recognized gold as a precious asset with a stable value for five millennia. But can we formulate stronger digital currencies and protocols to prevent such devastating events in the crypto space? Some have argued that BTC is a better investment asset than gold because private companies, governments, and banks cannot control its quantity.[37]

According to Cointelegraph, *Nick Szabo predicted that, in countries on economic sanctions lists or "where economic mismanagement has precipitated ruinous national currency devaluation or inflation," people would adopt cryptocurrencies such as BTC over gold in particular because central powers have proven themselves untrustworthy stewards of value. As an example, Szabo cited, "the Nazis' looting of Europe's gold reserves, beginning with Austria's in 1938."[38]*

Humankind has recognized gold as a precious asset with a stable value for five millennia. But can we formulate stronger digital currencies and protocols to prevent such devastating events in the crypto space?

Bitcoin is governed by computer science, cryptography, and mathematics, not by politicians.

Bitcoin is governed by computer science, cryptography, and mathematics, not by politicians. It's run by a social consensus implemented through the Hashcash proof-of-work system as part of the BTC mining algorithm. That's the consensus mechanism through which members of the distributed Bitcoin network decide upon unitary rational action. In general, consensus technology enables truly democratic governance and the coordination of free market activity. The Bitcoin network was the first to integrate a fully distributed consensus method for facilitating the transfer of value more efficiently P2P through electronic communications. The proof-of-work structure that secures and maintains the Bitcoin network is one way of organizing individuals who do not necessarily trust each other to act in the best interest of all participants of the network.

Bitcoin advocates have compared the market performance of gold over the last 43 years with that of BTC over the last six years and proclaimed an "uncanny resemblance" in the resulting charts of their respective prices.[39] Perhaps it is because Bitcoin's creator capped BTC quantity at 21 million, released steadily over time, and so it is finite like gold.

Once all 21 million bitcoins are minted, there will be no more to mine and its value will increase as demand grows. Crypto fanatics relish their proposed new gold standard. They can melt gold down to power the application-specific integrated circuit *(aka ASICs) devices used to mine and transfer BTC, thereby unleashing a new digital gold rush.*

So which is more beneficial to invest in—BTC or gold?[40] Remember, BTC and gold are completely different assets with different use cases. BTC will never be a tangible commodity, while volatility limits BTC's ability to be a haven for investors. Today we can invest in either one, or we can obtain both by investing in a legitimate gold-backed and gold-pegged stablecoin.

Coins Ancient Roman Money Old Copper Bronze *by Thanasis Papazacharias, 2020, used under Pixabay license of 27 March 2020. Cropped.*

Types of stablecoins

In this section, we develop a basic taxonomy of stablecoins for comparing and contrasting those in use and in development.

Asset-collateralized stablecoins

The socially agreed upon currency in most countries is termed *fiat*, meaning something created without effort, by dictate or decree.[41] Until 1971, most nations applied a gold exchange standard or else pegged foreign currency exchanges to the price of gold or silver.[42]

Shifting from an asset-backed currency to the current fiat system left centralized banks, governments, financial technologists, private entities, and economic experts with the concept of asset-collateralized stablecoins. Their purpose is to tokenize stable assets on a blockchain, and so serve as a means of speedy, secure, and stable daily transactions. Stablecoins in this category may guarantee to exchange one stablecoin for one unit of its underlying asset.

Fiat-collateralized stablecoins

The most basic type of stablecoin is a fiat-collateralized stablecoin. This token is a 1:1 ratio cryptocurrency backed by fiat like the US dollar or the Japanese yen. Stablecoins are created when a fiat asset is deposited to a distributed platform or centralized issuer and destroyed when the fiat asset is withdrawn: the stablecoin protocol or issuer accepts a deposit in fiat and issues the depositor one unit of stablecoin for every dollar deposited. The 1:1 ratio holds. The digital currency is effectively an IOU for its underlying asset. If depositors decide to liquidate their stablecoin tokens, the stablecoin protocol or issuer transfers the fiat currency and then "burns" the stablecoins representing the fiat currency transferred.

This digital currency system makes transactions safe, fast, and secure, making it useful as a medium of exchange as well as a short-term store of value. In addition to price stability, stablecoins are convenient and easier to convert back into fiat, and consumers are acquainted with government-backed assets. The disadvantages are several:

The digital currency system makes transactions safe, fast, and secure, making it useful as a medium of exchange as well as a short-term store of value.

» Centralized systems are prone to certain vulnerabilities (i.e., single point of failure, bankruptcy of the central entity, and moral hazards); using a centralized structure negates the decentralization principle of cryptocurrency.

» Users must trust some third party to hold sufficient fiat collateral for the system to function optimally; again, this idea goes against the principle of cryptocurrencies, which are traditionally *trustless media* of exchange.

» Governance must include external audits to verify transparency in fund accounts. Auditors can determine

whether the issuer is holding the appropriate amount of collateral. Auditing can be a tedious and expensive process.

» Processes involving fiat currency require greater oversight and more regulations, which could complicate and possibly compromise the efficiency and the anonymity of the cryptocurrency adoption process.

» Fiat-backed coins rely on traditional fiat currency payment systems, which tend to rely on older, slower, and more expensive technologies.

J.P.Morgan's official website states, "We have always believed in the potential of blockchain technology and we are supportive of cryptocurrencies."

Let's look at a well-known corporate example. JPMorgan Chase is the largest bank in America with $2.5 trillion worth of assets.[43] In 2017, Australia's ANZ bank and the Royal Bank of Canada co-launched the Interbank Information Network on JPMorgan Chase's Quorum blockchain and integrated with Microsoft Azure to streamline an array of financial processes such as compliance, settlement, origination, and interest rate payments.[44] Now rebranded Liink by J.P.Morgan, the platform connects over 400 banks worldwide.[45] (ConsenSys acquired Quorum in August 2020 and is now managing the underlying technology for the bank.[46])

JPMorgan Chase has integrated real-time settlements, indicating it has successfully launched a digital currency, which surprised many in the fintech sector.[47] The results were exciting for those awaiting JPM Coins. J.P.Morgan's official website states, "We have always believed in the potential of blockchain technology and we are supportive of cryptocurrencies ... ."[48]

Some would disagree. Jamie Dimon, the bank's chair and chief executive officer, called BTC a "terrible store of value" as early as 2014.[49] A year later, he said, "Bitcoin will not survive."[50]

Jamie Dimon, CEO of JPMorgan Chase *by Steve Jurvetson, 2013, used under CC BY 2.0, accessed 22 Dec. 2020. Cropped.*

Table 3: Fiat-collateralized stablecoins

Stablecoin	Symbol	Issuer	Released	Notes
AUD Ramp	AUDR	OnRamp Technologies	2018	ERC-20 compliant; backed by and pegged to AUD
Gemini Dollar	GUSD	Gemini Trust Co. LLC	2018	ERC-20 token; backed by and pegged to USD; publicly available monthly audit by accounting firm
Globcoin	GLX	Reserve Currency Solutions SA	2018	Backed by 15 fiat currencies
HUSD Token	HUSD	Stable Universal Ltd.	2018	ERC-20 token; backed 1:1 by USD
JPM Coin	JPM	JPMorgan Chase	2020	Backed by and pegged to USD
Libra Coin	N/A	Facebook	TBD	Backed by 50% UDS, 18% EUR, 14% JPY, 11% GBP, and 7% SGD; governed by Libra Assoc.
Monerium	N/A	Monerium EMI ehf.	2019	ERC-20 token; backed by USD, EUR, and other fiat currencies
Nollar	NOS	NOS Stablecoin	2018	Backed by EUR; pegged to USD and other fiat currencies
Paxos Standard	PAX	Paxos Trust Co.	2018	ERC-20 token; backed and pegged to USD; audited by WithumSmith+Brown PC
Reserve	RSV	N/A	2020	ERC-20 token; backed by fiat currency
USDK	USDK	OK Group, Prime Trust	2019	ERC-20 token; backed by USD, 1:1; exchange rate with USD; third-party auditors of accounts and smart contract
Stably USD	USDS	Stably Corp.	2018	ERC-20 token, BEP-2 token (Binance); backed by and pegged to USD; supply adjusted via open market operations
Stasis Euro	EURS	STSS Ltd.	2018	ERC-20 token; backed and pegged to EUR; verification streams supported by Stasis
Stronghold USD	N/A	Stronghold Institutional Services	N/A	Backed 100% by USD deposits; solely for the IBM World Wire Payment Network; different from SHx on Stellar platform
Tether	USDt	Tether Holdings Ltd.	2014	ERC-20 token; backed and pegged to USD; built on Omni chain; formerly Realcoin
TrustToken	TrueUSD	TrueCoin LLC	2018	Backed by and pegged to USD; built on Ethereum; focused on transparency; also TrueAUD, TrueCAD, TrueGBP, TrueHKD
USD Coin	USDC	CENTRE Consortium	2018	Co-founded by Circle and Coinbase; ERC-20 token; backed by and pegged 1:1 to USD; audited by Grant Thornton

Sources: CoinMarketCap.com, Etherscan.io, and individual token websites, Nov. 2020.

The JPM Coin is based on blockchain-based technology enabling the instantaneous transfer of payments between institutional clients.

In September 2017, he very publicly dismissed BTC as a "fraud" and threatened to fire any staff members who used it. Dimon later said he regretted making this statement.[51] During the "Delivering Alpha" conference in 2018, Dimon announced, "My daughter bought some bitcoin and it went up and she thinks she's a genius now."[52]

However, for the underlying Bitcoin blockchain, Dimon never had anything but praise, evidenced not only by his words but his actions. JPMorgan Chase had been experimenting with distributed ledger technology for several years. Anticipating cryptocurrency regulation, J.P.Morgan plans to evolve with financial trends. In February 2019, its site proclaimed, "J.P.Morgan this month became the first US bank to create and successfully test a digital coin representing a fiat currency. The JPM Coin is based on blockchain-based technology enabling the instantaneous transfer of payments between institutional clients."[53]

Despite Dimon's disdain for BTC, JPM Coin tries to imitate the technology for trust. It will be a fiat-collateralized stablecoin pegged to the US dollar.[54] On 28 May 2019, JPMorgan Chase announced that its "blockchain team [had] developed a privacy feature for Ethereum-based blockchains," an open-source extension to the Zether protocol that masks user identities and amounts of transactions.[55] Oli Harris, then head of digital-assets strategy and Quorum at J.P.Morgan, explained the extension's function to *CoinDesk*:

> *In the basic Zether, the account balances and the transfer accounts are concealed but the participants' identities are not. So, we have solved that. In our implementation, we provide a proof protocol for the anonymous extension in which the sender may hide herself and the transaction's recipients in a larger group of parties.[56]*

Money Coins Euro Currency *by Alexas_Fotos, 2016, used under Pixabay license of 27 March 2020.*

JPM Coin went live in October 2020.[57] Although JPM Coin made headlines, it was not the first stablecoin launched by an American bank. The first was actually Signet, launched by Signature Bank in January 2019 with the regulatory approval of the Department of Financial Services of the State of New York.[58]

Although JPM Coin made headlines, it was not the first stablecoin launched by an American bank.

Financial service providers in the digital asset industry like OKCoin (USDK), Huobi Group (HUSD), and Binance USD (BUSD, launched in collaboration with Paxos Trust Company) have all launched stablecoins. The coins are tradable at their parent company's asset exchanges as well as other platforms that offer other stablecoins. USDK, HUSD, and BUSD are all ERC-20 tokens issued on the Ethereum blockchain. They are all pegged 1:1 to the US dollar.

Crypto-collateralized stablecoins

Crypto-collateralized stablecoins are tokens backed by other cryptocurrencies. Typically, they are backed by a mix of cryptocurrencies. This tethering of value allows for better risk distribution: the volatility risks for a single cryptocurrency is much higher than a basket of such currencies. They resemble mutual funds or exchange-traded funds (ETFs) depending on risk management, respectively.[59]

Crypto-collateralized coins are often over-collateralized to withstand price fluctuations of underlying cryptocurrencies. The most common form of crypto supported stablecoins require users to stake (vault) a certain amount of digital currencies according to the specifications of a smart contract, which will result in a fixed ratio of stablecoins.

This approach is on-chain, trustless insurance. The system uses the stablecoin when assets are pledged as collateral on the network. The token maintains stability through over-collaterization, market efficiencies, profit motives, complimentary incentives, as well as fallback procedures such as global settlement.

Table 4: Crypto-collateralized stablecoins at a glance

Advantages	Disadvantages
› Potentially decentralized underlying asset with transparent and secure structure and no central party to trust	› Complex elements that can obfuscate the minting process
› Convenient and fast conversions occurring on a blockchain	› Requires excess collateral to secure
› Easily used in leverage trading related to the over-collateralization	› Possible instantaneous liquidation if value falls below a certain threshold
› All transactions recorded on a public blockchain for accountability	› Backed by multiple cryptos; selecting the right coins for maximal price stability can be challenging

Table 5: Crypto-collateralized stablecoins

Stablecoin	Symbol	Issuer	Released	Notes
Alchemint	SDUSD	Alchemint Foundation	2018	Backed by a pool of assets; fiat and cryptos; built on top of NEO
Augmint	A-EUR	Augmint DAO	N/A	Pegged to EUR and backed by ether (ETH); planned to replicate fiat using stability reserves and smart contracts
bitUSD	BITUSD	BitShares	2014	Collateralized 1:1 by USD; backed by BTS, fiat, silver, gold, and other assets; uses derivative instruments; also bitCNY (BITCNY)
EOSDT	EOSDT	Equilibrium Lab	2019	EOS-based; pegged to USD; collateralized by other digital assets
Dai	DAI	MakerDAO	2017	ERC-20 token; backed by ETH, eventually backed by multiple assets; 1:1 soft peg to USD; maintained by MakerDAO community, governed by MKR holders; assimilable to derivatives
Neutral Dollar	NUSD	Neutral	N/A	Backed by basket of other stablecoins; Ethereum smart contract; maintained by "profit-seeking arbitrageurs"‡; auditable on-chain custody

‡NeutralProject.com, as of 1 Nov. 2020.

Venture capitalist Haseeb Qureshi pointed out two disadvantages of crypto-collateralized coins: they are more vulnerable to price instability than fiat-collateralized coins and can automatically revert to the underlying cryptocurrency if the crypto's price drops far enough. "This could be a dealbreaker for exchanges," Qureshi wrote. "In the case of a market crash, they would have to deal with stablecoin balances and trading pairs suddenly mutating into the underlying crypto assets."[60]

Commodity-collateralized stablecoins

Commodity-collateralized stablecoins are cryptocurrency backed by commodities; that is, assets that are undifferentiated from each other in an asset class and are therefore fungible for convenient trading and transactions.[61] Investors will still invest in gold and other precious metals when every other market is bearish or struggling because they generally view precious metals as reliable stores of value and largely recession-proof.

Anthem Blanchard, CEO and founder of the commodity-collateralized stablecoin Anthem Gold, told us, "Gold is a recognized store of value ingrained in our DNA. Bitcoin has freed gold to become a currency again by creating a better way of accounting. We utilize public protocols, including Bitcoin's, to ensure the most transparency in the history of gold currency."[62]

"Gold is a recognized store of value ingrained in our DNA. Bitcoin has freed gold to become a currency again by creating a better way of accounting."

◇ Anthem Blanchard
CEO and Founder
Anthem Gold

A Pile of Coal by oatsy40, 2013, used under CC BY 2.0, accessed 22 Dec. 2020. Cropped.

Backing these cryptocurrencies by commodities with long-term stable market prices helps to ensure that their prices won't fluctuate wildly and that their carrying costs are lower, since users need not hold the commodities themselves in inventory. Consider the logistics of delivering and storing goods: transporting physical assets like precious metals can be costly, time consuming, and ecologically irresponsible.

Commodity-collateralized stablecoins have value because they are digital representations of a different asset.

A commodities-backed stablecoin represents a specific amount of a commodity. For example, we could peg one stablecoin to one gram of gold. Its owner would store the physical asset in a trusted third party's vault. Whenever someone invested in a commodity-collateralized stablecoin, the network would mint a new token. Conversely, when the stablecoin was liquidated, the network would burn the token and release the collateral.

Commodity-collateralized stablecoins have value because they are digital representations of a different asset, therefore, some would say, it is an inherently centralized design. A mix of enthusiasts believe cryptocurrency should always be trustless, in other words, beholden to no external authority. Requiring a third party and audits is time intensive, costly, and leaves room for error. Intense regulation is needed to maintain transparency, which is why so many fail.

Table 6: Commodity-collateralized stablecoins at a glance

Advantages	Disadvantages
› Backed largely by established tangible commodities rather than intangibles like computing power or communications bandwidth	› Centralized systems are prone to various vulnerabilities and risks (e.g., single point of failure, incompetence, or corruption of the central entity, etc.)
› Converting into and out of these tends to be convenient, fast, and secure	› Using these requires trust in a third party to hold enough fiat collateral
› Average consumers can understand commodity structure	› For greater transparency, governance includes external audits to verify account balances
› The tokenization of commodities increases market liquidity and improves price discovery	

Table 7: Commodity-collateralized stablecoins

Stablecoin	Symbol	Issuer	Released	Notes
AgAu	AgAu	AgAu AG	N/A	AgAu Gold token: 1.0 g gold equals LBMA (London Bullion Market Association) gold; AgAu Silver token: 1.0 g silver equals LBMA silver; Ethereum based
Anthem Gold	AGLD	Anthem Vault Inc.	2019	Backed by 1.0 g tangible gold; fully insured; vaulted securely in nonbank
AssetBase	ABT	AssetBase Foundation	N/A	Five different cryptocurrencies; pegged to different precious metals (gold, platinum, silver, palladium, and rhodium); separate coin for each metal
AurusGOLD	AWG	Aurus Technologies	2020	Software offering established gold traders tokenization service; ERC-20 token; 1 token to 1.0 g 99.99% LBMA approved gold; currency transaction fees pay for insurance and storage; user can withdraw gold at any time
Digix Gold Digix DAO	DGX DGD	Digix Global	2016	Backed by gold; crowd sale raised 465K ETH; two ERC-20 tokens: DGX pegged to 1.0 g 99.99% LMBA gold vaulted in Singapore; and DGD to reward users quarterly based on total DGX transaction fees
DinarCoin	DNC	Harimau Mint Gold	2019	ERC-20 token equal to a gold spot contract offered by company's forex liquidity provider; gold smart contract: gold in 1.0 g, 100 g, or 1.0 kg; silver in 100 oz., and 1.0 kg
Dorado*	DOR	Dorado Tech	2018	Backed by gold; ERC-20 token; launched to support gold mining company in Chile
EGold*	EGD	Egold	2018	Pegged to physical gold; EGold has its own blockchain; last trade March 2020
Ozeety	OZTG	Flash Group	2018	Claimed to be pegged to gold: price would never go below the set $0.13 price; as of this writing, price is $0.00
Gold Bits Coin**	GBC	Gold Bits Coin	2018	ERC-20 token; website no longer working; last trade February 2020; founders under investigation by Australian Securities and Investments Comm.
Goldmint	MNTP	Goldmint PTE Ltd.	2018	ERC-20 token; reliant on Graphene technology; pegged to gold and/or exchange traded funds
GoldMineCoin*	GMC	GoldMine	2017	Backed by gold vaulted in Magadan region in Russian Federation; only seven trades, all in 2017
G-Coin Responsible Gold	XGC XRG	Emergent Technology Holdings LP	2020	Backed by 1.0 g conflict-free gold; stored in an approved vault; blockchain used to track gold from mine to vault before tokenized
IC3 Token	IC3	IC3 Cubes	2017	Backed by 100% Canadian gold; site is currently offline; the project's fate is unknown
Karatcoin*	KCG	Karat Lab Ltd.	2018	ERC-20 token pegged to 1.0 g 99.99% LBMA gold; securely stored in Safehouse Vaults; status unclear

Table 7: Commodity-collateralized stablecoins, continued

Stablecoin	Symbol	Issuer	Released	Notes
OneGram	OGC	OneGram Project	2018	Backed by 1.0 g physical gold; vaulted near Dubai airport; compliant with Islamic Sharia; max number of OGC coins is 12,400,786; smart contract burns unsold coins after ICO
Orocrypt*	OCG	Orocrypt Inc.	2019	ERC-20 token backed by 30 g LBMA gold; securely vaulted in Switzerland, Liechtenstein, and Cayman Islands
Pecunio Gold Coin	PGX	Pecunio	N/A	Backed by 1.0 g 99.9% LBMA gold; issued and handled by Tabarak Investment Bank, UAE
Puregold Token	PGTS PGPAY	Puregold Group	2018	Two ERC-20 tokens: PGTS for transactions, PGPAY backed by physical gold, equal to cost of 1.0 g gold plus 5% commission for fiat
Royal Mint Gold	RMG	The Royal Mint Ltd.	On hold	Backed by gold reserves in UK Royal Mint vault; CME Group stepped back
Sudan Gold Coin	SGC	Sudan Gold Coin	2020	ERC-20 token pegged to 0.05 g gold; backed by Sudanese gold mining business 100% controlled by Dubai SG Mining Co.
The Midas Touch Gold	TMTG	Digital Global Enterprise Ltd.	2020	ERC-20 token pegged to 1.0 g gold; Digital Gold Exchange is platform for exchanging cryptocurrencies for gold
X8Currency	X8C X8D	X8Currency	N/A	ERC-20 tokens: X8C backed by 8 fiat currencies and gold; X8D back by USD; reserves stored in Zug
Xaurum	XAUR	Auresco Institute	2016	ERC-20 token backed by gold owned by Xaurum CommonWealth; 1 coin worth 1.0 g 99.99% gold; users can exchange XAUR for physical gold, deliverable to any destination

*These coins appear on "ICO Scams – Fake Initial Coin Offering Tokens List," BitcoinExchangeGuide.com, as of 1 Nov. 2020.
**Maria Nikolova, "ASIC Secures Court Orders for Winding Up Illegal Investment Scheme MyWealth Manager," FinanceFeeds. com, FinanceFeeds Ltd., 28 July 2020. All trade data from Etherscan.io.

Non-collateralized stablecoins

Critics sometimes disparage the inherently centralized nature of asset-backed stablecoins. If one company owns a large amount of a desired asset, the company can control the stablecoin's price fluctuations and policies. This ownership model becomes a risk if users cannot exchange the coin for fiat or have low confidence that the central entity actually holds the amount it claims to hold. It also may operate on a fractional-reserve system, in which the platform backs only a fraction of its holdings by actual fiat currency on hand and available for withdrawal.[63] Fiat-collateralized stablecoins are also prone to destabilization by external factors like geopolitics and new regulations.

Seigniorage supply stablecoins rely on algorithms to auto-adjust the number of stablecoins in circulation.

Tether (USDT), the first fractional reserved stablecoin, has long been subject to accusations. One study found that a single entity used Tether to increase the price of BTC.[64] Parties to a class action complaint accused Tether Limited and Bitfinex of holding insufficient USD reserves, and both came under investigation regarding the reserve funds.[65]

Tether had a $2 billion-plus market capitalization, which meant that Tether Limited, in theory, should have had an equal amount of fiat in one or more of its accounts. Legal documents showed that the stablecoin was only backed 74 percent by the US dollar.[66] Hence, there was not enough currency in the reserve fund to ensure all token holders can convert their USDT to USD. Tether Limited adjusted Tether's terms so that it was not guaranteeing token holders a 1:1 conversion rate.[67]

The seigniorage supply stablecoins, also called algorithmic stablecoins, are the only noted type of non-collateralized cryptocurrency. *Seigniorage* is generally considered the difference between the price of the coin and the cost of creating it; if the creation cost is lower than the price, then the system makes a profit. Modeled after central banks' approach to managing money supply and discouraging price fluctuations, seigniorage supply stablecoins rely on algorithms to auto-adjust the number of stablecoins in circulation.

The algorithms apply what Robert Sams called an "elastic supply rule that adjusts the quantity of coin supply proportionately to changes in coin market value." In such a system, there are two types of coin: a cryptocurrency that acts like money and a stablecoin that acts like shares in the system's seigniorage—a seigniorage share.[68] Vitalik Buterin thanked Sams for his insights into the role of these seigniorage shares in valuing coins with volatile prices in multicurrency systems.[69]

Table 8: Seigniorage supply stablecoins at a glance

Advantages	Disadvantages
› Absence of collateral; no tangible asset required	› Rule-based system integrated with complex logic, making it difficult for some to understand
› Created or destroyed by an algorithm, reducing or eliminating the potential of human error	› Somewhat untested methodology based on a novel concept; one or more failures could hamper further attempts
› Autonomous, not easily influenced by outside markets	› Regulated in that real-world bonds are considered securities, and algorithmic stablecoin bonds will likely classify as such
› Decentralized to the extent that the protocols are transparent, on-chain, and governed by users	
› Theoretically protected against volatility, with automatic value adjustments to supply and demand	
› Supported by financial technology experts	

Seigniorage shares serve essentially as bonds used to raise funds for network users. They promise users the seigniorage profits derived from the growth of an algorithmic stablecoin supply.

In seigniorage supply stablecoins, the algorithms are written into and implemented through smart contracts. Let's say a stablecoin is one dollar per unit. The price drops to 80 cents, indicating that supply is outstripping demand. The algorithm uses seigniorage to buy the stablecoin, thereby decreasing supply and pushing price back to one dollar. If the price remains below one dollar, there are no profits to purchase excess supply, and so the algorithm issues seigniorage shares. These serve essentially as bonds used to raise funds for network users.

Bonds promise seigniorage profits to buyers. Users are essentially investing in the growth of an algorithmic stablecoin supply. When the stablecoin trades above a dollar, the algorithm issues additional tokens to increase supply until price returns to a dollar.

This method of stabilizing coin value is not without its critics. In a research paper on stablecoins, the Swiss Finance Institute's Didier Sornette and Richard Senner discussed the use of *quantitative easing* (QE), a monetary policy in which a central bank creates new money for itself to buy assets from a particular sector, thereby stimulating consumer prices.[70] Let's say the asset is a government bond. If demand for bonds increase, their price should increase, and interest rates should fall, thus stimulating purchasing.[71]

However, as Sornette and Senner concluded, "QE was not overly effective because it did not channel new liquidity to ordinary people, who would have a high propensity to consume."[72] In other words, if the scheme didn't stimulate buying in the real world, then why should it do so in a digital one? Preston Byrne alluded to Ponzi schemes

Table 9: Seigniorage supply stablecoins

Stablecoin	Symbol	Issuer	Released	Notes
Ampleforth	AMPL	Ampleforth Foundation	2019	Formerly μFragments; pegged to USD; security audit by Certik; monetary policy where supply adjusts to demand
Basis	N/A	Intangible Labs	Shut down in 2018	Algorithm automatically adjusted supply to keep prices stable; smart contracts acted as a central bank to manage price by issuing bonds
BitBay	BAY	BitBay Official	2015	Uses dynamic pegging to manage liquidity; decentralized governance mechanisms
Kowala Coin	kUSD	Kowala Tech	N/A	Pegged to USD; maintained with algorithms and market-based oracles so that supply adjusts to market conditions
NuBits	USNBT	NuBits	2014	Stabilized by issuance mechanisms and custodial grants; no vendor fees; no customer chargebacks
Steem Dollars	SBD	Steemit Inc.	2016	Stabilized on Steem blockchain with 1:1 USD; based on a convertible notes system

Sources: Ampleforth, TechCrunch.[76]

in his description of a failed algorithmic stablecoin: "An investment scheme backed by introducing new investors … and not backed by income-generating assets can be called a number of things. I leave it to you, dear reader, to decide what name you will choose to give to this one."[73]

Patrick Devereaux, CEO of Aperum and a contributor to this research, agreed with these assessments: "If there isn't a financial incentive to the risk, people are not likely to buy the bonds. The only way for there to be a manageable level of income to cover risk costs, is if the stabletoken seeks profits. If it is seeking profits, it is not a stablecoin."[74]

"A reserve is not an end-all solution, but it's a safety net that enables flexibility in managing any given currency," investor Nat Wittayatanaseth wrote. "If executed well, this type of stablecoin will unlock rich possibilities for crypto holders since it will be decentralized, efficient, and free of counterparty risk. The approach is promising, albeit in need of testing."[75] It could potentially collapse during a black swan event, such as war or pandemic, but this is no different from other assets.

Hybrid stablecoin models

Hybrid stablecoins combine two or more of the aforementioned crypto models (fiat, crypto, or commodity-collateralized and algorithmic) in one token. While the resulting combination of advantages may meet the needs of a greater diversity of users, these are more difficult to understand because of the basket of assets backing them or the mechanisms governing them. Also, financial regulations may limit hybrid stablecoin projects.

Hybrid stablecoins combine two or more of the aforementioned crypto models (fiat, crypto, or commodity-collateralized and algorithmic) in one token.

Sam Trautwein, founder and CEO of Carbon-12 Labs, observed, "While algorithmically backed stablecoins are superior in terms of the lack of centralized fail points, on the consumer side, they are initially inferior to fiat-backed stablecoins."[77] The downside of fiat-backed tokens is their inherent unscalability. He recognized that users wanted both price stability and redeemability—in other words, liquidity—in stablecoins, whereas investors in stablecoin projects tended to prefer rising prices. That tension was difficult to resolve. In Trautwein's view, "The fiat-backed algorithmic hybrid approach is by far the most elegant solution to this tension, maintaining a perfect reserve ratio and not misleading investors." That is what he has strived to achieve in CarbonUSD.

Sam Kazemian, co-founder and president of Everipedia, said, "Stablecoins, as an asset class, are the next big thing in crypto and will lead to a new bull market in the next six to 18 months."[78] Kazemian concluded that a hybrid stablecoin was the most promising and joined Mahbod Moghadam and Stephen Moore in announcing the launch of the stablecoin Frax.[79]

In an interview with *Fortune*, Moore said his libertarian views led him to support cryptocurrency, which he believes is an important

alternative to state-backed money. "I've followed monetary policy for 30 years and always been troubled by the government monopoly on currency, which is unhealthy for markets," said Moore. "It's very healthy for private competitors to challenge central banks over the money supply."[80]

Table 10: Hybrid stablecoin models

Stablecoin	Symbol	Issued by	Released	Features
Aurora DAO IDEX Token	AURA IDEX	Aurora Labs SA	2018	ERC-20 token rebranded IDEX; backed by a basket of ETH reserves, debt from loans, and Dapp
Celo	CUSD	Celo.org	2020	Pegged to fiat; backed by a diversified, over-collateralized, and auditable cryptoasset reserve
CorionPay	N/A	Corion Foundation	Est. 2022	Price maintained by an automated inflation/deflation control
Jibrel	JUSD	Jibrel Network	N/A	Also JGBP, JEUR, and JKRW; ERC-20 tokens pegged to fiat currency; and backed by Jibrel Network Token (JNT)
Frax	FRAX	Frax Cryptocurrency	N/A	Fractional-algorithmic stablecoin system, with some of its supply partly backed and some parts algorithmic. The protocol adjusts the collateral ratio of Frax based on the market price, making it more algorithmic if Frax is above $1 and increasing the collateral ratio if the price is below $1
LBXPeg	LBX	London Block Exchange	2018	Backed by GBP; stored in auditable UK bank account; ERC-621 token
Saga	SGA	Saga Foundation	2019	Pegged to the International Monetary Fund's special drawing rights (SDR), which is in turn tied to an underlying basket of currencies
StableUnit		Stable Unit	2019	Tokens price is maintained with multiple stabilization mechanisms involving a DAO, crypto reserves applying various monetary systems
SwissRealCoin		RealCoin	2018	Backed by a portfolio of Swiss commercial real estate
USDVault		Vault	2018	Backed by gold; pegged to USD
Terra Money		Terraform Labs	2020	Pegged to a basket of currencies (SDR) and assets with its value algorithmically stabilized through decentralized elastic supply mechanisms; price stability ensured by algorithmically expanding and contracting supply; backed by Luna, Terra's own asset
Tiberius Coin	TCX	Tiberius Group AG	2018	Backed by a combination of seven precious metals: gold, platinum, tin, nickel, cobalt, aluminium, and copper along with electric vehicle metals; tradable on the Estonia based LATOKEN exchange

Let's take a closer look at Frax.[81] Kazemian is known for launching the blockchain Wikipedia competitor, Everipedia. Mahbod Moghadam is a co-founder of Wikipedia and Genius.com, the world's largest collection of song lyrics and music knowledge.[82] Kazemian and Moore said that Frax didn't have any outside investors but they expected to launch it in the next few months. The overview on Frax's website described it as "a new paradigm in stablecoin design … the first and only stablecoin with parts of its supply backed by collateral and parts of the supply algorithmic."[83]

Many existing stablecoins are pegged to a 1:1 pool of reserve dollars, whereas Frax will rely on a fractional reserve. The plan is for algorithms to loan out its reserves and collect interest so that the value of Frax can maintain its peg to fiat. Kazemian claimed this system would eliminate the need for central banking entities, as users would record all transactions safely on a blockchain. But, as of this writing, it didn't have a real-world use case. Critics argued that a guarantee of 1:1 backing could be a challenge: token holders might decide to sell all at once, leading to collapse. Kazemian contended that Frax's loan mechanism would ensure its stability.[84]

Moore has made it known he feels cryptos can be valuable when governments follow misguided monetary policies. Moore, well-versed in economic history, warns governments have and may continue to deflate their currencies to pay back their debts. In his opinion, if users receive an alternative means of barter, governments could be less likely to pursue deflationary policies.

For now, senior US officials, many of whom have expressed deep skepticism about cryptocurrencies, do not appear to share his view. Central banks in other countries, however, have been more open to the potential of cryptocurrency. The Bank of Canada and the Bank of Japan, for instance, have been experimenting with crypto versions of their national currencies while Switzerland has created a special legal regime to foster the development of the crypto ecosystem.

Moore told *Fortune* that he hoped the Federal Reserve would eventually follow suit: "If I had been on the Fed, I would like to have seen encouragement for the development of cryptocurrencies like Frax. It can be a check and balance against runaway currencies."[85] Protocol Frax will be a fractional-reserve, algorithmic stablecoin.

According to the Frax team, "The basic premise is that we layer this over a collateralized stablecoin such as Dai and use interest from CompoundFinance loans to stabilize the price to one dollar to 1 Frax algorithmically changing the supply of Frax."[86] There is a two-token system in place: the stablecoin (FRX) and the investment token (FXS). The system starts 1:1 backed (reserve ratio of 100). For every 100 Dai put in, there are 100 FRX minted. The Dai is then lent out (either through the compound finance smart contract itself or the exact implementation within the Frax contract). The cash flow from the interest rate earned through the loan is accrued into the smart contract. Once there is a sufficient amount of interest earned, the

reserve ratio goes down by X. If X = 1, then for every 99 Dai put in, 100 Frax are minted. The difference in the reserve ratio (aka X) must be paid in FXS as a fee (which is burned from circulation) so that value isn't leaving the system but instead is being captured by the investment token.

The investment token, FXS, is essentially valued as the net future fiat value creation of the network in perpetuity. If the market price of FRX holds at $1, 1 FRX then the reserve ratio becomes more fractional by increasing X as more interest cash flow comes in. If the FRX price drops because the market only values FRX based on backing collateral, the accrued cash flow is used to buy back FRX and "walk back" the reserve ratio to the market's value of 1 FRX.

At all times, there is a small amount of Dai that is always kept in the contract to exchange out for FRX for easy redemption. Essentially, this is a system to algorithmically measure the market's value of the "monetary premium" of a currency. This can be used to scale Dai and allow DeFi loans to provide monetary policy and stability.

The investment token is essentially valued as the net future fiat value creation of the network in perpetuity.

Top ten stablecoins

Here is a brief look at the ten stablecoins with the highest market capitalization as of this writing. Another good tool is the Messari Stablecoin Index, provided by the start-up Messari team and originally created by Myles Snider and Mike McDonald.[87]

Screens by Christina @ wocintechchat.com, 2019, used under Unsplash license, accessed 21 Dec. 2020. Cropped.

Tether (USDt)

In 2014, then-Bitcoin Foundation Director Brock Pierce, software engineer Craig Sellars, and entrepreneur Reeve Collins launched Realcoin, which they claimed to represent "the first dollar-backed cryptocurrency." Collins told *Cointelegraph*, "We are digitizing the dollar and giving that digital dollar access to the Bitcoin blockchain."[88] He also said that they planned to keep a "real-time record" of the firm's "dollar-based reserves, all held in conservative investments," and would "subject that record to the blockchain's authenticating system."

A few months later, they rebranded their token to Tether to dissociate it from altcoins. "We're not our own blockchain. We're a service, a token that represents dollars," Collins explained to *CoinDesk*. "*Tether* means a digital tie to a real-world asset, and the digital assets we're focused on are currencies."[89]

They wanted to create a fast and efficient way to transfer value from one crypto exchange to another without using a more volatile digital asset. Tether's convenience as well as its link to the US dollar appealed to stock magnates and everyday traders. The first stablecoin to be listed on exchanges, Tether (USDt) started trading in February 2015.

"We are digitizing the dollar and giving that digital dollar access to the Bitcoin blockchain."

REEVE COLLINS
Co-Founder
Former Chief Executive Officer
Tether Operations Ltd.

Table 11: Top ten stablecoins by market capitalization

	Symbol	Market cap	Circulating supply	All-time high price	All-time low price
Tether	USDt	$17,211,336,945	17,195,790,004	$1.21	$0.00
USD Coin	USDC	$2,871,200,808	2,871,555,568	$1.11	$0.929222
Dai	DAI	$960,909,099	952,892,325	$1.14	$0.945505
TrueUSD	TUSD	$273,838,581	273,829,017	$1.36	$0.917877
Paxos Standard	PAX	$245,166,964	244,951,954	$1.10	$0.872764
Gemini Dollar	GUSD	$15,166,351	15,166,871	$1.23	$0.852120
Equilibrium	EOSDT	$2,618,972	2,642,505	$1.32	$0.788283
BitShares	bitUSD	$1,614,998	1,961,580	$1.25	$0.43
Binance	BGBP	$913,540	700,001	$1.40	$0.00
Stably USD	USDS	$572,216	519,602	$1.63	$0.427445

CoinMarketCap.com, as of 8 Nov. 2020, plus authors' own research.

Brainstorming over paper *by Scott Graham, 2016, used under Unsplash license, accessed 21 Dec. 2020.*

"We're not our own blockchain. We're a service, a token that represents dollars. ... Tether means a digital tie to a real-world asset, and the digital assets we're focused on are currencies."

REEVE COLLINS
Co-Founder
Former Chief Executive Officer
Tether Operations Ltd.

Tether falls under the stablecoin category because it was originally designed to keep $1 in reserves for each Tether issued. Initially it issued only a couple of tens of millions. It stated that it would not increase the money supply of stablecoin. In early 2017, USDt authors began to "print money" as traditional banks in the United States and other countries do. In November 2017, it was allegedly hacked, and $31 million worth of Tether coins were stolen, prompting a hard fork.[90] Tether became a stablecoin market monopolist and started releasing USDt coins without retaining an equivalent US dollar backing.

In January 2018, it hit another hurdle as a necessary audit never took place. Instead, it announced that it was parting ways with the audit firm, after which it was issued a subpoena by regulators.[91] Yet, over the summer, Tether facilitated about 80 percent of all BTC trading, ensuring liquidity on the crypto market.[92] According to *The Wall Street Journal*, David Gerard said that Tether was "sort of the central bank of crypto trading ... [yet] they don't conduct themselves like you'd expect a responsible, sensible financial institution to do."[93]

In November 2018, *Bloomberg* reported that US federal prosecutors were investigating whether anyone had used USDt to manipulate the price of BTC. After several fraud allegations, Tether's price fell from $1 per token to 85 cents.[94] Tether had initially claimed that it backed each token with one US dollar. But on 14 March 2019, it changed the backing to include loans to affiliate companies. On 30 April 2019, Tether International Limited's lawyer claimed that each Tether was backed by 74 cents in cash and cash equivalents.[95] But owners of Tether tokens had no contractual obligation to guarantee that users could redeem or exchange Tether coins for fiat.[96]

"Tether Tokens are 100 percent backed by Tether's Reserves [and] denominated in a range of Fiat, but Tether Tokens are not Fiat themselves. … The composition of the Reserves used to back Tether Tokens is within the sole control and at the sole and absolute discretion of Tether."

Tether Terms of Service
Last updated 12 May 2020

In 2019, USDt surpassed BTC in trading volume with the highest daily and monthly trading volume of any cryptocurrency on the market. It has since become one of the most traded assets on the market. In April 2019, New York Attorney General Letitia James accused iFinex Inc., the parent company of Tether Ltd. and operator of cryptocurrency exchange Bitfinex, of hiding a loss of $850 million of commingled client and corporate funds from investors. Court filings claimed that the company had given these funds to a Panamanian entity called Crypto Capital Corp. without a contract or agreement to handle withdrawal requests.[97]

Bitfinex allegedly took at least $700 million from Tether's cash reserves to hide the gap after the money went missing. In a statement, Bitfinex said the NYAG's filings "were written in bad faith and are riddled with false assertions."[98] It explained that "these crypto capital amounts [were] not lost but have been, in fact, seized and safeguarded. We are and have been actively working to exercise our rights and remedies and get those funds released."

As of this writing, Tether's terms state, "Tether Tokens are 100 percent backed by Tether's Reserves [and] denominated in a range of Fiat, but Tether Tokens are not Fiat themselves. … The composition of the Reserves used to back Tether Tokens is within the sole control and at the sole and absolute discretion of Tether."[99] Tether's site describes the token as "money built for the Internet. … Whatever you can do with digital currencies, you can now do with digital cash."[100]

USD Coin (USDC)

In 2013, Internet entrepreneur Jeremy Allaire founded Circle Internet Financial to focus on digital currency innovation.[101] A Bitcoin blockchain advocate, he distinguished himself by underscoring the importance of compliance with national and local financial rules and regulations.[102]

By 2015, Circle had raised over $50 million from such respected investors as Accel Partners, Breyer Capital, General Catalyst Partners, Goldman Sachs Group, China's IDG Capital Partners and Oak Investment Partners.[103] With this funding, Circle planned "to expand beyond bitcoins to provide services in US dollars." The goal was to enable customers "to keep accounts in dollars, eliminating the risks associated with bitcoin price volatility, while still being able to send and receive currency both in dollars and bitcoins."[104]

In 2018, Circle launched its USD Coin (USDC), an ERC-20 compliant stablecoin pegged to the US dollar. Through Circle's platform, users could begin converting US dollars from their bank accounts into USDC tokens, and Circle's banking partners would hold the equivalent USD in reserve so that USDC could easily redeem them for US dollars. Tokenizing dollars was free, but users paid a 0.1% fee to redeem USDC for dollars.[105]

USDC reserves are subject to regular audits and public reporting. Each month, the accounting firm Grant Thornton LLP audits the dollar reserves, attests to the amounts, and writes a report published by Circle for users.

It also formed the CENTRE consortium as a multi-stakeholder operations, governance, and standards-setting body. Among the consortium's ongoing goals is to establish best practices for commercial issuers of fiat-based digital currencies, including "requirements for licensing, compliance, and proof of reserves."[106]

Others are providing research and development to CENTRE's open source software project, business development for the CENTRE Network, optional certification testing for node owners, and engineering expertise to the infrastructure on which it operates.[107]

USDC reserves are subject to regular audits and public reporting. Its site states that licensed and regulated financial institutions issue USDC and hold full reserves for any new coin issued. Each month, the accounting firm Grant Thornton LLP audits the dollar reserves, attests to the amounts, and writes a report that Circle publishes so that users can see whether they can redeem their coins for dollars.[108]

USDC has continued growing despite the occasional token burn, as the asset works like a fiat off-ramp in crypto trading. According to the CENTRE Consortium, "USDC has established itself as the second most popular stablecoin in the world; it has unparalleled support from more than 100 companies across the global crypto ecosystem, and it's the first stablecoin to reach $1 billion in issuance in less than a year."[109]

Critics have pointed out that USDC is a centrally controlled token with anti-money-laundering/counter-terrorist financing verification: users must provide personal information to use this stablecoin. Users do not have full pseudonymity or control of their funds as they do on the Bitcoin blockchain; and Circle can block or freeze accounts on Circle's balance sheet.[110]

According to critics, USDC users do not have full pseudonymity or control of their funds as they do on the Bitcoin blockchain; Circle may suspend, consolidate, or terminate USDC accounts per the terms of its user agreement.

Circle and Coinbase have continued to engage with financial oversight bodies. In 2020, they recommended that "relevant authorities across jurisdictions mutually agree on the principles, criteria and, where possible, measurable thresholds at which point a stablecoin is deemed to be a [global stablecoin or GSC] and, as a result, the GSC arrangement subject to additional regulatory requirements."[111] They advocated for a rapid shift to digital payment systems amid the COVID-19 crisis:

> *By expanding access to digital dollars and other reserve currency-backed stablecoins, through a system that has the reach and accessibility of the Internet, companies can partner with regulators and supervisors to create a fundamentally more open, inclusive, efficient and integrated world economy.[112]*

In December 2020, Circle announced that it had joined "Visa's Fintech Fast Track program" with "plans to issue a Visa corporate card enabling businesses to spend USDC anywhere Visa is accepted" and supporting "USDC payouts to Visa's growing network of digital currency wallets."[113]

Dai (DAI)

Founded in 2014 by Rune Christensen and launched in 2015, MakerDAO is both an open-source project and a decentralized autonomous organization (DAO) dedicated to decentralized finance (DeFi) on the Ethereum blockchain. Its protocol is among the largest Dapps running on Ethereum and gaining traction in the DeFi space. MakerDAO issued its governance token, MKR, in 2017.[114] Among early buyers of MKR in a $12 million sale were Andreessen Horowitz and Polychain Capital.[115]

Members who hold quantities of MKR make decisions about the Maker protocol, including key parameters and responses to problems.

Members who hold quantities of MKR make decisions about the Maker protocol, including key parameters (e.g., fees, collateral types, rates, etc.) and responses to problems that crop up such as malicious attacks, black swan events, user migration to a better stablecoin, or dissolution of the Maker Foundation. The governance system is scientific: it involves voting and polling of MKR holders. The more MKRs a person holds, the greater the weight of the person's vote in decision making.[116] It is also distributed, to the extent that MKRs are distributed among independent and diverse parties, where none has majority control over decisions.

One of the project goals was to design a stablecoin—the Dai (DAI), pinyin for the Chinese character meaning "loan" and issued at the end of 2019—that people could use to take full advantage of cryptocurrency payment and investment infrastructure without worrying about asset price volatility.[117] To access liquidity, users can either buy Dai through exchanges or generate them by depositing collateral assets into "Maker Vaults" within the Maker Protocol; and they burn Dai tokens by withdrawing their deposit.[118] In that sense, DAI is more decentralized because only users have power to create and destroy DAI. For the generation of DAI tokens (ERC-20), users must purchase and stake an equal value (in USD) of ETH tokens. When the cost of DAI rises, users will have incentive to create more. If the price falls, users will want to sell their DAI back to the pool.

Regarding the "collateral assets," the Maker Foundation selected the first types of collateral—all cryptocurrencies—to test in its Multi-Collateral Dai (MCD) system. The selection criteria included the "average daily volume of several million US dollars, and the relative stability of each token."[119]

When the cost of DAI rises, users will have incentive to create more. If the price falls, users will want to sell their DAI back to the pool.

The protocol has set the DAI's target price at $1 (i.e., a 1:1 soft peg to USD) to calculate the value of collateral assets that DAI holders would receive, in case of an attack on the Maker Protocol infrastructure or to facilitate a system upgrade.

There are two foundations to the MakerDAO protocol. The first is the Maker Foundation, which works with the "MakerDAO community to bootstrap decentralized governance of the project and drive it toward complete decentralization."[120] To protect the intellectual property that MakerDAO founders couldn't technologically decentralize in the Maker Protocol, they set up a second governance body, the Dai Foundation. Independent of the Maker Foundation, "it operates solely on the

basis of objective and rigid statutes that define its mandate," as set forth in the Dai Foundation Trust Deed.[121] Those include keeping the protocol "free of charge, as open source and without restrictions, on equal terms and for anyone," with a "a high degree of access and distribution to the unbanked and financially underserved."[122]

With DAI, the team at Maker hopes to overcome the sometimes-violent price swings associated with cryptocurrency.

With DAI, the team at Maker hopes to overcome the sometimes-violent price swings associated with cryptocurrency. In its white paper, the team cites examples like BTC falling 25 percent in one day or rising more than 300 percent in one month.

External market factors such as collateralized debt positions, autonomous response mechanisms, and external economic incentives also help to stabilize the DAI's price. Issued on the MakerDAO platform, the DAI is transparent: the smart contracts that run operations are publicly available to read. DAI is a good fit for betting, financial markets, international trading, and transparent auditing. Going forward, Maker plans to gives users a chance to choose the ecosystem's expanding set of collateral types.[123]

TrueUSD (TUSD)

TrueUSD (TUSD) was the first stablecoin fully backed by the US dollar held in escrow accounts by third parties. Created by TrustToken Inc. and launched in 2018, TrueUSD is an ERC-20 token project unrelated to TrustUSD (TRUSD), which launched in 2019 by the United Trust Company.

Screen Watch *by MayoFi, 2020, used under Unsplash license, accessed 21 Dec. 2020. Cropped.*

The first version of TrustExplorer was a simple dashboard that confirmed the issuance of stablecoins.

Transparency was paramount from the start of this project. The founders wanted investors and users to be able to trust that TUSD was fully backed 1:1 by USD. That required third-part attestation. Every month from March 2018 to March 2020, the independent US certified public accounting firm Cohen & Company audited and attested to the funds held in escrow as collateral to all the TrueCurrencies (TUSD, TGBP, TCAD, TAUD, and THKD) in circulation.[124] Cohen conducts its first audit on 1 March 2018 and determined that $4,777,750 were deposited in Prime Trust LLC in anticipation of the TrueUSD token launch four days later.[125] A week later, Cohen confirmed that the number of TrueUSD tokens issued did not exceed the $6.6 million balance held in escrow. Two years later, there were over 137 million TUSD tokens issued and in circulation and over $138 million held in escrow, meaning that $1.01 was backing each TUSD. In other words, TUSD was 101 percent secured by US dollars in legally protected escrow accounts.

In April 2020, TrustToken started pointing to TrustExplorer, a blockchain-based assurance dashboard launched by accounting firm Armanino LLP in December 2019.[126] Armanino recognized the need for third-party assurance of private and hybrid blockchains that weren't transparent or decentralized enough for prospective users in the space. To the Armanino team, "stablecoins minted on public blockchains [presented] a unique use case for assurance."[127]

The first version of TrustExplorer was a simple dashboard that confirmed the issuance of stablecoins. The second version provides near-real-time attestations according to American Institute of Certified Public Accountants Auditing Standards.[128] To implement this new service, Armanino decided to host and control a full Ethereum node. There are two parts to the balance sheet, so to speak.

In November 2020, TrustToken collaborated with Armanino and Chainlink, a decentralized oracle network, to introduce "proof of reserve" and "proof of supply" contracts running on Ethereum.

On the left side are current wallet balances and the total circulating supply of tokens. To get those numbers, "a microservice within the application … extracts new and existing blockchain data, translates it to a readable format, and writes that data to a database. The application layer of the dashboard can then query the database to populate the left side of the dashboard with the total circulating supply of ERC-20 tokens."[129] Since the Ethereum protocols add 12 blocks to Ethereum every 10 or 20 seconds, the service "parses and indexes blockchain data every 15 seconds."[130]

On the right side is the total balance of dollars held as collateral. To get this number, a representational state transfer application programming interface (REST API 13) pulls account balance data every 30 seconds from the trust company's database of accounts and writes the data to the TrustExplorer database.[131]

In November 2020, TrustToken collaborated with Armanino and Chainlink, a decentralized oracle network, to introduce "proof of reserve" and "proof of supply" contracts running on Ethereum. A deviation in the balance of TUSD supply and USD reserve triggers an on-chain transaction update and proof of reserve that Dapps can query before processing transactions. If TUSD supply exceeds

USD reserve, then a Dapp can reject the transaction. If the reserve exceeds the supply, then a Dapp can approve the transaction. According to TrustToken, "With the support of Armanino and Chainlink, TUSD becomes the world's first stablecoin with live, on-chain attestations."[132]

Paxos Standard (PAX)

In 10 September 2018, the Paxos Trust Company LLC announced the launch of its ERC-20 stable token, the Paxos Standard (PAX), which sought to combine the efficiency of blockchain technology with the stability of USD.[133] Its press release stated that PAX would be "the world's first regulated crypto asset. The Paxos Standard token is fully collateralized 1:1 by the US dollar, … and approved and regulated by the New York State Department of Financial Services" (NYDFS), which oversees the asset's issuance and trading.[134] Nomic Labs conducted two security audits of the Paxos system and found no vulnerabilities but recommended changes to improve its interoperability and sustainability, which Paxos addressed.[135]

The Paxos Trust Company positioned itself as "a fiduciary and qualified custodian of customer funds [that could] therefore offer greater protections for customer assets than any other existing stablecoin."[136] Paxos co-founder and CEO Charles Cascarilla said, "In the current marketplace, the biggest hindrances to digital asset adoption are trust and volatility. As a regulated trust with a 1:1 dollar-collateralized stablecoin, we believe we are offering an asset that improves on the utility of money."[137] Cascarilla is also CEO of Kabompo Holdings Inc., Paxos' holding company registered in the Cayman Islands.[138]

Paxos Trust Co.'s press release stated that PAX would be "the world's first regulated crypto asset. The Paxos Standard token is fully collateralized 1:1 by the US dollar."

Caribbean Reflections *by William Duggan, 2019, used under Unsplash license, accessed 23 Dec. 2020. Cropped.*

Since Paxos is an ERC-20 token, users of Ethereum wallets can send and receive it, conduct all their transactions according to the rules of the Ethereum network, and share all its features including smart contracts. US government treasuries or Federal Deposit Insurance Corporation (FDIC) insured US banks collateralize the dollar deposits held by the Paxos Trust and accounted for as property of the tokens' holders. Moreover, the number of PAX in circulation corresponds to the number of dollars held in reserve. Upon redemption for dollars, PAX tokens are immediately destroyed.

The number of PAX in circulation corresponds to the number of dollars held in reserve.

PAX retains simple integration with Paxos payments. Users trade PAX with other assets available on the site. In particular, PAX users can buy or sell BTC, ETH, Binance Coin (BNB), EOSDT, Ripple's XRP, as well as Stellar's XLM.

Compared to fiat currencies in cryptocurrency exchanges, PAX is faster and cheaper to use—a positive for those who want to buy and sell quickly and inexpensively as well as safely and reliably. Paxos has other favorable attributes including:

» No transaction fees

» 24/7 customer support for Ethereum based transactions

» Monthly attestation of reserves by the accounting firm WithumSmith+Brown PC[139]

» Reliable in a number of use cases such as remittances and payments

» Suitable for cryptocurrency traders during volatile periods

» Useful as a cash component of a transaction outside of traditional banking hours, as an alternative to Tether (USDt)

Paxos Trust Company has issued two other ERC-20 tokens, both asset based. The first is Binance USD (BUSD), also pegged 1:1 to USD, with monthly attestations available.[140] The other is Paxos Gold (PAXG) pegged to gold. Specifically, its redemption value is "strictly pegged at 1:1 to the number of troy ounces of gold held in custody by third parties," and its supply did "not exceed the balance (in troy ounces) of gold on hand at third parties … specifically segregated for Paxos Trust Company LLC" as of 30 October 2020.[141]

Gemini (GUSD)

In 2014, Cameron and Tyler Winklevoss founded the Gemini Trust Company LLC "with a 'security-first' mentality and ethos of asking for permission, not forgiveness."

In 2014, Cameron and Tyler Winklevoss founded the Gemini Trust Company LLC "with a 'security-first' mentality and ethos of *asking for permission, not forgiveness*," from its customers and regulators.[142] Gemini began adding to its financial services thereafter, with a series of innovations, such as the Financial Information eXchange protocol and API support early on. The innovations kept coming.

In May 2016, New York State Governor Andrew Cuomo announced Gemini as the first licensed exchange of ether (ETH) based in the

In April 2018, Gemini began offering block trading, where users can program orders to buy or sell specific quantities of assets with a minimum acceptable quantity and a maximum acceptable price.

United States.[143] Under the New York Banking Law and under the Investment Advisers Act of 1940, Gemini was authorized to act as a custodian of digital assets, and it complies with anti-money laundering and know-your-customer requirements. It began operating its exchange continuously, with full reserves, for buying and selling digital assets.

In December 2017, Gemini worked out the details of a licensing and information sharing agreement with the Chicago Board Options Exchange (Cboe) for "a cash-settled bitcoin future to be traded on [Cboe Futures Exchange LLC]," and Cboe submitted the terms and conditions to the Commodity Futures Trading Commission for certification.[144] Cboe called this new financial product "Cboe Bitcoin futures" (XBT), that is, cash-settled futures contracts "based on the auction price of bitcoin in US dollars on the Gemini Exchange" and "designed to reflect economic exposure related to the price of bitcoin."[145] Gemini was the first exchange to launch BTC futures contracts.

In April 2018, Gemini began offering *block trading*, where users can program orders to buy or sell specific quantities of assets with a minimum acceptable quantity and a maximum acceptable price.[146] Block trading enables users to buy and sell large quantities of digital assets outside of Gemini's continuous order books, which creates additional liquidity mechanisms when trading in greater amounts. Also in April 2018, Nasdaq reported that Gemini would use Nasdaq's SMARTS technology to monitor trades and combat fraudulent activity and price manipulation on its exchange.[147]

In May 2018, the NYDFS announced that it had approved Gemini to offer Zcash (ZEC) on its platform. The NYDFS commented that its decision was a "continuation of New York's longstanding commitment to innovation and leadership in the marketplace."[148] Gemini's CEO

The Winkelvoss Twins *by Rory Cellan, 2010, used under CC BY-SA 2.0, accessed 22 Dec. 2020. Cropped.*

Tyler Winklevoss said that Gemini was "proud to be the first licensed exchange in the world to offer Zcash trading and custody services."[149]

After laying all the groundwork, Gemini received NYDFS' approval in September 2018 to launch a stablecoin, the Gemini Dollar (GUSD), collateralized 1:1 by USD held in reserve by State Street Bank and Trust Company.[150] GUSD launched shortly after.[151] According to the Gemini dollar white paper, the stablecoin "combines the creditworthiness and price stability of the US dollar with the technological advantages of a cryptocurrency and the oversight of US regulators."[152] Gemini created it to address the existing "implementations of fiat-pegged stablecoins" that lacked "some combination of *supervision*, *transparency*, and *examination*."[153] Its white paper elaborates on its stablecoin solution:

> *Building a viable stablecoin is as much of a trust problem as it is a computer science one. While Bitcoin created a system based on cryptographic proof instead of trust, a fiat-pegged stablecoin requires both due to its reliance on a centralized issuer. Desirable outcomes in a system that relies (at least in part) on trust requires oversight. In the context of a stablecoin, we submit that the issuer must be licensed and subject to regulatory supervision. From this, transparency and examination become requirements of the system, ensuring its integrity and engendering market confidence.[154]*

Gemini did everything required to obtain the necessary licenses and maintain registrations to issue GUSD legally. From a technical standpoint, GUSD is an ERC-20 compliant token that Gemini customers can transfer across the Ethereum network. They can trade USD and GUSD at a 1:1 exchange rate, creating or destroying GUSD by depositing or withdrawing USD from their Gemini accounts, and the platform updates their Gemini account balances accordingly."[155]

To summarize, here are GUSD's advantages. First, GUSD is under supervision of the NYDFS and compliant with US laws and regulations. Second, the number of dollars in the account strictly corresponds to the number of tokens in circulation, and those dollars are held by State Street. Third, in October 2018, Gemini obtained insurance covering digital assets held on its exchange. Aon, a London based public risk consulting company, brokered the insurance underwritten by a consortium of global underwriters.[156] Fourth, BPM LLP, an independently registered public accounting firm based in California, examines the deposit balance each month to verify the necessary 1:1 peg and attests to what Gemini calls *proof of solvency.[157]* Users can review the monthly audits online.[158]

EOSDT

Equilibrium's EOSDT is a stablecoin designed for cryptocurrency diversification and built on the Equilibrium framework, which leverages the EOS blockchain on Ethereum architecture, making it a more stable and practical cryptocurrency. The framework's utility token is NUT, and NUT holders participate in the governance of its

After laying all the groundwork, Gemini received NYDFS' approval in September 2018 to launch a stablecoin, the Gemini Dollar (GUSD), collateralized 1:1 by USD.

Equilibrium's EOSDT is a stablecoin designed for cryptocurrency diversification and built on the Equilibrium framework.

protocols. EOSDT is the world's first decentralized stablecoin on the EOS blockchain, pegged to the US dollar and backed by a user's own cryptoasset holdings.

"The EOS blockchain is quite fast with huge network capacity and excellent potential for development," said Alex Melikhov, co-founder and CEO of Equilibrium. "Equilibrium is the framework, the technology basis, for building decentralized stablecoins. The first proof of concept was the EODST stablecoin that we launched in April 2019. And we think it has succeeded in terms of its traction so far."[159]

Currently, Equilibrium accepts EOS and aims to create asset-backed stablecoins across multiple blockchains that support smart contracts.

Currently, Equilibrium accepts EOS and aims to create asset-backed stablecoins across multiple blockchains that support smart contracts:

> *We chose to start with the EOS blockchain and EOSIO technology because it is faster than Ethereum, has near zero transaction fees, and boasts an infrastructure robust enough to offer a high-quality experience to lots of users at once. ... EOS is our first choice because it offers great infrastructure prospects with the implementation of cross-chain solutions and support for multiple forms of collateral for the EOSDT stablecoin.[160]*

Users can generate EOSDT and choose the underlying asset. The protocol process flows as follows:

1. User generates EOSDT tokens with EOSIO technology on the Equilibrium platform. Through a self-service gateway, any user holding a digital asset compatible with the Equilibrium framework can leverage that asset to generate EOSDT stablecoins.[161]

2. The user chooses the collateral and then implements the smart contract. This "position contract" holds the deposited collateral. Active positions are always over-collateralized, that is, the value of the collateral exceeds the value of the generated stablecoins.

The framework seeks to maintain the minimum viable ratio of collateral to loan at all times. EOSDAQ, Newdex, and DEXEOS have listed EOSDT as a stablecoin, and so it is available for adoption.

3. Users can generate as many EOSDT tokens as the collateral can back. (As of Dec. 2019, the collateral-to-debt ratio was 130 percent. For example, if users deposit $100 worth of collateral, then they can generate up to $76.92 worth of EOSDTs.)[162]

4. Users (aka "position holders" here) can deploy EOSDT tokens for storage, crypto exchange, payments, and so forth.

5. Users can recover their collateral by paying back the equivalent amount of EOSDT along with any accrued fees, and they can withdraw the balance of recovered collateral.

The framework seeks to maintain the minimum viable ratio of collateral to loan at all times. EOSDAQ, Newdex, and DEXEOS have listed EOSDT as a stablecoin, and so it is available for adoption.[163]

Binance GBP (BGBP)

Binance is a blockchain ecosystem composed of several arms to serve the greater mission of blockchain advancement and the freedom of money. The Binance ecosystem includes Binance Labs, the venture capital arm and incubator; Binance DEX, its decentralized exchange feature developed on top of its native, community-driven blockchain software system, Binance Chain; Binance Launchpad, the token sale platform; Binance Academy, its educational portal; Binance Research, the market analysis; Binance Charity Foundation, the blockchain-powered donation platform and nonprofit for aiding in sustainability; and Trust Wallet, its official multi-coin wallet and Dapps browser.

The BGBP stablecoin was Binance's first step toward its cryptocurrency exchange ambition. Its leaders wanted to create a portfolio of stablecoins pegged to different fiat currencies on the Binance blockchain.

The Binance Jersey Exchange, a fiat-to-cryptocurrency exchange that accepts euros (EUR) and British pounds (GBP), first announced that it was testing a GBP backed stablecoin in June 2019. Binance CEO Changpeng Zhao confirmed that the company had issued only £200 worth of the stable asset.

In July 2019, the Binance Jersey Exchange announced the listing of its GBP backed token, the Binance GBP stablecoin (BGBP). An ERC-20 token based on the Ethereum platform, BGBP is pegged 1:1 to GBP and backed by fiat in reserve in Binance's bank.[164] At the time of the BGPB launch, only two other venues provided GBP pegged stablecoins: the TrueGBP project and the eToro GBP stablecoin project.[165]

Binance reported that it wanted to continue offering more options in the cryptocurrency space and provide its European users with better trading experiences. Wei Zhou, chief financial officer of Binance, said:

> There has been an overwhelming demand in the market and Binance community for more stablecoin diversification, including a GBP-pegged stablecoin, and listing BGBP is in response to it. Use cases and the utility of stablecoins have increased as well as BNB, which has tripled since the beginning of the year and continuing to grow rapidly with the advancement of Binance Chain.[166]

This development was significant because, at the time, Binance was one of the leading global cryptocurrency exchanges by trading volume with users from over 180 countries. Capable of processing more than 1.4 million orders per second, Binance remains among the fastest cryptocurrency trading platforms in the world.

In September 2019, Binance received clearance from the NYDFS to issue its stablecoin in partnership with the Paxos Trust Company.[167] In October 2020, Binance decided to close Binance Jersey to deposits,

Binance leaders wanted to create a portfolio of stablecoins pegged to different fiat currencies on the Binance blockchain.

Binance reported that it wanted to continue offering more options in the cryptocurrency space and provide its European users with better trading experiences.

BitShares is an open-source, real-time financial platform based on public blockchain. Its founder figured out how to create a fiat-to-bitcoin exchange without fiat deposits.

shut down the specialized exchange in November 2020, and take over the secure and reliable trading of EUR and GBP with BTC and ETH in addition to digital asset management services for users around the world.[168]

BitShares (BitUSD)

BitShares is a P2P polymorphic digital asset exchange similar to the New York Stock Exchange but without a central authority.[169] In software programming, *polymorphism* refers to the "ability to process objects differently depending on their data type or class."[170] On the BitShares exchange, digital assets could "track the value of gold, silver, dollars or other currencies while paying dividends to holders and avoiding all counterparty risk."[171] It is pegged 1:1 to USD and backed by fiat, silver, gold, and other assets.

BitShares is an open-source, real-time financial platform based on public blockchain. It features a built-in decentralized asset exchange. It can execute trading using an international network of computers in which anyone can take part. BitShares also provides a cryptocurrency token (BTS) that holders can transfer between accounts and use as a collateral for loans and to collect fees for network operations.

In 2013, Dan Larimer figured out how to create a fiat-to-bitcoin exchange without fiat deposits. His solution was to introduce a token backed by another token on the same blockchain. Larimer and Charles Hoskinson, a co-founder of Ethereum, presented a business plan to Li Xiaolai, a Chinese BTC entrepreneur who agreed to fund its development.[172] The token launched in 2014. Since March 2016, the project is a part of Microsoft Azure Blockchain as a service package.[173] Hoskinson, founder of the Bitcoin Education Project and Cardano, has since left the team.

Gold Bars Wealth Finance Deposit *by PublicDomainPictures / 17909 images, 2013, used under Pixabay license of 27 March 2019. Cropped.*

In the "The economics behind the protocols" section above, we described Larimer's search for a solution to the hidden costs of securing the Bitcoin blockchain through hash power (proof-of-work consensus).

The BitShares ecosystem employs *delegated proof-of-stake* consensus mechanism to achieve efficient distributed decision-making.[174] BitShares' founders implemented these rules as publicly auditable open-source software distributed across stakeholders. Users become stakeholders by obtaining "stock" in the DAC. This stock may entitle a holder to a share of its "profits."

BitUSD's value is backed by futures, fiat, gold, silver, and other assets.

The BitShares community is a global network of individuals that share the same goal of participating in various DACs. The community mainly revolves around the BitShares team and third parties that use Graphene, the toolkit that makes BitShares possible, to create their own DAC. BitShares community discussions take place openly at BitSharestalk.org.[175]

BitUSD's value is backed by futures, fiat, gold, silver, and other assets. BitUSD has the following advantages: (1) It's a relatively reliable investment tool because of the predictable price of the asset and minimal volatility; (2) it hedges against sudden price action and sudden cryptocurrency market movements; and (3) this unit of account is different from assets with capital gains or losses.

According to BitShares, its SmartCoins take the concept of a *contract for difference* and make the long side fungible.[176] Let's assume that the long side of the contract is bitUSD and that the backing collateral is BTS (the BitShares core asset). To achieve SmartCoins status, it follows these market rules:

1. Holders of BitUSD can exit their position within 24 hours at settlement price.

2. Holders use the least-collateralized short positions to settle the position.

3. The price feed, updated at least once per hour, is the median of many sources.

The BitShares platform provides a toolset with which innovators can experiment to find optimal currency solutions using free market discovery.

4. Short positions never expire, except when they hit the maintenance collateral limit or are force-settled as the least collateralized at the time of forced settlement.

5. If the least-collateralized short position lacks enough collateral to cover at the price feed, then all bitUSD positions are force-settled at the price of the least-collateralized short.

According to BitShares, "SmartCoins are a powerful tool for everyone from speculators and savers to traders and entrepreneurs. The BitShares platform provides a toolset with which innovators can experiment to find optimal currency solutions using free market discovery."[177]

Stably USD (USDS)

The founders of Stably Inc.—Kory Hoang, Bryan Guy, David Zhang, and Amiya Diwan—designed the Stably Dollar (USDS, formerly StableUSD) to fill needs other stablecoins lacked and provide a price-stable and reserve-backed asset. Their mission was "to make financial transactions faster, cheaper and more transparent through a borderless neobanking platform powered by blockchain, stablecoins and open finance APIs."[178]

The Stably Dollar is among the top ten USD backed stablecoins in the world, available on major crypto exchanges like Binance and Bittrex.

The Stably Dollar is among the top ten USD backed stablecoins in the world, available on major crypto exchanges like Binance and Bittrex.[179] Stably is also the creator of Stably Prime, a borderless account with a multitude of financial services and products, customizable to the individual or institution's specific needs.

It is a fiat-collateralized token pegged 1:1 with USD held by a third-party custodian, the Prime Trust Company LLC, a Nevada chartered and regulated financial institution. Prime Trust provides "all asset custody, funds processing, convertible virtual currency administration, issuance, redemption, trustee and fiduciary services."[180] It holds all digital assets in secure cold storage and all USD funds in its FDIC-insured bank.

According to the company's blog, USDS uses a proven centralized model to back up each issued token fully. It's based on the ERC-20 token standard for Ethereum and the BEP-2 standard for Binance Chain.[181] The emission process allows the use of BTC, ETH, or USDt. Stably Inc. opened early access to USDS on the Ethereum blockchain in November 2018.

According to Forklog Consulting, it works like this: the user sends an amount of ETH to the smart contract, the smart contract forwards it to the exchange, and the exchange sells it for USD, which goes into the reserve account at a bank. The smart contract issues the equivalent amount of Stably USD and sends it to the user. To redeem Stably USD, the user sends an amount of Stably to the smart contract. The smart contract transfers an equivalent amount of USD from the reserve to an exchange, buys ETH on that exchange, and forwards the ETH to the user. The smart contract then burns the redeemed tokens in question.[182]

Since the start-up Lumi introduced an Apple Pay feature in its iOS wallet, users have been able to buy Stably USD as well as Binance USD, Dai, Gemini USD, Huobi USD, Paxos Standard Token, Tether, and USD Coin.

Stably predicted, "In the near future, Stably and our regulated partners will release more stablecoins backed by other national currencies as well as commodities and precious metals such as gold and silver. We will also expand to other blockchains that have better features such as speed, scalability and security."[183]

Since the start-up Lumi introduced an Apple Pay feature in its iOS wallet, users have been able to buy Stably USD as well as Binance USD, Dai, Gemini USD, Huobi USD, Paxos Standard Token, Tether, and USD Coin. The service is unavailable in 15 jurisdictions including China, Kazakhstan, Romania, Russia, Serbia, Taiwan, and Ukraine.[184]

Using stablecoins: A few ideas

As the Sufi scholar Muhammad Tahir-ul-Qadri once said, "If knowledge is not put into practice, it does not benefit one."[185] Users might consider experimenting with stablecoins as part of their crypto portfolios. Here is a review of stablecoin's uses.

1. Trading fiat to cryptocurrency quickly

Nearly every exchange in existence allows crypto-to-crypto trading. Very few exchanges allow users to trade crypto directly for fiat currency. Now they can go from fiat to stablecoins quickly to the digital currency trading market. Many stablecoins are 1:1 equivalent to fiat; therefore, users can almost instantly sell crypto for stablecoins and convert to fiat without leaving their preferred exchange.

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2. Making payments

There's no question digital currency is the future. In 1999, Nobel Laureate Milton Friedman said, "I think the Internet is going to be one of the major forces for reducing the role of government. The one thing that's missing but that will soon be developed, is a reliable e-cash."[186] Daily use of stablecoins allows for riskless, secure, and interchangeable payments with fiat. Users will adopt stablecoins initially for convenience. This usage may serve to educate consumers on cryptocurrencies overall, as blockchain technology matures.

3. Protecting asset value

Some users have found the following methods effective in managing their crypto asset portfolios. Timing one market correctly is difficult, let alone two markets. No one wants to watch profits disappear. Less advanced crypto traders tend to use cryptocurrency exchanges but should be aware of fees for each transaction. Here is a typical process:

Less advanced crypto traders tend to use cryptocurrency exchanges but should be aware of fees for each transaction.

1. Obtain BTC or altcoin with centralized fiat-to-cryptocurrency exchange platform that allows deposits.

2. Transfer cryptocurrency to preferred digital currency exchange.

3. Trade, obtain, exchange, and so forth on the exchange.

4. Trade crypto back to BTC or altcoin on preferred trading exchange in a fluctuating market.

5. Transfer cryptocurrency to centralized cryptocurrency-to-fiat exchange that allows withdrawals.

6. Sell BTC or altcoin on exchange and withdraw to bank account.

7. Wait three to seven days for bank transfer.

Stablecoins, while not guaranteed to hold their value, provide a more likely way to retain value.

4. Stopping a loss in a volatile cryptocurrency market

In the stop-loss method, users exchange digital currency for stablecoins. Seasoned users know to refresh their browsers regularly for enough confirmations to approve a transaction. Then the asset becomes tradable. Historical charts show that price of BTC can change in a short amount of time. A crypto buyout, another country ban, or major headline has prompted a 30 percent drop. Stablecoins, while not guaranteed to hold their value, provide a more likely way to retain value.

5. Gaining a profit in a declining market

Exchanging fluctuating cryptocurrency investments into stablecoins allows users to rebalance a portfolio during market dips to secure more investments. Users can then reinvest these profits gained during market highs.

One strategy is hedging with stablecoins, using them "to reduce the risk of adverse price movements in an asset."[187] Investors use different financial instruments when hedging that risk. A successful hedge minimizes portfolio losses. For example, let's say we hold a portfolio of $1000: 50 percent BTC and 50 percent stablecoin. If the cryptocurrency market decreases by 20 percent in value, our portfolio is over-allocated in stablecoin (55.56%) and under-allocated in BTC (44.44%). To rebalance the portfolio, we can buy $50 worth of BTC with stablecoins. Our portfolio is once again 50/50.

Thanks to stablecoin security, we lose only 10 percent in overall portfolio value. Rebalancing the portfolio gives the investor more BTC during market dips. This is beneficial in a market increase and our harvesting scenario.

Another strategy is harvesting BTC profits while hedging with stablecoins. According to *Investopedia*, the harvesting "method is commonly referred to as an exit strategy, as investors seek to exit the investment after its success. Investors will use a harvest strategy

Table 12: Hedging with stablecoins

Hedging event	Bitcoin	Stablecoin	Portfolio
Balanced portfolio	50%	50%	Total: $1,000
Crypto market decreases 20% in value	44.44%	55.56%	Total: $900
Rebalance portfolio	Buy $50	Sell $50	Use stablecoin to buy BTC at a lower price
Ending portfolio	50%	50%	Increase BTC investments Total: $900

Vintage Coin and Memories *by Vinson Tan, 2019, used under Pixabay license of 27 March 2020. Cropped.*

Cryptocurrency is not inherently considered a security and therefore is not subject to wash-sale loss limitations.

to collect the profit from their investment so that funds can be reinvested into new ventures."[188] Employing a harvest strategy could allow users to harvest maximum profits before the market starts to decline.

Since 2017, the US Internal Revenue Code Section 1031 does not apply to nested portfolio gains.[189] Crypto users are left with alternative means to balance profits, losses, and US tax implications. The Internal Revenue Service (IRS) issued present guidance in IRS Publication 2014-21 and as clarification in 2019.[190]

Cryptocurrency is not inherently considered a security and therefore is not subject to wash-sale loss limitations.[191] Therefore, crypto users could harvest losses in a crypto market downturn and use those capital losses to offset current year capital gains. Furthermore, taxpayers can use up to $3,000 in annual losses to offset ordinary income or carry it forward to offset future capital gains. Hire a certified tax professional before executing any tax mitigation strategy.

Here's another example. If the cryptocurrency market increases by 20 percent, the portfolio will hold more value in BTC. Harvesting consists of taking the BTC profit and reinvesting. Rebalance the portfolio by taking 20 percent of the BTC profit to purchase stablecoins. Portfolio is once again 50/50; however, the return on investment has risen.

Table 13: Harvesting profits while hedging with stablecoins

Hedging event	Bitcoin	Stablecoin	Portfolio
Balanced portfolio	50%	50%	Total: $1,000
Crypto market increases 20% in value	55.56%	44.44%	100%
Rebalance portfolio	Sell $50	Buy $50	Sell BTC at a higher price, yielding $50 in profit
Ending portfolio	50%	50%	Total: $1,100

Conclusion and review

As stablecoins advance, many question where they are heading. In its survey of stablecoins, BitMEX Research concluded that "the transformative nature of such a technology on society would be immense, perhaps far more significant than Bitcoin or Ethereum tokens with their floating exchange rates."[192] *Cointelegraph* reported:

> *Various models of stablecoins have surged in popularity last year … research firm Diar published an analysis saying that the adoption of stablecoins is growing based on the increasing number of on-chain transactions. As per the study, the same four major stablecoins to date have broken the $5 billion mark in on-chain transactions within the three-month period.[193]*

Stablecoins are already considered commodities and traded among crypto exchanges.

Stablecoins are already considered commodities and traded among crypto exchanges. Naturally, during cryptocurrency market fluctuations, stablecoins do a better job of holding their value. For example, during the largest cryptocurrency market crash of all time in 2018, many currencies lost 30 to 70 percent of their value whereas Tether's stablecoin held within eight percent. Still, critics raise three concerns about their design and governance.

1. Many are centrally controlled. Can binding to a traditional banking system foster a decentralized ecosystem and still retain users' anonymity? BitMEX Research concluded that distributed stablecoins more so than centrally controlled ones "could have the advantages of bitcoin … without the difficulties of a volatile exchange rate and the challenge of encouraging users and merchants to adopt a new unknown token."[194]

2. Many are not backed by true assets. If fiat currency is backed by government promises rather than gold, then what type of backing is sufficient for nongovernmental stablecoins? According to one governor of the US Federal Reserve System, people use fiat currency because they "are confident that they can convert it on demand to the liability of another commercial bank or the central bank, such as physical cash. … because bank deposits are insured, and commercial banks are subject to supervision, regulation, and deposit insurance requirements."[195]

A high-quality stablecoin could allow the use of fiat currency on crypto exchanges in today's rapidly changing financial landscape.

3. Many are not necessarily transparent. Transactions on public blockchains are recorded on inviolable digital ledgers. If we back a stablecoin with a traditional asset, which often requires off-chain storage and related costs, then users may expect a third party to audit those reserves for full transparency of system.

A high-quality stablecoin could allow the use of fiat currency on crypto exchanges in today's rapidly changing financial landscape. With stablecoins, users could control their assets while taking advantage of many positive aspects of a crypto economy. People can use stablecoins with real-world value assets in everyday life, which opens the floodgates to mass adoption.

After a majority use digital cash, say, in the form of stablecoins, the cryptocurrency community can inform the public about the benefits of decentralization and need for trustless cash exchanges. With digital cash experience, there's less to learn in a new, highly complex, and ever-evolving financial technology ecosystem. Crypto enthusiasts can't disagree; stablecoins could be the key to getting more people to use BTC and altcoins in the future.

Stablecoins could be the key to increasing adoption and use of BTC and altcoins in everyday life.

In all likelihood, stablecoins will be a critical part of the future as bridges toward more decentralized digital currencies and in their own right as sensible investments. We may need a wave of stablecoins now to encourage adoption and later, perhaps in perpetuity, to hedge against risk. Let's remember, stablecoins are designed not to be speculative instruments for investment but to maintain a steady value for payments and exchange.

For further reading

Adachi, Mitsutoshi, Matteo Cominetta, Christoph Kaufmann, and Anton van der Kraaij, "A Regulatory and Financial Stability Perspective on Global Stablecoins," *Macroprudential Bulletin*, European Central Bank, Eurosystem, 2019. www.ecb.europa.eu/pub/financial-stability/macroprudential-bulletin/html/ecb.mpbu202005_1~3e9ac10eb1.en.html, accessed 1 Nov. 2020.

Baughman, Garth and Jean Flemming, "Global Demand for Basket-Backed Stablecoins," *Finance and Economics Discussion Series* 2020-048, Washington: Board of Governors of the Federal Reserve System, 22 June 2020. doi.org/10.17016/FEDS.2020.048, accessed 1 Nov. 2020.

Bullmann, Dirk, Jonas Klemm, and Andrea Pinna, "In Search for Stability in CryptoAssets: Are Stablecoins the Solution?" *Occasional Paper Series*, No. 230, European Central Bank, Eurosystem, Aug. 2019. www.ecb.europa.eu/pub/pdf/scpops/ecb.op230~d57946be3b.en.pdf, accessed 1 Nov. 2020.

Calle, George and Daniel Eidan, "Central Bank Digital Currency: An Innovation in Payments," White Paper, *r3.com*, April 2020. www.r3.com/wp-content/uploads/2020/04/r3_CBDC_report.pdf, accessed 29 Nov. 2020.

Cheng, Jess, "How to Build a Stablecoin: Certainty, Finality, and Stability Through Commercial Law Principles," *Berkeley Business Law Journal*, Vol. 17, No. 2 (23 Sept. 2020): 320–346. SSRN, ssrn.com/abstract=3698410, accessed 1 Nov. 2020.

ECB Crypto-Assets Task Force, "Stablecoins: Implications for Monetary Policy, Financial Stability, Market Infrastructure and Payments, and Banking Supervision in the Euro Area," chaired by Fiona Echelpoel, *Occasional Paper Series*, No. 247, European Central Bank, Eurosystem, Sept. 2020. www.ecb.europa.eu/pub/pdf/scpops/ecb.op247~fe3df92991.en.pdf, accessed 1 Nov. 2020.

G7 Working Group on Stablecoins, "Investigating the Impact of Global Stablecoins," chaired by Benoît Cœuré, BIS Committee on Payments and Market Infrastructures, No. 187, European Central Bank, International Monetary Fund, and Bank of International Settlements, 17 Oct. 2019. www.bis.org/cpmi/publ/d187.pdf, accessed 1 Nov. 2020.

Klages-Mundt, Ariah, Dominik Harz, Lewis Gudgeon, Jun-You Liu, and Andreea Minca, "Stablecoins 2.0: Economic Foundations and Risk-based Models," *arXiv.org*, Cornell University, 21 Oct. 2020. arxiv.org/pdf/2006.12388.pdf, accessed 1 Nov. 2020.

Klages-Mundt, Ariah and Andreea Minca, "While Stability Lasts: A Stochastic Model of Stablecoins," *arXiv.org*, Cornell University, 6 April 2020. arxiv.org/pdf/2004.01304.pdf, accessed 1 Nov. 2020.

Lipton, Alexander, Aetienne Sardon, Fabian Schar, and Christian Schupbach, "From Tether to Libra: Stablecoins, Digital Currency, and the Future of Money," *arXiv.org*, Cornell University, 26 May 2020. arxiv.org/pdf/2005.12949.pdf, accessed 1 Nov. 2020.

Lyons, Richard K., and Ganesh Viswanath-Natraj, "What Keeps Stablecoins Stable?" Working Paper 27136, *NBER Working Paper Series*, National Bureau of Economic Research, May 2020. www.nber.org/system/files/working_papers/w27136/w27136.pdf, accessed 1 Nov. 2020.

Mita, Makiko, Kensuke Ito, Shohei Ohsawa, and Hideyuki Tanaka, "What is Stablecoin? A Survey on Its Mechanism and Potential as Decentralized Payment Systems," *International Institute of Applied Informatics* Vol. 1, No. 1 (2015): 48–63, uploaded to *arXiv.org*, 22 June 2020. arxiv.org/pdf/1906.06037.pdf, accessed 1 Nov. 2020.

Moin, Amani, Emin Gün Sirer, and Kevin Sekniqi, "A Classification Framework for Stablecoin Designs," *arXiv.org*, Cornell University, 18 Sept. 2019. arxiv.org/pdf/1910.10098.pdf, accessed 1 Nov. 2020.

Pernice, Ingolf G.A. Sebastian Henningsen, Roman Proskalovich, Martin Florian, Hermann Elendner, and Bjorn Scheuermann, "Monetary Stabilization in Cryptocurrencies—Design Approaches and Open Questions," *arXiv.org*, Cornell University, 28 May 2019. arxiv.org/pdf/1905.11905.pdf, accessed 1 Nov. 2020.
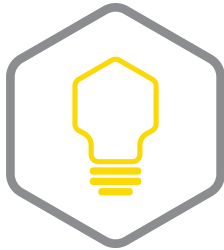
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Patrick Devereaux not only retains an impressive financial and accounting background beginning more than a decade ago, but he also encompasses a diverse résumé of experiences in a variety of industries. Devereaux has successfully collaborated with many

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Jean-Phillippe Beaudet is CEO and co-founder of VSEKUR, which creates user-centric, scalable, and effective solutions to help businesses implement trustworthy, burden-free identity and data security management. An experienced gaming developer, he launched his career at UbiSoft and worked for Luminary, a private American research lab. His interest in machine learning and decentralized technology led him to co-found S3R3NITY Technologies, a tech incubator where he launched numerous start-ups, and he contributed to a Bitcoin brokerage platform and a marketing data analytics tool for financial institutions. He is a privacy advocate, an advisor on multiple blockchain initiatives, and a regular conference speaker.

Tommy Austin is the chief operating officer and co-founder of Illumnine Corporation. He had a humble beginning in blockchain when he discovered the technology had potential to better impact the planet. Austin started his career in digital finance as a security guard for technology celebrity and gifted inventor, John McAfee. Austin took a business development director position at Team McAfee. He traveled at McAfee's side, fully engrossed in the crypto world. By asking the right questions and bringing value to blockchain-based businesses, he became an expert and has been a huge supporter of others in the crypto industry.

Acknowledgments

Notes

1. Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," White Paper, *Bitcoin.org*, 1 Nov. 2008. bitcoin.org/bitcoin.pdf, accessed 29 Oct. 2020.

2. Vitalik Buterin, "The Search for a Stable Cryptocurrency," *Ethereum Blog*, Ethereum Foundation, 11 Nov. 2014. blog.ethereum.org/2014/11/11/search-stable-cryptocurrency, accessed 29 Oct. 2020.

3. Vitalik Buterin, "The Search for a Stable Cryptocurrency."

4. For the original paper, see J.R. Willett, "The Second Bitcoin Whitepaper," Version 0.5, n.d. drive.google.com/file/d/18iRKDmZy44YDd3jyEtafouT1PA7dEi5e/view; for commentary on the original paper, see Dominik Zynis, "A Brief History of Mastercoin," *Omni Blog*, Omni Foundation, 29 Nov. 2013. blog.omni.foundation/2013/11/29/a-brief-history-of-mastercoin, both accessed 29 Oct. 2020.

5. Daniel Larimer, Charles Hoskinson, and Stan Larimer, "BitShares – A Peer-to-Peer Polymorphic Digital Asset Exchange (P2P-PDAE)," *BitMEX.com*, HDR Global Trading Ltd., uploaded June 2018. blog.bitmex.com/wp-content/uploads/2018/06/173481633-BitShares-White-Paper.pdf, accessed 29 Oct. 2020. Originally published by authors on *BitcoinTalk.org*, 19 Oct. 2013. bitcointalk.org/index.php?topic=313873.0.

6. Dan Larimer, Charles Hoskinson, and Stan Larimer, "BitShares."

7. Dan Larimer, Charles Hoskinson, and Stan Larimer, "BitShares."

8. Adam Hayes, "Fiat Money vs. Commodity Money: Which Is More Prone to Inflation?" *Investopedia*, Dotdash, 15 July 2020. www.investopedia.com/ask/answers/041515/fiat-money-more-prone-inflation-commodity-money.asp, accessed 29 Oct. 2020.

9. "Top 10 Use Cases and Benefits of the Dai Stablecoin," *Maker Blog*, Maker Foundation, 8 April 2020. blog.makerdao.com/top-10-use-cases-and-benefits-of-the-dai-stablecoin, accessed 29 Oct. 2020.

10. Lucas Mearian, "For Real Estate, Blockchain Could Unshackle Investment," *Computerworld*, IDG Communication Inc., 24 May 2019. www.computerworld.com/article/3396627/for-real-estate-blockchain-could-unshackle-investment.html, accessed 29 Oct. 2020.

11. Jeff John Roberts, "Winklevoss Twins: Bitcoin Can Overtake Gold with the Right Rules," *Fortune.com*, Fortune Media IP Ltd., 13 Jan. 2019. fortune.com/2019/01/13/winklevoss-gemini, accessed 29 Oct. 2020.

12. Ameer Rosic, "Smart Contracts: The Blockchain Technology That Will Replace Lawyers," *Blockgeeks*, Blockgeeks, n.d. blockgeeks.com/guides/smart-contracts, accessed 29 Oct. 2020.

13. Thomas M. Humphrey, "The Quantity Theory of Money: Its Historical Evolution and Role in Policy Debates," *Economic Review*, Federal Reserve Bank of Richmond, May/June 1974. www.richmondfed.org/~/media/richmondfedorg/publications/research/economic_review/1974/pdf/er600301.pdf, accessed 2 Nov. 2020.

14. Thomas M. Humphrey, "The Quantity Theory of Money."

15. Koshy Mathai, "Monetary Policy: Stabilizing Prices and Output," International Monetary Fund, last updated 24 Feb. 2020. www.imf.org/external/pubs/ft/fandd/basics/monpol.htm, accessed 1 Nov. 2020.

16. Taegun Charles Kim, "[ENG] The World of Stablecoin : Mapping Stablecoin (Part 1)," *Decon*, Medium.com, 12 Oct. 2018. medium.com/decon-lab/the-world-of-stablecoin-mapping-stablecoin-1-84970903cb0d, accessed 1 Nov. 2020.

17. Jackie Lohrey, "Fisher Effect Formula," *Zacks.com*, Zacks Investment Research, last updated 5 Feb. 2019. finance.zacks.com/fisher-effect-formula-9023.html, accessed 30 Oct. 2020.

18. Daniel Larimer, "Overpaying for Security: The Hidden Costs of Bitcoin," *Let's Talk Bitcoin!*, BTC Media LLC, 7 Sept. 2013. letstalkbitcoin.com/is-bitcoin-overpaying-for-false-security, accessed 30 Oct. 2020.

19. Daniel Larimer, "Overpaying for Security: The Hidden Costs of Bitcoin."

20. Daniel Larimer, "Overpaying for Security: The Hidden Costs of Bitcoin."

21. BitMEX Research, "A Brief History of Stablecoins," *BitMEX.com*, HDR Global Trading Ltd., 2 July 2018. blog.bitmex.com/a-brief-history-of-stablecoins-part-1, accessed 29 Oct. 2020.

22. Preston Byrne, "Basecoin (aka the Basis Protocol): The Worst Idea in Cryptocurrency, Reborn," *The Back of the Envelope Blog*, PrestonBryne.com, 13 Oct. 2017. prestonbyrne.com/2017/10/13/basecoin-bitshares-2-electric-boogaloo, accessed 29 Oct. 2020.

23. Preston Byrne, "The Cryptopocalypse," *The Back of the Envelope Blog*, PrestonBryne.com, 16 Jan. 2018. prestonbyrne.com/2018/01/16/on-the-investors-field-guide, accessed 29 Oct. 2020.

24. Mike Orcutt, "'Stablecoins' Are Trending, But They May Ignore Basic Economics," *MIT Technology Review*, Massachusetts Institute of Technology, 7 June 2018. www.technologyreview.com/2018/06/07/240613/stablecoins-are-trending-but-they-may-ignore-basic-economics, accessed 1 Nov. 2020.

25. For more on Hashcash, see Adam Back, "The Hashcash Proof-of-Work Function," Network Working Group Draft, The Internet Society, June 2003. www.hashcash.org/papers/draft-hashcash.txt, accessed 30 Oct. 2020.

26. Cassio Gusson, "Exclusive: 'Nothing Is Above Bitcoin, No CBDC, No Stablecoins,' Says Blockstream CEO Adam Back," *Cointelegraph.com*, 25 Nov. 2019. cointelegraph.com/news/exclusive-nothing-is-above-bitcoin-no-cbdc-no-stablecoins-says-blockstream-ceo-adam-back, accessed 30 Oct. 2020.

27. John Shipman and George Samman, "Stable Coin Evolution and Market Trends: Key Observations," *PwC.com.au*, PricewaterhouseCoopers International Ltd., Oct. 2018. www.pwc.com.au/pdf/stable-coin-evolution-and-market-trends.pdf, accessed 29 Oct. 2020.

28. BitMEX Research, "A Brief History of Stablecoins," *BitMEX.com*, HDR Global Trading Ltd., 2 July 2018. blog.bitmex.com/a-brief-history-of-stablecoins-part-1, accessed 29 Oct. 2020.

29. Steven Ehrlich, "After an $850 Million Controversy, What Everyone Should Know About Bitfinex, Tether and Stablecoins," *Forbes.com*, Forbes Media LLC, 2 May 2019. www.forbes.com/sites/stevenehrlich/2019/05/02/after-an-850-million-controversy-what-everyone-should-know-about-bitfinex-tether-and-stablecoins; and Cali Haan, "Bitfinex Starts Buying Back LEO Tokens Issued to Cover Funds Seized by Law Enforcement," *CrowdFundInsider.com*, Crowded Media Group, LLC, 15 June 2016. www.crowdfundinsider.com/2019/06/148443-bitfinex-starts-buying-back-leo-tokens-issued-to-cover-funds-seized-by-law-enforcement, both accessed 1 Nov. 2020.

30. "H.R.5197 - Managed Stablecoins Are Securities Act of 2019," 116th Congress, *Congress.gov*, Library of Congress, United States Copyright Office, 20 Nov. 2019. www.congress.gov/bill/116th-congress/house-bill/5197, accessed 30 Oct. 2020.

31. "Rep. Sylvia Garcia and Rep. Lance Gooden Introduce the 'Managed Stablecoins Are Securities Act of 2019,'" Press Release, *SylviaGarcia.House.gov*, US House of Representatives, 21 Nov. 2019. sylviagarcia.house.gov/media/press-releases/rep-sylvia-garcia-and-rep-lance-gooden-introduce-managed-stablecoins-are, accessed 30 Oct. 2020.

32. "Rep. Sylvia Garcia and Rep. Lance Gooden Introduce the 'Managed Stablecoins Are Securities Act of 2019.'"

33. Nick Lioudis, "What Is the Gold Standard?" *Investopedia*, Dotdash, last updated 24 Sept. 2020. www.investopedia.com/ask/answers/09/gold-standard.asp, accessed 2 Nov. 2020.

34. The United States hung onto some version of the gold standard until the early 1970s. See Nick Lioudis, "What Is the Gold Standard?"

35. Carla Tardi, "Why Has Gold Always Been Valuable?" *Investopedia*, Dotdash, last updated 14 Sept. 2020. www.investopedia.com/articles/investing/071114/why-gold-has-always-had-value.asp, accessed 30 Oct. 2020.

36. Mark Cartwright, "Mansa Musa I," *Ancient History Encyclopedia*, Ancient History Encyclopedia Foundation, 26 Feb. 2019. www.ancient.eu/Mansa_Musa_I, accessed 30 Oct. 2020.

37. Clem Chambers, "Bitcoin Is Better Than Gold for One Simple Reason," *Forbes.com*, Fortune Media IP Ltd., 4 Nov. 2019. www.forbes.com/sites/investor/2019/11/04/bitcoin-is-better-than-gold-for-one-simple-reason, accessed 3 Nov. 2020.

38. Marie Huillet, "Crypto Trailblazer Nick Szabo: Central Banks Could Turn to Crypto to Support Reserves," *Cointelegraph.com*, 9 Jan. 2019. cointelegraph.com/news/crypto-trailblazer-nick-szabo-central-banks-could-turn-to-crypto-to-support-reserves, accessed 2 Nov. 2020.

39. Georgi Georgiev, "'Uncanny': Historic Gold & Bitcoin Price Charts Almost Identical," *Bitcoinist.com*, 8 Sept. 2018. bitcoinist.com/gold-bitcoin-history-identical, accessed 30 Oct. 2020.

40. Alyze Sam, "BITCOIN vs GOLD: What's Valuable & What's Not," *The Capital*, Medium. com, 26 April 2019. medium.com/the-capital/bitcoin-vs-gold-whats-valuable-what-s-not-db117c40ad0d, accessed 30 Oct. 2020.

41. "Fiat," *Merriam-Webster.com Dictionary*, Merriam-Webster Inc., last updated 25 Oct. 2020. www.merriam-webster.com/dictionary/fiat, accessed 3 Nov. 2020.

42. The Editors of Encyclopaedia Britannica, "Gold Standard," ed. Brian Duignan, *Encyclopaedia Britannica*, Encyclopædia Britannica Inc., n.d. www.britannica.com/topic/gold-standard; "What is Fiat Money?" *CorporateFinanceInstitute.com*, CFI Education Inc., n.d. corporatefinanceinstitute.com/resources/knowledge/economics/fiat-money-currency, accessed 30 Oct. 2020.

43. John Maxfield, "JPMorgan Chase Is 10 Times Bigger Than You Think It Is," *The Motley Fool*, The Motley Fool, 24 Aug. 2016, last updated 9 Oct. 2018. www.fool.com/investing/2016/08/24/jpmorgan-chase-is-10-times-bigger-than-you-think-i.aspx, accessed 30 Oct. 2020.

44. Stan Higgins, "JPMorgan Launches Interbank Payments Platform on Quorum Blockchain," *CoinDesk*, Digital Currency Group, 16 Oct. 2017. www.coindesk.com/jpmorgan-launches-interbank-payments-platform-quorum-blockchain; Daniel Palmer, "JPMorgan Expanding Blockchain Project with 220 Banks to Include Payments," *CoinDesk*, Digital Currency Group, 22 April 2019. www.coindesk.com/jpmorgan-expanding-blockchain-project-with-220-banks-to-include-payments, accessed 31 Oct. 2020.

45. "Liink by J.P.Morgan: Transforming How Information Moves," *J.P.Morgan*, JPMorgan Chase & Co., n.d. www.jpmorgan.com/onyx/liink, accessed 1 Nov. 2020.

46. Ian Allison, "ConsenSys Acquires JPMorgan's Quorum Blockchain," *CoinDesk*, Digital Currency Group, 25 Aug 2020. www.coindesk.com/consensys-acquires-jp-morgan-quorum-blockchain, accessed 1 Nov. 2020.

47. Ian Allison, "JPMorgan Adds Privacy Features to Ethereum-Based Quorum Blockchain," *CoinDesk*, Digital Currency Group, 28 May 2019. www.coindesk.com/jpmorgan-adds-new-privacy-features-to-its-ethereum-based-quorum-blockchain, accessed 30 Oct. 2020.

48. "J.P.Morgan Creates Digital Coin for Payments," Press Release, *JPMorgan.com*, JPMorgan Chase & Co., 14 Feb. 2019. www.jpmorgan.com/solutions/cib/news/digital-coin-payments, accessed 1 Nov. 2020.

49. Saumya Vaishampayan, "J.P. Morgan's Jamie Dimon says bitcoin is a 'terrible store of value,'" *Thetell Blog,* MarketWatch Inc., 23 Jan. 2014. www.marketwatch.com/story/jp-morganaposs-jamie-dimon-says-bitcoin-is-a-aposterrible-store-of-valueapos-1390498669, accessed 1 Nov. 2020.

50. Yessi Bello Perez, "Jamie Dimon: Bitcoin Will Not Survive," *CoinDesk*, Digital Currency Group, 5 Nov. 2015, last updated 19 May 2017. www.coindesk.com/jamie-dimon-bitcoin-will-not-survive, accessed 1 Nov. 2020.

51. Aaron Hankin, "Jamie Dimon: 'I Don't Really Give a Shit about Bitcoin,'" *MarketWatch*, MarketWatch Inc., 31 Oct. 2018. www.marketwatch.com/story/jamie-dimon-i-dont-really-give-a-shit-about-bitcoin-2018-10-31, accessed 1 Nov. 2020.

52. Alyze Sam, "The J.P.Morgan Cryptocurrency Criticisms and Their Cryptocurrency … ," *The Capital*, Medium.com, 3 Oct. 2019. medium.com/the-capital/the-j-p-morgan-cryptocurrency-criticisms-and-their-cryptocurrency-49bef4ec4fbeJ, accessed 21 Nov. 2020.

53. "J.P.Morgan Creates Digital Coin for Payments," *JPMorgan.com*, JPMorgan Chase & Co., 14 Feb. 2019. www.jpmorgan.com/global/news/digital-coin-payments; Daniel Palmer, "JPMorgan's 'JPM Coin' Is Live, Execs Say," *CoinDesk*, Digital Currency Group, 27 Oct. 2020. www.coindesk.com/jpmorgans-jpm-coin-is-live-exec-says, both accessed 1 Nov. 2020.

54. Hugh Son, "JPMorgan Is Rolling Out the First US Bank-Backed Cryptocurrency to Transform Payments Business," *CNBC.com*, CNBC LLC, 14 Feb. 2019. www.cnbc.com/2019/02/13/jp-morgan-is-rolling-out-the-first-us-bank-backed-cryptocurrency-to-transform-payments--.html, accessed 1 Nov. 2020.

55. Ian Allison, "JPMorgan Adds Privacy Features to Ethereum-Based Quorum Blockchain"; "GoQuorum Projects," *GoQuorum*, ConsenSys, n.d. docs.goquorum.consensys.net/en/stable/Reference/GoQuorum-Projects; and Benedikt Bünz, Shashank Agrawal, Mahdi Zamani, and Dan Boneh, "Zether: Towards Privacy in a Smart Contract World," *Crypto. stanford.edu.*, Applied Cryptography Group, Stanford University, Feb. 2020. crypto.stanford.edu/~buenz/papers/zether.pdf, all accessed 1 Nov. 2020.

56. Ian Allison, "JPMorgan Adds Privacy Features to Ethereum-Based Quorum Blockchain."

57. Hugh Son, "JPMorgan Creates New Unit for Blockchain Projects, Says the Technology Is Close to Making Money," *CNBC.com*, CNBC LLC, 27 Oct. 2020. www.cnbc.com/2020/10/27/jpmorgan-creates-new-unit-for-blockchain-projects-as-it-says-the-technology-is-close-to-making-money.html, accessed 31 Oct. 2020.

58. "Signet," *Signature*, Signature Bank, 4 Dec. 2018. www.signatureny.com/business/signet, accessed 21 Nov. 2020; and Benjamin Pirus, "Signature Bank Beats JPMorgan to Ethereum-Based Token Services," *Forbes.com*, Forbes Media LLC, 22 Feb. 2019. www.forbes.com/sites/benjaminpirus/2019/02/22/signature-bank-already-has-hundreds-of-clients-using-private-ethereum-jpm-coin-still-in-testing, accessed 1 Nov. 2020.

59. Andrew Singer, "WisdomTree Grows a Stablecoin Today to Nurture a Crypto ETF Tomorrow," *Cointelegraph*, 18 Jan. 2020. cointelegraph.com/news/wisdomtree-grows-a-stablecoin-today-to-nurture-a-crypto-etf-tomorrow, accessed 1 Nov. 2020.

60. Haseeb Qureshi, "Stablecoins: Designing a Price-Stable Cryptocurrency," *HaseebQ.com*, 19 Feb. 2018. haseebq.com/stablecoins-designing-a-price-stable-cryptocurrency, accessed 1 Nov. 2020.

61. James Chen, "Commodity," *Investopedia*, Dotdash, last updated 14 Feb. 2020. www.investopedia.com/terms/c/commodity.asp, accessed 1 Nov. 2020.

62. Anthem Blanchard, message to authors, n.d. See also Anthem Gold, AnthemGold Inc, n.d. anthemgold.com; Patrick Donohoe, "Financial Structures: A New Gold Standard with Anthem Blanchard," Podcast, *TheWealthStandard.com*, 16 April 2020. thewealthstandard.com/financial-structures-a-new-gold-standard-with-anthem-blanchard, accessed 16 Oct. 2020.

63. Julia Kagan, "Fractional Reserve Banking," *Investopedia*, Dotdash, last updated 4 May 2020. www.investopedia.com/terms/f/fractionalreservebanking.asp, accessed 31 Oct. 2020.

64. John M. Griffin and Amin Shams, "Is Bitcoin Really Un-Tethered?" *SSRN.com*, Elsevier, 28 Oct. 2019, last updated 5 Nov. 2019. ssrn.com/abstract=3195066, accessed 1 Nov. 2020.

65. "United States District Court Southern District of New York," Case 1:20-cv-00169, *CourtHouseNews.com*, 8 Jan. 2020. www.courthousenews.com/wp-content/uploads/2020/01/Bitcoin.pdf; Michael del Castillo, "New York Court Approves Investigation into $10 Billion Cryptocurrency Created by a Presidential Candidate," *Forbes.com*, Forbes Media LLC, 9 July 2020. www.forbes.com/sites/michaeldelcastillo/2020/07/09/ny-supreme-court-approves-investigation-into-10-billion-cryptocurrency-created-by-a-presidential-candidate/?sh=66446fc3783b, both accessed 1 Nov. 2020.

66. Nikhilesh De, "Tether Lawyer Admits Stablecoin Now 74% Backed by Cash and Equivalents," *CoinDesk*, Digital Currency Group, 30 April 2019, last updated 1 May 2019. www.coindesk.com/tether-lawyer-confirms-stablecoin-74-percent-backed-by-cash-and-equivalents, accessed 2 Nov. 2020.

67. "Risk Disclosure Statement," Tether, Tether Operations Ltd., last updated 12 May 2020. tether.to/legal, accessed 2 Nov. 2020.

68. Robert Sams, "A Note on Cryptocurrency Stabilisation: Seigniorage Shares," *GitHub.com*, GitHub Inc., 24 Oct. 2014, last revised 28 April 2015. github.com/rmsams/stablecoins/blob/master/paper.pdf; Ferdinando M. Ametrano, "Hayek Money: The Cryptocurrency Price Stability Solution," *SSRN.com*, Elsevier, 17 April 2014, last revised 13 Aug. 2016. ssrn.com/abstract=2425270, both accessed 1 Nov. 2020.

69. Vitalik Buterin, "The Search for a Stable Cryptocurrency," *Ethereum Blog*, Ethereum Foundation, 11 Nov. 2014. blog.ethereum.org/2014/11/11/search-stable-cryptocurrency, accessed 31 Oct. 2020.

70. Richard Senner and Didier Sornette, "The 'New Normal' of the Swiss Balance of Payments in a Global Perspective: Central Bank Intervention, Global Imbalances and the Rise of Sovereign Wealth Funds," Swiss Finance Institute Research Paper No. 17-22, *SSRN.com*, Elsevier, 1 June 2017. ssrn.com/abstract=2990512, accessed 31 Oct. 2020.

71. Neil Irwin, "Quantitative Easing Is Ending. Here's What It Did, in Charts," *The New York Times*, The New York Times Company, 29 Oct. 2014. www.nytimes.com/2014/10/30/upshot/quantitative-easing-is-about-to-end-heres-what-it-did-in-seven-charts.html, accessed 31 Oct. 2020.

72. Richard Senner and Didier Sornette, "The 'New Normal' of the Swiss Balance of Payments in a Global Perspective."

73. Preston Byrne, "Basecoin (aka the Basis Protocol): The Worst Idea in Cryptocurrency, Reborn," *The Back of the Envelope Blog*, PrestonBryne.com, 13 Oct. 2017. prestonbyrne.com/2017/10/13/basecoin-bitshares-2-electric-boogaloo, accessed 31 Oct. 2020.

74. Patrick Devereaux, CEO of Aperum, contributed this quote to the manuscript.

75. Nat Wittayatanaseth, "Stablecoins: De-Risking Non-Collateralized Stablecoins," *Medium.com*, A Medium Corp., 27 April 2018. medium.com/@natwittayatanaseth/https-medium-com-fintech-kellogg-de-risking-non-collateralized-stablecoins-40e832562090, accessed 31 Oct. 2020.

76. Evan Kuo, Brandon Iles, and Manny Rincon Cruz, "Ampleforth: A New Synthetic Commodity," Ampleforth, 12 July 2019. drive.google.com/file/d/1I-NmSnQ6E7wY1nyouuf-GuDdJWNCnJWl/view; Connie Loizos, "Basis, Backed with $133 Million from Top VCs to Build a Price-Stable Cryptocurrency, Says It's Shutting Down and Returning the Money," *TechCrunch*, Verizon Media, 13 Dec. 2018. techcrunch.com/2018/12/13/basis-backed-with-133-million-from-top-vcs-to-build-a-price-stable-cryptocurrency-says-its-shutting-down-and-returning-the-money, both accessed 31 Oct. 2020.

77. Sam Trautwein, "Why Hybrid?" *LinkedIn*, LinkedIn Corp., 20 Sept. 2018. www.linkedin.com/pulse/why-hybrid-sam-trautwein, accessed 31 Oct. 2020.

78. Yogita Khatri, "Carbon's Stablecoin Can Now Be Swapped Between EOS and Ethereum," *CoinDesk*, Digital Currency Group, 9 Nov. 2018, last updated 12 Nov. 2018. www.coindesk.com/carbons-stablecoin-can-now-be-swapped-between-eos-and-ethereum-blockchains, accessed 31 Oct. 2020.

79. Frax, "Trump and Reagan Advisors Join Frax to Launch World's First Fully Decentralized Global Currency," *Cision PR Newswire*, Newswire Association LLC, 22 Oct. 2019. www.prnewswire.com/news-releases/trump-and-reagan-advisors-join-frax-to-launch-worlds-first-fully-decentralized-global-currency-300943571.html, accessed 31 Oct. 2020.

80. Jeff John Roberts, "Trump's Former Fed Pick Stephen Moore Announces Cryptocurrency to Compete with Central Banks," *Fortune.com*, Fortune Media IP Ltd., 21 Oct. 2019. fortune.com/2019/10/21/stephen-moore-trump-fed-nomination-cryptocurrency-stablecoin-frax, accessed 31 Oct. 2020.

81. Not to be confused with the Fracture Risk Assessment Tool. See the Frax white paper here: Sam Kazemian and Jason Huan, "Introduction," *Frax.Finance*, ~8 Nov. 2020. docs.frax.finance/overview, accessed 1 Dec. 2020.

82. Genius, Genius Media Group Inc., n.d, genius.com, accessed 31 Oct. 2020.

83. Sam Kazemian and Jason Huan, "Frax: Fractional-Algorithmic Stablecoin Protocol," *Frax.Finance*, ~1 Nov. 2020. docs.frax.finance, accessed 1 Dec. 2020.

84. Jeff John Roberts, "Trump's Former Fed Pick Stephen Moore Announces Cryptocurrency to Compete with Central Banks." See also "Frax Bonds (FXB)," *Frax.Finance*, ~1 Nov. 2020. docs.frax.finance/frax-bonds-fxb, accessed 1 Dec. 2020.

85. Jeff John Roberts, "Trump's Former Fed Pick Stephen Moore Announces Cryptocurrency to Compete with Central Banks."

86. EazyC (Sam Kazemian), "DeFi Algorithmic Stablecoin: FRAX (feedback wanted)," *ETHresearch*, Sept. 2019. ethresear.ch/t/defi-algorithmic-stablecoin-frax-feedback-wanted/6169, accessed 1 Nov. 2020.

87. Messari Stablecoin Index, stablecoinindex.com, accessed 29 Nov. 2020. It includes a good resource page with quick links for further reading: stablecoinindex.com/resources.

88. Bogdan Ulm, "Brock Pierce Unveils Realcoin to Fix Bitcoin's Volatility Concerns," *Cointelegraph.com*, 9 July 2014. cointelegraph.com/news/brock-pierce-unveils-realcoin-to-fix-bitcoins-volatility-concerns, accessed 1 Nov. 2020.

89. Pete Rizzo, "Realcoin Rebrands as 'Tether' to Avoid Altcoin Association," *CoinDesk*, Digital Currency Group, 20 Nov. 2014. www.coindesk.com/realcoin-relaunches-tether-avoid-altcoin-association, accessed 1 Nov. 2020.

90. Stan Higgins, "Million in US Dollar Token Stolen," *CoinDesk*, Digital Currency Group, 20 Nov. 2017. www.coindesk.com/tether-claims-30-million-stable-token-stolen-attacker, accessed 2 Nov. 2020.

91. Gareth Jenkinson, "Untethered: The History of Stablecoin Tether and How It Has Lost Its $1 Peg," *Cointelegraph.com*, 17 Oct. 2018. cointelegraph.com/news/untethered-the-history-of-stablecoin-tether-and-how-it-has-lost-its-1-peg, accessed 1 Nov. 2020.

92. Paul Vigna and Steven Russolillo, "The Mystery Behind Tether, the Crypto World's Digital Dollar," *The Wall Street Journal*, Dow Jones & Co. Inc., 12 Aug. 2018. www.wsj.com/articles/the-mystery-behind-tether-the-crypto-worlds-digital-dollar-1534089601, accessed 1 Nov. 2020.

93. Paul Vigna and Steven Russolillo, "The Mystery Behind Tether, the Crypto World's Digital Dollar."

94. Richard K. Lyons and Ganesh Viswanath-Natraj, "What Keeps Stablecoins Stable?" Working Paper 27136, *NBER Working Paper Series*, National Bureau of Economic Research, May 2020, p. 43. www.nber.org/system/files/working_papers/w27136/w27136.pdf, accessed 1 Nov. 2020.

95. Jemima Kelly, "Tether Slammed as 'Part-Fraud, Part-Pump-and-Dump, and Part-Money Laundering,'" FT Alphaville, *Financial Times*, Financial Times Ltd., 7 Oct. 2019. www.ft.com/content/eb5cf045-1ea1-3b54-80cd-e9f8c8287f08, accessed 2 Nov. 2020.

96.   John M. Griffin and Amin Shams, "Is Bitcoin Really Untethered?" *The Journal of Finance* 75 (Aug. 2020): 1913–1964. onlinelibrary.wiley.com/doi/full/10.1111/jofi.12903, accessed 2 Nov. 2020.

97.   "Attorney General James Announces Court Order Against 'Crypto' Currency Company under Investigation for Fraud," Press Release, *AG.NY.Gov*, New York State Attorney General, 25 April 2019. ag.ny.gov/press-release/2019/attorney-general-james-announces-court-order-against-crypto-currency-company, accessed 1 Nov. 2020.

98.   "Bitfinex Responds to New York Attorney General's Actions," *Bitfinex*, iFinex Inc., 26 April 2019. www.bitfinex.com/posts/356, accessed 1 Nov. 2020.

99.   "Legal," Tether Operations Ltd., last updated 12 May 2020. tether.to/legal, accessed 2 Nov. 2020.

100.   "Why Use Tether?" *Tether.io*, Tether Operations Ltd., n.d. tether.to/why-use-tether, accessed 1 Nov. 2020.

101.   "Circle Internet Financial Closes $17 Million Series B Financing," Press Release, Business Wire Inc., 26 March 2014. www.businesswire.com/news/home/20140326005423/en/Circle-Internet-Financial-Closes-17-Million-Series-B-Financing, accessed 29 Nov. 2020.

102.   Jeremy Allaire, Testimony, Hearing on "Beyond Silk Road: Potential Risks, Threats and Promises of Virtual Currencies," US Senate Committee on Homeland Security and Governmental Affairs Hearing, 18 Nov. 2013. www.hsgac.senate.gov/imo/media/doc/Testimony-Allaire-2013-11-18.pdf, accessed 29 Nov. 2020.

103.   Dean Starkman, "Goldman Sachs Invests in Bitcoin Start-Up Circle Internet Financial," *Los Angeles Times*, Los Angeles Times Communications LLC, 30 April 2015. www.latimes.com/business/la-fi-goldman-sachs-bitcoin-20150430-story.html, accessed 29 Nov. 2020.

104.   Dean Starkman, "Goldman Sachs Invests in Bitcoin Start-Up Circle Internet Financial."

105.   Sarah Hansen, "Circle Launches USD-Backed Stablecoin," *Forbes.com*, Forbes Media LLC, 26 Sept. 2018. www.forbes.com/sites/sarahhansen/2018/09/26/circle-launches-usd-backed-stablecoin/?sh=4fb9a8125d3f, accessed 29 Nov. 2020.

106.   Sarah Hansen, "Circle Launches USD-Backed Stablecoin."

107.   CENTRE Consortium, "CENTRE White Paper," version 2.0, *CENTRE.io*, 15 May 2018. www.centre.io/index.html, accessed 29 Nov. 2020.

108.   "USDC: The Fastest Growing, Fully Reserved Digital Dollar Stablecoin," *Circle.com*, Circle Internet Financial Inc., n.d. www.circle.com/en/usdc, accessed 29 Nov. 2020.

109.   CENTRE Consortium, "USDC: Celebrating the First Anniversary of the Fastest Growing Stablecoin," *Centre Blog*, Medium.com, 25 Sept. 2019. medium.com/centre-blog/usdc-celebrating-the-1st-anniversary-of-the-fastest-growing-stablecoin-4a05dc3784b8, accessed 31 Oct. 2020.

110.   "Circle USDC User Agreement," *About Circle USDC: Legal*, Circle Internet Financial Inc., last updated 12 May 2020. support.usdc.circle.com/hc/en-us/articles/360001233386-Circle-USDC-User-Agreement, accessed 14 Dec. 2020.

111.   Mark DuBose and Amy Luo, "Re: Addressing the Regulatory, Supervisory, and Oversight Challenges Raise by 'Global Stablecoin' Arrangements," Memorandum to the Financial Stability Board Bank for International Settlements, *FSB.org*, Circle and Coinbase, 15 July 2020. www.fsb.org/wp-content/uploads/CircleCoinbase.pdf, accessed 29 Nov. 2020.

112.   Mark DuBose and Amy Luo, "Re: Addressing the Regulatory, Supervisory, and Oversight Challenges Raise by 'Global Stablecoin' Arrangements."

113.   Circle Internet Financial Inc., "Circle Announces Partnership with Visa to Bring the Benefits of Stablecoins to Businesses Worldwide," Press Release, *Cision PR Newswire*, Newswire Association LLC, 3 Dec. 2020. www.prnewswire.com/news-releases/circle-announces-partnership-with-visa-to-bring-the-benefits-of-stablecoins-to-businesses-worldwide-301185942.html, accessed 14 Dec. 2020.

114.   Maker (MKR), *CoinMarketCap.com*, as of 29 Nov. 2020. coinmarketcap.com/currencies/maker.

115.   "Maker Sells $12M of MKR to Partners, Led by Andreessen Horowitz and Polychain Capital," *Maker Blog*, MakerDAO.com, 16 Dec. 2017. blog.makerdao.com/maker-sells-12m-of-mkr-to-partners-led-by-andreessen-horowitz-and-polychain-capital, accessed 31 Oct. 2020.

116.   "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System," MakerDAO.com, n.d. makerdao.com/en/whitepaper#abstract, accessed 31 Oct. 2020.

117.   Dai (DAI), *CoinMarketCap.com*, as of 29 Nov. 2020. coinmarketcap.com/currencies/multi-collateral-dai.

118.   "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System."

119. "Multi-Collateral Dai: Collateral Types," *Maker Blog*, MakerDAO.com, 27 June 2019. blog. makerdao.com/multi-collateral-dai-collateral-types, accessed 31 Oct. 2020.

120. "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System."

121. "The Maker Protocol: MakerDAO's Multi-Collateral Dai (MCD) System."

122. Søren Peter Nielsen, "Announcing the Dai Foundation," MakerDAO Forum, 31 Dec. 2019. forum.makerdao.com/t/announcing-the-dai-foundation/1046, accessed 29 Nov. 2020.

123. "Multi-Collateral Dai: Milestones Roadmap," *Maker Blog*, MakerDAO.com, 27 June 2019. blog.makerdao.com/multi-collateral-dai-milestones-roadmap, accessed 29 Nov. 2020.

124. TrustToken, "TrueCurrency Attestation Reports," *TrustToken Blog*, A Medium Corp., 23 May 2018, updated 31 May 2020. blog.trusttoken.com/trueusd-attestation-reports-86f693b90a4, accessed 29 Nov. 2020.

125. "Independent Accountants' Report: Escrow Holdings Report to the Members and TrueUSD Token Holders, TrueCoin LLC," Cohen & Company Ltd., 1 March 2018. drive.google.com/file/d/1okXidblukRNHs6RgPLJVjMOIOJAVIfuH/view, accessed 29 Nov. 2020.

126. TrustToken, "TrueCurrency Attestation Reports."

127. Armanino, "Real-Time Attest Reporting," White Paper, Armanino LLP, 30 Oct. 2019, p. 3. www.armaninollp.com/-/media/pdf/white-papers/whitepaper-trustexplorer-real-time-audit.pdf, accessed 29 Nov. 2020.

128. "Concepts Common to All Attestation Engagements," AT-C § 105.A76, *Statement on Standards for Attestation Engagements (SSAE)* No. 18, American Institute of Certified Public Accountants (AICPA) Auditing Standards Board, 2020. www.aicpa.org/Research/Standards/AuditAttest/DownloadableDocuments/AT-C-00105.pdf; "Examination Engagements," AT-C § 205.04, *SSAE* No. 19, AICPA Auditing Standards Board, 2020. www.aicpa.org/Research/Standards/AuditAttest/DownloadableDocuments/AT-C-00205.pdf, accessed 29 Nov. 2020.

129. Armanino, "Real-Time Attest Reporting," p. 9.

130. Armanino, "Real-Time Attest Reporting," p. 9.

131. Armanino, "Real-Time Attest Reporting," pp. 9–10.

132. TrustToken, "TrustToken Introduces Proof of Reserve for TUSD Stablecoin in Collaboration with Chainlink and Armanino," *TrustToken Blog*, A Medium Corp., 11 Nov. 2020. blog.trusttoken.com/trusttoken-introduces-proof-of-reserve-for-tusd-stablecoin-in-collaboration-with-chainlink-and-584b3674b89f; and Armanino, "Real-Time Attest," *TrustExplorer.io*, Armanino LLP, n.d. real-time-attest.trustexplorer.io/trusttoken, both accessed 29 Nov. 2020.

133. "Paxos Launches New Stablecoin, Paxos Standard," Press Release, *Cision PR Newswire*, Newswire Association LLC, 10 Sept. 2018. www.prnewswire.com/news-releases/paxos--launches-new-stablecoin-paxos-standard-300709434.html, accessed 30 Nov. 2020.

134. "Paxos Launches New Stablecoin, Paxos Standard."

135. "Paxos Standard (PAX) Audit Report," *Nomic Labs Blog*, Medium.com, 10 Sept. 2018. medium.com/nomic-labs-blog/paxos-standard-pax-audit-report-ca743c9575dc, both accessed 1 Nov. 2020.

136. "Paxos Launches New Stablecoin, Paxos Standard."

137. "Paxos Launches New Stablecoin, Paxos Standard."

138. Kabompo Holdings Ltd., "Notice of Exempt Offering of Securities," OMB Number: 3235-0076, Form D, US Securities and Exchange Commission, *SEC.gov*, 6 Nov. 2017. www.sec.gov/Archives/edgar/data/1587702/000158770217000002/xslFormDX01/primary_doc.xml; and Aequi Acquisition Corp., "Amendment No. 2 to Form S-1, Registration Statement under the Securities Act of 1933," Registration No. 333-249337, US SEC, *SEC.gov*, 16 Nov. 2020. www.sec.gov/Archives/edgar/data/1823826/000121390020037147/fs12020a2_aequiacqcorp.htm, both accessed 30 Nov. 2020.

139. WithumSmith+Brown PC, "Paxos Trust Company LLC, Examination of Management Assertions Reserve Accounts Report – PAX Standard Token, 30 Oct. 2020 – with Independent Accountant's Report," *Paxos.com*, Paxos Trust Co. LLC, 30 Oct. 2020. www.paxos.com/attestations, accessed 30 Nov. 2020.

140. WithumSmith+Brown PC, "Paxos Trust Company LLC, Examination of Management Assertions Reserve Accounts Report – BUSD Token 30 Oct. 2020 – with Independent Accountant's Report," *Paxos.com*, Paxos Trust Co. LLC, 30 Oct. 2020. www.paxos.com/attestations, accessed 30 Nov. 2020.

141. WithumSmith+Brown PC, "Paxos Trust Company LLC, Examination of Management Assertions Reserve Accounts Report – PAX Gold Token, 30 Oct. 2020 – with Independent Accountant's Report," *Paxos.com*, Paxos Trust Co. LLC, 30 Oct. 2020. www.paxos.com/wp-content/uploads/2020/11/PAX-Gold-Report-October-2020.pdf, accessed 30 Nov. 2020.

142. "About Gemini," Gemini Trust Company LLC, n.d. gemini.com/about, accessed 30 Nov. 2020.

143. "Governor Cuomo Announces Approval of First US-Based Ethereum Exchange, Created and Operated In New York," Press Release, Office of the Governor of New York State Andrew M. Cuomo, 5 May 2016. www.governor.ny.gov/news/governor-cuomo-announces-approval-first-us-based-ethereum-exchange-created-and-operated-new, accessed 30 Nov. 2020.

144. Andrew Lowenthal, "Re: Cboe Futures Exchange LLC, Product Certification for Bitcoin Futures, Submission Number CFE-2017-018," submitted to Christopher J. Kirkpatrick, Commodity Futures Trading Commission, *CFE.Cboe.com*, 1 Dec. 2017. cfe.cboe.com/publish/CFErulefilings/SR-CFE-2017-018.pdf, accessed 30 Nov. 2020.

145. Andrew Lowenthal, "Re: Cboe Futures Exchange LLC."

146. Team Gemini, "Introducing Gemini Block Trading," *Cameron Winklevoss Blog*, Medium.com, 8 April 2018. medium.com/@winklevoss/introducing-gemini-block-trading-ac80bdaa6320, accessed 30 Nov. 2020.

147. "Gemini to Launch Market Surveillance Technology in Collaboration with Nasdaq," Press Release, Nasdaq Inc., 25 April 2018. www.nasdaq.com/about/press-center/gemini-launch-market-surveillance-technology-collaboration-nasdaq, accessed 30 Nov. 2020.

148. "DFS Authorizes Gemini Trust Company to Provide Additional Virtual Currency Products and Services: Gemini is the First Qualified Custodian and Exchange to Receive DFS Approval to Offer Trading of Emerging Digital Currency Zcash in New York," Press Release, New York State Department of Financial Services, *DFS.NY.gov*, 14 May 2018. www.dfs.ny.gov/reports_and_publications/press_releases/pr1805141, accessed 30 Nov. 2020.

149. "DFS Authorizes Gemini Trust Company to Provide Additional Virtual Currency Products and Services."

150. Robert Hackett, "Winklevoss Twins Win Regulatory Approval for State Street-Backed, Dollar-Pegged Cryptocurrency," *Fortune.com*, Fortune Media IP Ltd., 10 Sept. 2018. fortune.com/2018/09/10/cryptocurrency-state-street-winklevoss-gemini-dollar-regulator-nydfs; and "Gemini dollar," *Gemini.com*, Gemini Trust Company LLC, n.d. gemini.com/static/dollar/gemini-dollar-whitepaper.pdf, both accessed 31 Oct. 2020.

151. *CoinMarketCap.com* started reporting on Gemini's price on 6 Oct. 2018. See Gemini Dollar Charts, coinmarketcap.com/currencies/gemini-dollar.

152. "The Gemini Dollar: A Regulated Stable Value Coin," White Paper, Gemini Trust Company LLC, 10 Sept. 2018. gemini.com/static/dollar/gemini-dollar-whitepaper.pdf, accessed 30 Nov. 2020.

153. "The Gemini Dollar: A Regulated Stable Value Coin."

154. "The Gemini Dollar: A Regulated Stable Value Coin."

155. "The Gemini Dollar: A Regulated Stable Value Coin."

156. "Gemini Obtains Digital Asset Insurance via Aon: Digital Asset Insurance Coverage Adds to Gemini's Existing FDIC Insurance for Fiat Funds," Press Release, Business Wire Inc., 3 Oct. 2018. www.businesswire.com/news/home/20181003005283/en/Gemini-Obtains-Digital-Asset-Insurance-Aon, accessed 30 Nov. 2020.

157. For more on BPM LLP, see www.bpmcpa.com/Industries/Blockchain-and-Digital-Assets, accessed 30 Nov. 2020. Gemini explains "proof of solvency" further in its white paper.

158. For all reports to date, see gemini.com/dollar#reports. For the latest, see "Independent Accountants' Report: Gemini Dollar and Cash Balances as of 30 Nov. 2020," BPM CPA (NY) LLP, 30 Nov. 2020. assets.ctfassets.net/jg6lo9a2ukvr/4BkDN9UnhB3dR0nsmdFrl8/6bd8079e5c3caad17aa61d536ff38bd9/Gemini_Dollar_Examination_Report_11-30-20.pdf, accessed 6 Dec. 2020.

159. CardRates.com, "EOSDT: A USD-Pegged Stablecoin That Collateralizes Crypto and Offers Practical Financial Value," *StablecoinBuzz.com*, n.d. stablecoinbuzz.com/eosdt-a-usd-pegged-stablecoin-that-collateralizes-crypto-and-offers-practical-financial-value-cardrates-com, accessed 6 Dec. 2020. We were unable to confirm whether this news item originally appeared on CardRates.com.

160. "Equilibrium Review: A Stablecoin That Is Overcollateralized Above 170%," *Equilibrium Blog*, Equilibrium Lab, 1 April 2019. blog.eosdt.com/equilibrium-review-a-stablecoin-that-is-overcollateralized-above-170, accessed 31 Oct. 2020.

161. "EOSDT," *EOSDT.com*, EOSDT, n.d. gateway.eosdt.com, accessed 31 Oct. 2020.

162. "Equilibrium Overview," *Knowledgebase.Equilibrium.io*, ~Dec. 2019. knowledgebase.equilibrium.io, accessed 6 Dec. 2020.

163. "How to Use Equilibrium's NUT Token," *EquilBrium Blog*, 12 Nov. 2019. blog.eosdt.com/how-to-use-equilibriums-nut-token, accessed 6 Dec. 2020.

164. Binance Research, "Binance GBP (BGBP): A GBP Collateralized Stablecoin Backed by Fiat Reserves," *Binance.com*, 21 May 2020. research.binance.com/en/projects/binance-gbp, accessed 6 Dec. 2020.

165. Christina Comben, "How Could a GBP-Pegged Stablecoin Threaten UK Banks?" *Coin Rivet*, Yahoo Finance UK, 14 June 2019. uk.finance.yahoo.com/news/could-gbp-pegged-stablecoin-threaten-080019270.html, accessed 6 Dec. 2020.

166. Arnab Shome, "Binance Jersey Expands Trading Options with BGBP Listing," *FinanceMagnates.com*, Finance Magnates Ltd., 19 July 2019. www.financemagnates.com/cryptocurrency/news/binance-jersey-expands-trading-options-with-bgbp-listing; and "Binance Weekly Report: Oops, We Staked It Again (WINk, WINk)," *Binance Blog*, Binance.com, 22 July 2019. www.binance.com/en/blog, both accessed 6 Dec. 2020.

167. Nikhilesh De, "Binance Launches Dollar-Backed Crypto Stablecoin with NYDFS Blessing," *CoinDesk*, Digital Currency Group, 5 Sept. 2019. www.coindesk.com/binance-launches-dollar-backed-stablecoin-with-nydfs-blessing, accessed 10 Dec. 2020.

168. Binance Jersey Team, "Closure of Binance Jersey," *Binance.je*, ~15 Oct. 2020. support.binance.je/hc/en-us/articles/360051246251-Closure-of-Binance-Jersey, accessed 6 Dec. 2020.

169. Dan Larimer, Charles Hoskinson, and Stan Larimer, "BitShares – A Peer-to-Peer Polymorphic Digital Asset Exchange (P2PPDAE)," *BitMEX.com*, HDR Global Trading Ltd., uploaded June 2018. blog.bitmex.com/wp-content/uploads/2018/06/173481633-BitShares-White-Paper.pdf, accessed 29 Oct. 2020. Originally published by authors on *BitcoinTalk.org*, 19 Oct. 2013. bitcointalk.org/index.php?topic=313873.0.

170. Vangie Beal, "Polymorphism (*in object-oriented programming*)," *Webopedia.com*, TechnologyAdvice LLC, n.d. www.webopedia.com/TERM/P/polymorphism.html, accessed 29 Oct. 2020.

171. Dan Larimer, Charles Hoskinson, and Stan Larimer, "BitShares."

172. Danny Bradbury, "BitShares P2P Trading Platform to Offer Dividends on Bitcoins," *CoinDesk*, Digital Currency Group, 22 Aug. 2013, last updated 6 Dec. 2013. www.coindesk.com/bitshares-p2p-trading-platform-to-offer-dividends-on-bitcoins, accessed 31 Oct. 2020.

173. Marley Gray, "Azure Blockchain as a Service Update #6," *Microsoft Azure Blog*, Microsoft Corp., 14 March 2016. azure.microsoft.com/en-us/blog/tag/bitshares, accessed 31 Oct. 2020.

174. Binance Academy, "Delegated Proof of Stake Explained," *Binance.com*, 10 Dec 2020. academy.binance.com/en/articles/delegated-proof-of-stake-explained, accessed 14 Dec. 2020.

175. The BitShares Forum includes general discussion, shareholder proposals, and technical support as well as specific projects. See bitsharestalk.org, accessed 6 Dec. 2020.

176. According to *Investopedia.com*, "A contract for difference is a financial contract that pays the differences in the settlement price between the open and closing trades." For a richer explanation, see James Chen, "Contract for differences," *Investopedia.com*, Dotdash, last updated 24 Nov. 2020. www.investopedia.com/terms/c/contractfordifferences.asp, accessed 6 Dec. 2020.

177. "Price-Stable Cryptocurrencies: SmartCoins Provide the Freedom of Cryptocurrency with the Stability of the Dollar," *BitSharesHub.io*, n.d. bitshareshub.io/price-stable-cryptocurrencies, accessed 10 Dec. 2020.

178. "Our Mission," *Stably*, Stably Corp., n.d. www.stably.io/about, accessed 31 Oct. 2020.

179. Stably USD, *CryptoSlate.com*, as of 10 Dec. 2020. cryptoslate.com/coins/stably-usd, accessed 10 Dec. 2020.

180. Stably Terms of Service, last updated 13 Nov. 2020. files.stably.io/legal/stably-terms-of-service.pdf, accessed 10 Dec. 2020.

181. XDB Foundation, "Stably to Integrate the DigitalBits Blockchain," Press Release, *GlobeNewswire.com*, Intrado Corp., 12 Nov. 2020. www.globenewswire.com/news-release/2020/11/12/2125784/0/en/Stably-to-Integrate-the-DigitalBits-Blockchain.html, accessed 10 Dec. 2020.

182. Dmitry Bondar, "Stable Coins: From Electronic Money on Blockchain to a Cryptocurrency Basket," foreword by Toly Kaplan, Forklog Consulting, 2019. forklog.com/pdf/FLC_Stablecoins_report_eng.pdf, accessed 10 Dec. 2020.

183. "What Is a Stablecoin," *Stably*, Stably Corp., n.d. www.stably.io/stablecoins, accessed 31 Oct. 2020.

184. Paul Muir, "Apple Pay Users Can Now Buy Crypto," *AsiaTimes.com*, Asia Times (Hong Kong) Ltd., 14 Dec. 2020. asiatimes.com/2020/12/apple-pay-users-can-now-buy-crypto, accessed 14 Dec. 2020.

185. Muhammad Tahir-ul-Qadri, *Mawlid Al-nabi: Celebration and Permissibility* (United Kingdom: Minhaj-ul-Quran Publications, 2014).

186. John Berthoud, "Milton Friedman Full Interview on Anti-Trust and Tech," Video Interview, National Taxpayers Union, 1 March 1999, uploaded to *YouTube.com* 9 Aug. 2012. youtu.be/mlwxdyLnMXM, accessed 1 Nov. 2020.

187. Jason Chen, "Hedge," *Investopedia.com*, Dotdash, last updated 20 Aug. 2018. www.investopedia.com/terms/d/de-hedge.asp, accessed 6 Dec. 2020.

188. Will Kenton, "Harvest Strategy," *Investopedia.com*, Dotdash, last updated 6 Aug. 2020. www.investopedia.com/terms/h/harvest-strategy.asp, accessed 29 Oct. 2020.

189. "Section 26 U.S. Code § 1031 - Exchange of real property held for productive use or investment," Legal Information Institute, Cornell Law School, n.d. www.law.cornell.edu/uscode/text/26/1031, accessed 29 Oct. 2020.

190. "Notice 2014-21," *IRS.gov*, Internal Revenue Service, 2014. www.irs.gov/pub/irs-drop/n-14-21.pdf; and "Frequently Asked Questions on Virtual Currency Transactions," *IRS.gov*, Internal Revenue Service, last updated 8 Oct. 2020. www.irs.gov/individuals/international-taxpayers/frequently-asked-questions-on-virtual-currency-transactions, accessed 29 Oct. 2020.

191. "Wash Sale: Avoid This Tax Pitfall," *Fidelity.com*, FMR LLC, 26 March 2020. www.fidelity.com/learning-center/personal-finance/wash-sales-rules-tax, accessed 29 Oct. 2020.

192. BitMEX Research, "A Brief History of Stablecoins," *BitMEX.com*, HDR Global Trading Ltd., 2 July 2018. blog.bitmex.com/a-brief-history-of-stablecoins-part-1, accessed 29 Oct. 2020.

193. Marie Huillet, "Crypto Trailblazer Nick Szabo: Central Banks Could Turn to Crypto to Support Reserves," *Cointelegraph.com*, 9 Jan. 2019. cointelegraph.com/news/crypto-trailblazer-nick-szabo-central-banks-could-turn-to-crypto-to-support-reserves, accessed 31 Oct. 2020.

194. BitMEX Research, "A Brief History of Stablecoins," *BitMEX.com*, HDR Global Trading Ltd., 2 July 2018. blog.bitmex.com/a-brief-history-of-stablecoins-part-1, accessed 29 Oct. 2020.

195. Lael Brainard, "Digital Currencies, Stablecoins, and the Evolving Payments Landscape," Speech, *The Future of Money in the Digital Age*, Peterson Institute for International Economics and Princeton University's Bendheim Center for Finance, Washington DC, 16 Oct. 2019. www.federalreserve.gov/newsevents/speech/brainard20191016a.htm, accessed 29 Oct. 2020.