Government Blockchain Association

The Impact of Cryptocurrency Adoption on Governments

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Table of Contents

1 Introduction

1.1 Executive Summary

There is plenty of anecdotal evidence that how we exchange value is changing, the most obvious being the rapid growth of the FinTech (financial technology) start-up community. Consumers must be using at least some of the solutions coming out of this area for the sector to be growing so strongly. There is a lot of noise, but is this noise borne out by data? The most recent Reserve Bank of Australia's (RBA) Trends in Retail Payments survey (the third in a series) found that the use of cash and cheques – the two main physical mechanisms for exchanging value – had both declined noticeably over the previous three years, (2017-2019), while the main electronic forms of payment (debit and credit) increased. The hurried trip to the bank late on a Friday afternoon to obtain enough cash to last the weekend is a distant memory.[1]

Where does crypto come into this equation? Will the electronic forms of payment suffice? Will crypto compliment them, compete with them, or even replace them?

1.2 Purpose

In the past decade crypto currencies have gone from concept to hundreds of billions of dollars in market capitalization. The value of cryptocurrency today is approximately $175 billion[2]. And, while that number is still insignificant by global standards, in ten years it has exceeded the economies of 155 nations. If that trend persists over the next ten years, what will that look like for the global financial system and the financial systems for many countries? If significant transactions bypass traditional financial institutions, how will governments manage their economies and enforce their laws? The adoption of cryptocurrency may have wide sweeping impacts on governments.

[1] https://www2.deloitte.com/content/dam/Deloitte/au/Documents/technology/deloitte-au-technology-future-exchanging-value-trust-economy-021219.pdf
[2] https://coinmarketcap.com

The purpose of this study is to examine the adoption of cryptocurrency and determine the impact that it may have on governments around the world. It is also intended to provide recommendations about potential courses of actions.

1.3 Scope

While there are literally thousands of cryptocurrencies, the scope of this study is limited to the adoption of the top 15 cryptocurrencies as determined by market capitalization? (source). The top 15 crypto currencies comprise approximately 90 percent of the global cryptocurrency value.

We are also limiting the study to the impact of the cryptocurrency adoption on the following government functions:

- Economic Impact
- Revenue collection and disbursement
- Debt Servicing
- Money Supply
- Global Competitiveness
- Law Enforcement
- National Security

1.4 Method

The scope of this study will be realized through two methodologies. Each method will address scope goals and measurements and quantified data collection, analysis, and reporting, respectively.

1.5 Goal-Question-Metric (GQM) Methodology

This study is being conducted using the Goal, Question, Metric (GQM)Methodology. The method includes three steps. They are:

- Define the goals that you want the study to achieve
- Determine the questions that need to be asked to determine goal satisfaction
- Identify the metrics that need to be collected to answer the questions

Appendix A describes the GQM Results

1.6 Data Collection, Analysis, & Reporting Methodology

The data obtained for this study will follow traditional quantitative data collection and analysis methods. It is the intention of this study to provide established known facts for the concepts and predictions expressed in this study.

1.7 Cryptocurrency Adoption

Cryptocurrency adoption is determined by examining objective data such as:

- Wallet downloads
- Cryptocurrency transactions
- Numbers of cryptocurrency ATMs
- Numbers of cryptocurrency service providers
- Numbers of new accounts on cryptocurrency exchanges

- Numbers of vendors accepting cryptocurrency
- Increased number of proposed/enforced laws (2017-2020)

The data sources are captured in Appendix B: Data Collection Plan

2 Intro to Cryptocurrencies

Currency can be defined as a medium of exchange for goods and services in the form of paper or coins, usually issued by a government and generally accepted at its face value as a method of payment. This method can be expressed as a system of money in general use in any country around the world.

Fiat money [3]is legal tender whose value is backed by the government that issued it. The U.S. dollar is fiat money, as are the euro and many other major world currencies.

Fiat money differs from money whose value is underpinned by some physical good such as gold or silver. This type of money is called commodity money. The United States, for example, used a gold standard for most of the late 19th and early 20th century. A person could exchange U.S. currency -- as well as many public and even some private debts -- for gold as late as 1971.

A fiat money's value is underpinned by the strength of the government that issues it, not its worth in gold or silver. Money can be defined as a social construct with its intrinsic value being tied directly to public confidence. Lack of public confidence in a government issued currency can rendered the currency worthless.

How does cryptocurrency differ from fiat currency?[4]

Like fiat currency, cryptocurrency can be used as a medium of exchange but there are differences. Unlike a fiat currency that is issued by a central bank or government, cryptocurrency is not issued or controlled by a central body. Cryptocurrency is decentralized, the means no one entity controls the issuing or the currency itself. With fiat, at any time, governments and banks can decide to print more money when stresses in the economy call for it. On the other hand, the cryptocurrency network for Bitcoin has a finite amount of currency to be issued over time. This adds to Bitcoin's digital scarcity definition and has many in the cryptocurrency space labeling Bitcoin as 'digital gold'.

Another difference between fiat currency and cryptocurrency is the idea of programmable money. Unlike fiat currency, cryptocurrencies can be designed to have attributes such as when or how to be spent or exchanged, represent a physical asset such as music or art or have inherent privacy or governance characteristics for the currency holder.

The programmable aspect of cryptocurrencies provides the ability for platform tokens to represent physical and non-physical assets as digital tokens on the blockchain. This process is called tokenization.

[3]https://www.fool.com/investing/general/2015/12/06/fiat-currency-what-it-is-and-why-its-better-than-a.aspx
[4]https://gem.co/crypto-101/what-is-fiat-money/

Cryptoassets – Cryptoassets (aka cryptographic tokens) are digital representations of value that are cryptographically secured and use blockchain technology to control the storage, trade, transfer, and creation of new units of value. The unique difference between a platform tokens and a cryptoassets is in the form of tokenization. Tokenization is the process of representing physical and non-physical assets in the form of digital tokens. Cryptoassets may originate on a blockchain such as Ethereum but it does not necessarily receive value from the blockchain, and its function is not just for payment transactions. Cryptoassets can store value and that value can in turn be converted in cash, other cryptocurrencies or traded for other tokens of value. Examples of cryptoassets include tokenized securities, ICOs, cryptocurrency/payment tokens (Bitcoin), platform tokens (Ethereum), access tokens (utility, security, protocol), transaction tokens (Ripple) and stablecoins.

Bitcoin

In 2009, the pseudonymous Satoshi Nakamoto published a novel white paper that outlined a secured peer-to-peer digital currency network without any central authority, unlike government-issued currencies. Bitcoin signaled the emergence of a radically new form of digital money that operates outside the control of any government or corporation.[1]

Bitcoin succeeded where other previous online currencies have failed and has become a predecessor to virtually all cryptocurrencies which have been developed over the past decade.[1] Bitcoin has managed to coexist with the financial system despite being regularly scrutinized and debated.[1]

At the start of the cryptocurrency boom in 2017, Bitcoin's market value accounted for close to 87% of the total cryptocurrency market.[1] Bitcoin's blockchain technology is being used to create applications that go beyond just enabling a digital currency.

2.1 Types of Cryptocurrency and related technology

Bitcoin is the main cryptocurrency that gave birth to all other cryptocurrencies. Cryptocurrency can be created at any time and can have varying uses such as privacy transactions or lower exchange fees. As of this study there are over 2850 cryptocurrencies in the world.

2.1.1 Types of cryptocurrencies:

Bitcoin – The archetype for all cryptocurrency with true decentralization, distributed consensus, transparency, open-source code, and a permanent public ledger. A public ledger is an electronic record of all transactions on the blockchain accessible to anyone.

Altcoins – All coins other than Bitcoin are considered (alt)ernative coins. The open-source programmable nature of Bitcoin provides altcoins with the many, wide range use cases, functionality, and applications including their own blockchain networks. Ethereum and Ripple are examples of altcoins and their varying application.

Tokens – Tokens (aka platform tokens) are like tickets in an amusement park or shopping rewards at a grocery store. The tokens can only be used with a certain blockchain network and only serve a function within that blockchain network only. Examples include utility and security tokens.

Additional information on token types can be found in Appendix D: Tokens.

2.1.2 *Cryptocurrency categories:*

Cryptocurrency types, e.g. Bitcoin altcoins and tokens, can be grouped into categories based on the coins or tokens use and functionality. The categories represent all major cryptocurrencies in circulation.

Privacy coins – An altcoin that has increased privacy attributes programmed into the coin's functionality. The attributes include stealth addresses and invisible transaction routing.

Stable coins – An altcoin that is tied one-for-one to a government fiat currency such as the U.S. dollar or the European Euro. Stable coins are used to offset the volatility of cryptocurrency and to help stabilize risk in loans collateralized using cryptocurrency.

- JP Morgan Chase became the first bank to create an institutionally managed stable coin (JP Coin) for use in retail interbank transactions.
- (If realized) Facebook's Libra will become the first major corporation to create a private sector managed stable coin (Libra).

Exchange tokens – A token created by a cryptocurrency exchange for use only on that exchange. Exchange tokens are used to pay for transaction costs and fees and are often sold at discounted prices to incentivize exchange membership.

CBDCs

The Bank for International Settlements (BIS) Papers No 107 surveyed central banks about their plans for a digital currency[1]. The survey states that money can be divided into its four different properties: issuer, form, accessibility, and technology.
Further, a CBDC is, by definition, a central bank-issued digital money with two broad accessibility types: general purpose and wholesale. A "wholesale", "token-based" CBDC, is a restricted-access digital token for wholesale settlements (e.g. interbank payments, or securities settlement).

A general-purpose variant CBDC (available to the public) can be based on tokens or accounts.[1] and primarily targeted at retail transactions (but would also be available for broader use). A token-based variant would resemble a type of "digital cash" which could be distributed to the public in different ways to a more direct account-based variant.

2.1.3 *Central Bank Digital Currency*

Central Bank Digital Currency (CBDC) is not a cryptocurrency and is not a stable coin (per). CDBC's are essentially digital currency or a fully digitized version of a government fiat currency. This study would be incomplete without a mention of CBDC's as there is a fight club-like diatribe triangle between cryptocurrency, stable coins and CBDC's.

Many central banks are researching the viability of digital currency to lessen printing, maintenance and fees associated with traditional fiat currency. The 2020 pandemic has not only heighted awareness of cryptocurrency and its achieved speed of providing value (and security) to the public but also exposed the slow response of the traditional global monetary system.

Six central banks have formed a working group with the Bank of International Settlements (BIS) to share findings as each investigates potential cases for central bank digital currencies (CBDCs).[5]

The group will be comprised of the central banks of Sweden, Canada, Switzerland, the U.K., and Japan, as well as the European Central Bank (ECB) and the BIS. Announced by all seven members, each institution will continue assessing the "economic, functional and technical design choices, including cross-border interoperability" of CBDCs and will sharing any findings.

2.2 Exchanges

Cryptocurrency exchanges can be viewed the same way as the previously identified cryptocurrency types: Bitcoin, altcoins, and tokens. All crypto exchanges list Bitcoin (80%), altcoins (15%) and tokens (5%) in total market cap with offerings in the cash and derivatives markets including cash exchanges.

Crypto exchanges, like blockchain, remove the need for an intermediary. Unlike traditional exchanges, crypto exchanges do not have brokers and handle all custody, orders, and settlements for the costumer. With crypto exchanges the funds are available immediately.

Most crypto exchanges are not regulated with the data being subject to manipulation. Many coins are subject to ticker stuffing to have the coin rate higher on an exchange. Crypto exchanges offer adjusted and non-adjusted reports. Crypto markets are also consumer lead and are influenced by speculative investing.

2.2.1 Exchange Types

There are 190 cryptocurrency exchanges that fall into the following categories: Regulated, Non-regulated and decentralized.

Regulated Exchanges

Currently, exchanges are typically regulated as Money Services Businesses (MSBs) for state regulators. New York Department of Financial Services (NYFDS) offers license (BitLicense) for MSBs to operate virtual currency business in New York State. Businesses that are assigned a BitLicense are regulated for KYC (Know Your Costumer), AML (Anti-Money Laundering) and consumer protections laws. Eleven businesses have applied and received a Bit License. Some of the most notable cryptocurrency exchanges include Gemini, Coinbase, Circle and Binance.

Non-Regulated Exchanges

Many cryptocurrency exchanges are not regulated and have little to no oversight from any governing institution. Non-regulated exchanges have a shaky past with a history of illegal

Petrodollar

The petrodollar is any U.S. dollar paid to oil-exporting countries in exchange for oil. The dollar is the preeminent global currency. As a result, all international transactions, including oil, are priced in dollars. Oil-exporting nations must receive dollars for their exports, not their own currency.

As a result, most of these oil exporters also peg their currencies to the dollar. That way, if the dollar's value falls, so does the price of all their domestic good, services and government revenue. That helps these countries avoid wide swings in inflation or deflation.[1]

[5] https://www.coindesk.com/6-central-banks-form-digital-currency-use-case-working-group

activity that includes pump-and-dump and front-running schemes. Increased fraudulent has led to state and government regulators to issuing cease and desist letters to many non-regulated exchanges.

Decentralized Exchanges (DEXs)[6].
Decentralized exchanges are distinctly different than a regulated cryptocurrency exchange and their unique properties present challenges for government regulators.

Unlike regulated cryptocurrency exchanges, DEXs do not hold customer funds, direct transaction without intermediary, and transactions are automatically settled on ledger. DEX's are also not targeted by hackers because there are no funds stored on the distributed exchange. From a regulator standpoint, DEXs present challenges because there is not central group for accountability (DEXs are maintained by software), no personal accounts to enforce KYC/AML and cannot be easily blocked or taken down. DEXs also provide the ability to convert cryptocurrencies into other types of currencies without regulatory oversight and could help entities avoid national sanctions.

For additional information see Appendix E: Decentralized Exchanges

Digital Identity

The ability to program representation of a physical asset in the digital realm is the most excited attribute of cryptocurrencies. This is evident with cryptoassets and its many flavors of representation.

Historically, digital identity was fundamentally insecure. Limited by the available technology and the traditional ID and password framework.

The ability to tokenize a person's identity using the same cryptographic and blockchain technology methods have made digital identity a viable option for digital and cryptocurrency wallets.

Most importantly, an interoperable digital identity, wallet and decentralized framework could provide the common money exchange mechanism needed to remove financial exclusion and increase overall prosperity of multiple groups.

2.3 Wallets[7]

Cryptocurrency wallets are software programs that store your public and private keys and interface with various blockchains so users can monitor their balance, send money and conduct other operations. When a person sends you bitcoins or any other type of digital currency, they are essentially signing off ownership of the coins to your wallet's address. To be able to spend those coins and unlock the funds, the private key stored in your wallet must match the public key the currency is assigned to. If the public and private keys match, the balance in your digital wallet will increase, and the senders will decrease accordingly. There is no actual exchange of real coins. The transaction is signified merely by a transaction record on the blockchain and a change in balance in your cryptocurrency wallet.

[6] https://medium.com/totle/decentralized-exchanges-three-types-that-will-be-essential-for-the-crypto-economy-91461b330f50
[7] https://blockgeeks.com/guides/cryptocurrency-wallet-guide

Wallets are secure to varying degrees. The level of security depends on the type of wallet you use (desktop, mobile, online, paper, hardware) and the service provider. A web server is an intrinsically riskier environment to keep your currency compared to offline. Online wallets can expose users to possible vulnerabilities in the wallet platform which can be exploited by hackers to steal your funds. Offline wallets, on the other hand, cannot be hacked because they simply aren't connected to an online network and don't rely on a third party for security. Although online wallets have proven the most vulnerable and prone to hacking attacks, diligent security precautions need to be implemented and followed when using any wallet. Remember that no matter which wallet you use, losing your private keys will lead you to lose your money. Similarly, if your wallet gets hacked, or you send money to a scammer, there is no way to reclaim lost currency or reverse the transaction.

Novi

Facebook's new private digital currency will be stored in a new wallet called Novi. Novi stands for "new way" and Facebook's announcement of Libra is certainly a new way of doing financial transactions.

With Libra, Facebook wants to "make sending currency as easy as sending a text message." Novi will be available in Messenger and WhatsApp and provide the ability to save, send and spend Libra.

2.3.1 Wallet Types

Online (Hosted wallet): wallets run on the cloud and are accessible from any computing device in any location. While they are more convenient to access, online wallets store your private keys online and are controlled by a third party which makes them more vulnerable to hacking attacks and theft.

Desktop (Software wallet): wallets are downloaded and installed on a PC or laptop. They are only accessible from the single computer in which they are downloaded. Desktop wallets offer one of the highest levels of security however if your computer is hacked or gets a virus there is the possibility that you may lose all your funds.

Mobile (Software wallet): wallets run on an app on your phone and are useful because they can be used anywhere including retail stores. Mobile wallets are usually much smaller and simpler than desktop wallets because of the limited space available on mobile.

Hardware: wallets differ from software wallets in that they store a user's private keys on a hardware device like a USB. Although hardware wallets make transactions online, they are stored offline which delivers increased security. Hardware wallets can be compatible with several web interfaces and can support different currencies; it just depends on which one you decide to use. What's more, making a transaction is easy. Users simply plug in their device to any internet-enabled computer or device, enter a pin, send currency, and confirm. Hardware wallets make it possible to easily transact while also keeping your money offline and away from danger.

Paper: wallets are easy to use and provide a very high level of security. While the term paper wallet can simply refer to a physical copy or printout of your public and private keys, it can also

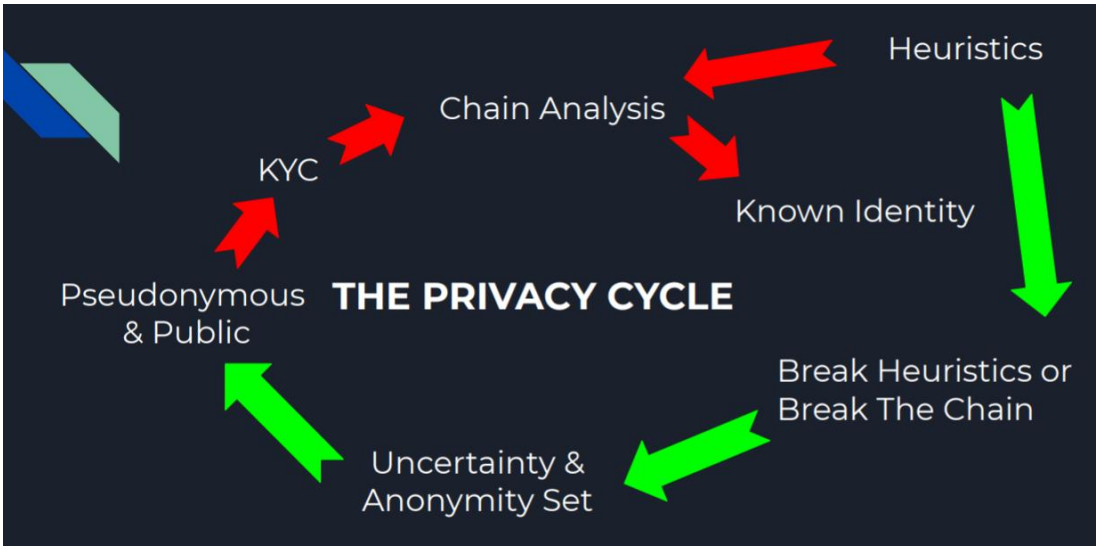
refer to a piece of software that is used to securely generate a pair of keys which are then printed. Using a paper wallet is relatively straightforward. Transferring Bitcoin or any other currency to your paper wallet is accomplished by the transfer of funds from your software wallet to the public key shown on your paper wallet. Alternatively, if you want to withdraw or spend currency, all you need to do is transfer funds from your paper wallet to your software wallet. This process, often referred to as 'sweeping,' can either be done manually by entering your private keys or by scanning the QR code on the paper wallet.

2.3.2 Wallet Anonymity vs. Privacy

"Privacy is necessary for an open society in the electronic age."

Eric Hughes opening statement in *A Cypherpunk's Manifesto* still rings true today as it did in 1993. Taking privacy back and placing it in the hands of the public is the major implication offered by an anonymous system that allows secure electronic transactions in an adversarial environment without the means of an intermediary. This has always been the vision of Satoshi's whitepaper. In 2020, the financial industry remains unstable as it did in 2008 and this fragile industry has yet to become crisis resistant. 2020 will usher in a new recession and blockchain will remain resistant just like the internet has in the past. Individuals have become comfortable managing their own finances and will soon be comfortable enough able to manage their own privacy using the blockchain and crypto tokens.

DigiCash was the first e-money effort developed with electronic payment privacy in mind. DigiCash's creator David Chaum developed a unique way to ensure complete privacy of transactions using cryptographic public and private keys. DigiCash's transactions were totally untraceable by governments and banks.



Bring together wallet privacy and anonymity offerings here. Followed by summary.

3 Cryptocurrency Adoption Factors

3.1 Ease of Use

In the early days of bitcoin, only a handful of tech enthusiasts knew how to acquire, send, receive, and store cryptocurrency. However, as each day goes by more and more mobile apps and websites are being developed to make using cryptocurrency as easy to use as swiping a debit card. Clearly ease of use has a significant impact on cryptocurrency adoption.

Developing a user-friendly interface that hides the complexity of technology (the ability to authenticate a transaction and ensuring the transaction is authentic) in making digital transactions is the crux for cryptocurrency adoption.

Digital Yuan

China is developing a digital currency for *digital currency and electronic payments (DCEP)*. To ensure that the central bank's digital currency is not oversold, commercial institutions will pay a 100% reserve to the central bank, says the institution. In other words, at the time of issuance, the People's Bank of China will first exchange the digital currency to banks or other operating [redacted] release the digital currency into public circulation.[1]

Unlike other cryptocurrencies, the digital Yuan is launched by China's central bank and is therefore backed by the country's credit. This is like an electronic version of the renminbi. The bank says that, compared with Bitcoin, this new digital currency will have greater inherent stability.[1]

The latest developments are unlikely to have an impact on crypto assets in the long term because the issuance of a digital yuan would be tightly controlled with no public mining or trading with existing cryptos, said eToro analyst Nemo Qin.

3.2 Inflation

Inflation simply describes the rate of change in value of a currency. All currencies have an inflation rate. Inflation is impacted by the supply of and demand for the currency. This report includes several types of currencies that have different inflation consideration. They include:

Sovereign currencies: The supply is determined by the issuing government. Since most governments spend more than they collect in revenues, they solve this problem by creating additional currency. This effectively creates an unlimited supply of money. The demand is driven by several factors including gross domestic product and the exchange rate of other currencies. However, typically the value of sovereign currencies diminishes over time because governments continue to create more money without limitations.

Public cryptocurrencies: Currencies that are governed by algorithms like bitcoin have a fixed total supply of money. The inflation rate of these currencies is primarily impacted by demand.

Private cryptocurrencies: These tokens can be controlled by the issuer and may rise or fall in value based on the decisions and actions of the issuer and the communities that use them.

When the value of a currency appreciates, more people acquire the currency. However, they are less likely to spend it because they believe that it is more advantageous to hold it than spend it. However, when the value of a cryptocurrency depreciates, people are more likely to spend them

than hold them. For this study, the term "Cryptocurrency adoption" includes both the acquisition of cryptocurrency and the spending of cryptocurrency.

3.3 Regulation

Like many areas of society, consumers rather than businesses or governments are setting the technological ground rules.[8] The need for balanced cryptocurrency regulation[9] and policies greatly impacts its global adoption. All countries and governing bodies around the world are affected.

Many countries are researching the probability of using cryptocurrency in their local economies. Some countries have published strategic whitepapers with cryptocurrency recommendations. Use cases vary but each country is starting to see the benefits of how digital government backed cryptocurrencies can help evade sanctions, provide ease of accounting, and reduce the overall cost for the nations.[10]

Countries adopting their own cryptocurrencies: Dubai (Emcash), Venezuela (Petro), Marshall Islands (SOV)

Countries adopting their national digital currencies: Israel (SGA stable coin), Canada (QCAD stable coin), China (DCEP digital currency), Swiss (e-Krona)

3.3.1 Why are regulations needed?

Creating legislation that encourages the adoption of cutting-edge financial infrastructure could be a massive boon to economic competitiveness. However, giving people too much freedom may risk the integrity of the country's own paper money. A balance has not yet been struck, and so accordingly, major governments have reacted quite differently to the introduction of bitcoin (and other cryptocurrency technology) in their respective countries. Reactions have ranged from apprehension and fear, to full-scale acceptance. The one thing all of them can agree on is that the decision should not be taken lightly.

Policy makers run a fine line between encouraging innovation and ensuring consumer and investor protections. That is why many Governments are issuing notices about the pitfalls of investing in the cryptocurrency markets. Most government warnings are designed to educate citizens about the high volatility risk associated with cryptocurrencies and the fact that many of the organizations that facilitate such transactions are unregulated.

Another reason for government regulation is the opportunity that cryptocurrencies create for illegal activities, such as money laundering and terrorism. Some of the countries go beyond simply warning the public and have expanded their laws on money laundering, counterterrorism, and organized crimes to include cryptocurrency markets, and require banks

[8] https://www2.deloitte.com/content/dam/Deloitte/au/Documents/technology/deloitte-au-technology-future-exchanging-value-trust-economy-021219.pdf

[9] Innovation with consumer protection.

[10] https://coinsutra.com/national-cryptocurrencies/

and other financial institutions to conduct all the due diligence requirements imposed under such laws.

Recent enacted laws bring cryptocurrency transactions and institutions that facilitate them under the ambit of money laundering and counter-terrorist financing laws.

3.3.2 *International Anti-Money Laundering Regulation*

The European Commission's Fifth Anti-Money Laundering Directive (5AMLD)

In 2020, the European Commission released the Fifth Money Laundering Directive (5AMLD) which tightens rules on existing prior regulation involving pre-paid cards, high value goods, high-risk third-party counties, beneficial ownership, politically exposed persons, and cryptocurrencies. Crypto exchanges and custodial wallets must register with financial authorities and are subject to Anti-Money Laundering rules such as customer due diligence, monitor behavior and suspicious activity reporting (SAR).

The Financial Action Task Force on Money laundering (FATF)

The intergovernmental organization Financial Action Task Force on Money laundering (FATF) issued guidance on the regulation of cryptocurrency for it 39 member countries. The guidance subjects crypto exchanges to the similar bank 'travel rule' that require sharing of costumer transaction information. Information to include sender, recipient, and wallet address. In certain circumstances, individual wallet holders may be subject to a licensing fee.

3.3.3 *U.S. Money Services Businesses and Custodial Guidance*

The U.S. Treasury Financial Crimes Enforcement Network (FinCEN)

The U.S. Treasury Financial Crimes Enforcement Network (FinCEN) issued guidance for Money Services Businesses (MSB) with a virtual currency business model. The guidance places clarifying money transmitter definitions on blockchain and cryptocurrency applications which are subject to the Bank Secrecy Act (BSA). Money transmitters include Dapps, Dapp users, hosted wallets, mixers, ICO's, ATMs/kiosks and privacy coins. Privacy coins are also subject to the banks 'travel rule'.

The U.S. Securities and Exchange Commission (SEC) and the Financial Industry Regulatory Authority (FINRA) Joint Statement on Crypto Custody

The U.S. Securities and Exchange Commission (SEC) and the Financial Industry Regulatory Authority (FINRA) issued a joint statement that requires broker-dealers to apply additional controls in addition to holding a customer private key. The statement expresses that a third-party could have 'copied' the private key and perform a transaction without the broker-dealer or customer knowing. Leaving the broker-dealer without a means to reverse the transaction.

3.3.4 *Cryptocurrency and Taxes*

There is a lot of definition of bitcoin and crypto (or virtual) currency in general on the Internet, but from a legal point of view when we are talking about taxation, there is still not uniform tax approach.

There is no unique or precise definition of what crypto-assets are, and a variety of terms describe more or less overlapping phenomena (digital assets, tokens, ICOs, virtual currency, etc.). The European Supervisory Authorities (ESAs) identified a loss of opportunity from the absence of an EU regime, noting challenges to the scaling-up of cross-border activities in the absence of a common approach with regard to factors such as accounting treatment, conduct of business, including client asset rules, prudential treatment, custody and transaction finality, insolvency treatment, and tax. So far, regulators and legislators have struggled to classify crypto-assets within existing laws and regulatory schemes. The most important factor of the EU's approach to crypto-assets is a uniform one, based on the principle that activities that create the same risks should be governed by the same rules, thus avoiding fragmentation in this regard.[11]

The countries in Europe are following a decentralized approach to cryptocurrency regulation. The UK treats Bitcoin like a foreign Currency. In Germany, bitcoin sales do not incur a capital gains tax; however, if the investment is held for less than one-year German income taxes apply. Surprisingly, even Switzerland the land of cryptocurrency, taxes are levied. Swiss residents must pay income tax, profit tax, and wealth tax on their cryptocurrencies holdings. Fortunately, in all EU countries and Switzerland and Liechtenstein, cryptocurrency sales are exempt from the VAT. Although paying taxes is a real bummer, at least this extra revenue will make regulators think twice before outlawing bitcoin.[12]

Croatian Tax Administration has issued few opinions about tax treatment of crypto currency with reference to the judgment of ECJ (C-264/14, on 22 October 2015). The judgment is about transactions performed by an exchange office. Namely, this is one way by which a natural or legal person can become the owner of a crypto currency (by exchanging some of the so-called fiat currencies for bitcoins or other crypto currencies on various web portals offering such a service). In addition, crypto or virtual currency can be purchased or exchanged for one of the fiat currencies on specialized ATMs. According to the ECJ judgment, crypto currencies trading in Croatia is considered a financial transaction, and the income generated by the sale of crypto currencies is subject to personal income tax on the basis of capital gains, since it is the gain on the basis of the sale of that currency, which is an equivalent to money market instruments. Income is determined as the difference between the purchasing price (i.e. the value at which the crypto currency was purchased by the tax payer, measuring in one of the fiat currency, ex. in USD, euro or kuna) and the selling price (i.e. the value at which the crypto currency was sold by the same tax payer, measuring in the same fiat currency), less any potential trading costs (ex. entry and exit fees paid to the online trading platform). This means that the purchase or acquisition of a crypto currency itself (or its holding in an e-wallet) does not entail any tax liability, but the tax liability arises only after that crypto currency is sold. Income from capital based on capital gains shall not be in the case that the financial assets are alienated two years from the day of procurement, i.e. acquisition of those assets. It is possible to replace one crypto currency for another (for ex. bitcoin is replaced for Ethereum), but in this case no taxable income is determined.

[11] https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/191113-report-expert-group-regulatory-obstacles-financial-innovation_en.pdf

[12] https://cryptoresearch.report/crypto-research/taxation-cryptocurrencies-europe/

Similar example could be finding in France. France will tax cryptocurrency gains when they're converted into "traditional" currency, but crypto-to-crypto transactions remain tax exempt.[13] VAT is to be applied to cryptocurrency transactions only when they are used to acquire an asset or a service.[14]

Slovenia treats cryptocurrencies as virtual currencies, meaning that they are neither financial instruments nor monetary assets. The income obtained by individuals in the form of Bitcoin and other virtual currencies (e.g., employment income) is subject to personal income tax. The taxable value of such income is calculated based on the exchange rate between the virtual currency and euro on the date of receipt. The same strategy is used in taxing individual income resulting from mining cryptocurrencies. The profit received by individuals from trading Bitcoin (because of fluctuation in the cryptocurrency market) is not subject to any income taxation.[15]

In Denmark, with regard to the taxation of bitcoins, you generally have to consider one thing; did you trade with bitcoins as the means of payment, or did you trade in bitcoins with a view to achieving a profit - that is, did you buy and sell the cryptocurrency as an investment. If you used bitcoins as payment for a product or service, you should not think about taxation of the profit achieved, if any. If you invested in bitcoins, however, the situation is quite different. That is, if you bought the currency with the intention of selling it again to make a profit. If you are among those who jumped on the bandwagon and invested in one or more bitcoins, you must report any profits as personal income. Similarly, you can deduct a loss as a deduction.[16]

In Poland, for individual income tax purposes, revenue derived from the cryptocurrency transactions would be treated as capital gains, even if a taxpayer obtains the revenue within a business activity. Exchanges of one form of cryptocurrency for another cryptocurrency would be "tax neutral" regardless of the exchange method (i.e., on the market, in an exchange office or within an individual exchange).[17]

Romania has amended its tax laws, allowing it to start taxing gains from bitcoin investments at a rate of 10 percent. The improved fiscal code legislation categorizes earnings generated from buying and selling cryptocurrencies as "income from other sources" and therefore subject to income tax. [18]

HMRC would expect that buying and selling of cryptoassets by an individual will normally amount to investment activity (rather than a trade of dealing in cryptoassets). In such cases, if an individual invests in cryptoassets they will typically have to pay Capital Gains Tax on any gains they realise.

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[13] https://news.bloombergtax.com/daily-tax-report-international/france-wont-tax-crypto-to-crypto-trades-but-will-hit-gains-cashed-out

[14] https://cointelegraph.com/news/france-wont-tax-crypto-only-trades-will-tax-crypto-to-fiat-sales

[15] https://nomoretax.eu/crypto-taxation-slovenia/#:~:text=In%20Slovenia%2C%20tokens%20(cryptographic%20chips,revenues%20received%20by%20the%20company.

[16] https://www.azets.dk/eng/news/bitcoins/

[17] https://home.kpmg/xx/en/home/insights/2018/09/tnf-poland-proposals-for-taxation-of-cryptocurrency-transactions.html#:~:text=For%20individual%20income%20tax%20purposes,flat%20tax%20rate%20of%2019%25.

[18] https://news.bitcoin.com/romania-imposes-10-tax-on-cryptocurrency-earnings/#:~:text=Romania%20Imposes%2010%25%20Tax%20on,a%20rate%20of%2010%20percent.

Cryptoassets are digital and therefore intangible, but count as a 'chargeable asset' for Capital Gains Tax if they're both: (1) capable of being owned

(2) have a value that can be realized. Individuals need to calculate their gain or loss when they dispose of their cryptoassets to find out whether they need to pay Capital Gains Tax.[19]

Statista – one of the world's leading statistics portals, had revealed that Latin America is the region with the most crypto users in the world. According to the study, the top ten countries which are most involved were Brazil, Colombia, Argentina, Mexico, and Chile.[20]

Chile, for example, considers any crypto as "a digital or virtual asset"; Colombia as an "immaterial good"; Peru as a "movable asset," while in Argentina, there is no official definition at the moment. The guide highlights many doubts concerning when taxes should be paid for owning cryptos or trading them. In Peru, the authorities expect that people pay taxes on crypto when they receive payments in cryptocurrencies as a product of the recipient's profession.[21] In Chile, cryptocurrencies aren't subject to Value-Added Tax (VAT), as these are seen as "intangible assets." Chilean taxpayers will pay taxes on crypto-related earnings as these will swell up their total income. In Chile, income taxes are paid annually in April.[22]

In Colombia, it is illegal to use Bitcoins or any other crypto for any transaction, since it is a currency that is not issued and controlled by a government or authorized entity.[23]

Brazilian tax law has no legal specific act concerning the taxation of cryptocurrency operations, so transactions involving virtual currencies are currently subject to the same taxation as transactions with different classes of assets. The taxation will follow the set guidelines: (1) the revenue obtained with the settlement in cryptocurrency should be regularly taxed; (2) an entity that settles an obligation with the use of cryptocurrencies should withhold the applicable taxes; and (3) the capital gains earned with the sale of cryptocurrency should be taxed as well.[24]

In South Africa, cryptocurrencies as intangible assets. Any income received or accrued from cryptocurrencies are taxable. The income can either be of a revenue or capital nature. If you earn your cryptocurrency as payment for goods or services rendered or you're a day trader making money on trading pairs as part of your monthly income you may want to look at filing as gross income tax. If you've bought a cryptocurrency and held it for an extended period of time before cashing it out back to fiat then you may be liable for capital gains tax.[25]

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[19] https://www.gov.uk/government/publications/tax-on-cryptoassets/cryptoassets-for-individuals#:~:text=Many%20cryptoassets%20(such%20as%20bitcoin,the%20Self%20Assessment%20tax%20return.&text=The%20amount%20of%20tax%20due,their%20residence%20and%20domicile%20status.

[20] https://www.okex.com/academy/en/its-ok-to-be-different-crypto-in-mexico?channelFlag=ACECO2501190

[21] https://cointelegraph.com/news/guide-highlights-patchwork-of-crypto-tax-laws-in-latin-america

[22] https://finance.yahoo.com/news/chilean-citizens-begin-paying-cryptocurrency-092446347.html

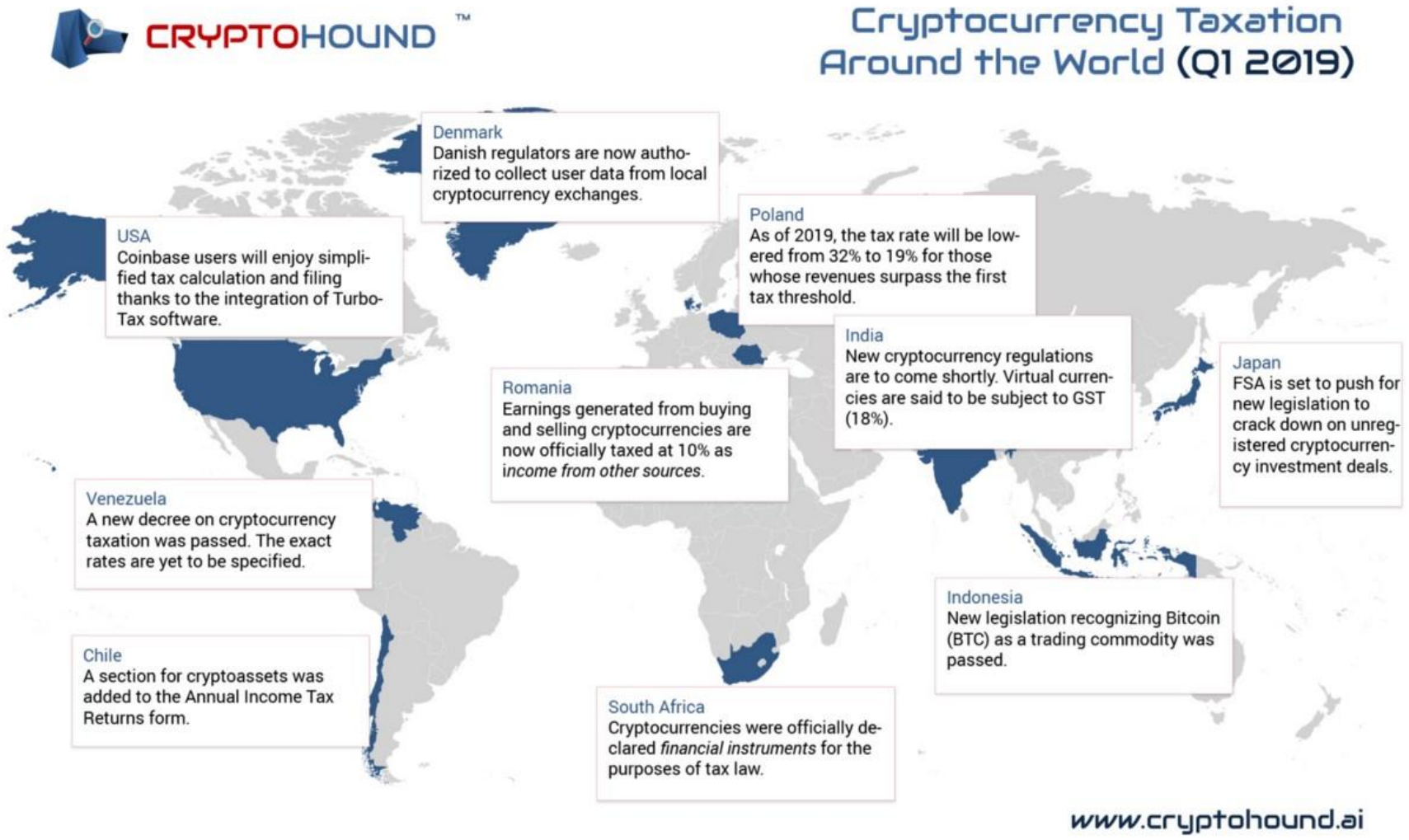
[23] https://cointelegraph.com/news/guide-highlights-patchwork-of-crypto-tax-laws-in-latin-america

[24] https://www.internationaltaxreview.com/article/b1jh3y3dhyjvz3/cryptocurrency-transactions-fall-on-to-the-brazilian-federal-revenues-radar#:~:text=Brazilian%20tax%20law%20has%20no,with%20different%20classes%20of%20assets.

[25] https://www.nichemarket.co.za/blog/money-talks/tax-cryptocurrency-south-africa

In Japan, cryptocurrency trading, mining, lending and other income is classified as miscellaneous income, subject to a tax rate up to 55%. Compared to Japan's taxes on stock profits of a flat 20%, crypto gains are very highly taxed, dissuading individuals and companies from properly reporting their crypto gains on their tax returns. However, non-residents are taxed a flat 20% tax rate on income which they need to pay upon leaving Japan. The relevant tax rates vary depending on how much you earned in the previous year. You could owe significantly less than the 55% maximum tax rate on your cryptocurrency gains.[26]

[26] https://tokentax.co/guides/crypto-taxes-in-japan/#:~:text=In%20Japan%2C%20cryptocurrency%20trading%2C%20mining,tax%20rate%20up%20to%2055%25.&text=However%2C%20non%2Dresidents%20are%20taxed,to%20pay%20upon%20leaving%20Japan.



USE GBA SOURCES INSTEAD: Source of infographic: https://blog.c-hound.ai/index.php/cryptocurrency-taxation-top-10-novelties-of-q1-of-2019/

Crypto tax havens

Tax and financial havens have a central role in the universe of illicit finance (assets that come from criminal and illicit activities), because they are "money laundering laboratories." These welcoming territories launder and monetize dirty money of crime and corruption.

It has been stated that cryptocurrency and financial havens go hand in hand.[27] Some tax jurisdictions have imposed restrictions on investments in cryptocurrencies, the extent of which varies from one jurisdiction to another.

According to the most common definition “tax havens” are those Countries or territories with lower taxation or where, in many cases, there is no taxation. The aim of these tax havens is to attract nonresidents, companies or natural persons, in order to let them start commercial activities or move their assets, avoiding or bypassing the regulations of the countries where they actually carry out their activities. The expression “haven or off-shore financial center” is related to islands such as Cayman or Bahamas, and the states of the hinterland such as Switzerland. Tax havens are offshore activities where a subject resident in a country – falsely - holds the assets or domiciles of the business in another Country to benefit from tax breaks. Many tax havens provide secrecy or opacity that guarantees the anonymity of these financial activities and commercial companies.

Several researches and investigations have, in fact, allowed to observe that "tax havens," carry out an essential function in the globalization of the activities related to financial crime because they ensure to their client's tax reliefs, banking secrecy and judicial immunity. Those criminal activities generate important profits, that subsequently can destabilize economic, industrial, and financial sectors, in other words impeding both national and international policies. Criminal organizations take advantage and abuse of the discrepancies of the legislative, regulatory, legal,

FINMA

Swiss financial regulator, the Swiss Financial Market Supervisory Authority (FINMA) has released multiple guidance on tokens, ICOs and Stablecoins. FINMA’s importance comes with the inquiry from the Libra Association to operate as a payment licensing system under Swiss law.

Tokens

Payment tokens (cryptocurrencies) develop functionality and becomes a means of payment over time.
Utility tokens provide digital access or a service.

Asset tokens represent real physical assets are comparable to equities, bonds, or derivatives.

ICOs

Payment ICOs (securities) require compliance with anti-money laundering regulations.
Utility ICOs not a security if used as a service or for digital access but is a security if issued as an investment.

Asset ICOs (securities) civil and securities law requirements for trading.

Stablecoins

Statement based on the economic function and purpose of the token. Stablecoins, depending on which assets it is backed by will be subject to money laundering, securities trading, banking, fund management and financial infrastructure regulation.

[27] https://repository.law.umich.edu/cgi/viewcontent.cgi?article=1001&context=mlr_fi

and judicial systems. In this way they can prosper without being regulated by common laws to which legal activities must comply.

Six countries where cryptocurrency is not taxed[28]: Malta, Singapore, Malaysia, Belarus,Switzerland, and Portugal.

Portugal is an example of a country that at first cautioned against the use of cryptocurrency and lessened its stand as time went. Portugal applies taxes only if you earn income as a trading company or services for yourself. A casual trader does not have to pay taxes. The Portuguese Central bank still does not monitor the issuing or trading of digital currencies.

The way these territories or states work is relatively simple, although each of them is regulated by a specific legislation. Many banks receive money coming from all over the world – without any preclusion related to the identity of the owners often requesting moderate bank charges compared to those applied by others credit institutions. In this way they can let money "work" legally on international financial markets, and clients cannot have the obligation to justify the origin of their capitals. The protection of the anonymity is guaranteed. Therefore, these places are far from being little faraway lands, rather the offshore areas are represented by a geography that closely corresponds to the main centers of the economic activity: United States, Europe, Asia.

The United States Internal Revenue Service (IRS) statement on virtual currencies
The U.S. Internal Revenue Service (IRS) classified virtual currencies as property for federal tax purposes. Cryptocurrency gains are considered investment income, crypto-to-crypto trades are considered capital gains income, coins received from mining are gross income and crypto received for services are taxable income.

The United Kingdom's Her Majesty's Revenue and Customs (HMRC) Tax on Cryptoassets Policy
The U.K. HM Revenue and Customs taxation on cryptoassets states tax rules for both individuals and businesses. Exchange, security, and utility tokens, received by individuals from a marketing or advertising (airdrop) campaigns, token trades or mining services are subject to capital gains tax.

Business with activities that involve exchange tokens such as buying/selling, crypto-to-crypto trades, mining or services rendered are subject to capital gains, corporate, income, stamp, and VAT taxes.

3.3.5 Decentralized Exchanges

The US Bank Secrecy Act (BSA) of 1970 established extensive requirements for certain financial institution to combat money laundering. In 2013 FinCEN, the federal regulatory agency responsible for enforcing compliance with the BSA, clarified the application of BSA in the virtual currency domain.

[28] https://www.forbes.com/sites/rogerhuang/2019/06/24/seven-countries-where-cryptocurrency-investments-are-not-taxed/#3485bb1e7303

Under the BSA, money transmitters fall into two main categories: administrators and exchangers.

- Administrators are engaged in the business of issuing virtual currency while having the authority to redeem such virtual currency. While certain DEXs do issue their own currency, they exert no control of the token once in circulation, making it a far stretch to classify them as administrators.

- Exchangers, on the other hand, are involved in accepting and transmitting virtual currency. Since DEX's are non-custodial, that is they do not take custody of user's funds, it is unlikely that they would be fit the definition of exchangers for the purpose of BSA compliance.

As the scope of cryptoassets increases, trustlessly exchanging between tokenized assets will require higher levels of speed, security, and interoperability. While the first generation of decentralized exchanges could not compete with their centralized counterparts in terms of speed and ease-of-use, innovative entrepreneurs are exploring the use of off-chain order books and smart contract-managed reserves as potential solutions to the exchange problem.
For many, the decentralization of cryptoasset exchange is essential infrastructure that will provide resiliency to the industry should governments attempt a heavy-handed ban as seen in China last year.

3.3.6 Anonymity and Privacy

Under the coordination of the ECB, the European System of Central Banks (ESCB) has established a proof of concept for anonymity in digital cash – referred to here as "central bank digital currency" (CBDC). The ECB will continue to analyze CBDC with a view to exploring the benefits of new technologies for European citizens and to be ready to act should the need arise in future. The prospect of central bank initiatives, however, should neither discourage nor crowd out private market-led solutions for fast and efficient retail payments in the euro area. The proof of concept drawn up by the ESCB demonstrates that it is possible to construct a simplified CBDC payment system that allows users some degree of privacy for lower-value transactions, while still ensuring that higher-value transactions are subject to mandatory AML/CFT checks.

GDPR and blockchain are not fully compatible (side text box)

4 Adoption (Past, Present, and Future)

4.1 Past (Retrospective Perspective)

The introduction of the consumer Internet – and the smartphone in particular – has resulted in a raft of new payments solutions and financial products, each designed to erase one of life's little annoyances or provide access to a financial product. New technologies and the new payments solutions that use them are shaping how we think about and pay for the products and services

we consume. We are choosing to pay with the tap or wave of a card, click of a mouse or the tap of a finger, rather than handing over the folding currency that has been used for generations.[29]

"Build it and they will come." - is an age old saying but in the blockchain and crypto world the saying should be, "Offer ease of use and they will come." One of the most profound differences and great example of where the consumer internet and the blockchain differ is in how the technology was offered to the public. Internet developers wanted to make the technology easy for the non-technical user. Early backers and developers created user-friendly interfaces for public access to the internet. Having a user-centric approach that abstracted the complexity of the technology aided in the rapid adoption of the internet. Blockchain has taken a different route, the technology was first offered to the cryptography hobbyist community which uses Unix-command line interfaces to work with the blockchain. Early blockchain and cryptocurrency technology required a working knowledge of cryptographic primitives and code compiling skills. Current blockchain and cryptocurrency technology still require skills a normal user does not have. Good examples of the current complexity include use of the Lighting Network or setting up a hardware wallet to purchase cryptocurrencies.

DigiCash

DigiCash was a form of digital payment that encrypted transactions using public and private key cryptography that were anonymous and untraceable.

HashCash

HashCash is a mechanism to solve puzzles using cryptographic hash functions where the puzzles take computing resources to solve but are easily verifiable.

B-Money

If Bitcoin is the archetype to cryptocurrencies, then B-money is the precursor to Bitcoin. B-money uses HashCash puzzle solving mechanism, offers a reward for work, transactions and work are verified by participants.

Technologies, applications, and business models will continue to improve and drive progress for blockchain and cryptocurrency technologies. As with the internet, some solutions will disappear in favor of ease of use, better user interfaces and convenience but the foundational technology (decentralization, security, incentives) will not disappear.

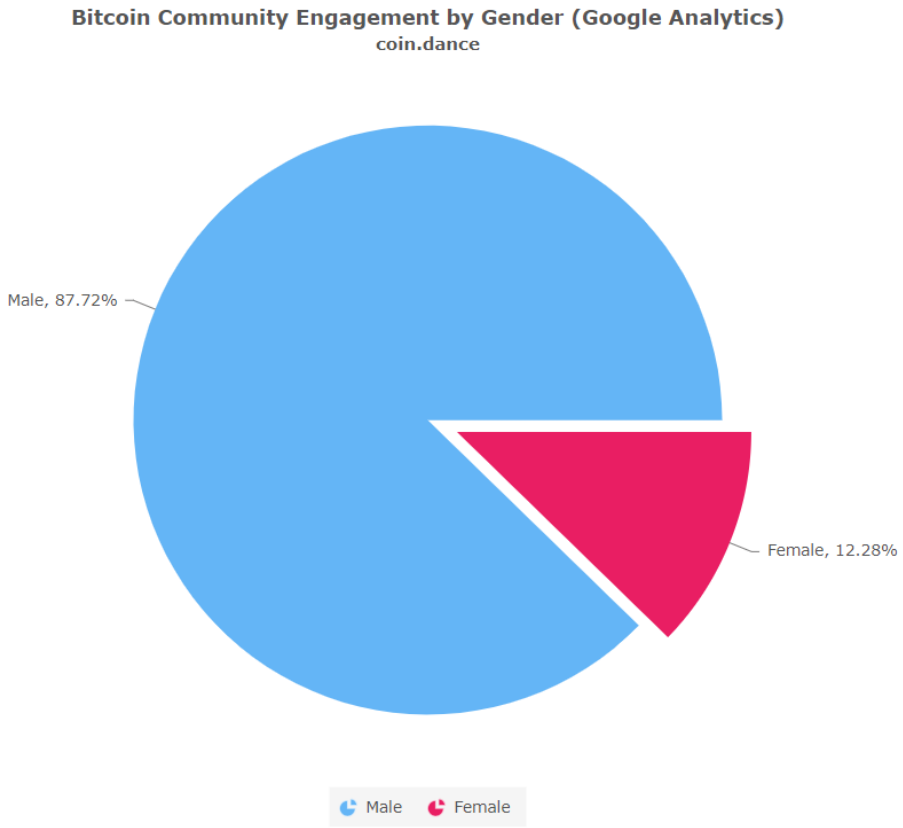
4.1.1 Demographics

Like the many cryptocurrency in the digital sea, ever diverse and evolving, so is demographic information pertaining to new global advancements. There is a clear link between gender, age group, geographic, and cryptocurrency adoption.

Gender

Males tend to maintain a majority (87%) of participation and involvement in the Bitcoin community while Females maintain less but have increased 3% from 2018 (9%) to 2019 (12%).

[29] https://www2.deloitte.com/content/dam/Deloitte/au/Documents/technology/deloitte-au-technology-future-exchanging-value-trust-economy-021219.pdf

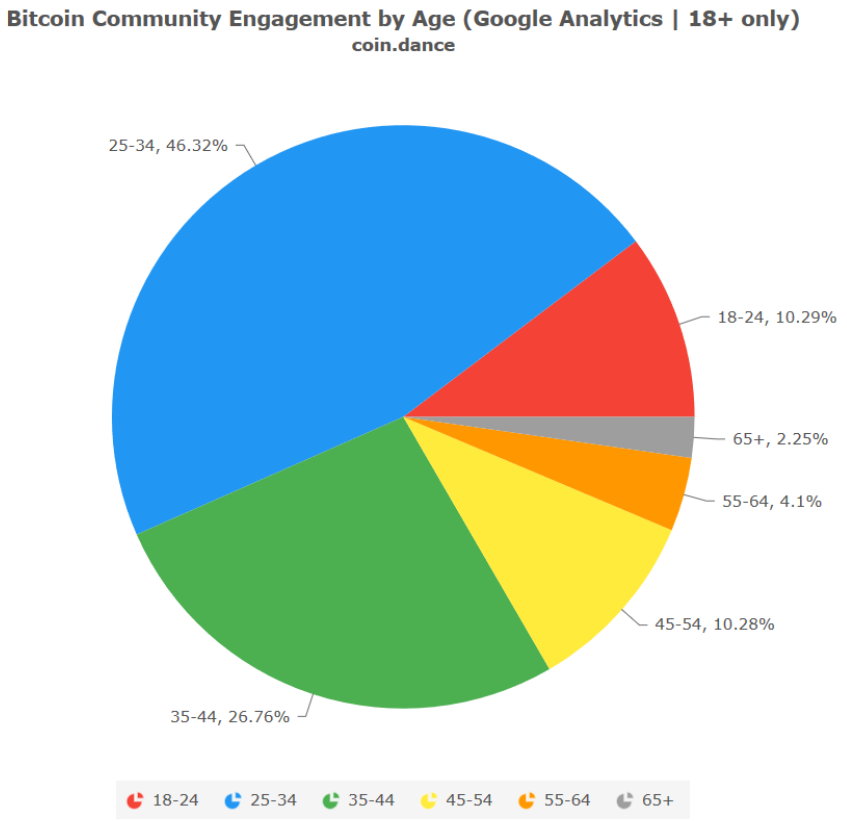


On the other end of the spectrum Females (71%) and Males (78%) close in having heard of cryptocurrencies such as Bitcoin.

Awareness of selected cryptocurrencies in the U.S. 2019, by gender			
Knowledge of selected cryptocurrencies in the United States in 2019, by gender			
	Male	Female	
Bitcoin	78	71	in %
Bitcoin Cash	26	21	in %
Ethereum	24	9	in %
Litecoin	18	8	in %
Ripple	12	5	in %
Other	1	1	in %
I have not heard of any cryptocurrencies	17	20	in %

Age Group

Groups from 25-34 have most of the active participation and involvement with Bitcoin (46%) with groups aged 35-44 with (26%).



Geographic

In the U.S. the number of individuals with awareness of cryptocurrency in 2019

Awareness of selected cryptocurrencies in the U.S. 2019		
Knowledge of selected cryptocurrencies in the United States in 2019		
Bitcoin	75	in %
Bitcoin Cash	24	in %
Ethereum	17	in %
Litecoin	13	in %
Ripple	8	in %
Other	1	in %
I have not heard of any cryptocurrencies	19	in %

The number is fair slimmer compared to those that are actual investors. Survey[30] from Finder.com show an increase of 7% in 2018 to 14% in 2019 but overall, it is estimated that only 5%[31] of Americans hold Bitcoin in 2020.

[30] https://www.finder.com/how-many-people-own-cryptocurrency
[31] https://www.bitcoinmarketjournal.com/how-many-people-use-bitcoin/

In the U.K. the overall average is about the same coming in at 5.3% [32] but that number seems to be growing. A 2018 survey from

https://think.ing.com/uploads/reports/IIS_New_Tech_Cryptocurrencies_report_18092019.pdf

The Organisation for Economic Co-operation and Development 2019 Cryptoassets report[33] of three Asian nations (Vietnam, Malaysia, and Philippines) show that crypto awareness is high at 80%

Sample: Main sample, no booster.
Question: Which of the following statements applies to you? "I have heard of digital or cryptocurrencies such as Bitcoin or Ethereum".

Though awareness is high, only 30% of the nations surveyed owned cryptocurrencies.

Cryptocurrency Ownership	Total	Malaysia	Philippines	Viet Nam
Currently holds	30%	23%	32%	35%
Does not hold	70%	77%	68%	65%
Base	3006	1000	1003	1003

Sample: Main sample, no booster.
Question: Which of the following statements applies to you? "I currently hold digital or cryptocurrencies (such as Bitcoin or Ethereum)".

In South Korea, the Ministry of Education is teaching children how to earn cryptocurrency and list them on national cryptocurrency exchanges[34]

Asia education, Latin America, include global; results of GBA survey.

[32] https://www.prnewswire.com/news-releases/bitcoin-ownership-survey-reveals-5-3-of-uk-citizens-own-bitcoin-while-6-8-are-planning-to-buy-some-300947977.html
[33] https://www.oecd.org/countries/philippines/2019-cryptoassets-in-asia.pdf
[34] https://cryptonews.com/news/is-the-south-korean-government-teaching-children-how-to-use-6035.htm

4.2 Present

The 2020 pandemic ushered in many new challenges and exposed growing fissures of the current global economic system. Governing bodies, academia and the public have taken noticed and have proceeded to present ways to offer positive change.

U.S. Lawmakers Reintroduce the 'Digital Dollar'.
April 2020, US Lawmakers have reintroduced the 'Digital Dollar' into the latest Stimulus Bill. Congresswomen Rashida Tlaib (D-Mich.) and Pramila Jayapal (D-Wash.) introduced a new proposal to have the federal government issue $2,000 per month to residents by minting a pair of $1 trillion coins and using these to back the payments. The Automatic BOOST to Communities Act (ABC Act) also brings back the idea of a digital dollar, describing the concept using similar language to a series of bills introduced last month.

Under the ABC Act, Congress would authorize the Federal Reserve to create "FedAccounts," meaning "Digital Dollar Account Wallets," which would allow U.S. residents, citizens and businesses located in the country to access financial services.

Digital Dollar

The digital dollar has been the talk of the crypto world during the final week of March 2020. Drafts of the COVID-19 stimulus bill first included and then discarded the creation of digital dollar wallets; a digital distribution method that would enable direct aid to citizens.

While the proposed digital dollar lives on in at least one bill sponsored by Senator Sherrod Brown (D-OH), a United States central bank digital currency (CBDC) seems like it will have to wait for now. [1]

"The United States has to proceed thoughtfully, intelligently, deliberately. We advocate pilot programs to explore the utilization of the digital dollar and how it can be used, including how it can be used in a crisis. But I think one needs to be very cautious about trying to launch something as big as this amidst a crisis." founder of the Digital Dollar Project, former CFTC Chair Giancarlo[1]

Crypto-Currency Act of 2020
On March 9, 2020, Representative Paul Gosar (R-AZ) introduced the "Crypto-Currency Act of 2020," a bill that looks to designate a wide range of digital assets to the appropriate regulator.
The bill hopes to provide clarity and legitimacy to crypto assets in the United States. Gosar's proposal divides digital assets into three categories: crypto-commodity, crypto-currency and crypto security.

The three categories would be governed by the Commodity Futures Trading Commission (CFTC), the Secretary of the Treasury via the Financial Crimes Enforcement Network (FinCEN), and the Securities and Exchange Commission (SEC).

Token Taxonomy Act
In April of 2019, American congressmen, Reps. Warren Davidson (R) and Darren Soto (D), reintroduced the Token Taxonomy Act that would exclude crypto from being classified as a

security. The bill seeks to exclude digital currencies from being defined as securities by amending the Securities Act of 1933 and the Securities Act of 1934. The act also pursues the introduction of regulatory certainty for businesses and regulators in the U.S. blockchain industry, as well as clarifying conflicting state initiatives and regulatory rulings that have confused the issue.

Statements made about cryptocurrency from federal entities concern how people must report their profits (capital gains to the IRS), and how they're taxed (as property).
Europe is a more complex place for cryptocurrency. Unlike the inattentive stance taken by the US, Europe came out of the 2008 economic crisis more focused than ever, and quickly built laws and regulatory bodies to guide the young fintech industry on its upwards trajectory. In recent years, fintech has increasingly meant "blockchain", and thankfully there are already many laws designed to encourage its growth.

The European Retail Payment Landscape
In a December [35]2019 statement, the European Central Bank (ECB) stressed the need for a digital currency so that the public can continue to use central bank money in the case physical money continues to decline. The ECB stated that if "industry innovations falls short", resulting in the ECB issuing a central bank digital currency (CDBC).

Digital Euro in Large Value Payment and Settlements
The Banque de France issued a document calling for information on a central bank digital currency (CDBC) for use in various payment scenarios including retail, large value, and settlement payments.

Asia Early to Embrace Cryptocurrency
Asia has always been ahead of the game when it comes to crypto and digital currency. The top five cryptocurrency exchanges are in Asia[36].

Bank of Korea's 22-month CBDC Pilot
In 2020, the Bank of Korea launched a 22-month pilot program[37] to research the viability of a national digital currency. The project will include requirements, design, and implementation of a

Digital Euro

In November 2019, the Global Blockchain Congress took place in Malaga, Spain where a European Central Bank (ECB) official confirmed its work on a digital Euro. The bank has explored it as both a retail and wholesale central bank digital currency (CBDC) and noted it has experimented with blockchain.

A high-level task force is currently examining the pros and cons of introducing a digital currency, which could be used by intermediaries or even by citizens through their electronic devices (such as smartphones or tablets) for their day-to-day spending needs.

The Association of German Banks published its position on digital currency, saying a 'crypto-based digital Euro' should be launched. The banks believe that they, and other European entities, have the means to build and support the use of a digital Euro. But they need institutional backing first.

[35] https://www.ecb.europa.eu/pub/pdf/other/ecb.other191204~f6a84c14a7.en.pdf
[36] https://coinmarketcap.com/rankings/exchanges/
[37] https://cointelegraph.com/news/south-koreas-central-bank-launches-digital-currency-pilot-program

Korean CBDC. The Bank has not confirmed a release of a Korean CDBC and has stated that this exercise is for research only "just in case market conditions at home or abroad change rapidly."

4.3 Future

The future has laid out many avenues as the world progresses from the 1990 fiber and server laced internet frameworks, brick and mortar regulations, and patchwork policies. To a decentralized, cryptographically secured value of exchange where regulations and policies sprint to embrace or control a new international value of exchange framework.

Satoshi Nakamoto's seminal whitepaper combined existing cryptography, consensus, and mechanism design methods to create a new kind of science that gave the world the Bitcoin network. Since 2008, Satoshi's new science has progressed digital identity tools, created new types of digital wallets, established programmable money methods, and pushed blockchain technologies to new heights which are becoming the foundation for a new global financial system.

4.3.1 Digital Identity and Wallets

Proving your identity and properly securing transactions has been the staple for online banking, e-commerce, government interaction and healthcare for years now. Digital identity is not a digitized version of your name and password or social security number for a banking website. Digital identity is an anonymous verification tool that protects privacy by replacing sensitive information with non-sensitive elements through a process called tokenization. Essentially, once your identity is tokenized, it can be use with multiple wallets and devices.

Just like digital identity tokens, digital wallets are cross-platform and can be used across many different devices. The ability to use digital identity with digital wallets opens many opportunities to advance convenience and adoption and help with KYC/AML/CFT rules. Most importantly, digital identity and digitals wallets returns control of identity information back to the person and provides a way to control their information without a centralized middleman.

Note: Distinct on wallets for KYC-Exchange.

4.3.2 Programmable Money and Digital Assets

Before Bitcoin there was no mechanism to relate something in the physical world to something in the digital world. Bitcoin allows for real money to

Ethereum

Ethereum is considered the world's computer and is the largest, most well-established, open-ended decentralized software platform. Ethereum utilizes the Bitcoin blockchain technology not only for maintaining a decentralized payment network but also for storing computer code (smart contracts) which can be used to power tamper-proof decentralized financial contracts and applications.

Ether, Ethereum's native token, is used mainly for two purposes—it is traded as a digital currency on exchanges in the same fashion as other cryptocurrencies, and it is used on the Ethereum network to run decentralized applications (Dapps) without any downtime, fraud, control or interference from a third party.

be represented by something digital called a token. Often referred to as "programmable money" because in the blockchain world you can program the way your money works and based on circumstances it can be sold, traded, transferred, changed into another format and even enable an action in the physical world. For example, you can program a token to be transferred to a digital wallet implanted in solar cell to on electricity for a family in Africa[38]. This is not possible with the traditional financial system because of the existing banking infrastructure, international laws, and how slow traditional methods of getting services to remote locations are.

Bitcoin has given new life to the term *digital assets*. Traditionally digital assets included any physical medium that was converted to digital, e.g. video, music, documents, etc. The programmability part of Bitcoin has enhanced digital assets to not only include the physical part but also include its attributes such as trade history, who owns the asset or is the asset authentic. Digital assets and their attributes are programmed into tokens with the number of tokens continuing to grow each year. These tokens are classified as a securitization of a real tradeable asset.

The ability to tokenize real world physical items provides greater liquidity and access to a broader audience due to a lower investment cost.

4.3.3 Distributed Ledger and Blockchain Technology

Blockchain is a type of distributed ledger technology but not all distributed ledgers are blockchains. There are some similarities between the two technologies. Both can offer consensus mechanisms, decentralization, and cryptographic tokens, but the biggest difference is public vs. private (permissionless vs. permissioned). Blockchains have the following characteristics that set them apart from distributed ledger, a) anyone can participate in the consensus mechanism, b) open for anyone to use, c) and anyone can be a validating node. Distributed ledgers limited the characteristics of a blockchain by limiting who can validate and participate in the network.

Though distributed ledger and blockchain technology have their differences, both technologies offer transparency, security, and privacy. The ability to view the history of transactions provide extreme possibility to lower the costs for KYC, AML and CFT. This is possible by enforcing rules using digital identity and wallets where rules can be applied through the setup portion of establishing a wallet. The technologies also offer the ability for constant verification and validation for auditors and supervisory practices which could lessen reporting burden on financial entities.

4.3.4 The New Paradigm (Digitizing Value Exchange)

The purpose of a financial system is to facilitate the exchange of value between economic areas with risk being shared among the participating individuals and groups.

[38] https://www.sciencedirect.com/science/article/pii/S1364032118307184

Existing technologies can be combined with monetary methods and regulations to provide a framework for a new global financial system. Such as system offers the possibility to remove financial exclusion barriers while protecting privacy and securing transactions.

Technology

Blockchain and distributed ledger technology provides the underlying network (decentralized, scalable) and transport layer (consensus, validation) for the exchange of value from wallets (digital identity, currency) to the physical and non-physical assets (programmable money, digital assets).

Monetary methods

Blockchain based cryptocurrencies have no inherent physical value but may be exchanged for a physical or non-physical asset, such as fiat currency, other cryptocurrency, cars, music, art, etc.

Tokens created by blockchain networks are defined based on programmable algorithms which have no intrinsic value. Like today's fiat currency, tokens exist only as data for balances or records of credit. Unlike fiat, tokens are never created as paper or coins. Tokens are created for many purposes such as utility fees or stake investments on a blockchain network.

Blockchains can create tokens as loans for customers much like a bank. Tokens that are loaned to costumers may be backed by stablecoins (fiat-pegged tokens) but the tokens will never be physically created like banks currently do. It is quite possible that banks could participate on a blockchain and lend tokens creating deposit for costumers. It is possible that a central bank will create and control a digital currency allowing the commercial banks to manage and lend the currency to costumers.

Regulations

Regulation is needed for a new global financial system to be fully implemented and adopted.

(Insert quantum computing side test box) could be traded time =$1,000 tokenized
Transparency and accountability (automation [smart contracts], APIs, ability to monitor BC)
KYC, AML, CFT less cost with DLT.

Private digital currency

Libra

Although Christine Lagarde, then head of the International Monetary Fund, first called on central banks to begin seriously exploring digital currencies in late 2018, interest in CBDCs only really increased following the Libra announcement last summer. Since then, the prospect of a private currency initiative has accelerated central bank research and development into digital currencies.[39]

Public digital currency

[39] https://www.coindesk.com/6-central-banks-form-digital-currency-use-case-working-group

Chinese Digital Yuan
4/15/2020 The Agricultural Bank of China (ABC), one of the nation's four state-owned banking giants, is trialing a test interface for the country's central bank digital currency (CBDC) [40] also known as 'e-RMB'.

Screenshots of an internal mobile application developed by the ABC, initially seen circulating on WeChat on Tuesday and later verified by CoinDesk, shows the banking giant has already developed a front-end interface of how users could potentially interact with China's CBDC – also known as digital currency and electronic payments (DCEP).

The move hints at the acceleration of the development and deployment work of rolling out the DC/EP.[41]

The testing application, which is also available for download on iOS and Android mobile devices via a site on ABC's domain, offers a peek into the features that will be offered through a DC/EP wallet, including paying via a QR code, receiving and sending payments and initiating transactions by touching another user's phone.[42]Digital currencies more likely adopted by governments than crypto currencies with tokens cryptoassets coming in close second.

City-based digital currencies
(stimulate local economies) – Programming values of the community

Interoperability (wallets, currency)

5 Government Impacts

5.1 Economic Impact

5.2 Revenue Collection and Disbursement

5.3 Debt Servicing

The Trump administration and Congress have enacted three separate coronavirus-relief packages at a total cost of more than $2 trillion.

The most recent legislation—the Coronavirus Aid, Relief, and Economic Security (CARES) Act—provides $1.8 trillion in direct aid to individuals and businesses, the largest stimulus package in U.S. history.

While $1.8 trillion is a huge sum of money, how does it rank in the context of other federal spending?

[40] https://www.coindesk.com/chinese-state-owned-bank-offers-test-interface-for-pboc-central-bank-digital-currency
[41] https://www.coindesk.com/chinese-state-owned-bank-offers-test-interface-for-pboc-central-bank-digital-currency
[42] https://www.coindesk.com/chinese-state-owned-bank-offers-test-interface-for-pboc-central-bank-digital-currency

In 2009, the U.S. found itself amid what at that time was its largest economic contraction in 80 years. During the "Great Recession," America's unemployment rate rose to 10%, and at one point, the stock market had lost nearly 50% of its value.

In response, Congress passed the American Recovery and Reinvestment Act of 2009, which injected $831 billion into the U.S. economy through tax cuts and spending programs.

The CARES Act, which passed in March, is more than twice the size of the American Recovery and Reinvestment Act, dwarfing what was previously the country's largest stimulus package since World War II.[43]

5.4 Money Supply

Monetarism is an economic theory that says the money supply is the most important driver of economic growth. As the money supply increases, people demand more. Factories produce more, creating new jobs.

Monetarists (believers of the monetarism theory) warn that increasing the money supply only provides a temporary boost to economic growth and job creation. Over the long run, increasing the money supply increases inflation. As demand outstrips supply, prices will rise to match. [44]

The New York Times, April 2020, The United States has responded to the economic havoc wrought by the coronavirus with the biggest relief package in its history: $2 trillion. It essentially replaces a few months of American economic activity with a flood of government money — every penny of it borrowed.

And where is all that cash coming from? Mostly out of thin air.[45]

"the U.S. government has committed more than $6 trillion to arrest the economic downturn from the pandemic". [46]

-The Washington Post

USA Today, May 13, states: The Federal Reserve is creating dollars from scratch at an unprecedented rate, one of many tools to rescue the economy amid the coronavirus pandemic.

the central bank of the United States seems to have the ultimate superpower.

It works like magic. With a few strokes on a computer, the Federal Reserve can create dollars out of nothing, virtually "printing" money and injecting it into the commercial banking system, much like an electronic deposit. By the end of the year, the Fed is projected to have purchased $3.5 trillion in government securities with these newly created dollars, one of many tools it is

[43] https://www.heritage.org/budget-and-spending/commentary/how-big-the-covid-19-cares-act-relief-bill
[44] https://www.thebalance.com/monetarism-and-how-it-works-3305866
[45] https://www.nytimes.com/2020/04/15/business/coronavirus-stimulus-money.html
[46] https://www.washingtonpost.com/business/2020/04/15/coronavirus-economy-6-trillion/

using to help prop up the ailing economy during the COVID-19 pandemic, according to Oxford Economics.[47]

The FED's bond purchases creates money to finance the gigantic debt run up by Congress.

dollars should come from work, savings and investment instead of thin air.

In the age of a nearly $25 trillion national debt, such "sound money" concepts seem outdated – the value of a dollar once was based on a fixed amount of gold.

"What we're working with now is fake money, a fake measuring rod," former Republican presidential candidate Ron Paul told USA TODAY. "It is unbelievable."[48]

"Creating too much money that chases too few goods also leads to price inflation, decreasing the purchasing power of the dollar." Ron Paul

5.5 Global Competitiveness

5.6 Law Enforcement

5.7 National Security

6 Recommendations

"The network is robust in its unstructured simplicity".

"A new financial system is being carefully planned unlike the existing financial system that evolved from crashes and banks runs."

Financial inclusion

6.1 Predictions

6.2 Tax Policy

[47] https://www.usatoday.com/in-depth/money/2020/05/12/coronavirushow-u-s-printing-dollars-save-economy-during-crisis-fed/3038117001/

[48] https://www.usatoday.com/in-depth/money/2020/05/12/coronavirushow-u-s-printing-dollars-save-economy-during-crisis-fed/3038117001/

7 Appendix A GQM Results

Goal: Governments & societies are not negatively impacted if cryptocurrency adoption continues to increase.

Question	Metrics
1. What is the rate of cryptocurrency adoption?	Number of wallet downloads by cryptocurrency over time Number of wallet types available to users over time Number of wallet vendors over time Number of cryptocurrency transactions over time Value of cryptocurrency transactions over time Market capitalization of the cryptocurrency economy
2. What is the rate of cryptocurrency ecosystem maturity?	Number of ATMs by country Number of vendors accepting cryptocurrency Number cryptocurrency lawyers and accountants How many institutional investors, insurers, and financial services Number of cryptocurrency exchanges by type (Regulated, unregulated, decentralized) Transactions by exchanges types over time
3. What is the likelihood that cryptocurrency will continue to be adopted?	Inflation rates of fiat and cryptocurrency What is the cryptocurrency volatility
4. How much do tax policies impact adoption?	What countries require reporting capital gains compared to crypto transactions in that country How many vendors accept crypto compared to capital gains tax requirement
5. What is the rate that cryptocurrencies will continue to be adopted?	
6. What will the impact of cryptocurrency adoption be from the following perspectives?	Currency strength by country
a. Revenue collection	
b. Revenue disbursement	

Question	Metrics
c. Servicing debt	
d. Economic visibility, monitoring, tracking, oversight, influence, and control	
e. Enforcing laws	
7. What is the threshold of cryptocurrency adoption before it negatively impacts governments?	
a. Revenue collection	
b. Revenue disbursement	
c. Servicing debt	
d. Economic visibility, monitoring, tracking, oversight, influence, and control	
e. Enforcing laws	
8. What is the likelihood that cryptocurrency adoption will reach a threshold to negatively impact governments?	
9. When is it estimated that cryptocurrency adoption will negatively impact nations and fiat currencies?	
10. What can be done to mitigate the risks of wide-scale cryptocurrency adoption?	
11. What contingencies should be prepared if the risk is realized?	

8 Appendix B: Data Collection Plan

9 Appendix C: Sources

Taxation sources

1. http://thinkblocktank.org/wp-content/uploads/2019/10/thinkBLOCKtank-Token-Regulation-Paper-v1.0.pdf
2. https://cryptoresearch.report/crypto-research/taxation-cryptocurrencies-europe/
3. https://cointelegraph.com/news/around-the-world-in-2019-a-landmark-year-for-crypto-taxation
4. https://medium.com/@mainfinex/comparing-crypto-taxation-regulations-worldwide-56ba106e1f24
5. https://hackernoon.com/from-0-to-55-a-brief-guide-to-cryptocurrency-taxation-around-the-world-f3953cd74e58
6. https://complyadvantage.com/blog/cryptocurrency-regulations-around-world/

10 Appendix D: Glossary

Decentralized Exchange	DEX	
Crypto Currency (Decentralized)		
Digital Currency (Centralized)		

11 Appendix E: Tokens

Security tokens [49]derive their value from an external, tradable asset. For example, stocks or real estate.

If you buy a tokenized version of a stock, you will acquire the same rights that you would get when you buy a stock via a traditional stockbroker — profit share and voting rights. The only difference is that a token comes in digital form.

The major distinction to utility tokens is that security tokens are designed to be investments. Thus, they fall under the same regulatory oversight as other investment products.

[49]https://invao.org/token-classes-explained-coin-vs-utility-token-vs-security-token/

If a company issues a security token, the process is not called ICO but STO (Security Token Offering). STOs need to be registered with the respective financial market authority. The additional regulatory oversight should add significantly to the safety of STOs and make them much less vulnerable to fraud and misuse.

INVAO's token represents a pool of selected blockchain assets. Thus, our token is clearly an investment and considered a security token. We raise funds via an STO, which is strictly regulated by the Liechtenstein financial market authority (FMA). We have decided to go for this model, because we want to offer our investors the highest level of safety and confidence in our product.

Utility[50]

Utility tokens are digital tokens that are used for a blockchain-based product or service. They run on a blockchain platform, or in other words, are part of a Blockchain Economy.

A utility token has a wider functionality than a coin. Utility tokens do have value, but they cannot be considered money as straightforward as a coin.

Utility tokens can provide value to investors in different ways. They give users access to a future product or service.

Typically, a tech startup develops a digital product or service and initiates an ICO (Initial Coin Offering). During the ICO, the company sells utility tokens. Investors can buy these tokens and use them as a means of payment on the platform developed by the issuing company.

An Uber token, for example, could be used to pay for a ride with a Uber car. But not for anything else. If you wanted to use the Uber token to buy another product or service, you would first have to exchange it against either fiat money or a crypto coin such as bitcoin.

Dapp token is a special utility token that is programmed to operate in a network to provide unique services to developers of distributed applications.

[50] https://invao.org/token-classes-explained-coin-vs-utility-token-vs-security-token/

12 Appendix F: Decentralized Exchanges

There are three types of decentralized exchanges (DEXs)[51]. They are

- On-chain orderbooks and settlements
- Off-chain orderbooks with on-chain settlement
- Smart contract-managed reserves

On-chain Orderbooks and Settlements

The architecture of the first generation of DEX's was entirely blockchain-based. Every new order or adjustment to an existing order updates the state of the blockchain. Despite protecting user privacy and security this method renders exchanges illiquid, slow, expensive, and inoperable with one another.

Off-chain Orderbooks with On-chain Settlement

The 0x protocol, built on Ethereum, introduced a solution in the form of off-chain order books. While the execution of trades occurs on the Ethereum blockchain, giving users control of their funds until the exchange takes place, the order books are hosted by third parties called Relayers.

These Relayers host and maintain order books and using the 0x architecture they can pool their liquidity together creating a more robust trading infrastructure. After submitting an order to the Relayer, a market maker waits for a taker to fill that order, at which point the trade is trustlessly executed on the blockchain.

Smart contract-managed reserves

In addition to the two main hurdles faced by centralized exchanges (they are prone to government intervention and hacking), this model of connecting buyers and sellers functions sub-optimally when there is low liquidity. This problem, introduced by William Jevons (1875), is known as the double coincidence of wants. He reasons that "the first difficulty in barter is to find two persons whose disposable possessions mutually suit each other's wants."

With smart contract-managed reserves, instead of having to find a buyer for the bitcoin, a user can trade with an external reserve, depositing bitcoin into the reserve and receiving ether in return. In the case of Bancor, an Israel-based project which raised $153 million

[51] https://medium.com/totle/decentralized-exchanges-three-types-that-will-be-essential-for-the-crypto-economy-91461b330f50

through an ICO in June 2017, the smart contract facilitating this trade utilizes a precise mathematical formula to control the exchange rate between the two tokens which is based on an agreed-upon Constant Reserve Ratio (CRR.)

For example, the ICO saw the release of the BNT token which was backed up 20 percent by Ethereum raised in the crowd-sale and held in reserves. Should a seller wish the liquidated BNT in exchange for ETH, he would do so into the smart contract and receive ETH in return whereas the BNT token would subsequently be burnt.

The exchange rate is:

$$Price = \frac{Balance}{Supply \times CRR}$$

The larger the proportion of a particular asset held in reserves, the higher the price.

By substituting smart contract-managed reserves for the process finding a seller, Bancor creates a decentralized exchange solution that can circumvent the double coincidence of wants, opening illiquid tokens for trade.

13 Appendix Z: Acknowledgements