CAN WE MAKE CRYPTOCURRENCY SAFER WITHOUT HURTING IT?

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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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A STUDY OF VARIOUS CRYPTOCURRENCY SPLIT AND FORK RESOLVING METHODS AND AN EXAMINATION OF CRYPTOCURRENCY REGULATIONS

Satoshi Nakamoto (2009) released the white paper for Bitcoin, outlining a virtual peer to peer version of currency known as cryptocurrency, which sought to eliminate the need for a trusted third party to handle financial payments (p. 1). Since, cryptocurrency has become a household topic, as Perkins (2020), a cryptocurrency policy expert in association with the United States Congress, notes due to recent events surrounding cryptocurrencies. This includes news about various currencies, including the aforementioned Bitcoin, Ethereum, and Litecoin, currencies drastically rising and dropping price, as well as more widespread usage of it (p. 9). According to Simmons (2021), a law doctoral candidate focusing on cryptocurrency regulation, "Cryptocurrency is a digital or virtual currency that uses cryptographical functionality to conduct financial transactions and leverages blockchain technology to achieve a trustless, decentralized, and immutable ledger of account" (p. 87). Cryptocurrency is a valuable technology, however due to the age of this technology, cryptocurrency and laws surrounding it need to be studied in order to verify it can thrive in the future.

The STS research project seeks to examine cryptocurrency regulations applied in select countries in order to see if they could be applied to a US framework. Cryptocurrency regulations will be explored by modeling the relationship between key stakeholders in cryptocurrency, and use will Actor Network Theory, a theory pioneered by Callon and Law (1987) to various groups interact in a network, to model how certain regulations would affect the technology. Using these relationships, it can be shown how applied regulations would help or hurt the technology, and therefore show whether or not they should be applied or reworked.

The technical report examines select cryptocurrencies to look at resolving splits and forks on the blockchain. According to Fralix (2020), a professor at Clemson University that researches Bitcoin:

> Each miner in the system has its own version of the blockchain, so it is possible for there to exist short intervals of time where the blockchain versions of miners disagree due to propagation delay, which corresponds to the amount of time it takes a miner to communicate the existence of new blocks to other miners in the system, as well as the amount of time it takes the other miners to verify and accept the new block into their respective versions of the blockchain (p.1).

These are known as splits, and alongside hard forks in cryptocurrency, cause a question on how the ledger should get updated. There are multiple implementations of how to resolve splits, such as in Bitcoin and Ethereum, which will be analyzed, as well as case studies in Bitcoin Cash and Bitcoin Classic on cryptocurrency hard forks (Nakamoto, 2009; Buterin, 2014; Bitcoin Cash, 2017; Bitcoin Classic Foundation, 2017).

Coupling the STS research paper with the technical report allows for a true understanding of cryptocurrency in society from both regulatory and technical frameworks. At the time of writing, cryptocurrency as a public concept is only 13 years old, so there is a lot to study in relation to it. This thesis portfolio aims to provide a thorough study in two major areas; regulation and in the technical aspects of both splits and forks. These studies could lead to refinements of cryptocurrency development and regulation to help truly understand the effects of this important technology. Understanding both the technical implementations of cryptocurrency and regulation of cryptocurrency could lead to broader studies, such as on the societal impact of cryptocurrency.

REGULATING CRYPTOCURRENCY IN ORDER TO IMPROVE THE USAGE AS A CURRENCY

THE CURRENT STATE OF CRYPTOCURRENCY REGULATION IN THE US

In the United States, cryptocurrency has some regulation, however while it is not very well defined, it mostly falls onto the Securities and Exchanges Commission (SEC) in order to regulate it. Notably, there is an ongoing court case that was filed toward the end of the Trump administration against Ripple Labs and their usage of cryptocurrency, alleging it violated the Securities Act of 1933 (Securities and Exchanges Commission against Ripple Labs Inc., 2020). A white-collar financial crime reporter for the Wall Street Journal Dave Michaels (2022) has noted that this court case has led to increased calls for regulations that are clearer than the current framework. However, it is important to note that the United States is not the only country to be faced with the task of regulating cryptocurrency, so a good way to start a regulatory framework is to look at other countries and see what they did.

REGULATORY FRAMEWORKS TO ANALYZE

The Law Library of Congress (2018) has outlined various cryptocurrency regulations around the globe implemented by various countries. An important note is that the most common regulations in countries are either not regulating cryptocurrency or outright banning it. The first framework has already been discussed as to why that is not effective, and banning a technology would not be effective in order to improve usage of it, so these regulations while popular, will not be considered. In order to capture a wide array of regulations, three countries have been selected due to their unique treatment of cryptocurrency: Canada, Switzerland, and Germany. It is important to note Germany is also under regulation imposed by the European Union (Law Library of Congress, 2018).

The Canadian regulatory framework, as per the Canadian government (2022) is that people are allowed to use cryptocurrency as a currency with anyone who accepts the currency, however, the Canadian government does not recognize it as legal tender, so one cannot use any cryptocurrencies to pay the government. It is important to note that any income made via digital currency is also subject to income tax, yet with this restriction on paying the government in cryptocurrency, one would need to convert it to the Canadian Dollar in order to pay taxes.

The Swiss Framework, as outlined by Dragan Zelic, a lawyer at the Geneva Bar, and Nenad Baros, a faculty member of economics at the University of Banja Luka (2018), the Canton Zug region of Switzerland has been particularly open to new financial technology, and has developed a regulatory framework that has allowed cryptocurrency to thrive. This is due to a combination of regulations that say cryptocurrency ownership is like owning property, and may be used within the confines of the law, as well as a low tax rate, which is an incentive for many cryptocurrencies and other financial technologies to go to this region of Switzerland. The last key aspect of the Swiss framework is that Canton Zug will accept payments in Bitcoin worth up to 200 francs to settle any debts, making this the one example of a government that will accept cryptocurrency payments.

Finally, the German regulations on cryptocurrency are unique from the previous two namely in how cryptocurrencies are treated. Michael Juenemann (2018), a lawyer who specializes in financial regulation, notes that cryptocurrencies like Bitcoin and Ethereum are considered to be financial instruments, and that they are subject to regulations of a financial instrument rather than that of a security. There do exist other coins that are treated as securities, since some cryptocurrencies have more investment like qualities than others, however Germany

did make an important decision to separate out the coins in order to make sure that coins that are used like money are treated as such, and not all thrown into an umbrella category.

DETERMINING HOW THESE REGULATIONS AFFECT KEY STAKEHOLDERS

A key step to determine whether or not a regulation is worthwhile to apply is to identify key stakeholders in cryptocurrency, and see how it affects them. Actor Network Theory (ANT) allows for a visualization of key stakeholders and relationships between them (Law and Callon, 1987). Figure 1 defines the key stakeholders in cryptocurrency: the government, investors, miners, and general users of cryptocurrency.

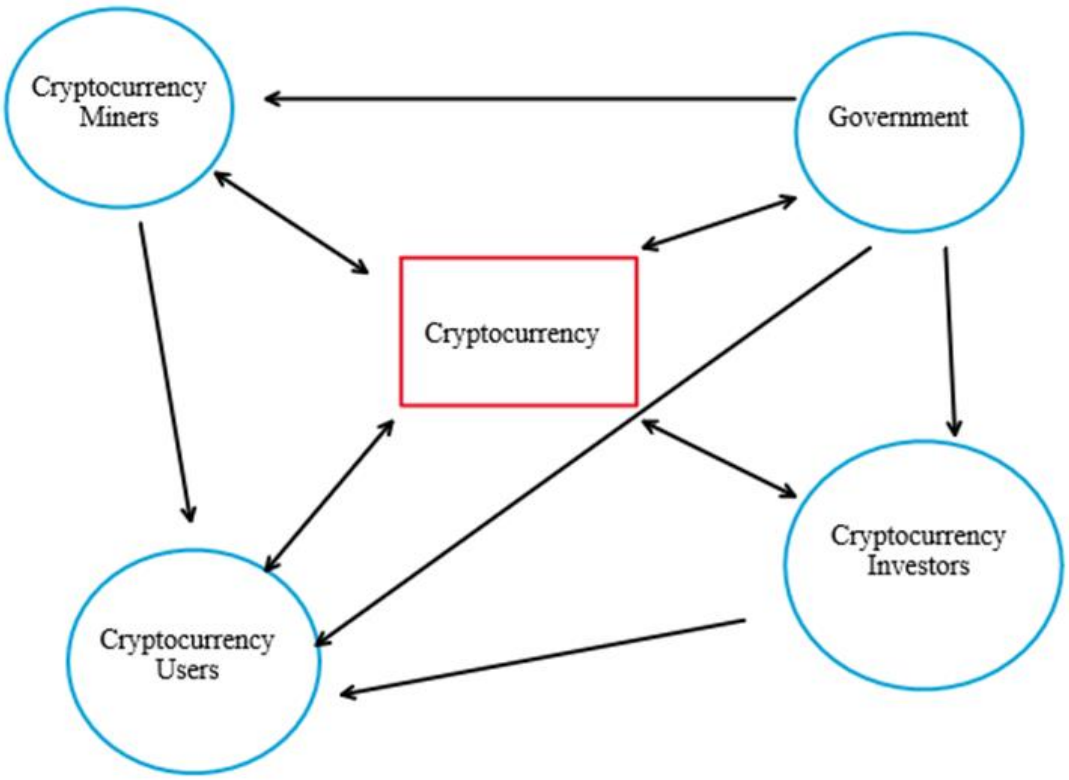

Figure 1: Cryptocurrency ANT model. This shows all the relationships between cryptocurrency, the government, users, miners, and investors (Gray, 2021)

These stakeholders were chosen carefully to show all aspects of cryptocurrency and its regulation. The government is shown to regulate investors, miners, and users individually, as noted by Andrew Hayes, a leading authority on financial

services regulation, “Owing to [cryptocurrency’s] decentralized nature they evade traditional forms of state regulation, lack a provider or issuer that could be held accountable, or a central database,” (2020, p. 249). Following this statement, regulation of cryptocurrencies, as can be seen in the previous regulations administered, cannot be applied directly to the currency itself, but to individuals. Investors are a key stakeholder due to the security-like nature of some cryptocurrencies, as users are important as a result of the currency-like nature of other cryptocurrencies. Miners are important as in all cryptocurrencies, namely defined in the Bitcoin and Ethereum white papers, as they are the ones who legitimize transactions by essentially being record keepers of every transaction that has occurred on the blockchain (Nakamoto, 2009; Buterin, 2014).

MEASURING SUCCESS OF CERTAIN REGULATIONS

The task of regulating cryptocurrency is a new one, so unsurprisingly there is little research done on effectiveness of cryptocurrency regulations. To that end, there will be one metric used in order to determine the effectiveness of cryptocurrency regulation: the size of the user base. The user base is important to the other actors for a variety of reasons. For users, it is important to have a user base to use cryptocurrency with, the same way it is useful to have others to use money with. For investors, a sharply declining user base would lead to a smaller value in cryptocurrency, the same way that if nobody owns stocks in a company, the stock value plummets. Miners need a strong user base due to the fact that the calculations they need to perform become much harder without any transactions, as defined in the Bitcoin and Ethereum white papers (Nakamoto, 2009; Buterin, 2014). If the user base were to decrease, governments who have applied taxes on cryptocurrencies would lose out on potential revenue gained from those taxes.

With an important metric defined and defended, it is now time to analyze the chosen case studies. Data on the number of users comes from Raynor de Best (2021), a researcher focusing on Financial technologies such as cryptocurrencies. All of the countries had cryptocurrency regulation implemented by 2018, as noted by the Law Library of Congress (2018), and the data analyzed will be spanning from 2019 until 2021. The graph in Figure 2 below shows the number of reported users over time.

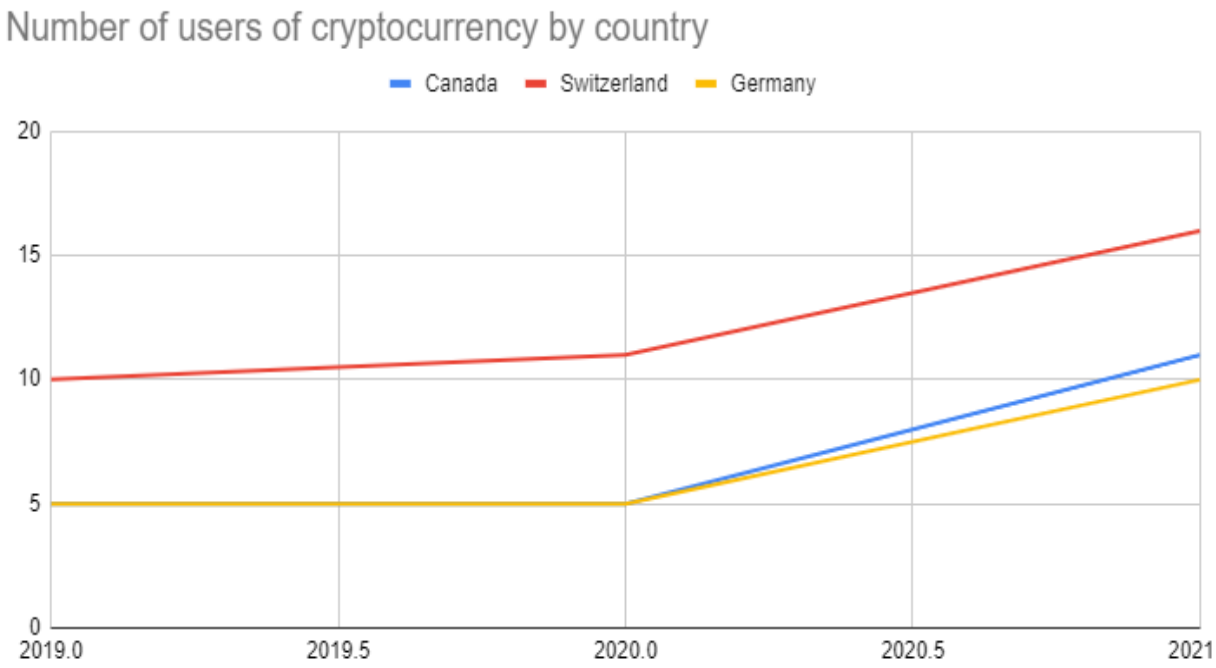

Figure 2: Number of users of cryptocurrency over time. This graph was adapted with data from Raymond de Best (2021) on what percentage of people in Canada, Switzerland, and Germany reported using cryptocurrency between 2019 and 2021 (Gray, 2022).

As seen in the Figure 2 on page 7, all three countries saw an increase in the number of users over the span of two years. According to Best (2021), Canada saw an increase from 5% to 11% of the country self-reporting use of cryptocurrency, Switzerland saw an increase from 10% to 16%, and Germany saw an increase from 5% to 10% (p. 1). As discussed, this would be beneficial to all actors, as the government would see more tax revenue, the miners would have an easier time performing calculations, the investors would have more confidence in that investment, and users would have others to use the technology with.

OUTCOMES AND FUTURE WORK IN CRYPTOCURRENCY REGULATION

Analyzing the data from Figure 2 on page 7, it can be concluded that indeed there can be cryptocurrency regulations that do not hurt the technology. The Swiss regulations in particular appear to be the most effective at drawing in users to their country, as by 2021, as much as 16% percent of their country had used cryptocurrency within that year (Best, 2021).

The results of this research paper have implications on the future of cryptocurrency regulation. This is by no means a final measure on what is a good regulation or a bad one, but it is a starting point. The Actor Network model used is encompassing the major stakeholders in this technology, so any regulation should at least consider all actors in the model to make sure the key individuals in cryptocurrency are considered. The user base statistics studied is a good starting point given the limited data available. To suggest other metrics that would be used by people who have access to the data mentioned are cryptocurrency tax data, to focus on the government actor, data on the impact of specific regulations, and how the price of cryptocurrency is affected by regulations, given that they do not fluctuate as much as noted in the graph in Figure 3 on page 9. If any measures were to be implemented in the US, further studies

would be crucial to see how they fare and if there are any significant differences due to the legal framework in the US.

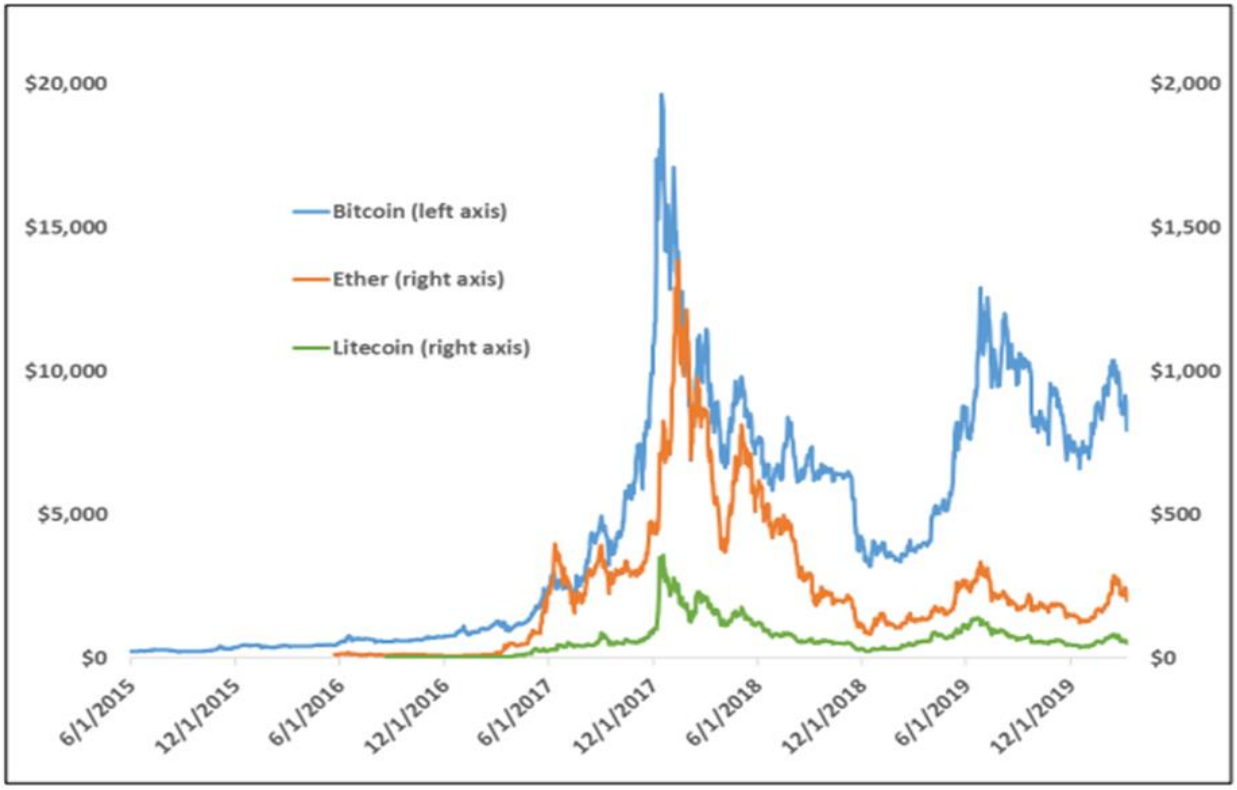

Figure 3: The price of Bitcoin, Ethereum, and Litecoin between June 1st 2015 and January 1st 2020. This graph illustrates the volatility of the cryptocurrency market, notably the spike in 2017 followed by a crash. (Perkins)

Due to the relatively young age of cryptocurrency regulation, there is a lot of further research that can be done, especially with recent news about unique regulations. A major example of cryptocurrency regulation that should be studied comes out of El Salvador. As reported by Sophie Kiderlin (2021), a reporter for Reuters, El Salvador had adopted Bitcoin as a form of legal tender on the same level of the US dollar, meaning that every store in the country must accept Bitcoin, however it will be converted into the US dollar immediately after payment. This regulation is fresh, and will be important to determine if adoption as a currency by a

government will be viable or if it needs to be an unofficial currency only used by people, not by governments.

Other work that can be done in regulation is in criminal regulation on cryptocurrency. Financial regulation, while important, does not paint the entire picture of what can be regulated with cryptocurrency. As pointed out by former Securities and Exchanges Commission chairman Jay Clayton and former Undersecretary to the Treasury Brent McIntosh (2021), cryptocurrencies are also a preferred method of payments for hackers, showing the potential dangers associated with them.

Overall, the regulations analyzed by this work are good regulations that do not hinder the cryptocurrency. They assure that usage is not hurt, and that has been discussed as a primary factor in what could hurt the future of cryptocurrency. There is more work that needs to be done to assure that future financial regulations proposed are good, however, with a proper analysis on the right actors, it is more sure that the right regulations to implement will be clear.

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