

# Cryptocurrency: Disruption of Financial Services

Opinion  
Snapshot

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## Introduction

The rise of cryptocurrencies over the past decade has become an undeniable disrupting force in the financial industry. The interest in cryptocurrency is reflected in the actions of markets, governments, companies, and investors. For example, Bitcoin's trading surged from \$.08 in July of 2010 to over \$60,000 in April of 2021.<sup>1</sup> Many researchers believe this growth is not slowing down, with some estimates for Bitcoin's 2030 price exceeding \$397,000.<sup>2</sup> This steep growth of Bitcoin's price begs the question: why is cryptocurrency so valuable?

Business and political leaders have taken strong stances on both sides of the argument, with many investors falling in the middle ground or having little to no understanding of cryptocurrency. Elon Musk declared Bitcoin as a legal payment method for Tesla products in March 2021. Replying to tweets over this the decision, Elon Musk said that Bitcoin payments will be retained on the balance sheet as Bitcoin and not converted to fiat currency.<sup>3</sup> In June 2021, El Salvador's president Nayib Bukele passed a law that declared Bitcoin as a legal tender starting September 7, 2021.<sup>4</sup> El Salvador's primary currency is the U.S. dollar and using Bitcoin will be optional. These examples show that cryptocurrency cannot be ignored in today's world and its rising acceptance is catching the attention of investors, politicians, and regulators.

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However, not all opinions of cryptocurrency are so positive, because there is still the question to be answered: Why do companies like Tesla and countries like El Salvador trust cryptocurrency as a real store of value? In other words, why should cryptocurrencies have any value at all? In fact, Elon Musk is both a supporter and a critic of crypto assets. After initially supporting Bitcoin as a payment for Tesla cars, Elon Musk reversed his decision in May of 2021. He reversed his decision based on concerns about the massive amounts of fossil fuels used for mining Bitcoin. However, Tesla is looking into investing in less environmentally damaging cryptocurrencies, as they still have faith in the concept itself.<sup>5</sup> The second example of a supporter-turned-critic is Anthony Di Iorio, the co-founder of Ethereum, one of the most prominent cryptocurrencies. Mr. Di Iorio claims that cryptocurrency holds a risk-profile beyond his comfort zone and this coupled with personal security reasons, is pushing him to leave the cryptocurrency world entirely. He also claims that although he is leaving, “I will incorporate crypto when needed, but a lot of times, it’s not,” encouraging the idea that cryptocurrency is “really a small percentage of what the world needs.”<sup>6</sup> Finally, many people in the financial industry have concerns about the inherent value of cryptocurrency as well. Nassim Taleb has published several popular books on financial topics. He recently published a paper explaining his stance on cryptocurrency, and it is assertively negative. He argues that cryptocurrency has ultimately failed to replace currency, is not a store of value, and has no protection for catastrophes.<sup>7</sup>

Yet, even many critics will concede that cryptocurrencies are changing industries and disrupting markets. This paper aims to evaluate instances in which cryptocurrencies are changing the way financial markets operate and are causing reevaluation by large financial institutions concerned with digital currency. Several questions surrounding cryptocurrency will be answered including how it works, why it has value, the implications for Central Banks, who will regulate it and how will it be regulated. Finally, we explore what the environmental impacts of cryptocurrency are and what it may look like in the future.

## Blockchain Technology and Cryptocurrency Evaluation

### Cryptocurrency Understood

There are many different cryptocurrencies with varying characteristics, so it is difficult to make generic statements covering all circumstances. In general, cryptocurrencies are digital, or electronic, currencies that can store value and, in some cases, act as a medium of exchange. They are made using cryptography, a code that uses deterministic algorithms. Each cryptocurrency is a piece of digital code that is stored on a blockchain. A blockchain is a transparent ledger, or database. Blockchain technology is a vital concept in understanding how cryptocurrencies operate and where the value originates. But the ultimate source of value from cryptocurrency stems from its ability to solve some of the shortcomings of the current money-payments system. So, it is worth reviewing these shortcomings.

Physical cash, such as dollar bills and coins, has many benefits. You can pay for goods and services directly, peer to peer. You do not need the permission of a bank or another third party to validate that your money exists. You can make the payment without any transaction cost or other frictional cost. And once the payment is made, no third party can unwind or cancel the transaction. A final benefit of physical cash is that it avoids the “double-spending” problem. You can only spend what you physically have at any one time.

However, most commerce today is carried out electronically, and digital currency (pre-cryptocurrency) is void of many of these benefits. Digital money is dependent on third parties, such as banks, to validate transactions and update the books (ledgers) of the digital balances. The introduction of third parties creates transaction costs and allows for one of the parties to censor, or cancel, a transaction without consent. In addition, double-spending issues can arise if two bank wires are made at the same time, drawing on the same digital money balance. In fact, the double-spending problem can cause settlement risks in the financial markets, and these risks can lead to large losses.

The introduction of Bitcoin, Ether, and other cryptocurrencies potentially creates a digital payment system that retains many of the attractive features of physical cash. And this is what makes cryptocurrencies so interesting, so disruptive, and so potentially valuable. As explained by Anthony Lewis:

*“Bitcoin is the very first digital asset of value that can be transferred over the internet without any third party having to approve the transaction or being able to deny it.”<sup>8</sup>*

Critics will point out that owning Bitcoin, Ether, or many other cryptocurrencies does not confer any additional right other than the ability to transfer the electronic coins to another person. This makes crypto assets similar to fiat currencies in that they are not backed by anything other than the belief that they have value, and this value is established in the marketplace.

Many cryptocurrencies have limited supply. For example, Bitcoin has a maximum of 21 million coins, and 18 million have already been mined. Some digital coins, however, are unlimited, and others can be adjusted to permit only a certain amount within a given period. The reason this technology can be seen as valuable, beyond the finance industry, is because the code that is being

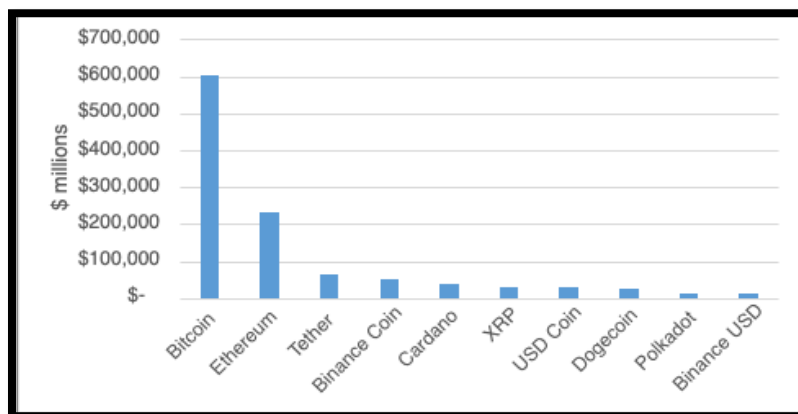
stored on block can be related to real-world applications. The scalability in the real-world ranges from cyber security, healthcare, manufacturing and industrial, to government, media, transportation and tourism, real estate, and especially financial services. Barclays has launched a number of blockchain initiatives involving tracking financial transactions, compliance and combating fraud. It states:

*“Our belief ... is that blockchain is a fundamental part of the new operating system for the planet.”<sup>9</sup>*

Understanding that cryptocurrencies are digital entries on a distributed ledger, blockchain, that can be seen as stores of value, or pieces of larger projects set to solve real-world problems, helps to better define what they are. They are programmable money and digital assets used to transact value in the traditional sense through trade and also transact information, ideas, protocols, and rules.

There are currently 11,059 cryptocurrencies with an estimated market capitalization, as of July 2021, totaling over 1.35 trillion U.S. dollars.<sup>10</sup> The space is vast and growing, but it is dominated by the two largest crypto assets by market capitalization: Bitcoin and Ethereum. The figure below shows the ten largest crypto assets as of July 31, 2021.

*Cryptocurrency Market Capitalization*



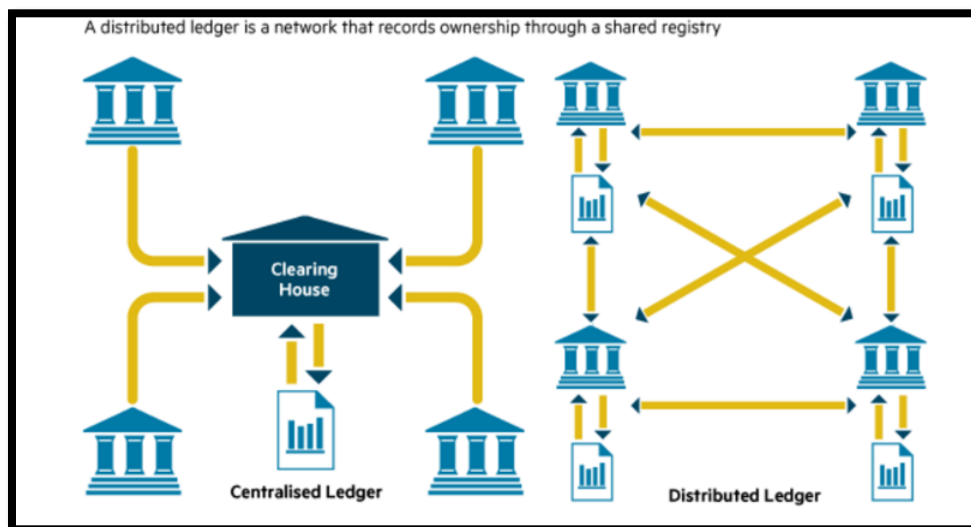
Source: coinmarketcap.com

## Blockchain Technology and Distributed Ledger Technology

Blockchain is a type of Distributed Ledger Technology (DTL) which allows for transactions to take place on a network made up of many

computers. “Transactions are recorded within these networks using cryptographic signatures called hashes. Properties and characteristics of DTL include programmable, secure, anonymous, unanimous, timestamped, irreversible, and distributed.”<sup>11</sup>

### *Embedding Distributed Ledger Technology*



Source: Santander InnoVentures, Oliver Wyman, Anthemis Partners

A blockchain can be programmed to start transactions once certain criteria are met; these are secure transactions because all records are encrypted individually. Anonymity refers to the ability for transactions to take place without knowing the identity of who has requested a transaction as well as who has fulfilled it. These transactions are unanimously agreed upon within the network. Each transaction is time-stamped and recorded in the block after a transaction is completed. Once completed, a transaction is irreversible. The ledger is then distributed to the network of computers allowing for transparency.

Blockchain technology can be viewed in three parts. With future activity expanding application and scalability of this technology, newer versions will come into existence.

*“Blockchain 1.0 is currency, as in digital payment systems and cryptocurrencies. Blockchain 2.0 is contracts, as in the more sophisticated value transfers of stocks, bonds, loans, mortgages, and titles via smart contracts. Blockchain 3.0 is applications beyond finance, as in government, health, science, arts and culture.”<sup>12</sup>*

Blockchain technology allows for cryptocurrencies to exist. Blockchain is the database or block that stores the transactions that cryptocurrencies create, then allows evaluation of the transaction to ensure it is valid and follows the rest of the blocks protocol.

### **Cryptocurrency’s Role in Financial Markets**

Blockchain technology can facilitate payments faster and cheaper than banks. Members of the European payment council believe that blockchain technology will change the way in which payment services will conduct business.<sup>13</sup> Sending money

via wire or financial institution is traditionally costly as well as timely. Sending digital currency peer-to-peer costs a fraction of what a traditional institution would charge. Ethereum has a scanner that shows hundreds of thousands of transactions occurring each day with substantial amounts of capital.<sup>14</sup> The number of transactions and size point towards continued growth.

Distributed ledgers cut operational costs and allow for more exact and prompt transactions between individuals. Blockchain takes intermediaries such as the Society for Worldwide Interbank Financial Communication out of the equation and adds networks associated with the transaction to allow for immediate transfer of funds.

Additionally, the digitalization of stocks and bonds recorded on the blockchain could improve the efficiency of financial markets. This could cause T+2 settlement days to turn into T+1 days and eventually T+ Seconds. “Asset tokenization” is a term for the use of blockchain technology to represent ownership or rights to an asset as a tradable, on-chain token. It most commonly refers to the tokenization of financial or fungible assets, such as shares in a company or a quantity of gold. Asset tokenization can hypothetically refer to the tokenization of any material or nonmaterial item possessing monetary value: everything from a piece of art to a patent to an hour of a skilled worker’s time.”<sup>15</sup> The use for custodian banks such as State Street and JP Morgan could become challenged as blockchain creates ways to distribute unique assets off chain. With the tokenization of real-world assets, such as certificates for stocks and bonds, there would no longer need to be intermediaries which may lead to lower asset exchange fees. Smart contracts and smart securities could pay out dividends through simple lines of code.

Blockchain technology makes borrowing money more secure and can potentially lead to lower interest rates than traditional loans from a bank or credit lender. Online debt marketplaces are still in the first stages of development. There are several blockchains seeking to prove credit history and gauge an individuals' likelihood to default on a loan.

*“More than one in five consumers have a “potentially material error” in their credit file that makes them look riskier than they are. Lenders respond to this incorrect data by offering you higher interest rates, less favorable terms, or denying credit if the error makes you look too risky.”<sup>16</sup>*

The implementation of blockchain would reduce the occurrence by accurately recording transaction history and establishing logs while evaluating data about an individual ensuring the borrower would pay the debt.

### **Cryptocurrencies and Blockchains Impact on Third Party Verification**

Third-party verification (TPV) is when a company uses an outside organization to review and ensure the accuracy of the customer’s information and intentions when transferring assets. TPV not only ensures the safety and accuracy of the information, but companies can also choose to reference the historical interaction maintained by the independent third party. These records can also be accessed in the case of a disagreement, such as when a client declines to pay, claims that the transaction was fraudulent, or has already paid and is being charged twice.

Despite these advantages, third party verification can be expensive. Even though the fees to access records in a third-party verification database seem to be a small, they accrue quickly.<sup>17</sup> It is also expensive to store all the ledgers. Even with advanced technology, with the largest single-memory computer system having 160 terabytes (1 terabyte equals 1,000 gigabytes), it is still extremely expensive to keep everything on record.<sup>18</sup> The energy used to look through all the entries trying to find a previous transaction is costly as well. Another weakness of TPV is fraud. Misrepresented calls or fraudulent third-party verifications are emerging more than usual. In 2018, the Federal Communications Commission passed a new rule to strengthen the existing policy and the TPV process to combat this.<sup>19</sup>

With emerging blockchain technology, there might be a profound change to the status quo and the way transactions are verified. Eliminating cost is one of the main advantages of blockchain verification compared to existing third-party verification. Instead of spending billions of dollars

on TPV, blockchain has the technology to keep all the information unaltered and timestamped once it has been created. All the transactions are documented on the network of computers that code for the blockchain. Therefore, to counterfeit a transaction, one needs to control over 50% of the existing machines to convince the whole blockchain it is true and not just one hacked computer. It makes fraud nearly impossible. Moreover, with the nature of a de-centralized model, all parties have a copy of the information history. This saves energy when digging into files to find the needed information. Anyone with a computer can have access to the information, simply by hashing through the keys. It is both time-efficient and capital-efficient. The collision-free property of blockchain guarantees that no two keys will be the same, preventing data breaches.<sup>20</sup> Blockchain could also improve accuracy because it removes human involvement, thereby reducing human error. Philosophically, blockchain might be a significant step for the world to be more capital-efficient, for all the resources used for TPV can now be allocated to capital markets.<sup>21</sup>

## Cryptocurrencies Impact on Banking

### Central Banking System vs. Cryptocurrencies

Central banks are charged, in part, with maintaining financial stability by targeting the growth in the money supply and changes in short-term interest rates.<sup>22</sup> The major mission of central banks is to stabilize the nation's currency, keep unemployment low, and prevent inflation. This is accomplished through monetary policy and bank regulation.<sup>23</sup> The U.S. Federal Reserve, for example, can lower interest rates to stimulate borrowing and purchasing activities in times when the economy is slow. An example of this behavior could be seen during the COVID-19 pandemic where the Federal Reserve pushed short-term rates to nearly 0% to stimulate the economy. The central bank can also contract the money supply during periods of economic strength.

The emergence of cryptocurrency will impact the significant role of central banks, such as the operations and abilities to reassure financial

stability and maintain price stability. The attitudes from various governments and central banks towards cryptocurrencies varies. Some central banks are trying to create and adopt cryptocurrency directly, while others are resisting this development and in fear of endangering monetary and financial stability.<sup>24</sup>

### Central Banks and Digital Currency

Many central banks are beginning to develop cryptocurrencies that can be used similarly to fiat currencies. Central Bank Digital Currencies (CBDCs) are designed to improve the efficiency of the current system. A token of this nature would be simple to adopt since balances held by commercial banks and the central bank reserves are already in electronic form.<sup>25</sup> Jerome Powell, the current chair of the Federal Reserve, agreed during a congressional hearing that having a digital currency issued by the federal government would be a more viable alternative than having multiple cryptocurrencies or stable coins emerge in the payment systems. A stable coin is a cryptocurrency that attempts to peg its value to a conventional currency such as the US dollar, which are issued only by nonbanks.

*“I think that may be the case and I think that’s one of the arguments that are offered in favor of digital currency.”*

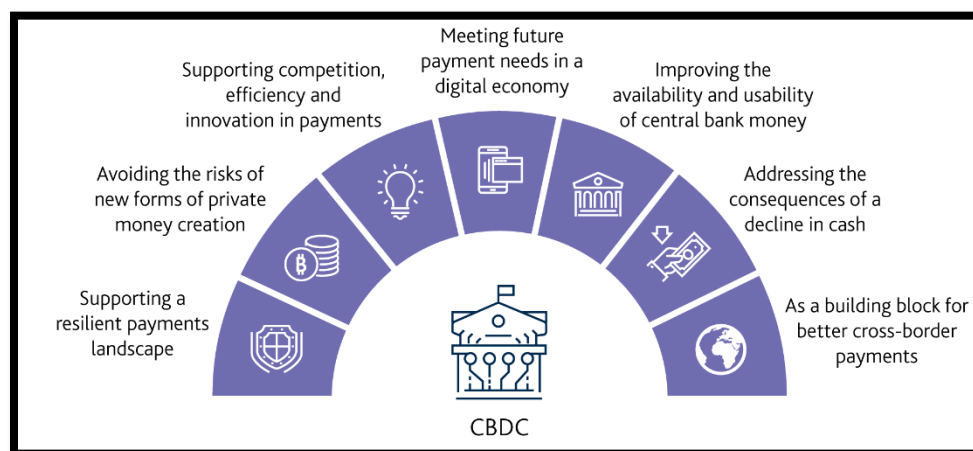
Powell said during a hearing before the US House of Representatives Financial Services Committee. ‘That, you wouldn’t need stable coins, you wouldn’t need cryptocurrencies if you had a digital US currency – I think that’s one of the stronger arguments in its favor.’ Moreover, ‘we have a pretty strong regulatory framework around bank deposits, for example, or money market funds,’ Powell said.

*“That doesn’t exist currently for stable coins, and if they’re going to be a significant part of the payments universe – which we don’t think crypto assets will be but stable coins might be – then we need an appropriate regulatory framework.”<sup>26</sup>*

The development of CBDCs would still allow for the implementation of monetary policy. For example, central banks could reduce balances on all electronic wallets at a pre-announced rate to institute negative nominal interest rates, thereby

stimulating consumption by making it expensive to maintain cash positions.<sup>27</sup> Moreover, more aggressive forms of monetary policy could also be implemented through “helicopter drops” of money.<sup>28</sup> Central banks could theoretically increase cash holdings in an economy by making lump sum transfers to all households. For example, with the help of CBDCs, it is easier for the Fed and the U.S. government to send \$1,400 COVID aid packages to full-time workers. Of course, such flexibility might concern those who prefer more

modest forms of monetary policy. Many other researchers have analyzed the impact on monetary policy. Bordo and Levin (2019) consider how digital cash could bolster the effectiveness of monetary policy.<sup>29</sup> Mishra and Prasad (2020) argued that the key differences between physical and electronic forms of fiat currency issued by central banks include lower transaction costs for CBDC, higher incidence of tax evasion for cash, and nominal rates of return shifting from zero for cash to potentially negative for CBDCs.<sup>30</sup>



Source: Bank of England

Compared to the United States, Europe is farther along in its exploration of CBDCs and has decided to launch the investigation phase of a digital euro in July 2021. The Governing Council of the European Central Bank (ECB) announced that they, “decided to move up a gear and start the digital euro project” with the goal of ensuring access to the safest form of money in the digital age.<sup>31</sup> Sweden’s Riksbank is also actively exploring the issuance of an e-krona, a digital complement to cash, with the objective of “promoting a safe and efficient payment system”.<sup>32</sup>

Other central banks have already issued or are considering issuing CBDCs, especially those in developing economies. Using the metrics of adoption rate, trading volume, and level of mining, across the top 10 countries, all except for the U.S., are developing countries. They are all exploring and utilizing the benefits of digital currencies in various ways. Kazakhstan, Kenya, and Ukraine are introducing their own digital currencies to ensure

the transparency on transferring currency to the poor. Developing and smaller advanced economies – such as Canada and Singapore, are taking the lead in pushing forward the development of their own version of digital currency, backed by their fiat currencies. According to the Bank for International Settlements (BIS), it is likely that one fifth of central banks will issue digital currencies in the next three years and that the most advanced of these will be hosted by emerging markets. BIS also noted that the most advanced projects are currently being run out of China and Korea.<sup>33</sup>

For China, digital yuan can initiate and facilitate trading between China and other international trade partners. “The rapid deployment of the digital yuan will basically enable China to expand its global influence.”<sup>34</sup> For example, for the “Belt and Road” initiative, China can utilize digital yuan to accelerate the process of connecting trade routes between China and many African countries and territories.

As for the US, Federal Reserve Chair Jerome Powell said he had not decided on the pros and cons of a central bank digital currency. He still wants Congress to authorize the creation of a digital currency before developing one. When Powell was asked in a hearing before the Senate Banking Committee, he responded, “I am legitimately undecided on whether the benefits outweigh the costs or vice versa (on US central banking creating digital currency)”.<sup>35</sup>

Although the Fed is undecided on CBDCs, they believe that CBDCs are becoming a real possibility. Unlike privately created cryptocurrencies, like Bitcoin, CBDCs still require third party oversight, allowing central banks to exert some control. It is much cheaper and more efficient by the nature of the digital currency, while the central bank can still hold some power. Well-designed CBDCs could preserve the benefits of lower transaction costs, easier monitoring of transactions, and security of the financial system, while still allowing for flexibility

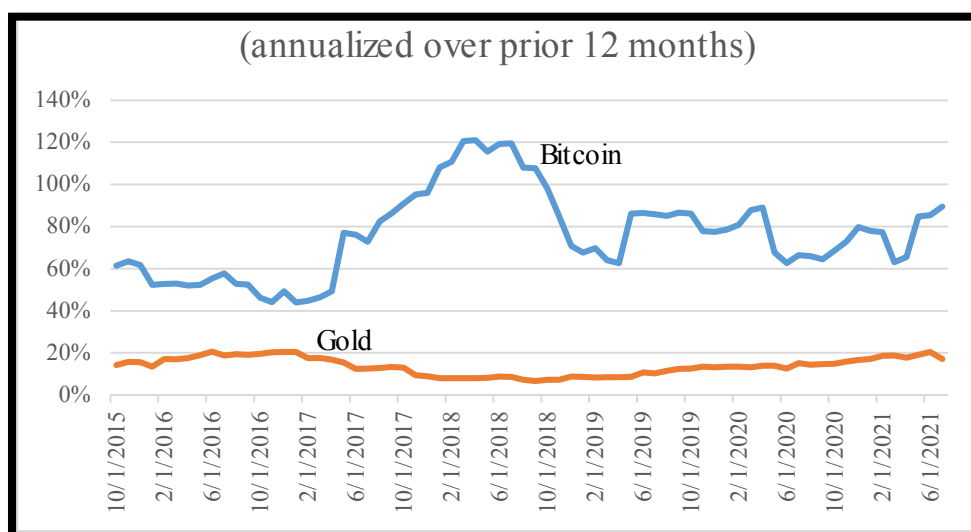
in the administration of monetary policy.

## Challenges with Cryptocurrency

### The Hesitation in the Financial Industry

With all the advantages blockchain technology and cryptocurrencies like Bitcoin offer, many in the industry still consider cryptocurrencies as risky. In a study conducted by Association of Certified Anti-Money Laundering Specialists (ACAMS) and UK’s Royal United Services Institute, nearly 63% of the participants in the banking industry expressed doubts about accepting cryptocurrency.<sup>36</sup> Many of the potential risks include its decentralized nature, money-laundering concerns, and high volatility. The chart below shows that volatility of Bitcoin trends between 60% to 100%, compared with gold, which is closer to 15% to 20%.

*Volatility: Bitcoin vs. Gold*



Source: yahoofinance.com

The volatility of Bitcoin and cryptocurrency in general is a cause for concern when central banks are considering adapting the innovative technology. The potential technological vulnerability and the repercussions of loss of confidence during periods of financial stress are dangerous.<sup>37</sup> In truth, multiple other payment

systems besides blockchain could potentially improve the safety of traditional payment methods. At the same time, all the systems, without backing from the official banks, could serve as potential channels for risk transmission in times of financial turmoil. With private digital currencies, central banks lack the power to stabilize the economy



during bouts of high inflation or economic recession.<sup>38</sup> Another concern is that a proliferation of digital currencies issued by a non-central bank party will have destabilizing implications for the economy. One example is the development of Libra, a digital currency released by Facebook. In particular, “it is not obvious what could restrain Facebook from using its massive financial clout to issue a cryptocurrency backed by its own resources rather than a basket of fiat currencies”.<sup>39</sup> The impact will not only be about the reduction in demand for central banks money as mediums of exchange or stores of value, it may also lead to consequences such as controlling and manipulating entire business models of banks and other existing financial institutions.<sup>40</sup>

### The Current State of Regulation

Cryptocurrency holds a high potential to change investing and even the concept of money. However, if investors wish to switch to this decentralized form of currency, there are still many unclear, disjointed ways in which they must interact with regulators in the United States. In general, the current regulatory landscape for cryptocurrency is made up of six main departments within the United States government. Exchanges of cryptocurrency are made legal and generally covered by the BSA, Banking Security Act, but there are many other complexities and regulations posed by the other departments as well.<sup>41</sup> In the United States, it is easy for retail investors to access many apps or platforms that trade Cryptocurrency, separating it from alternative investments that are reserved for only qualified investors or institutions. However, platforms and investors participating in cryptocurrency still must follow regulations set by the government.

The Securities and Exchange Commission (SEC), declared that digital tokens like cryptocurrencies should be registered as securities when they are purchased as an investment. This makes them subject to the same laws as all other securities (stocks, bonds, notes, etc.) purchased by investment firms. However, if cryptocurrency is purchased for any other reason than an investment, it does not have to be registered with the SEC or comply with their regulation laws.<sup>42</sup> At the end of 2020, the SEC filed a suit against Ripple Labs for not filing registration for over one billion

dollars in sales of their own digital coin, XRP, during an initial coin offering. Ripple claimed XRP was just a medium of exchange, changing hands between traders, and therefore should not fall under SEC regulation as a coin. This is still under investigation, and Ripple is not alone in navigating the regulatory system.<sup>43</sup> Additionally, the SEC has stated that both Ether and Bitcoin, the two most recognized cryptocurrencies, are not securities requiring registration.<sup>44</sup> This creates a very unclear and inconsistent landscape for institutional investors in cryptocurrency who seek clarity in the rules and regulations.

Despite this lack of clarity, there has recently been more acceptance and attempts for inclusion of cryptocurrencies in investor portfolios. In June 2021, the SEC delayed its decision on whether to approve Bitcoin ETFs once again.<sup>45</sup> Many cryptocurrency ETFs have been proposed, reflecting the increasing demand for crypto-based funds in the market. However, the SEC continues its delays in decision making to approve the first cryptocurrency ETF due to concerns about market manipulation and investor protection.<sup>46</sup> In the meantime, there are Trusts and other funds based in cryptocurrency to satisfy interested investor needs. All of these existing funds have already been approved and follow the SEC’s regulations.<sup>47</sup>

The lack of clarity from the SEC creates the most frustration for investors, but there are many other regulatory departments with mixed results as well. In order to get the full grasp of the regulatory landscape you must consider them all. For example, the FinCEN does not consider cryptocurrency a legal tender, but it does consider it to be a money transmitter.<sup>48</sup> This means that exchange providers and platforms must obtain a license from the FinCEN and follow the Travel Rule, a rule that requires the sharing of information about the senders and receivers of cryptocurrency transactions to prevent crime.<sup>49</sup> Similarly, the CFTC does not recognize cryptocurrency as money, but rather as a commodity, subjecting it to all the laws listed under the Commodity Exchange Act.<sup>50</sup> The IRS also does not consider cryptocurrency a legal tender; however, revenue from crypto sales can be taxed.<sup>51</sup> The FTC and CFPB both work to prevent unfair acts in the market especially on platforms that introduce a third party to cryptocurrency sales. State regulation

varies, but covers other action from lending, unclaimed property, to insurance.<sup>52</sup> While these individual department's regulations align on the fact that cryptocurrency is not money and individually have distinct purposes, they still present challenges for investors. Navigating regulations from over six departments is confusing, and often regulations go unfollowed no matter how pure intentions are.

## Regulating Bad Actors

The main reason that so many government regulators are involved is because cryptocurrency poses a potential disruptive threat to the financial system, and yet it does not fall cleanly into any one regulatory body. Financially, there is disagreement as to whether crypto should be considered money. Another department that had to adjust to the changes that come with the rise of crypto was the State Department in their continued attempt to regulate crime. "Bad actors", people who wish to use cryptocurrencies for illegal activities, are drawn to the platform because of cryptocurrency's peer-to-peer nature and anonymity.<sup>53</sup> Illicit uses for cryptocurrencies often include buying and selling tools to commit crimes, to support terrorism, for ransoms, blackmail and extortion payments, for money laundering, to operate unlicensed exchanges, to evade taxes, and to avoid sanctions.<sup>54</sup> Although transactions are public, blockchain allows individuals to have no identifying information linked to their wallets or transactions when completing a purchase. On top of keeping personal information separate from their digital coin wallets, bad actors will also frequently move illicit money from wallet to wallet to make it harder to track down. When coins are pinned as being part of an illegal transaction, tracking down the source of the crime can be difficult. If the coins were moved multiple times after the illicit transaction, it is much harder to track their current location; sorting through that amount of sophisticated blockchain code takes skill and time.<sup>55</sup>

This demand for skill and time is why the State Department and other federal agencies hire out private firms, such as Chainalysis. Firms like Chainalysis are hired by the State Department to do the high-level coding that requires specialized technology to track down coins, IP addresses, and wallets used for illicit activity. The State

Department itself has neither the money to pay for the technological resources to do this nor the salaries for the people that are specialized enough and take enough time to do this work.<sup>56</sup> However, large amounts of money must still be paid to these firms in order for them to do this work. This investment is worth the cost for two main reasons. First, hiring these firms to track down bad actors leads you to their apprehension and prevents future crime. Blockchain has every transaction on a public record, so once you discover an illicit user, you instantly have access to every single one of their transactions and crimes, making it much easier to convict these criminals and track down which coins are 'dirty'. Even if the individual person is never identified, which is sometimes the case, federal agents can blacklist the wallet and coins that were used for illicit activities, essentially making them worthless.<sup>57</sup> The second way the cost is justified is when large sums of cryptocurrency used in illicit activities is seized. The Silk Road was an infamous online crime network that functioned as a black market. The seizure of the Silk Road alone in November 2020 led to over one billion dollars worth of Bitcoin assets turned over to the government.<sup>58</sup> Sums of digital assets continue to be seized as more bad actors are discovered and tracked down in the market by federal agents and firms like Chainalysis.

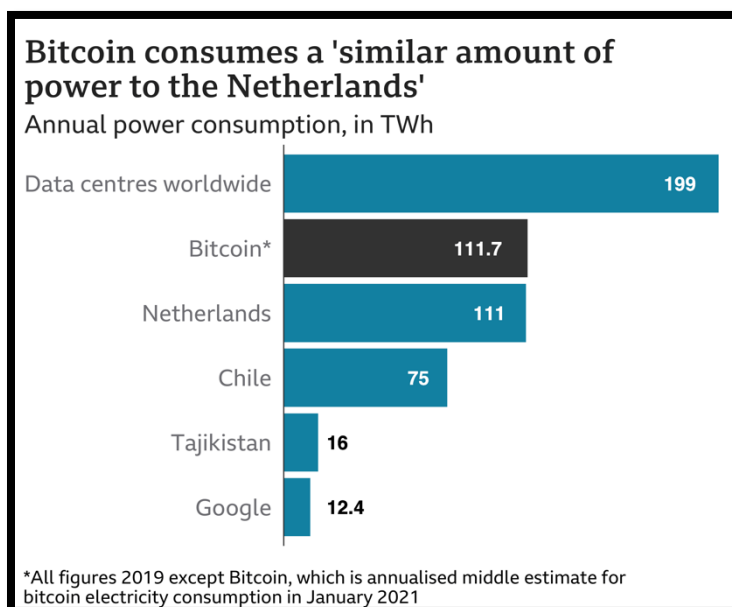
## Environmental Impact and Regulation

Beyond crime, the other large concern for regulators is the environmental impact of cryptocurrency, specifically the process of mining it. The current federal environmental regulatory landscape for cryptocurrencies is nonexistent. The concern about cryptocurrencies effect on the financial industry and use for crime ultimately outweigh the concern for the environment by policymakers when creating regulation. However, some states have individually decided to regulate where the federal government has not. These states:

*“Enacted piecemeal legislation amending existing definitions to either specifically include or exclude digital currencies from the definition,” a solution that only half addresses the problem.<sup>59</sup> Outside of the U.S.,*

*China is a main concern for regulation. After a reversal of a policy that banned cryptocurrency mining and trading in 2019, the Chinese government has allowed their country to become a mining hub due to low energy costs. The reason for both the U.S. lack of regulation and China’s reversal of regulation are the same: cryptocurrency is a lucrative market that they want to capitalize on. Banning cryptocurrencies costs money and allowing it encourages “economic gain and to not lose out on technological innovation”.<sup>60</sup>*

Why should there be environmental regulation despite the economic gains with non-regulation? The largest cryptocurrencies require very complex math puzzles to be solved for proof-of-work blockchain technologies to run. Over time, this puzzle has been increasing in complexity as prices have increased. Bitcoin alone uses just as much energy per year as the entire country of Argentina to run the blockchain. Bitcoin also produces 35.95 million tons of carbon dioxide emissions in a year, the same as New Zealand.<sup>61</sup> Similarly, Bitcoin consumes more power than the Netherlands it also consumes more power than Chile, Tajikistan, and Google combined.<sup>62</sup>



Source: Forbes, EIA, Cambridge Centre for Alternative Finance (BBC)

The energy just to run the blockchain is only a piece of the environmental concern; what sources this energy and what happens to the mining specific hardware once it becomes outdated are also worrisome. Most miners are located in China. The reason for this is China’s extraordinarily low electricity costs. The downside, however, is that most of China’s energy comes from coal, a resource that is rapidly depleting. The computers and technologies that are specific to mining Bitcoin also become outdated overtime. Throwing away of these technologies, so specific to Bitcoin that they

cannot be repurposed for anything else, results in 11.5 kilotons of e-waste per year. These are alarming numbers that should be considered when investing in cryptocurrency. However, there have been some signs of change from the crypto community concerning improving the environmental impact. While the numbers are debated on different sources, anywhere from 30% to 74% of Bitcoin’s energy is claimed to come from renewable resources.<sup>63</sup> This is a big step forward and if continued could attract more people to cryptocurrency. Secondly, not all cryptocurrencies use this proof-of-work blockchain, and the

high-energy math solving, that Bitcoin requires. Currencies like Cardano and EOS only require a proof-of-stake blockchain. Proof-of-stake blockchains require significantly less energy than proof-of-work blockchains like Bitcoin, and therefore have a lighter environmental impact.<sup>64</sup> Improvements like switching to proof-of-stake blockchains and renewable resources as well as governments and states regulating how much energy crypto can use could make cryptocurrency a much more well-rounded investment.

## Effects and Future Uncertainties

Cryptocurrency is proving itself as a disruptive force due to its ability to improve the current money payments system. The peer-to-peer nature of cryptocurrency resolves some of the drawbacks resulting from the current third-party verification system. The future of cryptocurrencies and

blockchain technology will continue to shift financial markets. The exact impact of how these sectors will be affected by the continued innovation of cryptocurrencies is not entirely known. Banks, third-party verification, and asset management are three areas likely to see disruption. Asset managers are still hesitant as to how to evaluate and incorporate digital currencies into traditional portfolios due to volatility and uncertainty of value. The future of cryptocurrency will be determined by the confines related to the impact on the environment accompanied by regulatory policy. Whether cryptocurrency ultimately supplants the current fiat currency system remains uncertain. However, digital currency could begin to replace cash in the years to come as the benefits slowly accumulate. New risks will continue to be resolved through regulation and technological advances. Our analysis suggests that cryptocurrency and blockchain technology have earned the seat of disruptive technology and do not appear to be going away any time soon.

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<sup>1</sup> John Edwards, Bitcoin's Price History, Investopedia, (June 1, 2021), available at:

[www.investopedia.com/articles/forex/121815/bitcoins-price-history.asp](http://www.investopedia.com/articles/forex/121815/bitcoins-price-history.asp)

<sup>2</sup> Ibid

<sup>3</sup> Wolfe Zhao, Elon Musk Says Tesla Now Accepts Bitcoin as a Payment Method, The Block, (March 24, 2021), available at:

[www.theblockcrypto.com/linked/99172/tesla-accept-bitcoin-btc](http://www.theblockcrypto.com/linked/99172/tesla-accept-bitcoin-btc)

<sup>4</sup> Zelson Renteria, Bitcoin to Become Legal Tender in El Salvador on Sept 7, Reuters, (June 24, 2021) available at:

[www.reuters.com/technology/bitcoin-become-legal-tender-el-salvador-sept-7-2021-06-25/](http://www.reuters.com/technology/bitcoin-become-legal-tender-el-salvador-sept-7-2021-06-25/)

<sup>5</sup> Fred Lambert, Tesla Removes Bitcoin Payment Option over Energy Use Concerns, Electrek, (May 12, 2021), available at:

<https://electrek.co/2021/05/12/tesla-removes-bitcoin-payment-option-electric-vehicles/>

<sup>6</sup> Olga Kharif, Ethereum Co-Founder Says Safety Concern Has Him Quitting Crypto, Bloomberg, (July 26, 2021), available at:

[www.bloomberg.com/news/articles/2021-07-16/ethereum-co-founder-says-safety-concern-has-him-quitting-crypto](http://www.bloomberg.com/news/articles/2021-07-16/ethereum-co-founder-says-safety-concern-has-him-quitting-crypto)

<sup>7</sup> Marc Hochstein, Nassim Taleb, Ex-Bitcoin Admirer, Publishes Paper Trashing It, CoinDesk, (June 22, 2021), available at:

[www.coindesk.com/nassim-taleb-bitcoin](http://www.coindesk.com/nassim-taleb-bitcoin)

<sup>8</sup> Antony Lewis, The Basics of Bitcoins and Blockchains an Introduction to Cryptocurrencies and the Technology That Powers Them, Mango Publishing, (2021)

<sup>9</sup> Bernard Marr, 35 Amazing Real-World Examples Of How Blockchain Is Changing Our World, Bernard Marr & co., available at:

<https://bernardmarr.com/35-amazing-real-world-examples-of-how-blockchain-is-changing-our-world/>

<sup>10</sup> All Cryptocurrencies, CoinMarketCap, available at:

<https://coinmarketcap.com/>

<sup>11</sup> What Is Blockchain?, Euromoney Learning, available at:

[www.euromoney.com/learning/blockchain-explained/what-is-blockchain](http://www.euromoney.com/learning/blockchain-explained/what-is-blockchain)

<sup>12</sup> Julie Frizzo-Barker et al., Blockchain as a Disruptive Technology for Business: A Systematic Review, International Journal of Information Management, (June, 2020) available at:

<https://www.sciencedirect-com.ezproxy.lib.umb.edu/science/article/pii/S0268401219306024?via%3Dihub>

<sup>13</sup> How Blockchain Could Disrupt Banking, CB Insights, (February 11, 2021), available at:

[www.cbinsights.com/research/blockchain-disrupting-banking](http://www.cbinsights.com/research/blockchain-disrupting-banking)

<sup>14</sup> Ethereum Daily Transactions Chart, Etherscan, available at:

<https://etherscan.io/chart/tx>

<sup>15</sup> Asset Tokenization: Bringing Real-World Value To Blockchain, Chainlink, (October 7, 2020), available at:

<https://blog.chain.link/asset-tokenization-bringing-real-world-value-to-the-blockchain/>

- 
- <sup>16</sup> Aaron Klein, The Real Problem with Credit Reports Is the Astounding Number of Errors, Brookings, (Sept 28, 2017), available at: [www.brookings.edu/research/the-real-problem-with-credit-reports-is-the-astounding-number-of-errors/](http://www.brookings.edu/research/the-real-problem-with-credit-reports-is-the-astounding-number-of-errors/)
- <sup>17</sup> Validity Team, Explained: Third-Party Verification Fees, Validity Screening Solutions, (November 7, 2018), available at: <https://validityscreening.com/8768/>
- <sup>18</sup> Aaron Tilley, HPE Has Constructed The Largest Single-Memory Computer System Ever Built, Forbes, (May 16, 2017), available at: [www.forbes.com/sites/aarontilley/2017/05/16/hpe-160-terabytes-memory/?sh=57e039f0383f](http://www.forbes.com/sites/aarontilley/2017/05/16/hpe-160-terabytes-memory/?sh=57e039f0383f)
- <sup>19</sup> Julia Kagan, Third-Party Verification (TPV), Investopedia, (April 26, 2021), available at: [www.investopedia.com/terms/t/third-party-verification.asp](http://www.investopedia.com/terms/t/third-party-verification.asp)
- <sup>20</sup> Latest Data Breach News, The Daily Swig, available at: <https://portswigger.net/daily-swig/data-breach>
- <sup>21</sup> Luke Conway, Blockchain Explained, Investopedia, (June 1, 2021), available at: <https://www.investopedia.com/terms/b/blockchain.asp>
- <sup>22</sup> Wikipedia, (August 1, 2021), available at: [https://en.wikipedia.org/wiki/Central\\_bank](https://en.wikipedia.org/wiki/Central_bank)
- <sup>23</sup> Kimberly Amadeo, Central Banks, Their Function and Role, The Balance, (July 1, 2021), available at: <https://www.thebalance.com/what-is-a-central-bank-definition-function-and-role-3305827>
- <sup>24</sup> Eswar S. Prasad, The Case for Central Bank Digital Currencies, Cato Journal, (Spring/Summer 2021), available at: [http://prasad.dyson.cornell.edu/doc/Cato\\_CBDC\\_Summer2021.pdf](http://prasad.dyson.cornell.edu/doc/Cato_CBDC_Summer2021.pdf)
- <sup>25</sup> Central Bank Digital Currencies, Bank for International Settlements, (March 2018), available at: <https://www.bis.org/cpmi/publ/d174.pdf>
- <sup>26</sup> Jonnelle Marte, Powell Says a FED Digital Currency Could Undercut Need for Cryptocurrencies, Reuters, (July 14, 2021), available at: <https://www.reuters.com/business/feds-powell-says-stablecoins-need-appropriate-regulatory-framework-2021-07-14/>
- <sup>27</sup> Sarah Allen et al., Design Choices for Central Bank Digital Currency, Brookings, (July 2020), available at: [https://www.brookings.edu/wp-content/uploads/2020/07/Design-Choices-for-CBDC\\_Final-for-web.pdf](https://www.brookings.edu/wp-content/uploads/2020/07/Design-Choices-for-CBDC_Final-for-web.pdf)
- <sup>28</sup> Thomas Hirst, What is Helicopter Money?, World Economic Forum, (August 113, 2015), available at: <https://www.weforum.org/agenda/2015/08/what-is-helicopter-money/>
- <sup>29</sup> Michael D. Bordo and Andrew T. Levin, Digital Cash: Principles & Practical Steps, National Bureau of Economic Research, (January 2019), available at: [https://www.nber.org/system/files/working\\_papers/w25455/w25455.pdf](https://www.nber.org/system/files/working_papers/w25455/w25455.pdf)
- <sup>30</sup> Sarah Allen et al., Design Choices for Central Bank Digital Currency
- <sup>31</sup> Eurosystem Launches Digital Euro Project, European Central Bank, (July 14, 2021), available at: <https://www.ecb.europa.eu/press/pr/date/2021/html/ecb.pr210714~d99198ea23.en.html>

---

<sup>32</sup> Task Force on Payment System Principles and Practices, Core Principals for Systematically Important Payment Systems, Bank for International Settlements, (Spring 2020), available at:

<https://www.bis.org/cpmi/publ/d34e.pdf>

<sup>33</sup> Sophie Mellor, From Mining to Spending, Emerging Markets are Leading the Way on Cryptocurrencies, Yahoo, (June 14, 2021), available at:

<https://www.yahoo.com/now/mining-spending-emerging-markets-leading-123045827.html>

<sup>34</sup> Camomile Shumba, China is years ahead of other major countries in the development of its digital yuan, giving Beijing the chance to expand its influence: Chainalysis, Markets Insider, available at:

<https://markets.businessinsider.com/news/currencies/china-digital-yuan-years-ahead-in-development-cbdc-cryptocurrencies-chainalysis-2021-8>

<sup>35</sup> Ann Saphir and Dan Burns, Fed's Powell 'legitimately undecided' on Central Bank Digital Currency, Reuters, (July 15, 2021), available at:

<https://www.reuters.com/business/finance/feds-powell-says-hes-undecided-central-bank-digital-currency-2021-07-15/#:~:text=%22I%20am%20legitimately%20undecided%20on,for%20the%20U.S.%20central%20bank>

<sup>36</sup> Kayla Izenman and Rick McDonell, Cryptocurrency Risk & Compliance Survey, RUSI-ACAMS, available at:

<https://www.acams.org/en/ACAMS-RUSI-Crypto-Survey-Report>

<sup>37</sup> Sarah Allen et al., Design Choices for Central Bank Digital Currency

<sup>38</sup> Eswar Prasad, The Future of Money: Digital Currency, Brookings, (July 18, 2021), available at:

<https://www.brookings.edu/testimonies/the-future-of-money-digital-currency/>

<sup>39</sup> Sarah Allen et al., Design Choices for Central Bank Digital Currency

<sup>40</sup> Dong He, Monetary Policy in the Digital Age, Finance & Development, (June 2018), available at:

<https://www.imf.org/external/pubs/ft/fandd/2018/06/central-bank-monetary-policy-and-cryptocurrencies/he.htm>

<sup>41</sup> Regulations in the United States, Comply Advantage, available at:

<https://complyadvantage.com/knowledgebase/crypto-regulations/cryptocurrency-regulations-united-states/>

<sup>42</sup> Zachary Fallon, Simona Mola, Cryptocurrency: DOJ's Enforcement Framework and the Current Regulatory Landscape, Strafford, (December 16, 2020), available at:

<https://www.straffordpub.com/products/cryptocurrency-doj-s-enforcement-framework-and-the-current-regulatory-landscape-2020-12-16>

<sup>43</sup> PYMNTS, SEC Reckons with Crypto's Currency And Security Conundrum, (April 20, 2021), available at:

<https://www.pymnts.com/cryptocurrency/2021/sec-reckons-with-cryptos-currency-and-security-conundrum/>

<sup>44</sup> Ibid

<sup>45</sup> Akshay Chinchalkar, These Charts Show Bitcoin's Comedown – and Where It Might Go Next, Bloomberg, (July 13, 2021), available at:

<https://www.bloomberg.com/news/articles/2021-07-13/these-charts-show-bitcoin-s-comedown-and-where-it-might-go-next>

---

<sup>46</sup> MarketInsite, The Race to a Bitcoin ETF: Monitoring Market Manipulation and How to Cope with it, Nasdaq, (May 21, 2019), available at:

<https://www.nasdaq.com/articles/the-race-to-a-bitcoin-etf%3A-monitoring-market-manipulation-and-how-to-cope-with-it-2019-05>

<sup>47</sup> Richard Best, 2 Funds that invest in Bitcoin, Investopedia, (January 21, 2020), available at:

<https://www.investopedia.com/articles/etfs-mutual-funds/042816/2-funds-invest-bitcoin-gbtc-arkw.asp>

<sup>48</sup> Zachary Fallon, Simona Mola, Cryptocurrency: DOJ's Enforcement Framework and the Current Regulatory Landscape

<sup>49</sup> Regulations in the United States, Comply Advantage

<sup>50</sup> Ryan Cartmill, Decrypting the crypto regulatory landscape – What lies ahead in 2021, (March 22, 2021), available at:

<https://www.aima.org/article/decrypting-the-crypto-regulatory-landscape-what-lies-ahead-in-2021.html>

<sup>51</sup> Regulations in the United States, Comply Advantage

<sup>52</sup> Zachary Fallon, Simona Mola, Cryptocurrency: DOJ's Enforcement Framework and the Current Regulatory Landscape

<sup>53</sup> Paul Vigna, Catlin Ostroff, Why Hackers Use Bitcoin and Why it is so Difficult to Trace, The Wall Street Journal, (July 16, 2021), available at:

<https://www.wsj.com/articles/why-hackers-use-bitcoin-and-why-it-is-so-difficult-to-trace-11594931595>

<sup>54</sup> United States Department of Justice, Office of the Deputy Attorney General, Cyber-Digital Task Force, Cryptocurrency Enforcement Framework, (October 2020), available at:

<https://www.justice.gov/archives/ag/page/file/1326061/download>

<sup>55</sup> Paul Vigna, Catlin Ostroff, Why Hackers Use Bitcoin and Why it is so Difficult to Trace

<sup>56</sup> Brett Wolf, US law enforcers partner with cryptocurrency tracking firm to fight financial crime, (December 23, 2020), available at:

<https://www.thomsonreuters.com/en-us/posts/investigation-fraud-and-risk/cryptocurrency-financial-crime/>

<sup>57</sup> Paul Vigna, Catlin Ostroff, Why Hackers Use Bitcoin and Why it is so Difficult to Trace

<sup>58</sup> Brett Wolf, US law enforcers partner with cryptocurrency tracking firm to fight financial crime

<sup>59</sup> Jeff Thomson, Tragedy of the Energy Commons: How Government Regulation Can Help Mitigate the Environmental and Public Health Consequences of Cryptocurrency Mining, Seattle Journal of Technology, Environmental & Innovation Law, (December 2020), available at:

<https://digitalcommons.law.seattleu.edu/cgi/viewcontent.cgi?article=1013&context=sjteil>

<sup>60</sup> Ibid

<sup>61</sup> Nathan Reiff, What's the Environmental Impact of Cryptocurrency, Investopedia, (May 13, 2021), available at:

<https://www.investopedia.com/tech/whats-environmental-impact-cryptocurrency/>

<sup>62</sup> Justin Rowlett, How Bitcoin's Vast Energy Use Could Burst its Bubble, BBC News, (February 27, 2021), available at:

<https://www.bbc.com/news/science-environment-56215787>

<sup>63</sup> Nathan Reiff, What's the Environmental Impact of Cryptocurrency

<sup>64</sup> Ibid