

The Role of Economic Policy Uncertainty and Volatility on the Adoption Process of Cryptocurrencies

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Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Economics

Eastern Mediterranean University
September 2022
Gazimağusa, North Cyprus

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ABSTRACT

Theoretical perspective has focused on the cryptocurrency adoption from more of a qualitative approach or from an infrastructural perspective. Therefore, the dismissal of the importance of quantitatively measuring the cryptocurrency adoption to be able to analyse and comprehend how this process is affected, has been limited in that sense. This paper has tried to come up with a solution to this problem as well as to inspect the extent to which economic policy uncertainty, financial development in United States and volatility affects this process. The quantification of this process was ensured by utilising principal component analysis to come up with what this study refers to as “cryptocurrency adoption index”. This enabled a methodological approach to use Ordinary Least Squares as the estimation method for the linear regression equations which was then accompanied with the Quantile Regression analysis for a profounder investigation of the relationship between economic policy uncertainty and the cryptocurrency adoption. The results of this study indicate the existence of a significant positive relationship between cryptocurrency adoption and global economic policy uncertainty. The positive relationship between United States’ financial development and cryptocurrency adoption have also been observed and possible inflationary pressures in United States also signified to be affecting cryptocurrency adoption positively.

Keywords: cryptocurrency adoption index, economic policy uncertainty, financial development, volatility, VIX, principal component analysis.

ÖZ

Teorik perspektif, daha çok nitel bir yaklaşımdan veya altyapı perspektifinden kripto paraların benimsenmesine odaklanmıştır. Bu nedenle, kripto para benimseme sürecinin nasıl etkilendiğini analiz edebilmek ve kavrayabilmek için kripto paraların benimsenmesini nicel olarak ölçmenin öneminin göz ardı edilmesi, bu anlamda çoğu araştırmanın sınırlı kalmasına sebep olmuştur. Bu makale, bu soruna nicel bir ölçümle çözüm getirmeyi denemesinin yanı sıra, ekonomik politika belirsizliğinin, Birleşik Devletler’ in finansal gelişmişliğinin ve volatilitenin bu süreci ne ölçüde etkilediğini incelemeye çalışmıştır. Bu sürecin nicelleştirilmesi, bu çalışmanın “kripto para benimseme endeksi” olarak adlandırdığı endeksi ortaya çıkarmak için temel bileşen analizi kullanılarak sağlandı. Bu, doğrusal regresyon denklemleri için tahmin yöntemi olarak En Küçük Kareler yöntemini kullanmak için metodolojik bir yaklaşımı mümkün kıldı ve buna daha sonra ekonomik politika belirsizliği ile kripto para benimsenmesi arasındaki ilişkinin daha derin bir araştırması için Kantil Regresyon analizi eşlik etti. Bu çalışmanın sonuçları, kripto para benimsenmesi ile küresel ekonomik politika belirsizliği arasında anlamlı bir pozitif ilişkinin varlığını göstermektedir. Birleşik Devletler’ deki finansal gelişmişlik ve kripto paranın benimsenmesi arasındaki pozitif ilişki de gözlemlendi ve olası enflasyonist baskıların kripto paraları benimsemeyi olumlu yönde etkilediği gözlemlenmiştir.

Anahtar Kelimeler: kripto para benimseme endeksi, ekonomik politika belirsizliği, finansal gelişmişlik, volatilité, VIX, temel bileşen analizi.

DEDICATION

To My Family & Future Me

ACKNOWLEDGEMENT

I would like to express my utmost gratitude to Prof. Dr. Hasan. Güngör for his never-ending support, supervision and guidance throughout this thesis. From the very early stages till the end, his guidance has shown me the way in the dark. Being able to experience working under his supervision can't be expressed with enough words. I am indebted to him more than he knows.

Without Dr. Hüseyin Özdemir, this thesis wouldn't be possible. I can't express how grateful I am to him about his never-ending support and guidance.

I would like to record my gratitude to Prof. Dr. Mustafa İsmihan for guiding me during my studies until I have reached to the point of writing my thesis. His love and effort in passing hard earned knowledge can't and will not be forgotten.

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Chapter 1

INTRODUCTION

Since Nakamoto (2008) and Buterin (2014) have published whitepapers on Bitcoin and Ethereum, they shook the world from its technological roots. There has been a wild debate going on whether cryptocurrencies are actual currencies or just speculative investments in their essence (Ciaian et al., 2016; Yermack, 2015). Debates even go as far as to claim cryptocurrencies are nothing but a scam and their values will eventually become zero. The heated arguments have often neglected on the technology that cryptocurrencies rely on and the possible technological implications of these technologies as well as their importance to our daily lives and the processes. Through only comprehending the very technology that is provided, we can then understand cryptocurrencies. Just like any other habit, it takes time for people to get used to any advancements in technological state and innovation. To what extent cryptocurrencies are actually used for their technological essence will enlighten the debates revolving around the very nature of cryptocurrencies and their technologies. The very reason why these technologies try to innovate existing payment methods as well as related technologies into decentralisation as an alternative to already existing centralised methods is at the center of debate on governance methods and the notion of privacy. The search of decentralisation signals for the outcry in our search for an alternative to the very institutions we humans have created. Cryptocurrencies are debated to be inflation hedgers as well as a reliable way to run away from governments supposedly unreliable monetaristic regimes and the economic policy uncertainty that various

factors contribute into. This paper tries to measure cryptocurrency adoption by separating it from the price information and using high frequency data using on-chain data to overcome the problems of measuring adoption to understand how global economic policy uncertainty affects our usage of cryptocurrencies and their technologies.

Chapter 2

LITERATURE REVIEW

2.1 Adoption

The vast majority of the literature focuses either on the social and institutional factors (Angelis & Silva, 2019; Sobhanifard & Sadatfarizani, 2019; Fujiki, 2020), the infrastructure shifts and expansions on the cryptocurrency realm (Saiedi et al., 2021), the intrinsic value and the measurement of an if existent value through the use of network via different models of valuation (García-Monleón et al., 2021; Sockin & Xiong, 2020) and lastly, regulatory arguments (Schaupp & Festa, 2018) when it comes to discuss on the nature of cryptocurrencies and its adoption (AlShamsi et al., 2022). Chainalysis (2021) have released its own crypto adoption index in 2021 in a report which takes into consideration various factors and ranks countries accordingly in a quarterly fashion then adds the index numbers of all countries to come up with a global index for cryptocurrency adoption. This is merely an academic work and hasn't been tested and published in academic platforms. Yet, it must be recognised that apart from ("The 2021 Geography of Cryptocurrency Report," 2021) by Chainalysis there hasn't been much effort to quantify adoption in a similar manner by academicians. The closest work is the work of Saiedi et al. (2021) which researches the global drivers of crypto adoption but still there is not an index or a quantifiable measurement that is widely recognised and used to the knowledge of this paper.

Adoption and how we must approach to adoption relies on our vision on the nature of cryptocurrencies and its technologies as well as the if existent intrinsic value they might possess. In order to be able to understand if any intrinsic value of cryptocurrencies exist, the basis of our perspective should launch from a ground of a naturalistic vision. In other words, the nature of cryptocurrencies should be discussed and defined as the definition of cryptocurrency this paper embraces will or might change the perspective to which we approach the concept of adoption and intrinsic value of such technology. Hence, we accept the work of García-Monleón et al. (2020) on defining cryptocurrencies categorically. García-Monleón et al. (2020) defines cryptocurrencies in three categories according to their technological nature:

2.1.1 ICO (Initial coin offering)

Initial coin offerings shouldn't be perceived so different than initial public offerings as García-Monleón et al. (2020) argues. Initial coin offerings are a way to raise capital through the release of tokens and more than often have the full intention to fund specific projects (Momtaz, 2020). Whether it is a pre-existing company trying to fund a specific project or a start-up trying to raise capital, the use of ICOs depending on the agreement during the issuance, grants its holders certain rights to transmission as well as autonomy in cases which are able. ICOs aren't limited to this, they could also be used in exchange for the goods and services which the project offers (Catalini & Gans, 2018). Therefore, it can be argued that ICOs have intrinsic value in a sense due to the fact in which the goods and services the ICO is converted or exchanged for will have intrinsic value to its holder (Meyer & Hudon, 2019).

2.1.2 Single-layered block chain cryptocurrencies

Quite contrary to ICOs, single layer block chain cryptocurrencies can't be converted or exchanged for goods and services. The user's trust is the only backing power this type of cryptocurrencies have (García-Monleón et al., 2020). Apart from using these coins for transfer, the single layer block chain network can't transfer any other form of information without changing the structure it very survives on. Therefore, Ciaian et al. (2016) argues on the absence of any intrinsic value for these types of cryptocurrencies. This type of cryptocurrencies is at the center of the arguments revolving around the nature of cryptocurrencies. Cryptocurrencies like Bitcoin and Bitcoin Cash fall into this category. This could clarify the argument why the Bitcoin is heavily discussed on its nature. Some scholars like Yermack (2015) argue that Bitcoin behaves more like a speculative investment rather than a form of currency. Yet, this topic is heavily debated among scholars as some authors have an opposing opinion on the nature of these kinds of cryptocurrencies. The opposing argument states that these cryptocurrencies have a store of value and these arguments go beyond this notion to indicate, a potential role for single layer block chain cryptocurrencies like Bitcoin to act as a global currency (García-Monleón et al., 2020).

Yet, as Metcalfe's Law states (García-Monleón et al., 2020) information transfer networks have value embedded in its nodes. The essence of value for information transfer networks, according to Metcalfe's Law, rely on the utility these networks provide. As a result, García-Monleón et al. (2020) uses this concept to argue the intrinsic value of single layer block chain cryptocurrencies exist. This paper adopts this perspective that the value of a node beholds intrinsic value of information networks of this sort.

2.1.3 Multi-layered block chain cryptocurrencies

As the name indicates, multiple layer block chain cryptocurrencies consist of multiple layers. Cryptocurrencies that rely on this network can operate transaction like the other types while also being able to circulate various forms of information (García-Monleón et al., 2020). The underlying technological aspects of this type of cryptocurrencies allow them to provide immense number of functionalities, be it intellectual property (Non-Fungible Tokens or NFTs for short, could be a good example for this case), micropayments, physical and financial assets, storage systems and many more. This might be one of the most important factors of difference between Bitcoin and Ethereum in a technological sense. Ethereum functions like a platform where other projects can link to its layers and developed a multi layered projects of their own. The base layer that Ethereum provides can be used for different technological purposes depending on the project that is being created and its purpose (García-Monleón et al., 2020). The fact that, Bitcoin have been the first and the most dominant cryptocurrency in the market caused it to be at the centre of arguments. Due to this centric approach of many articles on Bitcoin, it can be argued the multiple layer block chain technologies and its nature have often been overlooked as a result.

To sum up, the new utilities that can be embedded to multiple layer block chain cryptocurrencies increases the value of the network and the nodes it relies on. Therefore, accepting the existence of intrinsic value of single layer block chain cryptocurrencies, the same argument applies to multiple layer block chain cryptocurrencies. An intrinsic value of the sort that Metcalfe's Law states, then exists in this type of cryptocurrency.

For this paper the intrinsic value of cryptocurrencies exists as stated by the prior arguments of Metcalfe's law explains. The point is that cryptocurrencies have a distinct intrinsic value of their own due to the fact that they play the role of exchange for goods and services as well as the fact that the technology they surely depend provides a value of its own depending on the cryptocurrency type argued upon. There is a philosophical and political sense to this argument which is sometimes neglected. The existence of Decentralised Autonomous Organisations (DAOs), provide an alternative way to govern and manage organisations. The way in which an organisation is ruled alters regarding to the protocol it adopts. The protocol is defined in a way where all parties involved need to trust the code and sourcing data in which the protocol trusts on. Hence, the trust is into technology rather than an institution run by the people. The protocol works seamlessly according to the code that ensures organisation is ruled autonomously, hence the name "autonomous" defines this nature of such organisations (Hsieh, 2018). Consequently, understanding the intrinsic value of such technologies and their nature in which they operate is very important for understanding adoption because it is a deciding factor in which this paper chooses to define what we actually mean by adoption and how we attempt to measure it comparably to the notion of economic uncertainty. Why then DAOs are important to understanding both the adoption and uncertainty argument? DAOs are alternative ways to govern, alternative ways to rule digital and possibly offline societies, at least some people believe this way since they deem DAOs as a means to solve the agency problem (Hsieh et al., 2018).

Therefore, users who might use cryptocurrencies for the goods and services it provides might be actually accompanied with people who might see it as an alternative way to govern. We should remember the believers in cryptocurrencies who also tend to defend the position of cryptocurrencies as the future of all currencies and its role as a global currency.

The ongoing argument about whether cryptocurrencies have intrinsic value or not, or if they are speculative investments or global currencies is very complicated and there is no consensus on this matter. Nevertheless, it is vital that it is clear this paper accepts both sides of the argument in a sense. We believe arguments on cryptocurrencies playing the role of speculative investment is right as well as the argument cryptocurrencies having intrinsic value and that people are using them for the sake of technological benefits they provide, as well as the people who believe it will be a global currency one day or an alternative way to govern. When it comes to believing in something and using goods and services, different people usually possess different beliefs and people use different things for different and possibly multiple purposes. Therefore, arguing that only one set of people are the user base for cryptocurrencies, in the firm belief of this paper, is unrealistic hence why we accept all of the stated opinions about cryptocurrencies according to the evidence that is present in the works of others.

Respectively, in the framework for adoption this is quite crucial as it raises the question. If we accept to involve Bitcoins' and other cryptocurrencies' price information for measuring adoption, could we be involving fluctuating speculative behaviour of sorts into our measure? Should the amount to which we try to quantize adoption include price information of any cryptocurrency considering that they are

quite volatile? Maybe the most important of all, does the increased number of speculative investments also indicate a higher adoption? To be able to clear this blurring water of questions one must simply answer the following question: How do we define adoption?

From a social outlook, we can deduct that adoption can be defined by the desire and the ability to which people will use a certain thing (cryptocurrencies in this case) in a manner that doesn't feel alienated to them. Yet, measuring this is quite unlikely as the definition is blurry. Does the daily use of something is required for it to be defined as adopted? The cryptocurrencies are used daily to an extent to which it plays the role of a legal tender and is used as a form of exchange in certain economies.

Important aspects of adoption from the perspective of this paper dwell upon two factors: the number of people who use cryptocurrencies daily, this concept includes people who are using cryptocurrencies for its exchange value and institutions which also make use of the cryptocurrencies for its store of value as well as the technological benefits it stores intrinsically. Secondly, long term users and believers of the technology, this might mean people might not be using cryptocurrencies daily but they are slowly increasing their holding amounts of cryptocurrencies because of alter belief that cryptocurrencies might be the future, or at least might play a vital role in the future.

In addition to our understanding of adoption, speculative investors from our perspective don't count as a part of adoption because they are not using the cryptocurrency either for its technology, or what it might politically represent or for its store of value. The reason why is that, these investors are simply trying to make money and they are using cryptocurrencies as a tool for that. Which means

cryptocurrencies for them are not different than any other form of investment that could bring money to the table. They don't distinguish cryptocurrency simply because they believe to its value as a technology. This is why we desire to exclude speculative side of cryptocurrencies out of the conversation of adoption.

The cryptocurrency market present to have highly volatile prices as well, this might be of various reasons but the vital part here is that including cryptocurrency price information in measuring adoption we believe is problematic due to the reasons we have touched on (Cheah & Fry, 2015). Measuring adoption should simply discover, as this paper argues, the population which is using cryptocurrencies for the intrinsic values which it beholds as argued above.

2.2 Uncertainty

The times of political and economic crisis bring the times of uncertainty with them. The concerns surrounding policy implications rise bringing an uncertain outlook into the future. If and how uncertainty affects the functioning of the economy aids us into humouring the paths into which economists and policy makers should follow.

Investment's role in economy shouldn't be underestimated. Works of scholars like Kang et al. (2014) suggests that economic policy uncertainty affects investments negatively both over the long and short run depending on the uncertainty measure that is being used. This indicates the impact of uncertainty through macroeconomic channels as firm investment decisions are well affected. On top of that, investment isn't the only factor that takes the toll from shocks and waves of uncertainty. The consumption is also affected by this phenomenon. Wu & Zhao (2022) on their work discuss the details the which Chinese household consumption is negatively affected

by the economic policy uncertainty. The results indicate a negative correlation showing a persistent relationship between the two variables. Another study also approves the findings of these studies indirectly through looking at the same problem from a different perspective. Li & Wei (2022) analysing the effects of economic policy uncertainty on the government spending multiplier conclude a lower government spending multiplier is associated with higher economic policy uncertainty and a higher government spending multiplier is associated with lower economic policy uncertainty. Their work concludes the importance of uncertainty in decision making regarding the fiscal policy. Their arguments further suggest, the implication of an uncertainty lowering measure prior to making fiscal policy decisions to maximize the possible effect of the policy that is implied.

Therefore, the negative effects of uncertainty on economic activity can't be neglected or denied. The question at hand is then, the volume in which if these uncertainty shocks or waves affect cryptocurrencies. Additionally, this is reasonably vital in understanding a possible relationship between cryptocurrencies and their usage at the times of heightened economic policy uncertainty, this could change the way we might see a relationship between adoption and economic policy uncertainty. To be able to answer and understand this relationship we must turn our heads to the interdependence of traditional financial markets and cryptocurrencies. Investigating the interdependence of Bitcoin and traditional financial markets Matkovskyy et al. (2020) found the relationship is affected by the economic policy uncertainty. At times where the economic policy uncertainty is heightened or more accurately at the times of economic policy uncertainty shocks, the interdependence of Bitcoin and traditional financial markets decrease. The reasoning for such relationship might indicate a

substitute effect between cryptocurrencies and traditional financial markets as Bitcoin might be perceived as a good hedging tool against economic policy uncertainty for risk diversification. Furthermore, realising if Bitcoin could actually be a good hedging tool under different uncertainty measures for economic policy could help us in understanding the possible effects of uncertainty on the notion of adoption. Fang et al. (2019) indicates that depending on the circumstances Bitcoin has the ability to act as a hedging tool against economic policy uncertainty. At times of crisis, does Bitcoin play the role of safe-haven or is it only a good hedging tool? The idea suggests to question the nature and the means to which the level of uncertainty can affect adoption if it does. Even if relationship is expected, it shouldn't be the same and the distribution of the affect shouldn't be normal. The distribution should be skewed towards heightened uncertainty affecting adoption more where at low levels it doesn't. The reasoning is quite simple, if cryptocurrencies are an alternative from escaping the economic policies and the uncertainty they bring then in the presence of an if existent relationship, higher uncertainty should mean higher adoption. However, we should also make sure at times of crisis the situation doesn't shift, or if it does, it should be analysed and observed.

Looking at the works of others, Bouri et al. (2017) analysing the relationship between the times of crisis and Bitcoin's capability to hedge and also be more than a diversifier. The possible safe haven properties of Bitcoin have been analysed as well to investigate the times of crisis. The findings do implicate at times of Chinese crisis Bitcoin really does play the role of safe haven. However, evaluating Bitcoin's high volatility Yermack (2015) suggests Bitcoin's safe haven capability might be limited at a daily time frame comparably to its weekly performance. The work of Bouri et al. (2017)

discovers quite similar results to that of discussed by Yermack (2015). In addition, we must realise the remainder findings which also point out the association between higher economic policy uncertainty and lower volatility of cryptocurrency prices (Yen & Cheng, 2021). This also signals cryptocurrencies could be adopted more at times of uncertainty. Hence, expecting a positive relationship between and adoption makes sense. This paper wishes to test this hypothesis under the light of methods which will be revealed along the paper.

The point focus of literature has been related to the price information of cryptocurrencies. The volatility of these cryptocurrencies as well as their capability as risk diversifiers have been the mainly focus. Most of the studies investigate the changes in prices and very little work has been done on measuring adoption using on-chain data, transfer volumes and any related figures. Vast majority of the analyses indicate a possibility of relationship between adoption and other factors. This paper wants to investigate these factors without using volatility or price information as proxies for adoption as we believe it might misrepresent the level of adoption according to the definition of adoption this paper accepts. The mentioned papers using price information haven't actually investigated the adopters of cryptocurrencies from our perspective due to the reasons we have discussed about short term investors of cryptocurrencies. Casting aside short-term investors and not including investors as part of adoption measures doesn't mean we should completely neglect their presence when investigating adoption of cryptocurrency technologies. The reason isn't so vague, the risk diversification usages of cryptocurrencies might not be only adopted by investors who buy and sell coins in short time frames. This might be the characteristic trait of people who also don't trust in institutions anymore where the credibility of policy

makers is questioned or where high levels of inflation is present. Uncertainty shocks might be belief wreckers for some people and might instil fear making people look for alternative ways to be risk diverse and safe in the future hence looking out for an alternative. Therefore, when investigating adoption figures, the risk diversification capabilities of cryptocurrencies should be considered and the uncertainty measures which affect the actions of investors should be understood to understand the possible movements in adoption measures compared to uncertainty.

2.3 VIX

VIX is an index of volatility based on the S&P500 Index to measure the market volatility. It is an indicator of the levels of market volatility and for the sake of this argument it will be a proxy for the risk of traditional financial markets (López-Cabarcos et al., 2021). In other words, as mentioned VIX can loosely be thought as the risk factor of keeping money in the traditional financial market. An increased VIX could mean the risk is greater for people who wish to keep their money in the traditional financial markets. The relationship between VIX and Bitcoin prices have been investigated and no meaningful relationship have been found (López-Cabarcos et al., 2021). The study concluded by arguing this means investors have speculatively invested in the Bitcoin market without considering the market data from the traditional financial markets. However, this paper kindly wants to suggest by pointing out the possibility that, this result could be not because of speculative investing decision solely but also because of the belief that financial markets might not be the firm factor affecting Bitcoin returns. There is no contesting the fact that Bitcoin is speculatively traded by a certain population and that the traders rely on the previous day volatility as well as the news data to make their trading decisions instead of the data from the traditional financial markets as López-Cabarcos et al. (2021) finds. Yet, we believe

having an open mind for other possible reasons of the people's actions is only beneficial through the eyes of empirical approach. Simply, users of cryptocurrencies might believe cryptocurrency could be an isolating factor against the risk from traditional financial markets, then using this data in approaching cryptocurrencies would be inappropriate as it could be perceived irrelevant up to a certain extent. Of course, this is just a possibility and jumping into conclusion for both sides of the argument would be irresponsible. Therefore, more research is needed on this topic and this paper wishes to contribute to literature in this sense by analysing the relationship between the VIX and the levels of adoption.

The levels of return of cryptocurrencies or a shift in the nature of volatility due to traditional financial markets can indicate certain channel of factors affecting cryptocurrencies. This paper also believes VIX could affect the adoption of cryptocurrencies. The logic behind such expectation relies on the fact that, if traditional financial markets and fiat currencies have an alternative relying in the cryptocurrency technologies then an increased risk and volatility of traditional financial markets could positively influence cryptocurrency adoption.

This relationship might not necessarily be positive, there is the possibility of a negative correspondence which could mean few things. Firstly, it could mean that people don't use one as an alternative to another or might be afraid that increased risk in traditional financial markets could eventually affect cryptocurrencies, directly or indirectly. Secondly, it could be because of the fact that an increased volatility of traditional financial markets could instil fear and instead of choosing to save or invest in any way, people might choose more liquid ways to keep their money. Cryptocurrencies could be used as safe saving spots as we argue, and this could mean higher adoption rates.

However, at times of crisis or increased risk, people might be resorting into holding cash or in a money like liquid form.

2.4 Volatility of cryptocurrencies

It is well observed and documented that; cryptocurrencies have volatile prices. Additionally, whether Bitcoin is the dominant currency and how does the volatility of one currency affect the others is crucial in understanding the behaviour of the whole market. Yi et al. (2018) found that major cryptocurrencies have connected volatilities and the spill over effect amongst all major currencies are high. This relationship is amplified at times of uncertainty. Subsequently, when analysing the cryptocurrency market and its volatility, looking at the major cryptocurrencies can be helpful in understanding the whole market. In light of these findings, the relevance of such results in observing adoption would mean looking at the volatility of the largest currency in the market could be more than useful. This is why Bitcoin has been the center of our attention regarding the volatility information and luckily as mentioned most of the studies focus on Bitcoin's price and volatility information heavily.

The negative correlation of Bitcoin's volatility with adoption would mean that people who use cryptocurrencies might want to resort back to other major fiat currencies. Therefore, an increased volatility could hinder the possible adopters from intending to keep cryptocurrencies. Finding no meaningful relationship is also highly likely, as adopters might not be interested in using these cryptocurrencies comparably to other currency but simply because of their technological function. There is no work on to the best of our knowledge regarding this matter. Through working on this topic, this paper wishes to contribute to the literature and open new ways to argue the potential relationships between the above-mentioned factors and adoption.

2.5 Financial development

A well-developed financial system beholds certain characteristic traits starting with an enhanced increase in accessing to financial markets, wide in its size, proven as efficient and a stable financial market which all to benefit the economy in certain forms (Guru & Yadav, 2019). Looking at the growth rate of economy, financial development could be seen as a major player as it aids in capital accumulation and technological advancements (Calderón & Liu, 2003). Through an advancement in financial systems formation of capital as well as its growth can be accomplished as financial development attracts more capital and promotes national savings (Greenwood & Jovanovic, 1990). Additionally, in cases where financial systems are improved then the allocation of savings can be achieved more efficiently. Beneficially, information costs become lower which in return could impact the allocation of resources and productivity growth (Calderón & Liu, 2003). Financial depth as one of the prominent factors in financial development (Svirydzenka, 2016) is found to be critical in understanding contract enforcement in an economy. Clague et al. (1999) suggest that financial depth is in correlation with the strength of contract enforcement in an economy. Consequently, financial depth can act as a proxy for the strength of property rights in an economy (Benhabib & Spiegel, 2000). Financial development and financial depth as its component when investigated by Benhabib & Spiegel (2000) have been realised to be critical in the process of economic growth as well as investment and capital accumulation in an economy.

As national savings, investments and economic growth get positively affected by financial development, an increase in financial development should positively enhance the cryptocurrency adoption. In our previous arguments, the substitution between trust

in government and trust in cryptocurrency technology have been touched upon rigidly. Neglecting national developmental effects in the analysing process of cryptocurrency adoption could result in omitting a very crucial aspect of this situation. The dilemma we are trying to understand is simply ironic, an improvement in financial systems could result in people looking for alternatives to the system itself. However, this analysis wishes to show that it is more than looking for alternatives, that there is a strong possibility where improved financial systems might create more prosperous societies which then go fund technological advancements. In arguing on the nature of cryptocurrencies, what no author to our knowledge have argued on is the notion that cryptocurrencies are technologies and simply increased capital flow in such technologies should be evident in an improved economy. As economic theory suggests, as economy grows so does technological advancements come along the way and developed economies are the financers of technological advancements as well. Looking from this perspective, then improved financial systems should positively influence cryptocurrency adoption as it would do the same for any other technology.

M2/GDP is a widely used and accepted indicator used in understanding financial development and more importantly financial depth (Hetzel, 1989; Clague et al., 1999). Simply, the money supply in economy is an indicator of the monetary policy in the economy and investigating its relationship with GDP shows possible inflationary pressures in cases where M2 is growing faster than GDP (Hsing & Hsieh, 2012). However, this effect can be lagged and in the short run, even if M2 is growing larger than GDP, it could have positive impact. This was the case for stock market index, at first an increase in M2/GDP ratio resulted in positive impact till it passed a certain threshold and affected stock market index negatively (Hsing & Hsieh, 2012). Hsing

(2011) have found M2/GDP having a quadratic relationship with stock market performance. This is basically because, if the money supply is increasing rapidly without an accommodated increase in GDP, then there is too much money supply in the economy meaning inflationary pressure as a result (Hsing & Hsieh, 2012). There is no specific work between cryptocurrency adoption and M2/GDP so the nature of this relationship can only be assumed and investigated mildly at first. The lack of empirical work regarding this possible nature pushes this paper to analyse the relationship between these variables directly through a basic model of analysis. By doing so this paper wishes to lay the basis for future work and future analysis. A similar quadratic relationship might be found between cryptocurrency adoption and M2/GDP as it is the case for stock market index, however, threshold analysis is beyond the scope of this paper as there are other relationships this paper wishes to investigate. This paper as mentioned above, will investigate at first the direct relationship between financial depth and cryptocurrency adoption to lay the basis for future work on this matter. Therefore, further study will be needed to understand any possible quadratic nature of this relationship.

Chapter 3

DATA

Our dependent variable Cryptocurrency Adoption Index is constructed using principal component analysis (Jackson, 2005) through a combination of time series data for the following measures: number of daily active addresses, number of daily transactions, daily transfer volumes, daily balance by time held. The data consists of 4968 daily observations in total and dates between 03.01.2009 and 10.08.2022. All the data mentioned above (apart from “daily balance by time held”) can be found using glassnode.com which is a cryptocurrency informative data provisory website, the data for “daily balance by time held” can be found in intotheblock.com for the above-mentioned time frame. All of the following data is collected for Bitcoin, Ethereum and Litecoin which when combined make up more than 75 percent of the cryptocurrency market in market capitalisation throughout the span of our observations. (coinmarketcap.com). Number of daily active addresses indicate addresses that are actively in use as the name suggests whereas the number of daily transactions indicate the number of transactions completed in a day. This measure doesn’t include any “not confirmed” transactions, only the confirmed transactions are included in this data. Daily transfer volumes include the number of coins which are transferred from one address to another in total throughout the day. Using the exchange and price data between coins gathered from glassnode.com and investing.com, all Ethereum and Litecoin transfer volumes have been converted to corresponding values of Bitcoin to be able to measure the transfer volumes in the same unit form. Because the number of

Ethereum coins in circulation can't simply be added to Litecoins as they don't have same unit value. Lastly, daily balance by time held shows the number of coins in terms of account balance which are categorised according to time span the coin is held. The data is divided into three categories in terms of time held, hodlers, cruisers and traders. Hodlers consists of accounts which have been holding coins for more than 1 year whereas cruisers are holders of coins between 1-12 months and lastly traders are people who only hold coins less than a month. This data enables us to exclude trader data or visualise and analyse the shifts in holding time spans according. At first, we excluded traders and added the balances of cruisers and hodlers but have realised 99 percent similarity when we have included the data from traders. Therefore, for all categories of data from all coins, balances have been added to create a total balance information regarding the mentioned cryptocurrencies. Through combining all mentioned data, we get the following figure which is to measure Crypto Adoption without using price data of cryptocurrencies on trading which is, as mentioned in the above arguments, volatile. Instead of using trading volume, using on-chain transfer volumes enables us to adopt such an approach on cryptocurrency adoption.

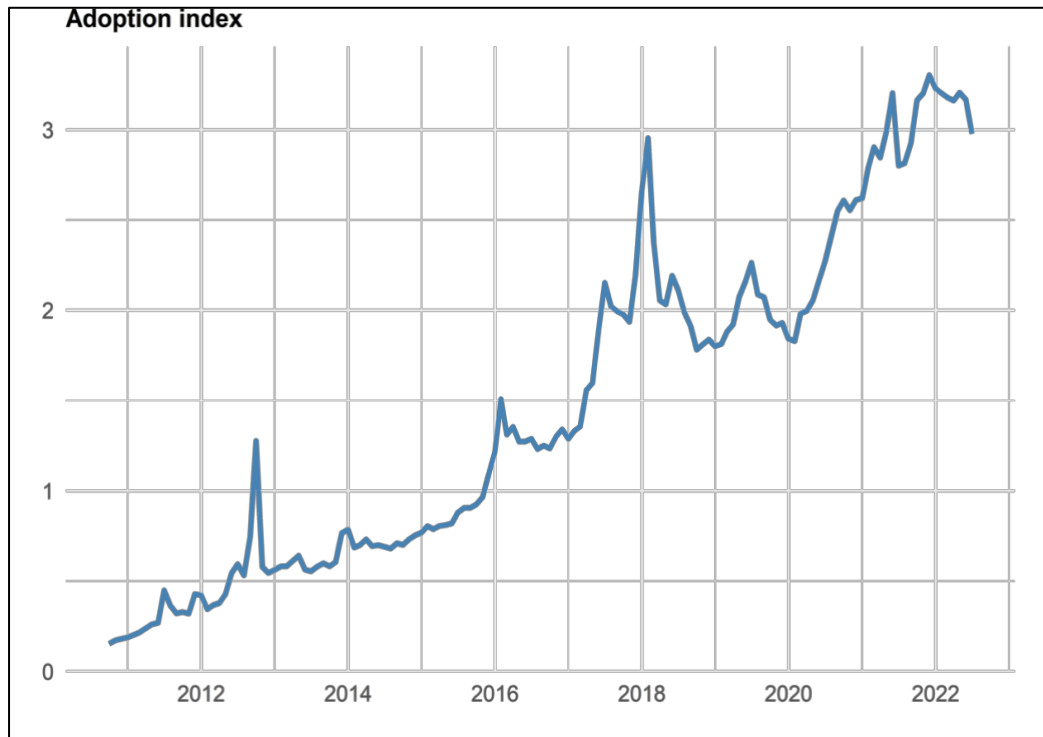


Figure 1: Cryptocurrency Adoption Index

To be able to obtain monthly financial depth as our proxy for financial development this paper utilizes monthly M2 data gathered from Fred (fred.stlouisfed.org) between 01.01.2009 and 01.06.2022. To obtain M2/GDP ratio at a monthly frequency quarterly GDP data gathered from Fred (fred.stlouisfed.org) was converted into monthly frequency through using Chow & Lin (1971) method using personal consumption expenditures as our indicator of related time series data. By using average matching and a Rho of 0.9 we obtained our monthly GDP data. This paper utilized personal consumption expenditure instead of industrial production data as industrial production have fallen enormously during the Covid-19 period and this paper realised it didn't match our GDP data. Thus, using personal consumption expenditures proved to be a better fit as our indicator when converting quarterly GDP into monthly data.

Concerning the volatility of cryptocurrency data, this paper has used realised volatility using the price information of Bitcoin to obtain Bitcoin price volatility. The data consists of daily observations in the time frame of 03.01.2009 and 10.08.2022. By using daily data, we have used rolling method of 30 observations a month and used their mean values to obtain monthly volatility of Bitcoin (Andersen & Bollerslev, 1998). The reason behind using Bitcoin price volatility as a proxy for all cryptocurrency market volatility relies on the findings of Yi et al. (2018) about the volatility connectedness of cryptocurrencies where the volatility of major cryptocurrencies affects the volatility of other currencies.

For our uncertainty measure we have used Economic Policy Uncertainty data gathered from economicpolicyuncertainty.com. Economic Policy Uncertainty as measured by the work of Baker et al. (2016) utilize use of trio of terms like: “economic” or “economy”; “uncertain” or “uncertainty”; and one or more of “Congress,” “deficit,” “Federal Reserve,” “legislation,” “regulation,” or “White House.” in newspapers to come up with a quantified measure of policy related economic uncertainty. Additionally, economic policy uncertainty index uses Federal Reserve Bank of Philadelphia’s Survey of Professional Forecasters as well as other data to come up with a reliable index of economic policy uncertainty (Baker et al., 2016). The data frequency for the above-mentioned time frames is daily for U.S. Economic Policy Uncertainty and monthly for our Global Economic Policy Uncertainty. As economic policy uncertainty index is widely accepted in this literature and tested by many articles this paper sees fit to use it as our uncertainty data for both U.S. and Global Economic Policy Uncertainty.

Lastly, VIX data have been gathered from investing.com for 01.01.2009 and 01.06.2022 at a monthly frequency as a proxy for volatility in traditional financial markets. VIX like Economic Policy Uncertainty Index is widely accepted in the literature therefore this paper sees fit to use it.

Chapter 4

METHODOLOGY

Using ordinary least squares as our method this paper investigates any possible linear relationship between our dependent variable and independent variables (Wooldridge, 2015). Following econometric models have been tested with this approach to get a grasp of the nature of cryptocurrency adoption and its relationship with our independent variables like, uncertainty, financial development, volatility and traditional financial market volatility.

$$CA_t = \beta_1 + \beta_2 EPU^{USA}_t + \varepsilon \quad (\text{Equation 1})$$

CA stands for Cryptocurrency Adoption whereas EPU^{USA} is the economic policy uncertainty for the United States. This regression equation investigates a bi-variate relationship between the two in the given time frame with error term ε . Term t denotes the time and β defines the coefficients for the given equations. This model attempts to examine if economic policy uncertainty in United States affects cryptocurrency adoption.

$$CA_t = \beta_1 + \beta_2 EPU^{Global}_t + \varepsilon \quad (\text{Equation 2})$$

CA stands for Cryptocurrency Adoption in this and all following equations. EPU^{Global} is the global economic policy uncertainty. This equation similar to the one above investigates a direct bi-variate relationship between the two variables. The point is to understand if global economic policy uncertainty is affecting cryptocurrency adoption.

$$CA_t = \beta_1 + \beta_2 EPU^{USA}_t + \beta_3 FDEV^{USA}_t + \beta_4 VIX_t + \varepsilon \quad (\text{Equation 3})$$

$FDEV^{USA}$ as the financial development indicator (made of M2/GDP) and VIX is introduced as a proxy for traditional financial market volatility as an indirect indicator of risk of holding money in traditional financial markets equation. Through adding these control variables into the first equation, the aim is to observe any changes in significance rate of estimators as well as changes in coefficients to analyse the extent of the relationship between financial development, traditional financial market volatility, uncertainty measures and cryptocurrency adoption. The aim is to observe the effect of United States economic policy uncertainty (denoted as EPU^{USA}) on cryptocurrency adoption as well as the effects of United States financial development.

$$CA_t = \beta_1 + \beta_2 EPU^{Global}_t + \beta_3 FDEV^{USA}_t + \beta_4 VIX_t + \varepsilon \quad (\text{Equation 4})$$

By adding the same control variables from United States $FDEV^{USA}$ and volatility proxy for traditional financial markets VIX , this equation inspects the changes in coefficient and significant ratios of the previous equations. The basic reason for using VIX as control variable is the fact that in other studies have widely utilised and analysed the effect of VIX on price related variables. By doing so, the aim is to have a systematic empirical approach while analysing the effects of Global economic policy uncertainty on the cryptocurrency adoption process. The point of using United States is the fact that it is a well-developed nation which have been investigated from various perspectives about variety of subjects. There is a vast study revolving around this nation. The reason why this paper doesn't investigate China instead of United States is due to China's ban of cryptocurrencies as there is disturbance of the process of cryptocurrency adoption. Therefore, it wouldn't be a good first case study for this topic since the dependent variable is a newly established measure which is yet to be tested.

$$CA_t = \beta_1 + \beta_2 EPU^{Global}_t + \beta_3 VoX_t + \varepsilon \quad (\text{Equation 5})$$

As argued before, there is a possibility in which cryptocurrencies and their price volatility might be hindering cryptocurrency adoption. Through adding volatility – denoted as VoX into the equation, this model wishes to test any such possible relationship.

$$VoX_t = \beta_1 + \beta_2 EPU^{Global}_t + \varepsilon \quad (\text{Equation 6})$$

Lastly, by investigating the effects of global economy policy uncertainty EPU^{Global} volatility – VoX , the equation aspires to study if an increased global economic policy results in higher price volatility in the cryptocurrency market. This might be an indicator of an indirect effect of global economic policy uncertainty on cryptocurrency adoption. This is possible if economic policy uncertainty might not show any direct effect on cryptocurrency adoption directly but might be increasing volatility and assuming price volatility shows negative effect on cryptocurrency adoption could possibly point us to different directions for future studies when analysing the notion of cryptocurrency adoption.

After using Ordinary Least Squares estimations our results indicate (results will be shown in the following section) problem of heteroscedasticity as well as autocorrelation. Therefore, this paper had to extend its approach and the method to which it estimates error terms by adopting Newey-West estimations (Newey & West, 1986, 1994). Regression models estimations when using time series data more than often exhibit the issue of serial correlation which is a common issue. Newey & West through developing their own methodology (1986,1994) overcome this problem. Hence, employing time series data and showing signs of autocorrelation, adopting this approach is necessary.

Lastly, linear regression and its estimates might not be ideal when analysing variables like economic policy uncertainty. The reasoning behind this lies on the notion that at times of crisis economic policy uncertainty is expected to peak and that's when actually this paper expects adoption to increase. If that's not the case, the least of all, the expectation of this paper is to find heightened levels of economic policy uncertainty to accommodate an increase in cryptocurrency adoption. This is only available through using quantile regression to investigate the relationship between each quantile to better understand and inspect the if existent effects of economic policy uncertainty on cryptocurrency adoption (Koenker & d'Orey, 1987).

Chapter 5

RESULTS AND FINDINGS

After conducting ordinary least squares estimation methods for the above-mentioned equations, the results have yielded to be highly significant for the positive effect of both global economic policy uncertainty as well as United States economic policy uncertainty on cryptocurrency adoption. Through introducing control variables to equation 1 and equation 2 our results have experienced a shift towards insignificance hence high significance yielded in first two equations could be a result of overestimation due to omitted variables.

Table 1: OLS and Newey-West Estimates for Equation 3

$CA_t = \beta_1 + \beta_2 EPU^{USA}_t + \beta_3 FDEV^{USA}_t + \beta_4 VIX_t + \varepsilon$				
OLS Estimates				
	Estimate	Std. Error	t value	Pr(> t)
EPU^{USA}	0.0001072	0.0005963	0.18	0.858
VIX	-0.0226985	0.0046431	-4.889	0.000***
$FDEV^{USA}$	8.9624029	0.3611983	24.813	0.000***
Newey-West Estimates				
	Estimate	Std. Error	t value	Pr(> t)
EPU^{USA}	0.0001072	0.00117584	0.0912	0.927
VIX	-0.0226985	0.00958365	-2.3685	0.019*
$FDEV^{USA}$	8.9624029	0.52470544	17.0808	0.000***
Signif. codes:	0 '***'	0.001 '**'	0.01 '*'	0.05 '.'
Adjusted R-Squared:	0.8413	F-statistic: 285.4	p-value:	0.000

As Table 1 presents OLS estimations for the equation 3 which is accompanied by the Newey-West estimations due to autocorrelation issues faced in our analysis. It can be deducted from the results that when control variables VIX and $FDEV^{USA}$ have been introduced, EPU^{USA} shows no significant effect on the cryptocurrency adoption index.

Therefore, it can be concluded that there is not a linear relationship between economic policy uncertainty in United States and the cryptocurrency adoption index. The outcomes show that VIX and $FDEV^{USA}$ have significant effect on the process of cryptocurrency adoption. For VIX , the relationship is negative at a rate of 2.3 percent with a significance level of 1 %. This indicates a heightened level of volatility in traditional financial markets could actually result in a fall in cryptocurrency adoption. From this perspective, it appears that when traditional financial markets are negatively impacted by the higher levels of volatility so does the cryptocurrency adoption. Therefore, people might be fleeing cryptocurrencies and their technologies when financial markets are volatile. Taking coefficients into account the effect of the variable may seem very tiny. However, we should keep in mind that our cryptocurrency adoption index data ranges from 0 to 3.5 at the moment. Therefore, 10 units of change resulting in 0.23 of response in cryptocurrency adoption is actually significantly large in proportion. This was not the case for financial development as it positively impacts cryptocurrency adoption at a high rate at a very high significance.

In light of these findings a highly developed nation in terms of financial infrastructure would have the ability to channel national savings efficiently as well as providing suitable environment for investments which are the backbones of economic growth. A well-developed financial system with high financial depth could yield more prosperous societies which could incentivise societies into funding and adopting technological advancements, hence an increase in cryptocurrency adoption would be very likely.

Table 2: OLS and Newey-West Estimates for Equation 4

$CA_t = \beta_1 + \beta_2 EPU^{Global}_t + \beta_3 FDEV^{USA}_t + \beta_4 VIX_t + \varepsilon$				
OLS Estimates				
	Estimate	Std. Error	t value	Pr(> t)
EPU^{Global}	0.0025222	0.0006277	4.018	0.000***
VIX	-0.0274799	0.0040359	-6.809	0.000***
$FDEV^{USA}$	7.7805836	0.4220652	18.435	0.000***
Newey-West Estimates				
	Estimate	Std. Error	t value	Pr(> t)
EPU^{Global}	0.0025222	0.0012751	1.978	0.0497*
VIX	-0.0274799	0.0075207	-3.6539	0.000***
$FDEV^{USA}$	7.7805836	0.6686151	11.6369	0.000***
Signif. codes:	0 '***'	0.001 '**'	0.01 '*'	0.05 '.'
Adjusted R-Squared:	0.8559	F-statistic: 319.9	p-value:	0.000

Instead of using country level data for economic policy uncertainty, the usage of global economic policy uncertainty has proved to be of different in nature comparably (see Table 2). The results signal that global economic policy uncertainty is a good fit for investigating this model as the significance level for our uncertainty have risen, but not only that, significance rates for our control variables have also increased. In addition, global economic policy uncertainty has a positive effect on cryptocurrency adoption with 5 percent significance level. Therefore, a heightened global economic policy uncertainty results in higher levels of cryptocurrency adoption. Looking at VIX and $FDEV^{USA}$ coefficients, there isn't much of a change which indicates the relationships haven't dramatically shifted both in size and direction compared to previous analysis.

To further investigate the nature of relationship between global economic policy uncertainty and cryptocurrency adoption, this paper utilises quantile regression analysis to explore both the tail relationships as well as the quantile differences in which uncertainty shows to effect cryptocurrency adoption.

Table 3: Quantile Regression Analysis 1

Coefficients				
		$EPUGlobal$	VIX	$FDEV^{USA}$
Quantiles	0.05	0.00034	-0.01828	6.5304
	0.25	0.00147	-0.01108	7.9361
	0.5	0.004	-0.01781	7.74249
	0.75	0.00463	-0.02681	7.8171
	0.95	0.00115	-0.02889	10.329

For both $FDEV^{USA}$ and VIX higher quantiles result in a linear relationship meaning there is a clear trend apparent from lower to upper quantiles (see Table 3). This linear relationship is negative for VIX meaning at higher percentiles of traditional market volatility, cryptocurrency adoption decreases. Therefore, increased risk in the financial markets show to be negatively correlated with our usage of cryptocurrencies. This might be because of fears of connectedness between traditional financial markets and cryptocurrency markets. When traditional financial markets are affected because of various reasons, peoples' perception of risk is affected and financing highly technological advancements or adopting their usages by substituting their liquidity for a less liquid form like cryptocurrencies might instil a higher risk. This could be why the VIX might be negative driver factor on cryptocurrency adoption.

On the other hand, as suggested a well-developed financial market could positively effectively affect national savings as well as investing in the economy. If the economy is healthy then expecting positive effects in related areas are quite reasonable. Apart from the already made arguments, these results signify to the possibility that United States economy is a major player in cryptocurrency adoption. Through analysing United States and its economic state, this paper is indirectly looking at the possible impact of other countries as United States is one of the biggest economies in the world and is one of largest trading partner for all other major economies. However, it should

be kept in mind that a very high values of M2/GDP is also associated with inflationary pressures after a certain threshold. The results might indicate United States' inflationary pressure could also affect cryptocurrency adoption positively. In our findings, there is no apparent quadratic relationship between cryptocurrency adoption and M2/GDP, unlike the case for stock markets. This points to a possible difference in nature of cryptocurrency markets and stock markets in general. However, acquiring more data and analysing this matter through different perspectives is vital in understanding the nature of relationship between these variables in more detail.

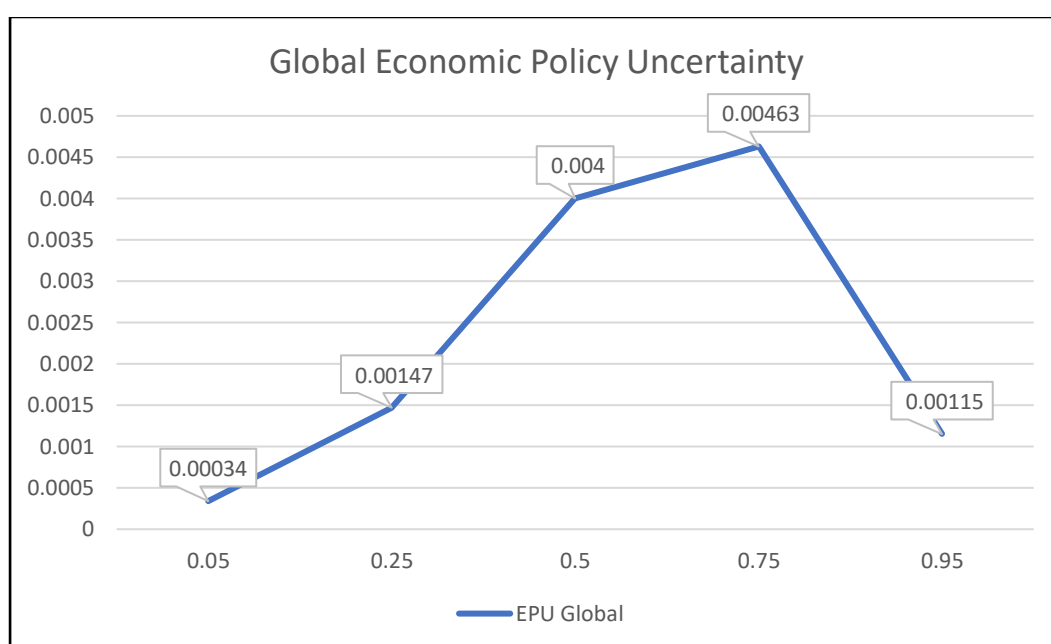


Figure 2: Quantile Regression Line Graph GEPU

Using the results gathered in Table 3, Figure 2 plots a line graph to aid in visualising how global economic policy uncertainty actually affects cryptocurrency adoption in each quantile. The findings reveal that higher levels will result in higher cryptocurrency adoption but at the times of uncertainty crisis this relationship inverts. Investigating the tail relationships therefore, it can be comprehended that at the 0.95 quantile there is a dramatic fall in the effect of economic policy uncertainty on

cryptocurrency adoption. Using the peaks at 0.5 and 0.75 quantile, it can be deduced that at times of crisis peoples' trust on cryptocurrencies fall enormously while they believe it is safer to adopt cryptocurrencies up to a point where uncertainty becomes so much that people don't trust both in traditional financial markets and cryptocurrency markets. The possible reason why for these findings could lie in a possible relationship between uncertainty and volatility, at times of uncertainty crisis the volatility of cryptocurrencies might increase resulting in the fear that the store of value might dramatically fall in these times. Of course, this paper argues on people who are adopting cryptocurrencies for their technological and ideological purposes rather than its fiat currency value. Bitcoin is simply a Bitcoin regardless of its fiat currency value. However, at times where market prices for cryptocurrencies are too volatile, the commitment to switch to cryptocurrencies and transferring them bares too much of a risk as people might be losing the value of their money so might want to keep their cryptocurrencies until the water is cooled down in the cryptocurrency markets.

Table 4: OLS and Newey-West Estimates for Equation 5

$CA_t = \beta_1 + \beta_2 EPU^{Global}_t + \beta_3 Vol_t + \varepsilon$				
OLS Estimates				
	Estimate	Std. Error	t value	Pr(> t)
<i>VoX</i>	-0.2594155	0.1250803	-2.074	0.040*
<i>EPU^{Global}</i>	0.0079866	0.0008594	9.293	0.000***
Newey-West Estimates				
	Estimate	Std. Error	t value	Pr(> t)
<i>VoX</i>	-0.2594155	0.241305	-1.0751	0.284
<i>EPU^{Global}</i>	0.0079866	0.0015627	5.1107	0.000***
Signif. codes:	0 '***'	0.001 '**'	0.01 '*'	0.05 '.'
Adjusted R-Squared:	0.4171	F-statistic: 51.45	p-value:	0.000

Table 5: OLS and Newey-West Estimates for Equation 6

$Vol_t = \beta_1 + \beta_2 EPU^{Global}_t + \varepsilon$				
OLS Estimates				
	Estimate	Std. Error	t value	Pr(> t)
EPU^{Global}	-0.0014099	0.0005683	-2.481	0.014*
Newey-West Estimates				
	Estimate	Std. Error	t value	Pr(> t)
EPU^{Global}	-0.0014099	0.00092924	-1.5173	0.131
Signif. codes:	0 ‘***’	0.001 ‘**’	0.01 ‘*’	0.05 ‘.’
Adjusted R-Squared:	0.03527	F-statistic: 6.154	p-value:	0.014

Testing the relationship between volatility and cryptocurrency adoption, there is no significant linear relationship between the two (Table 4). Therefore, this paper also tested the possible linear relationship between global economic policy uncertainty and Bitcoin’s price volatility, yet again results do indicate no significance in relationship (Table 5).

In light of these results, the price volatility of cryptocurrencies plays no linear significant role in the process of cryptocurrency adoption. Therefore, people who are using cryptocurrencies for their technological purposes as well as ideological ones don’t get affected by the price fluctuations of Bitcoin. Then, understanding the quantile movements in cryptocurrency adoption is vital even more. The 0.95 quantile movement towards a lessened cryptocurrency adoption could be a result of peoples’ need for safety and holding liquid assets compared to less liquid ones at time of crisis. However, at times of higher uncertainty their need for feeling safety from liquidity is less and so they use cryptocurrencies to divert risk. At times of crisis their actions to ensure safety might be shifting. Hence, this paper suggests that people use cryptocurrencies more at heightened uncertainty levels but this doesn’t apply to times

of crisis as their need for safety deriving from liquidity surpasses. This explains the negative correlation between *VIX* and cryptocurrency adoption as well.

To summarise, under the scope of these findings a negative relationship between cryptocurrency adoption and stock market volatility is evident whereas global economic policy uncertainty is in positive relationships. This could be because that, when stock markets are volatile the general perception of risk in the market is higher resulting in need for more liquid funds which might be in correspondence with the 0.95 quantile for global economic policy uncertainty. Further research on this topic is needed to enlighten the correspondence between these variables in more detail. However, Figure 1 representing cryptocurrency adoption shows a clear trend towards an ever-increasing usage of cryptocurrencies. As time passes, our usage of cryptocurrencies and their technologies are increasing. There are lot of arguments revolving around how cryptocurrencies might be utilised to hedge against inflation and how it is also a volatile speculative investment makes this topic quite complicated from the perspective of this paper due to the reasons that this paper accepts both notions at the same time. However, to be able to understand the following findings at a country level we could conclude that a well-developed United States financial system corresponds to higher adoption rate as well as the possible inflationary pressures from United States. Regardless, understanding the limitations and how future work of others could overcome these limitations is crucial in developing how we approach in understanding the processes of cryptocurrency adoption.

Chapter 6

LIMITATIONS AND FUTURE RESEARCH

Trying to approach a notion or a matter of discussion from a different perspective could prove fruitful. This study has tried to approach cryptocurrency adoption from a different perspective in hopes to create the means for discussion in order to be able to develop our understanding of the adoption process of cryptocurrency technologies. By trying so, there is not enough research on this topic and there are no alternative approaches to quantitatively measuring adoption process of cryptocurrencies. This in turn limits our findings as there are so many variables to be tested to ensure in limiting the presence of omitted variables. As most of the studies have analysed the relationship between cryptocurrency price information whether be it their volatility or returns, this paper was limited to use those variables as our explanatory variables. This was a limitation that is imposed by the very perspective this paper has tried to adopt, therefore these explanatory variables were have to be used to compare and understand our differences in findings comparably to those studies who have used price information. However, this paper firmly believes our cryptocurrency adoption processes behave quite differently compared to price reactions so adopting other variables is essential for the development of further studies. Hence, endogenous effects like the miner rewards or transactions fees must be tested for future studies as there is no prior research on this topic to the best of the knowledge of this paper.

On the other hand, measuring financial development at a high frequency is challenging as most of the financial development indicators have low frequency data. This have limited the approach of this study into using specific variables like M2 and this paper had to use low to high frequency data transition techniques to acquire a monthly GDP data. Meaning, there is more research needed on ways to measure financial development at higher frequencies and these variables could be tested with cryptocurrency adoption to find similarities or differences compared to our results. Inflationary pressures and possible effects of inflation should be tested as well with other methods in further researches to come.

Additionally, López-Cabarcos et al. (2021) finds no significant relationship between Bitcoins' price and VIX, this paper finds a negative relationship between VIX and cryptocurrency adoption. Hence, understanding cryptocurrency price and its relationship with cryptocurrency adoption could prove to be fruitful as well and more research on this topic is needed.

Finally, time is a huge limitation of this paper as there are unlimited possibilities of researches for this field as this adoption index is investigating something from a new perspective and understanding the details of this perspective can't be and, in our opinion, shouldn't be fit in a single academic work. There are a lot of things this paper couldn't possibly test.

Chapter 7

CONCLUSION

In conclusion, our knowledge on cryptocurrency adoption is vastly limited. This is because of the fact that there hasn't been 10 years since the introduction of multi-layered block chain cryptocurrencies like Ethereum which is the second largest cryptocurrency in the market. In such a new field our literature has managed to come up with strong evidence on the behaviour of price information of cryptocurrencies and how it is affected by the economic policy uncertainty which is also evident in our cryptocurrency adoption process as this paper finds. Through the channelling of future studies towards the perspective this paper adopts on cryptocurrency adoption, we believe there is now a possibility for new research even more. This, we believe, is incredibly imperative as it establishes the difference between price information and on-chain data this paper utilises. Further, investigating cryptocurrency adoption, our findings have led this paper to conclude that financial markets and financial system of United States plays a vital role in cryptocurrency adoption. Other countries in Asia and Africa as well as developing nations should be used to analyse cryptocurrency adoption so these findings can be compared with findings which use cryptocurrency price information as well. Lastly, this paper can't stress the importance of new research enough, this is because our findings can only be better understood under the light of new possible findings to come. This paper can't simply accept its findings as new discoveries up until these findings are matched and tested by the works of others to ensure the reliability and consistency of our perspective is evident.

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