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CRYPTOCURRENCIES IMPLICATIONS AND RISKS ANALYSIS OF BITCOIN

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CRYPTOCURRENCIES IMPLICATIONS AND RISKS ANALYSIS OF BITCOIN

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ABSTRACT

CRYPTOCURRENCIES IMPLICATIONS AND RISKS ANALYSIS OF BITCOIN

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This dissertation demonstrates how extensive the risks and implications of crypto-currencies can influence the financial stability along with prices and payment systems stabilities, if not regulated under deterrent international legal framework. In contrast, this paper acknowledges the opportunities and benefits these payment schemes might bring about and how appealing they might be perceived by investors. Moreover it highlights the legal uncertainties surrounding these schemes with respect to challenges they rise to public authorities, as they can be used by criminals, fraudsters and money launderers to perform illegal activities.

Furthermore, this paper examines factors that influence the demand for the most commonly traded cryptocurrency "Bitcoin" over the period 2013-2017 using annual data for fifteen designated countries. The study employs 2SLS technique and documents several findings. First, Bitcoin market-related factors such as econometric Beta, trading volume, and volatility appear to be significantly correlated to economic policies uncertainties, trade Barriers and remittance transfers for both developed and developing countries. Second, international migrants stock appears with lower P-value in developed

countries despite its overall insignificance. This indicates that; recognition of the economic uncertainties and trade frictions are not influenced by countries classification division and will hold their significance throughout. On the other hand, income level and tax payments variables are highly influenced by the country's classification when it comes to Bitcoin demand. Finally variables like number of internet users and exchange rates hold strong evidence of statistical insignificance with high likelihood of accepting the null hypothesis.

Keywords: Cryptocurrency, Bitcoin, Protectionism, trade barriers, remittance transfers, economic uncertainty, Bitcoin Analysis, Bitcoin demand determinants.

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CHAPTER ONE: GENERAL INTRODUCTION

1.1 Background of the study

In today's world, the increased connectivity provided by the Internet along with the increased magnitude of e-trade has changed the nature of financial transactions. With recent developments in social media, peer-to-peer software, and smartphone technology, we have seen the definition of money extend beyond the traditional, physical tender of government-backed currencies to include mobile payments, digital currencies, and virtual goods. (Peng, 3013)

Lately, Cryptocurrency has been an interesting phenomenon in the financial markets. The initial attention was toward the protocol used to operate the system, but afterwards the interest shifted more to the economic aspects rather than the cryptographic matters. (Gulled A. & Hossain J., 2018)

According to the European central bank report "virtual currency schemes" published in 2012", Virtual currency schemes differ from electronic money schemes insofar as the currency being used as the unit of account has no physical counterpart with legal tender status. The absence of a distinct legal framework leads to other important differences as well. Firstly, traditional financial actors, including central banks, are not involved. The issuer of the currency and scheme owner is usually a non-financial private company. This implies that typical financial sector regulation and supervision arrangements are not applicable. Secondly, the link between virtual currency and traditional currency (i.e. currency with a legal tender status) is not regulated by law, which might be problematic or costly when redeeming funds. Lastly, the fact that the currency is denominated differently (i.e. not euro, US dollar, etc.) means that complete control of the virtual currency is given to its issuer, who governs the scheme and manages the supply of money at will.

1.2 Chapters outlines:

This thesis is composed of five chapters and it aims at exploring the crypto-currencies phenomenon on several facets. First highlighting the risks and implications associated with these currencies in the meantime showing the opportunities and challenges brought

about by these technological advancements; eventually, reaching the economic theory under which the demand for these currencies fluctuates to draw a conclusion on whether the demand for these currencies is directly affected by endogenous Policies on economic uncertainties and trade frictions; where investors seek refuge in these currencies to escape such policies; which might bring about long term future risks and economic hazard under the absence of necessary regulatory framework.

Chapter one provides background information of the study, stating the study's objectives, research problem, motivation of this study, moreover it tackles the theoretical and empirical framework for the study by reviewing current literature on digital currencies, methodology used to investigate associated propositions and data collected, in an attempt to analyze the research questions and hypotheses.

Chapter two briefly reviews and interprets the traditional theories of money, crypto-currencies creation and adoption, then move on to focusing on the advantages and disadvantages brought about by the usage of these forms of payments instead of the traditional ones. Furthermore, the main uses are analyzed as medium of exchange and as store of wealth. Moreover, this chapter sheds some light on the risks brought about these types of technologies since they tend to be inherently unstable. Consequently measuring the extent to which their use can jeopardize the financial stability; given their limited connection with the real economy; while addressing the possible implications on price stability, smooth operation of payment systems, regulatory perspective and lack of prudential supervision. Lastly, this chapter analyses the possible scenarios to mitigate crypto-currencies risks through using a generic regulatory framework based on the fundamental utility model of criminal behavior as a benchmark. This scenario was first proposed by University of Chicago- Law review dialog in 2014 then developed by the Department of the US Treasury in its report "Cryptocurrency as a Payment Method" in 2017.

Chapter three presents the methodology and techniques of collecting and analyzing data. It discusses the source of data, how they were collected, arranged and analyzed in order to achieve reliable and authentic information. This chapter argues that economic uncertainties, trade frictions and massive immigrants waves caused the boosted demand

for Bitcoin. Furthermore, this chapter generally tackles the possible variables that might have triggered the demand for these currencies. However, the final empirical results; that utilize variables statistically tested for significance using OLS, 2SLS regression analysis, partial and semi-partial correlation, and fixed effect estimator that overrides the Omitted-variable bias due to leaving out one or more relevant; are displayed in chapter four.

Chapter four displays the empirical findings of our data analysis, through utilizing both OLS and 2SLS statistical tools in order to predict possible correlation between the dependent variable and the independent variables at a country level data over the period 2013-2017. This analysis is further expanded by dividing the designated countries in to two groups (developed vs developing countries) in an attempt to measure the contribution of each group to the regression results. Correlation matrix, Partial and semi-partial correlation analysis are further purposed to avoid multicollinearity amongst independent variables. Finally, the Omitted variables bias statistical tool is utilized to override the effect of the missing variables to the estimated effects of the included variables. Consequently, this chapter presents the empirical data analysis and interpretation as a basis of conclusion.

Chapter five concludes the study. In this chapter we answer the research questions, approve or reject the hypothesis and provide some recommendations for future studies and policies while acknowledging the limitations of our research.

The expected outcome of this study would be through drawing a framework for the emergence of the decentralized crypto-currencies in to our monetary and financial systems with respect to potential risks and threats in contrast with possible opportunities and benefits, while finding a correlation to variables that provide a basis for its demand. The study finishes by offering conclusions and proposals for future actions.

1.3 Crypto-currencies and Bitcoin:

Campbell, M. 2018, defined **Crypto-currency** as a digital asset designed to work as a medium of exchange that uses cryptography[1] to secure its transactions, to control the

[1] **Cryptography**: is the practice and study of techniques for secure communication in the presence of third parties called adversaries. More generally, cryptography is about constructing and analyzing protocols that prevent third parties or the public from reading private messages; various aspects in information

creation of additional units, and to verify the transfer of assets. Crypto-currencies are a type of digital currencies, alternative currencies and virtual currencies. Crypto-currencies use decentralized control as opposed to centralized electronic money and central banking systems. The decentralized control of each crypto-currency, works through a blockchain, which is a public transaction database, functioning as a distributed ledger.

By far, the most famous decentralized crypto-currency is Bitcoin, which was created in 2009. Since then, numerous other crypto-currencies have been created.

Bitcoin is a decentralized digital currency that enables instant payments to anyone, anywhere in the world. Bitcoin uses peer-to-peer technology to operate with no central authority: managing transactions and issuing money are carried out collectively by the network. Bitcoin is designed around the idea of using cryptography to control the creation and transfer of money, rather than relying on central authorities. (Vigna, & Casey 2016)

Transactions are made with no middlemen – meaning, no banks! Bitcoin can be used to book hotels, shop for furniture and buy products online. But much of the hype is about getting rich by trading it. In 2017 the price of bitcoin began to skyrocket into the thousands.

The unique characteristic of Bitcoin is its deregulated nature; it is neither controlled nor supervised by any commercial authority, government, or financial institution. Rather, a peer-to-peer network of users controls the creation and transfer of coins (Peng, 2013). Bitcoin's independence from 3rd party intermediaries provides its users a highly desired level of privacy and convenience. Since its inception, Bitcoin has gradually gained traction around the world and slowly entered the mainstream consciousness.

Cryptocurrencies in general (including Bitcoins) have the same characteristics of Money which are:

a) Medium of exchange.
b) They can act as a store of value.
c) Unit of account and measure of value.

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security such as data confidentiality, data integrity, authentication, and non-repudiation are central to modern cryptography.

That's why they are valued as assets. For example, Bitcoin is considered to be the gold of blockchains[2]. It is thought to be highly profitable storage of value. (Lannquist A., 2018)

There are many advantages to using cryptocurrencies among which are being anonymous, securing, users don't have to pay any online transaction fees or bank transfer costs, which can get pretty steep when dealing with large sums of money.

However, there are perhaps more roadblocks than advantages when it comes to cryptocurrencies, some of which are Price volatility, internet hacking can and will inevitable happen, it can be used to channel money out of the country, governments that prefer taking full control of monetary transactions would eventually try to intervene to impose some regulatory framework which can be seen as a disadvantage to the users. Of course, in some cases this is necessary, given the potential for money transfers going toward human trafficking, drug smuggling, and other illegal activities, but regular users are worried about the potential for government intervention due to taxation issues and concerns over country's border-control/ customs regulations.

1.4 Historical Timeline:

Crypto-currency was incepted in 2008, and then appeared in a whitepaper by an unknown computer scientist using the pseudonym "Satoshi Nakamoto" on January 2009. In the paper the inventor explained the system operation that permits the creation of this virtual currency. Since the Nakamoto's white paper the crypto-currency has received more and more attention. Especially for the upside and downside that characterize its value exchanged for US dollars. (Ira F., 2018)

[2] **Blockchain** is a digitized, decentralized, public ledger of all cryptocurrency transactions (a record of transactions). Banks keep ledgers on customers to prevent them from "double-spending" – using the same units of currency twice. The blockchain is similar, only it is powered by a peer-to-peer network.

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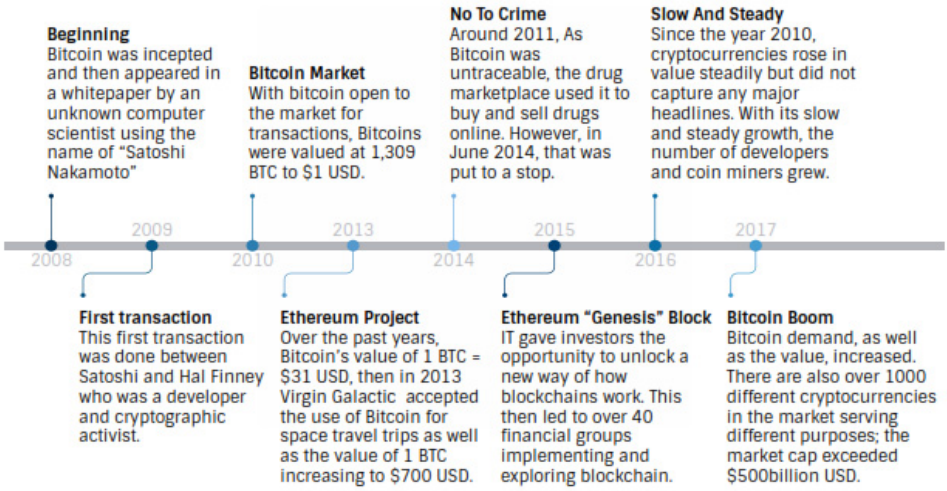

Figure 1.1: Cryptocurrency Timeline (source:https://seedly.sg)

2009 –Bitcoin "Genesis" Block: Called "Genesis" Block to represent the first of Bitcoin's mining which then led to the first transaction. This first transaction was done between Satoshi and Hal Finney who was a developer and cryptographic activist.

2010 – "Bitcoin Market": With bitcoin open to the market for transactions, Bitcoins were valued at 1,309 BTC to $1 USD.

2013- "Ethereum Project": Over the past years, Bitcoin's value managed to reach a value of 1 BTC = $31 USD, then in 2013 Virgin Galactic[3] accepted the use of Bitcoin for space travel trips as well as the value of 1 BTC increasing to $700 USD.

2014- No To Crime: Around 2011, Bitcoin was used as a way to conduct illegal business by selling drugs. As Bitcoin was untraceable then, the drug marketplace used it to buy and sell drugs online. However, in June 2014, that was put to a stop.

2015- Ethereum "Genesis" Block: The period of time that Ethereum[4] "Genesis"[5] Block was launched! Ethereum gave investors the opportunity to unlock a new way of how

[3] **Girgin Galactic** is a spaceflight company founded in 2004 in Long Beach, California. It is developing commercial spacecraft and aims to provide suborbital spaceflights to space tourists and suborbital launches for space science missions.

blockchains work. This then led to 40 over financial groups committing to implementing and exploring blockchain.

2016- Slow And Steady: Since the year 2010, cryptocurrencies rose in value steadily but did not capture any major headlines. With its slow and steady growth, the number of developers and coin miners grew!

2017- Bitcoin Boom: 2017 experience the Bitcoin boom. With countries like China- which was totally against it in the past- slowly accepting Bitcoin into the market, the demand, as well as the value, increased. There are also over 1000 different cryptocurrencies in the market serving different purposes; the market cap for the coin market has exceeded $100 billion USD.

1.5 Objective of the study

This thesis aims at revealing the risks and implications caused by crypto-currency, while highlighting the opportunities and challenges brought about by this technological advancement, eventually reaching the economic theory that provide an appropriate framework of these technologies in order to draw a conclusion on whether or not these advancements would bring about long term future risks and economic hazard.

Last but not least this thesis will try to identify the truth behind the skyrocket demand of Bitcoin and whether the high volatility of Bitcoin demand is itself interconnected to the price developments or just another assets bubble due to the social preference that can change anytime. In the meantime, examining the correlation (if any) between bitcoin demand and economic policies uncertainties, trade frictions, migrants stock and personal remittance transfers.

This thesis is not meant to examine the underlying structure and functions of Bitcoin, but rather to find a way to decide whether its demand can be anticipated to mitigate its risk through correlating it to global uncertainties and trading wars/frictions. Finally provide a comprehensive overview of the complications surrounding Bitcoin.

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[4] **Ethereum:** every time a program is used, a network of thousands of computers processes it. Contracts written in a smart contract-specific programming languages are compiled into 'bytecode', which a feature called the 'ethereum virtual machine' (EVM) can read and execute.

[5] **Genesis block** is the start of the blockchain, and the genesis.json is the file that defines it. It is the "settings" for the blockchain.

1.6 Research question

This study will answer the following questions:

- What are the economic implications of crypto-currencies in terms of threats, challenges and future risks, and what are the possible means that can be used to mitigate those risks? On the other hand, what is the possibility that the potential future opportunities and benefits could outweigh those implications?
- What are the determinant variables for the bitcoin high demand? And is there any significant correlation between its recent skyrocket demand and economic uncertainties, trade wars/frictions and massive waves of immigrants?

1.7 Significance of the study

Many literatures have concentrated on the technology behind crypto-currencies, how blockchain technology was invented and the encryption techniques to control the creation of monetary units to verify the transfer of funds and prevent "double-spending" – using the same units of currency twice. However; examining the reasons behind increasing demand for Bitcoin and finding possible correlation with endogenous Policies of economic uncertainties, migrants stock, remittance transfers and trade frictions in an attempt to draw a conclusion on the determinants of bitcoin demand; hadn't been tackled before in any of the crypto-currencies literature. This makes this study exceptionally intriguing and novel.

1.8 Methodology

This study utilizes mixed methodology design of both quantitative and qualitative approaches. We start-off by using qualitative research measures in examining the available literature tackling the advantages and disadvantages of crypto-currencies, while interpreting possible risks and implications of crypto-currencies with respect to:

- Risk to price system stability
- Risks to financial stability
- Risks to payment system stability
- Lack of Prudential supervision

In the meantime, we outline the possible opportunities they might bring about under the assumption of expanded unilateral trade system, which imposes protective trade measures, trade barriers, difficult trading environment, less room for economic cooperation and absence of recourse for enforcement and implementation.

Quantitative research is used to examine Data obtained from BNC2 database-coin dance, where historical country level price indices associated with country level trading volumes of Bitcoins are extracted to draw a conclusion on whether there is a correlation between cryptocurrencies and economic uncertainties/trade frictions.

Global price indices represent weighted average of the price of the respective cryptocurrencies (using prices from multiple exchanges). On the other hand, Bitcoin trading volumes used in building up our model represent snapshot at year end in each of the designated countries. For our analysis, we examine Bitcoin trade volumes over the period 2013 -2017; compare it using 2SLS estimator with trade-related variables as Instrumental Variable (IV) for global uncertainty index, trade barriers, migrants stock and remittances transfer over the same period.

Looking in to the same timeframe we examine the possible correlation while avoiding the multicollinearity trap through utilizing partial regression analysis. Lastly, we try to override the omitted variables bias through utilizing fixed effects OLS estimator.

1.9 Literature review:

Sovbetov, Y.,(2018) publish his paper "Factors Influencing Cryptocurrency Prices" which examines factors that influence prices of most common five cryptocurrencies such Bitcoin, Ethereum, Dash, Litecoin, and Monero over 2010-2018 using weekly data. The study employs the "Autoregressive Distributed Lag" (ARDL) technique. This study concluded that cryptomarket-related factors such as market beta, trading volume, and volatility appear to be significant determinant for all five cryptocurrencies both in short- and long-run. Secondly, attractiveness of cryptocurrencies also matters in terms of their price determination, but only in long-run. This indicates that the formation of the attractiveness of cryptocurrencies is subjected to time factor. In other words, it travels slowly within the market. lastly, SP500 index seems to have weak positive long-run impact on Bitcoin, Ethereum, and Litcoin, while its sign turns to negative losing

significance in short-run, except Bitcoin that generates an estimate of -0.20 at 10% significance level.

Catalini, C. & Gans J.S., (2017) publish their research paper "Some Simple Economics of the Blockchain" explaining the theory behind the blockchain technology and how it meant to shape the rate and direction of innovation. They identified two key costs affected by the technology: 1) the cost of verification which verifies the attributes of a transaction; and 2) the cost of networking which bootstrap and operate a marketplace without the need for a traditional intermediary: When combined with a native token allows a decentralized network of economic agents to agree, at regular intervals, about the true state of shared data. This shared data can represent exchanges of currency, intellectual property, equity, information or other types of contracts and digital assets - making blockchain a general purpose technology that can be used to trade scarce, digital property rights and create novel types of digital platforms. The resulting marketplaces are characterized by increased competition, lower barriers to entry and innovation, lower privacy and censorship risk, and allow participants within the same ecosystem to make investments to support and operate shared infrastructure without assigning market power to a platform operator. They also challenge the existing revenue models and accumulated knowledge and resources of incumbents, and open opportunities for new approaches to startup fundraising, the provision of public goods and software protocols, data ownership and licensing, auctions and reputation systems.

ElBahrawya, et al. (2017), published a study at the City University of London, titled "Evolutionary dynamics of the cryptocurrency market" they analyzed the Evolution of the Crypto-currencies market capitalization where they argued that it has entered a phase of exponential growth one year ago. Despite the fact that the Bitcoin has been steadily losing ground to the advantage of the immediate runners up. They further shed light on the properties of the cryptocurrency market and establish a first formal link between ecological modeling and the study of this growing system.

Koeppl, et al. (2017), in their paper titled "The Economics of Cryptocurrencies – Bitcoin and beyond". They developed a general equilibrium monetary model of a cryptocurrency system to study its optimal framework. This paper attempts to provide an economic

theory to help understand the fundamental economic trade-offs and address relevant policy issues.

Li and Wang (2017) have conducted a theory-driven empirical study of the Bitcoin exchange rate (against USD) determination, taking into consideration both technology and economic factors. According to these authors, in the short term, the Bitcoin exchange rate adjusts to changes in economic fundamentals and market conditions. The long-term Bitcoin exchange rate is more sensitive to economic fundamentals and less sensitive to technological factors. Furthermore, they claimed that they have identified a significant impact of mining technology and a decreasing significance of mining difficulty in the Bitcoin exchange price determination.

Popper's N., (2016) in his book ".DigitalGold" published 2016 presented the dramatic rise of Bitcoin and the fascinating personalities who are striving to create a new global money for the Internet age. This book tackles the engrossing history of Bitcoin, the landmark digital money and financial technology that has spawned a global social movement. It further describes the notion of this new currency, maintained by the computers of users around the world, which was the butt of many jokes for a while, yet this has not stopped it from growing into a technology worth billions of dollars, supported by the hordes of followers who view it as the most important new idea since the creation of the Internet. Believers from Beijing to Buenos Aires see the potential for a financial system free from banks and governments. More than just a tech industry fad, Bitcoin has threatened to decentralize some of society's most basic institutions. Digital Gold charts the rise of the Bitcoin technology through the eyes of the movement's colorful central characters, including a British anarchist, an Argentinian millionaire, a Chinese entrepreneur, Tyler and Cameron Winklevoss, and Bitcoin's elusive creator, Satoshi Nakamoto. Already, Bitcoin has led to untold riches for some, and prison terms for others.

Vora (2015) claims that cryptocurrencies will offer competition to the existing modalities of money and governmental regulation, they will provide alternative means to economic agents for their transactions, and their innovative existence should be encouraged so that their beneficial features outperform any deleterious ones. "Bitcoins are here to stay"

suggest the above mentioned author, unless considered illegitimate by governments or banned by regulatory actions.

Ceruleo, P. (2014), published "Bitcoin: A rival to fiat money or a speculative financial asset?" this study addressed some important questions regarding bitcoins such as "Why do Bitocoin exchanges quote different prices? "What determines the price differential?" and "Is the deregulation of the cryptocurrency a determinant of the arbitrageurs profit?" This thesis is centered around the arbitrage opportunities that investors seek on the currency exchanges. Thus it reports firstly the arbitrage opportunities that can be exploited in the market, as the statistical, interest rate and currency arbitrage to focus on a specific virtual currency conditions.

Moore and Christin (2013), in this study "Beware the Middleman: Empirical Analysis of Bitcoin-Exchange Risk" the authors point of view is focused on the risks related to the Bitcoin exchanges, in a way that points out the predominant role of the exchanges in the Bitcoin fluctuations.

A study conducted by **Bank of America Merrill Lynch**[6] in 2013 calculates the fair value of Bitcoin accruing its uses as medium of exchange and as a store of value. Furthermore, it tries to answer the question of whether or not crypto-currencies can be considered as money, coming to the conclusion on whether it's used for speculative aims rather than as a substitute of hard currency. Regarding reaching a fair value of bitcoin some assumptions are needed. It is assumed that 10% of all the payments in the B2C sector are undergone in bitcoins, that the average ratio of consumption expenditures and household checking deposits in USA is 0.047 and that the B2C e-commerce sector totalized $224 billion in 2012. Being everything else equal $10bn are used by US households for the on-line shopping, of them it is assumed that the 10% are made using Bitcoin. In a macro perspective it is possible to multiply the $1bn of Bitcoins for the rest of the world, considering that the US GDP accounts for 24% of world GDP. Doing so the value of Bitcoin used for the purchase of goods and services in the e-commerce roughly achieve the $5bn. But for medium of exchange it is included also the transfer of money around

[6] BofA Merrill Lynch, Bitcoin: a first assessment, December 2013
[7] This means that US households are holding 4 cents in their cash for every $1 sp

the world. In this case it is assumed that Bitcoin would be able to compete with the three major market players in the sector. To estimate the value of the cryptocurrency it is possible to use the valuation multiple enterprise model, obtaining $4.5 bn. In conclusion the maximum market capitalization for Bitcoin's as a medium of exchange could be $9.5 bn. However it is interesting to notice that the value calculated of Bitcoin as a medium of exchange, roughly around $9.5bn. is below its current market capitalization. As a consequence bitcoins are used beyond e-commerce or money transfer.

CHAPTER TWO: RISKS AND IMPLICATIOSNS

2.1 Traditional theories of money

Krugman, Obstfeld and Melitz defined Money in their book international economics as a tool that only has the value, which a society has given it. This tool was created to carry out transactions. Initially those transactions involved a "*physical medium of exchange"*[8], which served as a means to make the barter possible in the easiest manner. With barter any person possessing any surplus value, in terms of cattle or seeds for instance, could exchange it for something perceived to have a similar value but that generates satisfaction or utility for the part that lacks that good. In microeconomic theory the marginal rate of substitution shows the relative value that a good has for a person. Alongside the indifference curve are represented the demand patterns for individual consumers over commodity bundles. Of course the problem of this trade is directly linked to the "coincidence of wants" or complementary needs. The perishing of the products used in the barter transactions and the untrustworthiness of the trade parts led to the need of a third commodity into which trade wheat or other vanishing goods. The intermediate good assumed the function of "*store of value"*, overcoming the "coincidence of wants" costs and creating a trusteeship ecosystem, taking the roots of the commodity money. The emergence of intermediary commodities made the market more liquid because the actors were able to overcome the exchange incompatibilities triggering immediate transactions. Gold and silver were the mostly used metals for the scope aforementioned. The portability and transferability necessity conducted to the so-called commodity-backed money. Money consisted not any more in the intrinsic value of the commodity traded but in the underlying value that a certificate guaranteed. The certificate, generally a gold certificate, authenticated the exchange for a fixed quantity of the underlying commodity. The expansion of trade conducted to the creation of the bill of exchange, under which merchants and travelers could avoid the risk of travel with large amount of certificates and, at the same time, they were able to guarantee to creditors the payment at a specific time in the future. A third party that operated as financial intermediary guaranteed the convertibility of the certificate. The modern concept of the commodity-backed money is

[8] KRUGMAN, P. R., OBSTFELD, M., & MELITZ, M. J. (2012). International economics: theory & policy.

held by the fiat money that, on the contrary, cannot be longer redeemed for commodity. (Ceruleo, P. 2014)

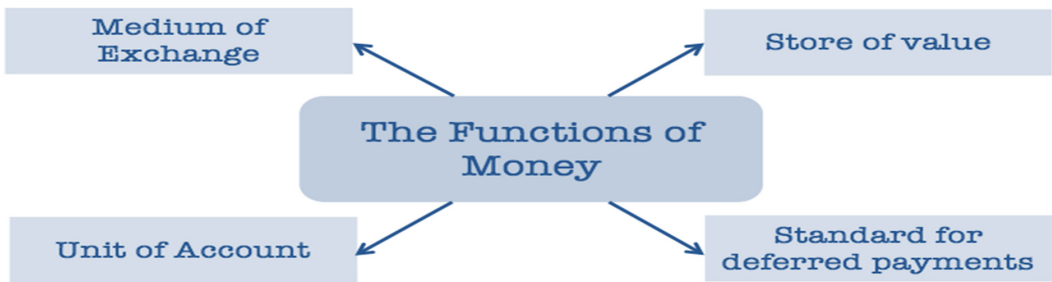


Figure 2.2: Functions of money

A study conducted by Bank of America Merrill Lynch[9] calculates the fair value of Bitcoin accruing its uses as *medium of exchange* and as a *store of value*. Regarding the former to reach a fair value some assumptions are needed. It is assumed that 10% of all the payments in the B2C sector are undergone in bitcoins, that the average ratio of consumption expenditures and household checking deposits in USA is 0.04[10] and that the B2C e-commerce sector totalized $224 billion in 2012. Being everything else equal $10bn are used by US households for the on-line shopping, of them it is assumed that the 10% are made using Bitcoin. In a macro perspective it is possible to multiply the $1bn of Bitcoins for the rest of the world, considering that the US GDP accounts for 24% of world GDP(2017). Doing so the value of Bitcoin used for the purchase of goods and services in the e-commerce roughly achieve the $5bn. But for medium of exchange it is included also the transfer of money around the world. In this case it is assumed that Bitcoin would be able to compete with the three major market players in the sector. To estimate the value of the cryptocurrency it is possible to use the valuation multiple enterprise model, obtaining $4.5 bn. In conclusion the maximum market capitalization for Bitcoin's as a medium of exchange could be $9.5 bn. However it is interesting to notice that the value calculated of Bitcoin as a medium of exchange, roughly around $9.5bn. is below its current market capitalization that reaches the $537bn (2017). As a consequence

[9] BofA Merrill Lynch, Bitcoin: a first assessment, December 2013
[10] This means that US households are holding 4 cents in their cash for every $1 sp

bitcoins are used beyond e-commerce or money transfer. (Woo, D., Gordon, L. & Iaralov, V., 2013)

FinCEN[11], Mandate from Congress, U.S. Dep't of the Treasury, Financial Crimes Enforcement Network, published in 2013 that Virtual currency can be defined as "a medium of exchange that operates like a currency in some environments, but does not have all the attributes of real currency. It does not have legal tender status in any jurisdiction. Virtual currency includes credit card points, air miles, loyalty points, coupon and digital or cryptocurrency. The sharply use of this form of currency is determined firstly by marketing tools. The marketers are interested in the exchange of personal data for digital content. For some authors as this trend increases as more digital currencies have the potential to compete with traditional currencies.

2.2 Virtual currencies creation and adoption:

The BITCOIN concept came into the scene in more modest circumstances, when it was posted to an obscure mailing list by a shadowy author going by the name Satoshi Nakamoto. From the beginning Satoshi envisioned a digital analog to old fashioned gold: a new kind of universal money that could be owned by everyone and spent everywhere. Like gold these new digital coins were worth only what someone was willing to pay for them, initially nothing, but the system was created so that bitcoin would always be scarce like gold. As with gold, it required work to release new ones from their source, computational work in the case of Bitcoins. For security Satoshi relied on uncrackable mathematical formulas rather than armed guards. (Hernández K., 2018)

Bitcoin has the ability of to live within a cleverly constructed decentralized network of the Internet. Like the internet, Bitcoin wasn't run by some central authority. Instead it was built and sustained by all the people who hooked their computers into it, which is available to anyone round the world. Bitcoins have their own software protocols which dictate how the system works. (Conti, M., et al. 2017)

[11] FinCEN is a bureau of the U.S. Department of the Treasury. FinCEN's mission is to safeguard the financial system from illicit use and combat money laundering and promote national security through the collection, analysis, and dissemination of financial intelligence and strategic use of financial authorities.

Nathaniel Popper in his book Digital Gold, 2015[12] argued that Bitcoin had the good fortune of entering the world at a utopian moment, in the wake of a financial crisis that had exposed many of the short-coming of our existing financial and political system, creating a desire for alternatives. Although Tea parties like Wall Street and Wikileaks, among others, have divergent goals yet they were united in their desire to take power back from the privileged elite and give it to the individual. Bitcoins provided an apparent technological solution to these desires.

Despite the positive effects for the consumers, contributing to the financial innovation and providing additional payment alternatives. On the other side these schemes pose some risks that can be connected to the lack of regulation by the side of the international institutions. (ECB, 2015)

Virtual currency schemes (VCS) were first tackled by the European central bank (ECB) in its 2012 Annual report. The ECB stated that the VCS differ from electronic money schemes insofar as the currency being used as the unit of account has no physical counterpart with legal tender status. The absence of a distinct legal framework leads to other important differences as well. Firstly, traditional financial actors, including central banks, are not involved. The issuer of the currency and scheme owner is usually a non-financial private company. This implies that typical financial sector regulation and supervision arrangements are not applicable. Secondly, the link between virtual currency and traditional currency (i.e. currency with a legal tender status) is not regulated by law, which might be problematic or costly when redeeming funds, if this is even permitted. Lastly, the fact that the currency is denominated differently (i.e. not euro, US dollar, etc.) means that complete control of the virtual currency is given to its issuer, who governs the scheme and manages the supply of money at will.

There are several business reasons behind the establishment of virtual currency schemes. They may provide a financial incentive for virtual community users to continue to participate, or create lock-in effects. Moreover, schemes are able to generate revenue for their owners, for instance float revenue. In addition, a virtual currency scheme, by

[12] Nathaniel Popper, 2015, Digital gold.

allowing the virtual community owner to control its basic elements (e.g. the creation of money and/or how to allocate funds), provides a high level of flexibility regarding the business model and business strategy for the virtual community. Finally, a virtual currency scheme may also be implemented in order to compete with traditional currencies, such as the euro or the US dollar.

The below chart represents the legal status of different types of money types as per the European Central Bank report of 2012: (Figure 2.3: The money matrix.

VCS Lack of regulation by the side of the international institutions.)

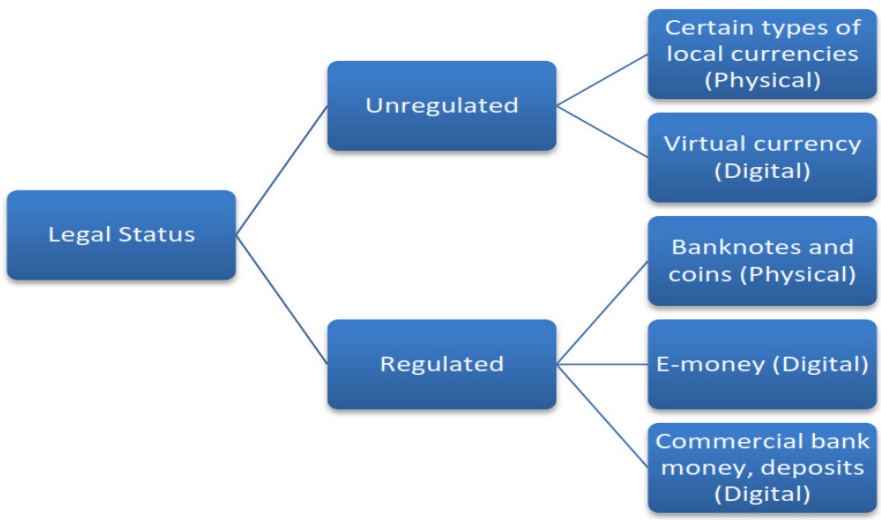


Figure 2.3: The money matrix.

VCS Lack of regulation by the side of the international institutions. Source: virtual currency schemes- European Central Bank. 2012

2.3 Differences between fiat currency and virtual currency

The main difference between virtual currency and real money is that the former is based on a fully decentralized monetary system, no group or individual may significantly upset the supply of money. The cryptocurrency community knows the amount of virtual currency in circulation at a specific time period where it's created through the mining process.

The value of the fiat money is not related to its intrinsic or backed value, but it is tied with the trust in the legal tender, which create and control money. Thus, money as also the function of "*unit of account"*, indeed, it determines the value of goods and services in standard numerical units. John Mynard Keynes[13] in the "Treaties of money" explained that "*Fiat Money is Representative (or token) Money (i.e something the intrinsic value of the material substance of which is divorced from its monetary face value) - now generally made of paper except in the case of small denominations — which is created and issued by the State, but is not convertible by law into anything other than itself. and has no fixed value in terms of an objective standard*".

A more specific definition of virtual currency is "a type of unregulated, digital money, which is issued and usually controlled by its developers or users and accepted among the members of a specific virtual community".[14]

The element that makes Fait money valuable for the social life is the trust in the central bank which issues such worthless tokens. Events as the 2008 financial crisis can undermine that power, as a consequent people are led up to rethink the conventional economic and financial structures. For this reason it can be crucial for the established institutions to understand the "alternative" currencies that the contemporary world offers. (Ceruleo, P., 2014)

2.4 Advantages of cryptocurrency:

Bitcoins hold many obvious advantages among which are; they don't require a ship to move Bitcoins from one place to another, it takes just a private digital key and the click of a mouse to initiate a transaction, last but not least, its security doesn't involve expensive armed guards but rather complicated mathematical formulas.

Bitcoins are not like dollars or euros, which are created by central banks, held and transferred by big powerful institutions. This is a currency created and sustained by its

[13] John Maynard Keynes, "The Classification of Money". A Treatise on Money, (1965)
[14] ECB, Virtual currency schemes, 2012.

users, with new money slowly distributed to people who help support the network[15]. (BIS, 2018)

Some way or another Bitcoin challenges the most powerful institutions in our society through holding out the promise of taking power from banks and governments and giving it to the people using the money who appreciated the benefits of a more universal money that doesn't have to be exchanged at every border, that doesn't require users to hand over their identifying information each time they use it, the fairness of a currency that even the poorest people in the world can keep in a digital account without paying hefty fees, rather than relying only on cash.

Bitcoins allowed online services to charge a penny or a dime to view a single news article or skip an ad skirting the current limits imposed by the 20 or 30 cent minimum charge for a credit card transaction.

Bitcoins managed to make its early users fabulously wealthy and empowered them through enhancing their sense of changing the world. It provides a glimpse of where we might be when the government inevitably stops printing the faces of dead presidents on the expensive paper.

The security of the system for both merchants and client is guaranteed by a protocol, known as a proof-of-work, which is a cryptographic analysis of the digital transactions. Using that system it is possible to bypass the need to trust in third party, therefore the overhead costs are lower and the digital product are delivered instantly for digital coins in return.

Considering the possibility for immigrant workers, almost 3% of the entire world population[16], to send remittances back home without paying supplement fees, generally very high being in the market only few and big providers (Western Union. MoneyGram and Euro-net).

[15] BIS Annual Economic Report 2018
[16] World Bank, Migration and Remittances, 2017.

In an economic perspective the finite supply of Bitcoin can be seen as an advantage in fighting against inflation. This element was introduced by the developers to emulate the supply of gold and to protect the currency value against governments and central banks instrumentality Furthermore it could be attractive for those looking to hedge their position against unstable local currencies.[17]

On the other hand, the capped supply of Bitcoins can generate a deflationary spiral. In the fiat currency system central banks increase the supply of money in circulation to accommodate the economic growth, while in the Bitcoin system it is not possible, so if the transactions in Bitcoin will continue to rise then there is no alternative except for an appreciation of its value. Furthermore some authors view in the Bitcoin system design the basis of the quantity theory of money, for which if more units of a currency are issued, then the value of each unit should fall. At this attempt Bitcoin predefined cap should make prices of good measured in Bitcoin stable. But as said before one problem is that if a currency had a constant value, then the prices in terms of this currency would be falling. The stability in the market is not generated by unmoving the components but equilibrating them.[18]

To sum up, Bitcoins can monetize new markets, lower transaction fees, get transactions instantly and avoid charge back[19]. Clients can perform the deal anytime anywhere without any transportation cost, storage-cost nor insurance or security charges[20]. Those form a decentralized network, the third party in this world, of peer-to-peer computer nodes works in sync to create and manage the currency. Therefore, it is clear that the main advantage for merchants to use a cryptocurrency is related to the easiness of starting up an account and to the acceptance time of the payments. From the client point of view, they appreciate the advantage of business flexibility and saving cost and time while purchasing goods and services across borders within minutes rather than wait the banks processing time. (Rogojanu A. & Badea L., 2014)

[17] Paola Ceruleo, Bitcoin: A rival to fiat money or a speculative financial asset?, 2014
[18] Younan S., Bitcoin: Gold and The Quantity of Money, The Gold Standard,issue 37, January 2014.
[19] Ahmad S., Nair M. and Varghese B., A survey on cryptocurrencies, 2013.
[20] Rogojanu A. & Badea L., (2014). The issue of competing currencies. Case study-Bitcoin, Theoretical and Applied Economics, Volume XXI, No. 1(590), pp.103-114.

2.5 Disadvantages of cryptocurrency:

Many bankers, economists and government official dismissed the Bitcoin Fanatics as naïve promoters of a speculative frenzy, where it bore out the warnings of the critics, illustrating the dangers involved in moving toward a more digitized world with no central authority.

In October 2013, the FBI reported that it had seized 144,000 Bitcoins, worth $28.5 million, and that the Bitcoins belonged to Ulbricht, the founder of Silk Road[21], who was convicted on 2015, of seven charges, including charges of engaging in a continuing criminal enterprise, narcotics trafficking, money laundering, and computer hacking. He faced 30 years to life in prison. (Levin, R. B., et al., 2015)

The most controversial feature of Bitcoin is price volatility. Indeed it can compromise the use of Bitcoin as store of value and so also its future usage as money. The high volatility is linked to the value of Bitcoin as more people become aware of it. Another consideration could be that the speculative nature of the market produces unstable returns. In addition it can compromise the use of Bitcoin as medium of exchange, because for merchants would be unprofitable to accept payment in a currency that the day after has dropped by 30% in value from Jan 2018 till Aug 2018.

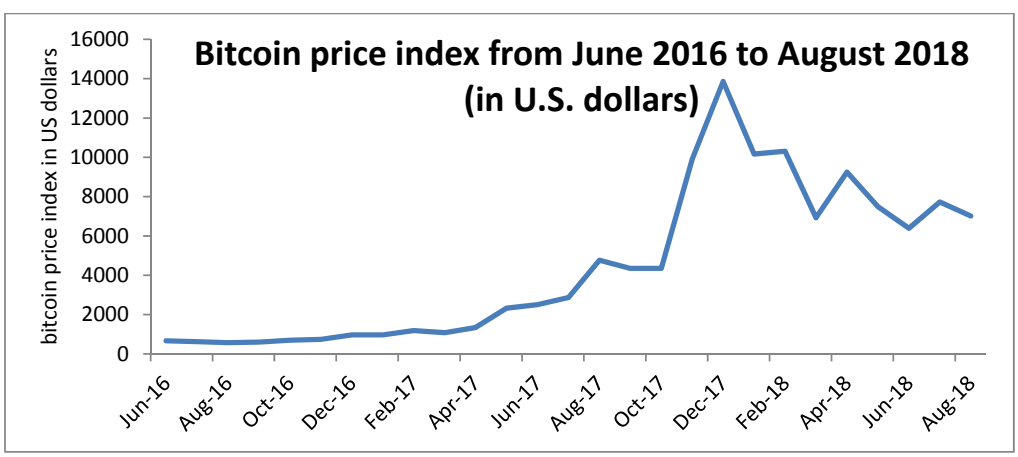


Figure 2.4: Bitcoin price index[22] from June 2016 to August 2018 (in U.S. dollars).
Source: https://www.statista.com/statistics/326707/bitcoin-price-index/

[21] Silk Road was an online black market and the first modern darknet market, best known as a platform for selling illegal drugs.

[22] The bitcoin price index: is an average of bitcoin prices across leading global exchanges.

The international body which should oversee potential global unbalances, the IMF, has not the power to intervene in cryptocurrencies' speculation, because is not clear the legislative framework concerning this area which makes bitcoins vulnerable towards the speculative attacks affecting its price volatility.

Besides a strong point in the Bitcoin ecosystem is properly the lack of regulation, however once a new regulation is produced which imposes higher transaction cost this would limit its use as medium of exchange.

Another problematic issue is connected to the fact that Bitcoin is not a legal tender; the effect of it is the lack of legal duty to accept the digital coins. Moreover it can be a dramatic matter for its potential in the OTC market[23].

2.6 Security implications of cryptocurrency:

Fraudsters can be attracted to use virtual currency because that type of currency guarantees a higher degree of privacy than a conventional one. An example of criminal enterprise, which circumvents the law enforcement for the traffic of illegal goods, launder money, finance terrorism and evade tax is Silk Road. The site was launched in February 2011, the "Amazon.com of illegal drugs" is accessible only through the anonymous internet browser The Onion Router (TOR), which operates in a way that online users are able to browse it anonymously and securely without potential traffic monitoring. The goods it sells include cocaine, heroin, ecstasy and marijuana. The products are delivered through regular mail and shipping services to a buyer's front door. To maintain the anonymity all the transactions made in this online market were issued by Bitcoin, the most controversial cryptocurrency present on internet. Even though the Silk Road server has been captured, the Bitcoin transactions and the suspect's wallet contained remain difficult for law enforcement to decrypt due to the tumbler used, delaying the identification of buyers and sellers of illegal materials and liquidation of criminal proceeds[24].

[23] An Over-The-Counter (OTC) Market is a decentralized market where the participants trade with one another directly, without the oversight of an exchange.
[24] NPR Staff, "Silk Road: Not Your Father's Amazon.com", 2011.

On 7 February 2014 Mt. Gox; one of the largest Bitcoin exchanges in Japan; announced that it had lost the equivalent of about $400 million worth of its users' Bitcoins and was going out of business; after an apparently undetected theft that had been occurring since 2011. This represents one of the many such scandals to hit Bitcoins users.

The office of investor education and advocacy of the Securities and Exchange Commission (SEC)[25] issued an investor alert in 2013 to warn individual investors about fraudulent investment schemes that may involve virtual currencies. The SEC is warned that the rising use of virtual currencies in the global marketplace may entice fraudsters to lure investors into Ponzi and other schemes in which these currencies are used to facilitate fraudulent, or simply fabricated, investments or transactions.

Moore and Christin (2013) examined the track record of 40 Bitcoin exchanges to assess the risks related to those platforms. The result of their study found that "an exchange's transaction volume indicates whether or not it is likely to close. Less popular exchanges are more likely to be shut than popular ones, while popular exchanges are more likely to suffer a security breach.[26]

However, despite the pre-mentioned crises the enthusiasm of Bitcoins believers, and the number of users kept growing through thick and thin.

2.7 Risks and implications of crypto-currencies:

The advocators of crypto-currencies see it as a chance to have a currency that is not backed by a single country. With revolutions, hyper-inflation and financial crises, many uncertainties about governments were risen questioning whether or not they would be there for the next twenty years which put people's LIFE SAVINGS in danger of disappearance. This empathize the value of having a currency that's potentially less volatile than a states with hyperinflation. It is important for many people to have the security of knowing "what is yours would stay yours" and can be transferred with you wherever you are, which is considered an empowering thing.

[25] SEC, Ponzi schemes using virtual currencies, 2013

[26] Moore T. and Christin N., Beware of the middleman: Empirical analysis of the Bitcoin exchange risks, Financial Cryptography and Data Security, Lecture Notes in Computer Science Volume 7859, pp. 25-33, 2013.

On the other hand despite the digital currencies positive aspects in terms of financial innovation and provision of additional payment alternatives to consumers, it is clear that they also entail risks. Owing to the small size of virtual currency schemes, these risks do not affect anyone other than users of the schemes. This assessment could change if usage increases significantly, for example if it were boosted by innovations which are currently being developed or offered. (ECB, 2015)

There are many risk-concerns brought about these types of currencies where they tend to be inherently unstable. Some financial specialists went to the extent of accusing them of jeopardizing the financial stability, given their limited connection with the real economy.

They are currently not regulated and not closely supervised or overseen by any public authority, even though participation in these schemes exposes users to credit, liquidity, operational and legal risks, which represents a challenge for public authorities, given the legal uncertainty surrounding these schemes, as they can be used by criminals, fraudsters and money launderers to perform their illegal activities.

2.7.1 Risks to price stability:

The ways in which these innovations in payment systems might have an impact on price stability and monetary policy whenever they start affecting the demand for the central bank's liabilities and interfering in the control of the supply of money through open market operations. Overall, these schemes could affect price stability if:

a) They substantially modify the quantity of money;

b) They have a significant impact on the velocity of money[27], the use of cash, and/or influence the measurement of monetary aggregates[28];

c) Increased interaction between the virtual currencies and the real economy.

The European central bank concluded in its 2015 issuance "VIRTUAL CURRENCY SCHEMES (VCS)", that "*In theory, VCS could have an impact on monetary policy and price stability. However, it was concluded that VCS did not pose a risk for price stability*

[27] The income velocity of money, which is the frequency at which the average same unit of currency is used to purchase newly domestically-produced goods and services within a given time period. In other words, it is the number of times one unit of money is spent to buy goods and services per unit of time.

[28] Money aggregates are broad categories that measure the money supply in an economy.

in practice, provided that the issuance volume of virtual currency continued to be stable and their usage low". It further emphasized that the ratio of VCS market capitalization to the money supply of the major currencies is still very low, despite the increases of the VCS issued volume over the past few years.[29]

2.7.2 Risks to Financial stability:

The developments of Bitcoin, confirmed that VCS are inherently unstable, From around USD 12 in October 2012, Bitcoin's exchange rate peaked first in April 2013 at USD 266 and reached its all-time high at USD 13860 in December 2017. In June 2018 the exchange rate dropped to approximately USD 6387. Having a brief recovery to USD 7013 in August 2018. The exchange rate has gradually fallen below USD7000 in September 2018. Another development has been the involvement of the traditional financial system over the past few years, including the issuing of Bitcoin-related securities. (see figure 4)

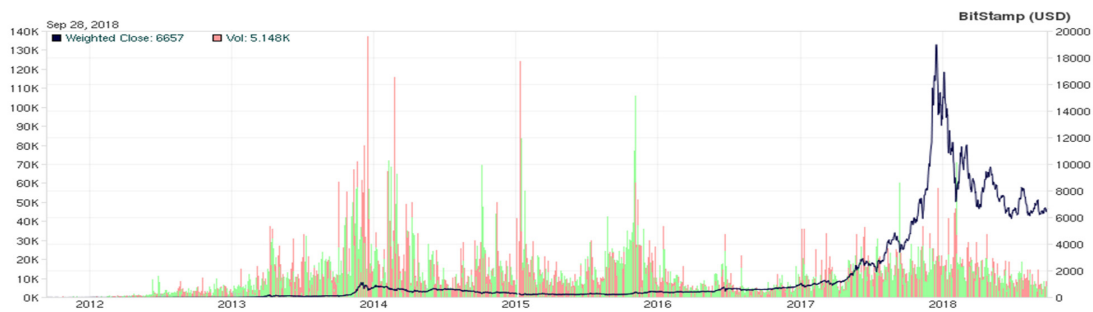


Figure 2.5: Bitcoin chart

Bitcoin price fluctuation and trade volume[30]: across various bitcoins market networks. source: bitcoincharts.com

Both the American and European central banks concluded that "*in reality VCS did not jeopardize financial stability given their limited connection to the real economy*" (i.e. the exchange rates and the exchange markets), the low volumes traded and the lack of wide user acceptance. However, it is considered that they are inherently unstable.

The European central bank further added that the build-up of financial stability risks from VCS would be likely under the following conditions: (i) VCS become more widely used in regular payments; (ii) greater links to the real economy develop, including through the

[29] ECB, Virtual currency schemes, 2015.

[30] The volume of a token listed on CoinMarketCap is the amount of the coin that has been traded throughout the designated period.

presence of financial institutions participating in VCS; and (iii) no structural developments are envisaged that would make VCS inherently more stable. As and when these conditions are met to a larger extent, more direct regulatory responses might be required from a financial stability perspective. Moreover, regulatory responses are likely to be more effective if they are internationally coordinated. A patchwork of inconsistent national-level regulatory responses to financial stability concerns may not address risks – as the activity of agents in this market may be international.[31]

2.7.3 Risks to Payment system stability

It's a well-known fact that, one of the central banks tasks is to promote the smooth operation of payment systems. VCS are a combination of a virtual currency, rules and procedures enabling transfers, similar to a (retail) payment system. For traditional payments, payment service providers participate in payment systems to be able to offer various payment services to users. However, with VCS, users participate directly in the system and hence face payment system-like risks (e.g. credit risk, liquidity risk, operational risk and legal risk), with VCS some aspects of these risks are very difficult to avoid or to mitigate, as these aspects are inherent to the VCS concept. In addition, the systems are not currently subject to oversight by a central banks. However, the overall situation as regards payment system stability might change if: i) large financial sector players interconnected to the global banking system started offering services related to VCS; and/or, ii) a significant increase in users and the volume of transactions took place (for example due to the acceptance of virtual currencies by large e-commerce merchants). In other words, if VCS became part of the regular financial system and/or were used on a large scale. If this did happen, a major incident involving large amounts of virtual currencies in one point of the VCS environment might theoretically trigger payment disruptions elsewhere in the VCS environment or even transmit shocks to traditional payment systems through financial institutions participating in VCS and in traditional payment systems. (Everette, J. et al. 2017)

[31] ECB, Virtual currency schemes, 2015.

2.7.4 Lack of Prudential supervision:

Cryptocurrencies' legal framework is very unclear. Virtual currency schemes, in contrast to traditional payment systems, are not regulated. The legal uncertainty surrounding these schemes might constitute a challenge for public authorities, as these schemes can be used by criminals, fraudsters and money launderers to perform their illegal activities.

The legal basis of a payment system consists of framework legislation, as well as specific laws, regulations, and agreements governing both payments and the operation of the system. Virtual currency schemes visibly lack a proper legal framework, as well as a clear definition of rights and obligations for the different parties. Key payment system concepts such as the finality of the settlement do not seem to be clearly specified. (Guadamuz, A. & Marsden, C. 2015)

Furthermore, the global scope that most of these virtual communities enjoy not only hinders the identification of the jurisdiction under which the system's rules and procedures should eventually be interpreted, it also means the location of the participants and the scheme owner are hard to establish.

The past few years have seen cryptocurrencies become ubiquitous, prompting more national and regional authorities to grapple with their regulation. Many central banks as well as governmental and regional organizations have issued laws or policies on the subject and some also have specific market conduct and consumer protection tasks. Hence, some local and international entities have decided to issue warnings or to take regulatory measures related to VCS. For instance, the European Banking Authority issued a Warning to consumers on virtual currencies (December 2013), followed by an Opinion on virtual currencies (July 2014) addressed to the national competent authorities and to the European Commission, the Council of the European Union and the European Parliament.

On March 20, 2018 the G20 summit addressed challenges posed by new technologies, infrastructure as an asset class, and crypto assets with the regulation aspect of crypto-currency on its agenda. The majority of the G20- nation's tilt towards regulating the

crypto-currencies by protecting the consumer interests though AML "Anti-money laundry" and KYC "Know your customer".

China on the other hand, took further step towards blocking access to overseas crypto-currencies trading options. On 27th of Feb, 2018 Chinese regulators announced that they would scrutinize the Chinese bank and online-payment accounts of businesses and individuals suspected of facilitating trades on offshore crypto-currency venues. The accounts' owners would have their assets frozen or blocked from the domestic financial system if proven to participate in crypto-currencies offshore transactions. Crypto-currency exchanges were banned in China earlier in September 2017 and in response citizens have traded crypto-currencies over the counter and traded through exchanges based in other countries.

To sum up, it's highly unlikely to control the use of such currencies thus it is highly plausible that regulations would be in place instead of an outright ban.

2.8 Mitigating Crypto-currencies risks:

Bitcoin markets are easy to manipulate, because "87.5 percent of the Bitcoin transactions have been owned by only 0.61 percent of the trading accounts in the world which add up to possible risks when trading in digital currency.[32]

University of Chicago Law published an article titled "A Conceptual Framework for the Regulation of Cryptocurrencies" in which it suggests a generic regulatory framework for addressing cryptocurrencies using the basic utility model of criminal behavior as a benchmark.it proposed anonymity tax on cryptocurrency transactions in which at least one party is not anonymous.

Regulating cryptocurrencies within discrete areas of law can provide a hedge against its increasing risks. However their relatively high level of anonymity makes it difficult for regulators to identify individuals who use the protocol for illicit value. That is contributed to the fact that the documentation of ownership and transfers doesn't identify the owners

[32] https://www.ukbitcoinblog.com

themselves, but rather a set of letters and numbers representing their public cryptocurrency address.

So far regulatory responses have ranged from providing no guidance or regulation, to issuing warnings, prohibiting banks from buying and selling cryptocurrencies, regulating certain actors in the cryptocurrency ecosystem (e.g., wallet providers and exchangers), and banning cryptocurrencies altogether (Bangladesh, Bolivia, China, Ecuador, Kyrgyzstan, and Saudi Arabia). The Financial Action Task Force—the global anti-money laundering (AML) standards setting body—in 2015 provided its members with guidance for a risk-based approach to virtual currencies which clarifies the application of FATF AML Recommendations to convertible virtual currency exchanges and helps national authorities develop regulatory responses.

The Department of the US Treasury issued its report "Cryptocurrency as a Payment Method" in 2017 suggesting attributes that are likely to be acceptable by the official sectors to mitigate the risks of cryptocurrencies while maintaining the possible benefits that are most important to its dealers:

1. Transparency of customer information and transaction information by recording ownership and value transfers this would allow governments to retrieve information in alleged criminal matters. The cryptocurrency code could allow for a third-party to store personally identifiable information. This would provide an insight into financial stability.

2. Government smart contracts: The cryptocurrency should allow for governments to build smart contracts on the cryptocurrency's blockchain in order to perform key state functions, such as identifying suspicious activity or enabling tax collection.

3. Inherent governance structure: The cryptocurrency will need a governance structure that allows for some form of social institution that ensures accountability and preserves the legitimacy of the system as a whole. The blockchain could be used as a platform on which people might encode their own set of rules and procedures that will define a particular system of governance—one that can benefit from the distinctive characteristics of the blockchain (i.e., transparency,

traceability, accountability, and incorruptibility) but would also leave room for the establishment of an institutional framework that could operate on top of that (decentralized) network.

Nevertheless, it goes without saying that, the above proposed framework could theoretically collapse if cryptocurrencies' protocols become completely anonymous.

More importantly, mitigating crypto currencies risks would require more collective direct regulatory responses; that are internationally coordinated; from a financial stability perspective. A patchwork of inconsistent national-level regulatory responses to financial stability concerns may not address risks, as the activity of agents in this market may be international.

CHAPTER THREE: DETERMINANTS OF BITCOIN DEMAND

3.1 Introduction:

Cryptocurrency-market has attracted the attention of many people and continues to gain popularity. The most advanced cryptocurrencies, such as Bitcoin, Ethereum, Litecoin and Verge, have grown tens and hundreds times in just a few years. The Internet is full of stories about lucky people who successfully stocked up with Bitcoins or Ethereum at the right time. (Covesting, 2018)

Many new investors are interested in getting into the cryptocurrencies, but there are significant risks involved. The market may correct 50–70% in a matter of few days, and the ones who are not experienced enough can suffer severe losses. Therefore, it is important to understand the determinant factors behind the course of the currency. (Popper N., & Lee S.H. 2018)

The dynamics of the exchange rate is determined by the supply-and-demand. "Price takes all into account"—that is what one of the basic rules of trading says. These laws are universal for any market. But this is a generalized representation. It is necessary to identify the main criterions and variables that influenced crypto-currencies' market trends for short and long-term projections and a deeper understanding of this particular market. (Covesting, 2018)

There has been plenty of literature regarding the widespread anecdotal evidence that lower trade barriers increase international trade. In the meantime firm quantitative data were examined to find evidence of the 'trade-cost elasticity' of trade flows, to quantify the economic welfare effects of trade-policy liberalizations and/or trade-cost reductions (Bergstrand J. H., 2013). However, examining the effect of Endogenous Policies on e-trade, consequently the use of crypto-currencies is yet to be explored.

Political and economic uncertainties might have pushed people to invest in these types of currencies whereas the sharp global economic downturn in 2008/09 has nurtured fears that governments might resort to trade protectionism in order to support their economies by sheltering them from foreign competition. As the experience of the Great Depression

in the 1930s has vividly illustrated, such a policy response is likely to trigger retaliatory action and thereby to deepen the recession significantly.(Georgiadis G., & Gräb J. 2013)

Governments are more likely to erect trade barriers and taxes whenever their economies experience recessions and/or losses in competitiveness through an appreciation of the real exchange rate. CRS Report for Congress: (2005)

European central bank concluded in its 2013[33] issuance "Growth, Real Exchange Rates and Trade Protectionism since the Financial Crisis" that: *Countries continue to pursue more trade-restrictive policies when they experience recessions and/or when their competitiveness deteriorates through an appreciation of the real exchange rate; and this finding holds for a wide array of contemporary trade policies, including "murky" protectionism measures.*

For the last few years the global economy was facing a downturn which resulted in many governments imposing protectionist measures to protect domestic producers from international competition. But the question is "Could this pose a threat or opportunity to Bitcoin?"

Though the Bitcoin has been frequently discussed on various financial blogs and even mainstream financial media, the research community is still primarily focused on the currency's technical, safety and legal issues, but discussion about the economic, financial and political aspects, triggering demand for these currencies, remains relatively sparse.

3.2 Methodology used:

This thesis analyses country-level Bitcoin volume data, which was found to be much more helpful than world-aggregate time-series data, to examine the correlation between Bitcoin demand and trade wars/frictions and economic policies uncertainties. The expected results would help identifying the determinant variables of Bitcoin demand.

That said, this research utilizes the "two stage least squares" 2SLS estimator, while using trade-related variables such as Instrumental Variable (IV) for endogenous policies to find

[33] ECB, Growth, Real Exchange Rates and Trade Protectionism since the Financial Crisis", 2013.

the role of "trade wars" and economic uncertainties that contributed to the recent fluctuations in Bitcoin demand.

Two-Stage least squares (2SLS) [34]regression analysis is used as the statistical technique to analyze the bitcoin demand structural equation. This technique is the extension of the OLS method. It is usually used when the dependent variable's error terms are correlated with the independent variables. Additionally, it is useful when there are feedback loops in the model. In structural equations modeling, we used the maximum likelihood method to estimate the path coefficient. This technique is an alternative in SEM modeling to estimate the path coefficient (Lani J., 2018). Last but not least, we utilize the omitted variables bias statistical technique to override the effect of the missing variables to the estimated effects of the included variables.

3.3 Research design:

In order to maximize the likelihood of generating evidence that provides a convincing answer to our research question we tried to rely on reliable and authentic data provided by multinational institutions in their web published databases such as world bank(WB) and United nations(UN), World Integrated Trade Solution (WITS), coin dance statistics and economic policy uncertainty database.

The correlation is designed in this study to help explain the relationship among dependent variable (Bitcoin trade volume) and independent variables of interest. However, we do not attempt to control or manipulate these variables but rather we try to understand the link among them if any. It is against this reason; our research design aims at knowing the extent to which Bitcoin demand is driven by economic policies uncertainties, trade wars and protectionism. According to Salkind, 2010 the main purpose of exploring research is to test the theory. With exploring study, the researcher analyzes the variables and come up with evidence that supports or disapproves the hypothesis that there is a cause and effect relationship among variables which is exactly what our study aims to achieve.

[34] https://www.statisticssolutions.com

3.4 Data collection:

This thesis involves the examination of studies of other researchers, journals, articles, reports, journals, textbooks and other formal research sources. Secondary data are collected basically from international organizations databases such as world development indicators, World Integrated Trade Solution (WITS), United Nations Migrants database, economic policy uncertainty database, Bitcoin charts database, and finally coin dance statistics.

3.5 Data and variables:

Our study covers 15 countries over the period 2013- 2017. We shall use time series data analysis to examine the data from those countries overtime. The time series data analysis helps examining the relationship pattern across variables to identify the extent to which these variables are dependent on one another. The advantage of using time series analysis is to examine the past and present relationship between variables as well as forecasting the possible future variations of a dependent variable. (Adhikari, Ratnadip & R. K. Agrawal, 2009)

With time series analysis we examine 75 observations to identify whether there is a significant relationship between Bitcoin trading volume and protectionism/economic uncertainties. However no single source can generate all data needed in this study, we shall use data collected from different accredited sources.

3.6 Main drivers for the Bitcoin price index:

In economic theory, the price of a currency is standardly driven by its use in transactions, its supply and the price level. From the theory, the price of the currency should be positively correlated with its usage for real transactions because this increases the utility of holding the currency, and the usage should be leading the price.

Kristoufek L., concluded in his 2015 study that there is a significant coherence between Bitcoin price and Trade-Exchange ratio (the ratio between trade and exchange transaction volume)since the currency usage should be leading its price. Therefore, the Bitcoin

behaves according to the standard economic theory, specifically the quantity theory of money, in the long run but it is prone to bubbles and busts in the short run. This study provides a statistical analysis of bitcoin as speculative asset that uses the standard fundamental factors used in trade, money supply and price level— and proved that these factors play a role in Bitcoin price over the long term. These findings are well in hand with standard economic theory, and specifically monetary economics and the quantity theory of money. Second, from a technical standpoint, the increasing price of the Bitcoin motivates users to become miners. However, the effect is found to be vanishing over time, as specialized mining hardware components have driven the hash rates and difficulty too high. Third, the prices of bitcoins are driven by investors' interest in the crypto-currency. The relationship is most evident in the long run, but during episodes of explosive prices, this interest drives prices further up, and during rapid declines, it pushes them further down. Fourth, the Bitcoin does not appear to be a safe haven investment.

Kondor *et al*. (2014) studied the Bitcoin network in a standard complex networks framework and showed that the network characteristics of the Bitcoin evolve in time and that these are due to bitcoins increasing acceptance as a means of payment. Further, they show that the wealth in bitcoins is accumulating in time and that such accumulation is tightly related to the ability to attract new connections in the network.

Kristoufek L. (2013) study focused on a speculative part of the Bitcoin value as measured by the search queries on Google and searched words on Wikipedia, showing that both the bubble and bust cycles of Bitcoin prices can be at least partially explained by interest in the currency.

The figure below reflects the skyrocket price of Bitcoin generated by the increasing demand volumes across different Bitcoin exchanges for the period (1/2016-1/2018).

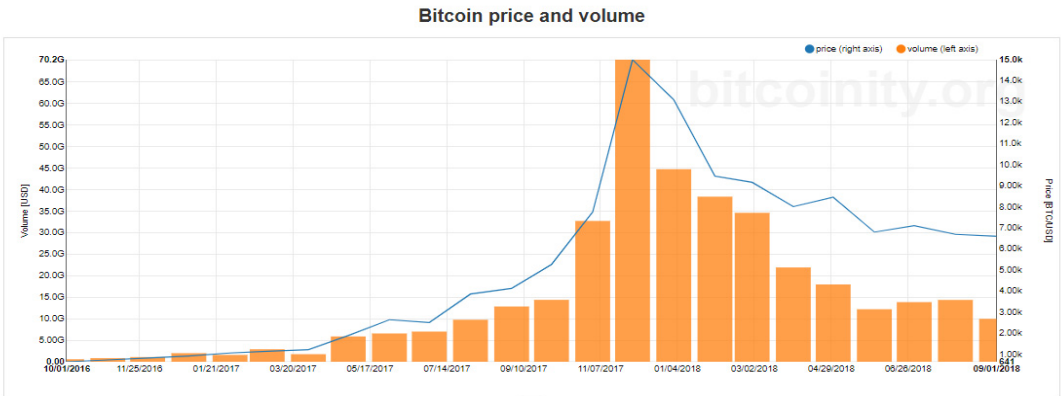


Figure 3.6: Bitcoin price and volume.
source: https://bitcoincharts.com/

Bitcoin price peaked in 2017 to be faced with rather gradual decline in 2018. This fluctuation can be contributed to many economic, political and social attributes. The majority of transactions took place in the OKcoin Market exchange with 35.5% of the market share followed by Huobi exchange with 33% of the shares. Shown below, the pie chart that reflects the Bitcoin exchanges market shares during the period 2011-2018.

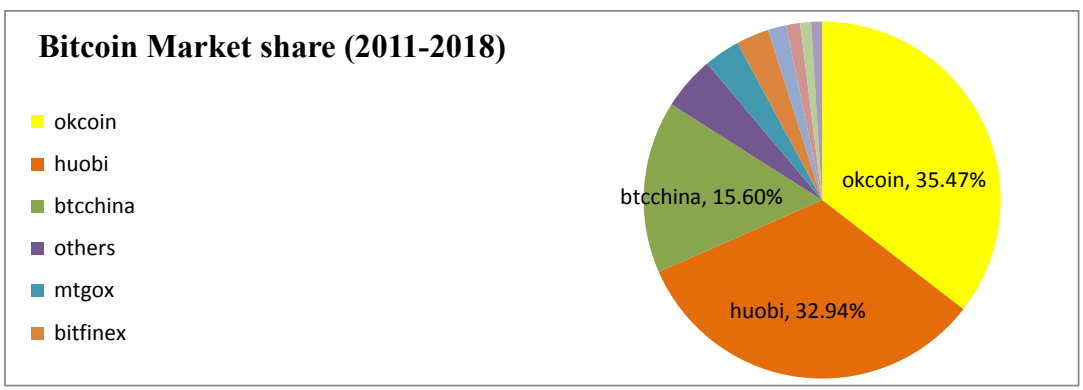


Figure 3.7: Market shares of different Bitcoins exchanges over the period 2011-2018.
Source: https://data.bitcoinity.org

3.7 Variables affecting the demand for Crypto currencies:

In this research we argue that economic uncertainties, trade frictions and increasing immigrations waves followed by their remittance money transfers caused the boosted demand for Bitcoin. This chapter generally discusses the possible variables that might have influenced the trade volume of these currencies; however our regression model displayed in the next chapter will be more precise,

utilizing solely the variables that are tested for significance using partial correlation/added variable plots in an attempt to show the effect of adding another variable to the model. Shown below are the possible macro and micro-economic variables that might have influenced crypto-currencies demand.

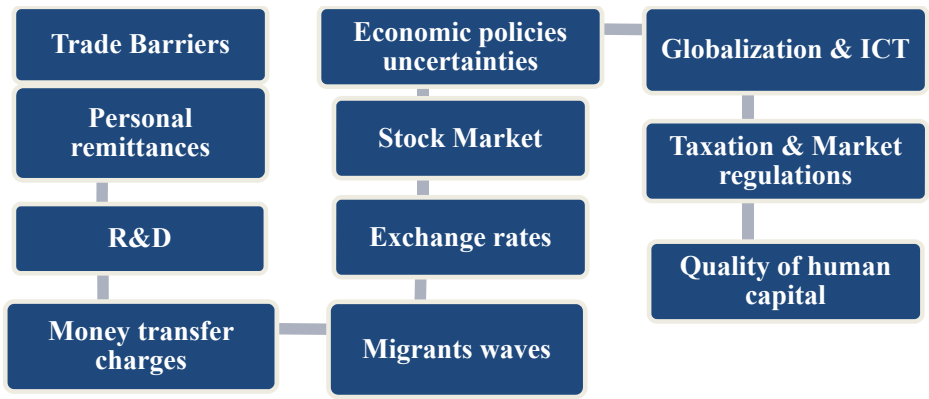


Figure 3.8: Variables affecting demand for Bitcoin

3.7.1 Globalization and ICT advancements:

In September 2016, WTO published[35] the "TRADE STATISTICS AND OUTLOOK" report stating that Globalization and the corresponding increase in world trade has driven global GDP growth for the last couple of decades. Countries have found their niche areas in the global economy and have flourished – China in manufacturing, India in software, Philippines in Business Process Outsourcing, etc.

Globalization has been the true enabling factor of Bitcoin, where it made it possible to carry out payments across the globe without paper work. Unlike regular currency which created by some sort of central banks. To generate Bitcoins, computers that run specialized software are required because of the complicated math needed to generate a Bitcoin. This process is known as mining and requires very powerful processors which can be found in CPUs, graphics cards and others. The people who use their computers to mine Bitcoin are paid a small percentage of the coins they generate.(Jacob J., 2016)

[35] WTO, 2016, TRADE STATISTICS AND OUTLOOK.

The supply of Bitcoins is regulated by software technologies that provides security to the users so that the system cannot be manipulated by any government, banking institution or even other individuals. (Acheson, N.2018)

Indicators for measuring the effect of ICT and globalization on Bitcoin trading volume such as country level High-technology, and ICT service exports and number of people having access to internet…etc.

3.7.2 Personal remittances:

The zone with the biggest potential for the virtual currencies lies with international remittances: money sent home by workers living abroad. This money had to be handled by several intermediaries: banks, wire services, and asset exchanges and each one took their cut. A research by Businessweek[36] showed that the average fee for remittances was 9% of the money transferred, with conversion to cash often costing an extra 5%. Migrant workers (or businesses operating on their behalf) now use these services to cut down on the transaction costs and transfer money without the hassle of extensive paperwork etc. This article suggests that cryptocurrencies provide a better way to send money back home for those migrants. (Brustein, J. 2013)

In our regression analysis we tried to measure the effect of personal remittance on Bitcoin demand through including country level Personal remittances transfers and International migrant stock (% of population),

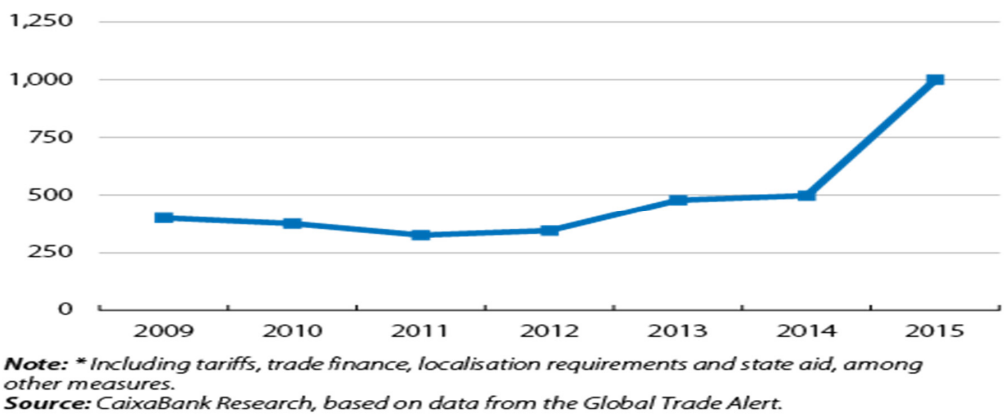
3.7.3 Rising protectionism against hyperglobalization and Bitcoin:

The free trade trend was dominating throughout the late 20th century. In 1993 the World Development Report issued by the World Bank[37] considers export-oriented growth to be the hallmark of a successful development strategy for less industrialized nations in East Asia. More recently, proponents of NAFTA and GATT have argued that reduced trade barriers will promote domestic growth through the rise in exports. In a letter to Congress accompanying the National Export Strategy report (TPCC, 1995)[38], the U.S.

[36] Brustein Joshua, "Will Migrant Workers Drive Bitcoin's Mundane Future", 2013.
[37] WB, World Development Report 1993.
[38] National Export Strategy, 1995

Secretary of Commerce argued ‘‘simply put, U.S. exports equal U.S. jobs.’’ Ever since the beginning of the 21st century this trend was reversed toward a more protectionist measures; particularly by UK and USA; pleading that the rapid growth in global trade seems to be plateauing. According to the pre-mentioned World Trade Organization report, the forecast trade growth rate for 2017 has been cut to 1.8% to 3.1% (from 3.7% previously). There is a possibility that global trade growth would be lower than global GDP growth (forecast of 2.2%)

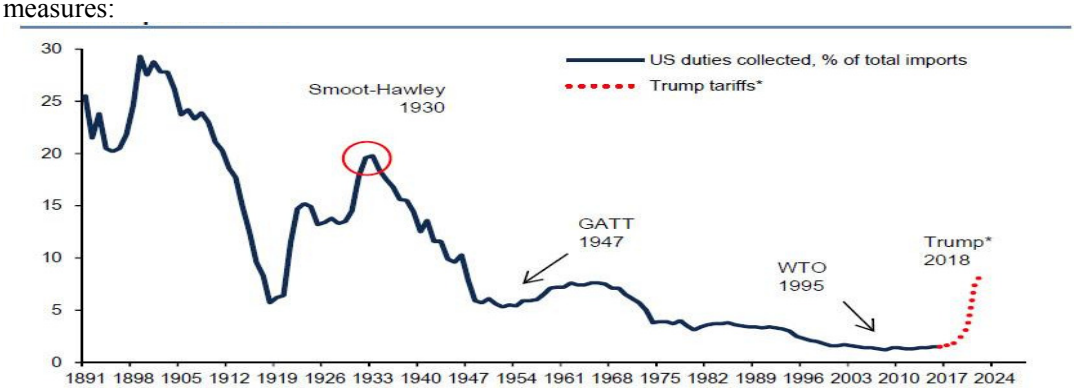
Shown below is the world protectionist pattern over the period 2009-2015.



Note: ** Including tariffs, trade finance, localisation requirements and state aid, among other measures.*
Source: *CaixaBank Research, based on data from the Global Trade Alert.*

Figure 3.9: Global Protectionist policies pattern over the period 2009-2015

The figure below shows the change in USA trade pattern toward more protectionist measures:



Source: BofA Merrill Lynch Global Investment Strategy, US International Trade Commission 2017; assumes stated and potential tariffs implemented

Figure 3.10: USA protectionism.
Source: Bank of America Merrill Lynch Global Research, 2017.

Furthermore, the eruption of 2009 financial crisis was followed by a sharp global economic downturn and a collapse in world trade, which was followed by protectionist response particularly ever since the year 2012. (ECB, 2013)

3.7.3.1 Examples of protectionism- Brexit and Trump:

When faced with tough questions about the performance of their economies, politicians have an easy excuse "to blame it on other countries". Donald Trump's rapid rise as a politician shows that he could tap into the unease of Americans about immigrants and China taking away jobs. (Jacob J. 2016)

Brexit shows that in spite of London's position as a global financial center, the people of UK as a whole felt that their jobs were threatened by immigrants. Protectionist measures are being imposed by multiple countries in varying degrees, as indicated by the growing number of trade disputes. The WTO issued its 2018 report "The Heterogeneous Impact of Brexit: Early Indications from the FTSE" in which it analyzed the expectations embodied in stock market price movements as a result of Brexit. Furthermore this report concluded that the market's reaction is consistent with investors responding to the potential impacts on a firm's global value chain. This can be seen in several ways. First, firms with GVCs heavily oriented towards Europe perform worse than the market as a whole. Second, because the depreciation of the Sterling is expected to encourage exports but hamper imports. Third, firms with more complex global networks (measured by the number of affiliates) did worse compare to others. Finally, larger firms seem like they are expected to ride out the turmoil of Brexit more easily than the average firm.[39](Davies, R. B. & Studnicka, Z. 2018)

[39] WTO, 2018, the Heterogeneous Impact of Brexit: Early Indications from the FTSE.

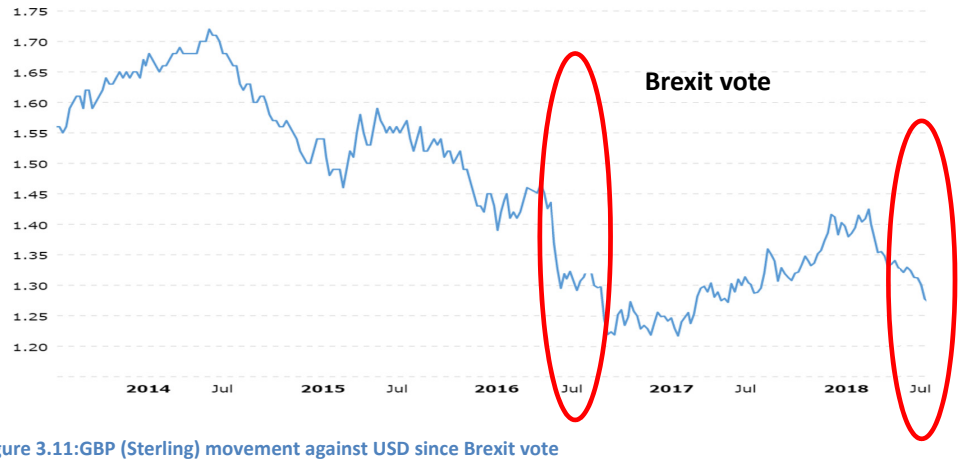


Figure 3.11:GBP (Sterling) movement against USD since Brexit vote
Source: WTO

3.7.3.2 Bitcoin knows no borders:

When a trade happens between two parties located in different countries, the question of which currency the trade has to be denominated in arises. If neither of the two parties has sufficient bargaining power, the trade is denominated in a neutral, liquid currency like the Dollar. (Jacob J. 2016)

This is a role Bitcoin could easily have slipped into, once it matures, given its ease of transmission across borders. As the Bitcoin community grows and adoption increases, it would acquire the characteristics of a 'mature' currency – liquidity and low volatility. Global trade, currently being hindered by protectionism, could be a growth driver for Bitcoin.

Bitcoin is a chance to have a currency not backed by single country. With protectionism, revolutions and inflations there are uncertainty about governments to be there for the next twenty years. With financial crisis and hyper-inflation people see their life savings disappear. Investors appreciate the benefits of having a currency that's less volatile than a single state currency with hyperinflation. Bitcoins provides the security and the empowerment of transferring money wherever and whenever needed just by a simple click without having to pay extra-fees.

To measure the effect of Protectionism on the demand for Bitcoin, we examined country level tariff and trade defense measures such as Number of tariff agreements, trade

agreements, tariff rate applied simple mean, and Taxes on international trade. However, out of the aforementioned indicators we solely displayed "Tariff rate applied" in our final regression results to avoid multicollinearity trap.

3.7.4 Economic policy uncertainty:

Regime uncertainty, which is a class of economic risk where the future path of government policy is uncertain, raising risk premia and leading businesses and individuals to delay spending and investment until this uncertainty has been resolved.

To measure the effect of policy-related economic uncertainty on the demand for Bitcoin, we included an index from the "economic policy uncertainty database" provided by Stanford Institute for Economic Policy Research together with the National Science Foundation, Becker Friedman Institute and Booth School of Business[40] this index constructs three types of underlying components. One component quantifies newspaper coverage of policy-related economic uncertainty. A second component reflects the number of federal tax code provisions set to expire in future years. The third component uses disagreement among economic forecasters as a proxy for uncertainty.

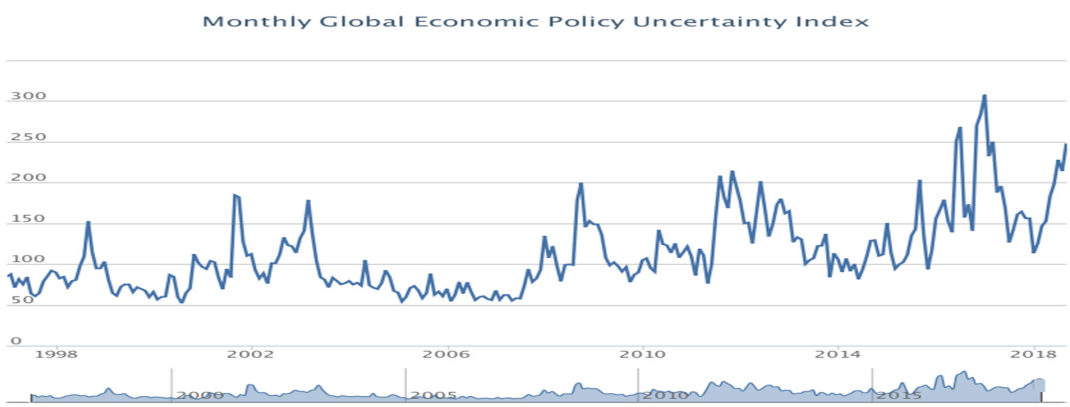


Figure 3.12: Global economic policy uncertainty index.
Source: http://www.policyuncertainty.com

To measure the effect of economic uncertainty on demand for Bitcoin, we included indicators such as country level Real Effective Exchange Rate and policy uncertainty index into our regression model.

[40] http://www.policyuncertainty.com/

Economic policy uncertainty index for the USA, For instance, is based on three basic components:

a. The first component is an index of search results from 10 large newspapers. The newspapers included in included in the index are USA Today, the Miami Herald, the Chicago Tribune, the Washington Post, the Los Angeles Times, the Boston Globe, the San Francisco Chronicle, the Dallas Morning News, the New York Times, and the Wall Street Journal. From these papers, a normalized index was conducted from the volume of news articles discussing economic policy uncertainty.
b. The second component of the index draws on reports by the Congressional Budget Office (CBO) that compiles lists of temporary federal tax code provisions. It accounts for the annual dollar-weighted numbers of tax code provisions scheduled to expire over the next 10 years, giving a measure of the level of uncertainty regarding the path that the federal tax code will take in the future.
c. The third component of the USA policy-related uncertainty index draws on the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters. It utilizes the dispersion between individual forecasters' predictions about future levels of the Consumer Price Index, Federal Expenditures, and State and Local Expenditures to construct indices of uncertainty about policy-related macroeconomic variables.

3.7.5 Quality of human capital:

Quality of Human Capital might affect the demand for crypto-currencies, not in the context of health and education but rather in the context of income level of people and the percentage of people having access to internet and the percentage of entrepreneurs who have enough money to initiate their own business with the necessary speculative sprite to endure the associated risks.

To measure the effect of quality of human capital on the demand of Bitcoin, we examined indicators such as country level percentage of Individuals using the Internet (% of population), GDP per capita, Unemployment rate, and the Percentage Self-employed.

However, out of the aforementioned indicators we enclosed GDP per capita and percentage of internet users in our final regression results so as to avoid multicolinearlity trap.

3.7.6 Taxation, market regulations and money transfer charges:

Taxes may be applicable to Bitcoins. For instance As of April 2017, cryptocurrency exchange businesses operating in Japan have been regulated by the Payment Services Act. The law on cryptocurrency transactions must comply with the anti-money laundering law; and measures to protect users investors. (Attached Annex I: Cryptocurrency Regulations landscape in the 15 countries selected for the regression analysis)

However, in other countries there are no taxes imposed on bitcoin revenues which are tempting for investors who are seeking tax evasion. In the meantime increasing money transfer charges, Foreign exchange controls [41] and imposing limits on send money overseas; made investors appreciate the benefits of crypto-currencies.

Foreign exchange controls might have various forms such as:

- Banning the use of foreign currency within the country
- Banning locals from possessing foreign currency
- Restricting currency exchange to government-approved exchangers
- Fixed exchange rates
- Restrictions on the amount of currency that may be imported or exported

To measure the effect of taxation and market regulations on the demand for Bitcoin, we examined country level Taxes on income, profits and capital gains, Tax payments (number), Other taxes and Other taxes payable by businesses. However, out of the aforementioned indicators our final regression results includes solely Tax payments so as to avoid multicollinearity.

[41] Foreigh exchange controls are various forms of controls imposed by a government on the purchase/sale of foreign currencies by residents or on the purchase/sale of local currency by nonresidents.

3.7.7 Stock market:

Some scholars argue that there might be a possible correlation between cryptocurriencies and stock market noticing the similarities in the pattern of some famous cryptocurrecnies such as Bitcoin and some well-known stock markets “S&P 500”. During Trump’s 2017 elections, the stock market was growing to new heights rapidly, with Bitcoin surging up to a new height. (Pollock, D. 2018)

Both markets then started to plunge, first, it was Bitcoin, whose price steadily dropped towards $6,000 before hitting a floor. Meanwhile, the stock market fell a lot quicker, but the pattern looked obviously similar. Questions then started to rose whether or not there was a correlation between those vastly different assets. And is it possible to predict the future moves?

Possible indicators for examining correlation between Bitcoin; as the most traded virtual currency; and stock market under different interest rates and inflation rates would be variables like country level Inflation, Interest rates and Stocks traded…. etc.

CHAPTER FOUR: FINDINGS, DATA ANALYSIS AND INTERPRETATION

4.1 Introduction:

For some time now there has been considerable skepticism about the cryptocurrencies implications and risk, with the increasing demand on these currencies it became important to know what factors influence the demand volume. To explain the actual pattern of the increasing volume of these currencies, this chapter will examine Bitcoins trade volume (one of the most traded crypto-currencies) with respect to the actual pattern of trade, particularly under recent trade frictions and uncertainties.

The most novel feature of our model is measuring the degree to which Bitcoin trade volume is correlated to economic uncertainties and trade frictions. To test this hypothesis, we acquired data that quantify the extent of these uncertainties and frictions across countries of interest.

Finally, this chapter discusses the main findings of our research. The findings are used to test the hypothesis and research questions posed in the first chapter. The analysis of data is presented in descriptive statistics, correlation test, multiple regressions, statistical test of significance, partial & semi-partial correlation analysis, 2SLS regression estimator and omitted variables bias analysis.

4.2 Descriptive statistics:

Shown below the descriptive statistics tables for our model reflecting the mean, standard deviation, maximum values, median and number of observations for each of our variables:

Stats	Bitcoin demand	GDP/ capita	Policy uncertainty index	Intl. migrant stock
Mean	5.94	4.47	1.96	2.65
Sd	1.15	0.31	0.58	8.3
Max	9.22	4.97	2.74	45.39
Median	6.03	4.59	2.07	0
N	75	75	75	75

Stats	Tariff rate applied	Tax payments	Real exchange rate	Personal remittances	No. of internet users
Mean	0.52	1.02	1.6	9.11	1.71
Sd	0.4	0.23	0.81	2.53	0.49
Max	1.2	1.56	2.18	10.84	1.99
Median	0.58	1	1.98	9.76	1.89
N	75	75	75	75	75

Table 4.1: Descriptive statistics tables

4.3 Data Variables:

Since our data is limited to fifteen countries, we shall use time series analysis to measure the relationships amongst our variables of interest and extent to which they are considered dependent on each other overtime. The time series analysis incorporates a unique advantage of explaining the past and present relationship between variables as well as forecast the future variations of the dependent variable.

With time series data analysis, we study whether there is a significant relationship between demand for Bitcoin and economic policies uncertainties, trade frictions, migrants volume and their respective remittances over the period 2013 to 2017. Since data are collected on yearly bases, we have 75 observations in this study. However, no single source can generate all data needed in this study; we shall use data collected from different accredited sources.

4.3.1 Dependent variable:

The Bitcoin country level trade volume is our dependent variable. Fifteen countries were selected, as per data availability, to run a regression measuring the extent to which Bitcoin volume is dependent on our variables of interest. Bitcoin trade volume data, over the period 2013-2017, were collected from coin dance statistics database. Country level trade volume figures represent a snapshot at year end. Understandably, the over-the-counter (OTC) transactions are not covered.

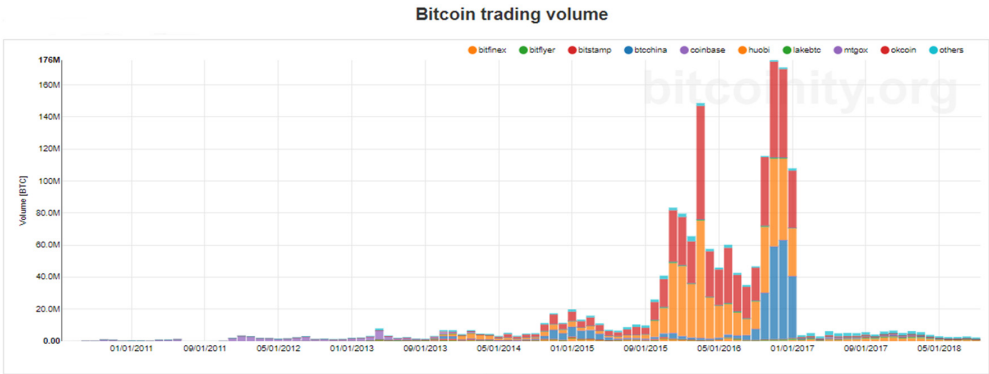


Figure 4.1: Bitcoin trading volume overtime across different exchanges.
Source: https://data.bitcoinity.org

Shown below the fifteen countries selected for our analysis categorized into developed and developing groups as per united nation Country classification report:

Developed	Developing
Australia	India
Canada	Brazil
United States	Korea, Rep.
United Kingdom	Singapore
Russian Federation	Egypt, Arab Rep.
Sweden	China
Japan	Hong Kong SAR, China
	Mexico

Table 4.2: Analysised Countries classifed in to developed Vs developing countries (UN country-classification)

4.3.2 Independent variables:

- Policy uncertainty index: to measure the uncertainties in each of our respective countries, annual data collected from web source ”www.policyuncertainty.com”, over the period 2013-2017.
- Tariff rate applied: Simple mean applied tariff is the unweighted average of effectively applied rates for all products subject to tariffs calculated for all traded goods. Data are classified using the Harmonized System of trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) revision 3 codes to define commodity groups. Effectively applied tariff rates at the six- and eight-digit product level are averaged for

products in each commodity group. Annual data used from World Bank- world development indicators over the period 2013- 2017.

- Tax payments number: reflects business regulations and their enforcement across economies of selected countries at the subnational and regional level. Data collected from "The Doing Business" database affiliated to world-bank over the period 2013-2017.
- Personal remittances received: data based on IMF balance of payments. Annual data collected over the period 2013-2017 from World Bank- world development indicators.

4.3.3 Control variables:

Control variables are those variables that the researcher is not interested in but have been justified to have a relationship with a dependent variable. The control variables in our model are GDP per-capita, real effective exchange rate and number of people using the internet per each of our selected countries.

- GDP is the commonly used statistics to measure the level of the economy. It is defined as an annual economic turnover within the country. GDP is simply the market value of all final goods and services produced in a county in a given time period (Krugman et al., 2012). GDP per capita divides a country's GDP by its total population. In this study the GDP per capita would be the proxy for the income level per country, in the meantime it represents the *Control variable* for our model. Annual data used from World Bank- world development indicators over the period 2013- 2017.
- Real effective exchange rate: (REER) is the weighted average of a country's currency in relation to an index or basket of other major currencies, adjusted for the effects of inflation. The weights are determined by comparing the relative trade balance of a country's currency against each country within the index. This exchange rate is used to determine an individual country's currency value relative to the other major currencies in the index. Annual data collected from World Bank- world development indicators over the period 2013- 2017.

- Individuals using the Internet (% of population): this variable reflects the individuals who have used the Internet in our respected countries. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc. Annual data collected from International Telecommunication Union, World Telecommunication/ICT Development Report and database over the period 2013-2017

4.4 correlation matrix results:

Variables	Bitcoin demand	GDP per capita	Policy uncertain	Intl. migrant	Tariff rate applied	Tax payments	RER	Personal remit. received	Internet users
Bitcoin demand	1								
GDP per capita	-0.0147	1							
Policy uncertain	0.4373	0.392	1						
Intl. migrant	-0.0427	0.2567	0.0734	1					
Tariff rate applied	-0.2654	-0.4251	-0.1932	-0.1192	1				
Tax payments	-0.1496	**-0.6431**	-0.5469	-0.2021	0.3706	1			
RER	0.1183	0.4534	**0.5088**	-0.0003	0.069	-0.351	1		
Personal remittances received	0.28	-0.5471	-0.1438	-0.2487	0.358	0.3769	-0.1757	1	
Internet users	-0.1891	0.3207	-0.0049	0.1368	0.2208	-0.223	0.1889	-0.1629	1

Table 4.3: Correlation matrix

The above Correlation matrix shows the correlation coefficients between our designated variables. It reflects which pairs have the highest correlation.

According to the correlation matrix results there is a strong positive correlation between real exchange rate and economic policy uncertainty, in other words the higher the economic uncertainties exchange rate the higher the real exchange rate. On the other hand the lowest negative correlation is between tax payments and GDP per-capita.

4.5 Regression analysis:

4.5.1 Anva section:

Source	SS	Df	MS	Number of obs		75
				F(8,66)	=	6.190
Model	41.788	8	5.22	Prob > F	=	0
Residual	55.740	66	0.84	R-squared	=	0.429
				Adj R-squared	=	0.359
Total	97.528	74	1.32	Root MSE	=	0.919

Table 4.4: Anova table

Interpretation:

Out of the 97.528 sum of squares our model explains 41.788 of them. And the residuals are 55.740 using our 75 observations (at degrees of freedom n-1=74) and 8 independent variables we are having in our model.

Thus the $r^{2=}$ 0.429 meaning round 43% of the variation in Y"Bitcoin trade volume" is being explained by our "X" variables. The remaining residuals would be 57% going unexplained. Similarly the adjusted R^2 shows variances of 35.9% taking into account the number of variables in our regression model**.**

We notice here that the mean square error (MS) is very low which indicate the extent to which our model is considered fit.

P-value is less than the level of significance (5%). Then we can reject the null hypothesis (H0)

Hypothesis:

H0: β1=β2=β3…. β 75=zero (our model is rejected)

H1= β1=β2=β3…. β 75≠zero (our model is accepted)

F statistic = 5.22/ 0.84= 6.190 which allows us to reject the null hypothesis "H0" at 5% level of significance.

4.5.2 Regression formula:

We run the below two dimensions regression formula in an attempt of determining the effect of endogenous Policies and uncertainties on the spread of Bitcoin demand to come to a conclusion; based on evidence and observations; on whether economic uncertainties and trade frictions significantly affect the Bitcoin demand.(i.e: "i=1,…,15 countries". T=time)

- Cross-County data:

$$Log(Y_i) = \beta_0 + [\beta_1 \log(X_{1i}) + \beta_2 \log(X_{2i}) + \beta_3 \log(X_{3i}) + \beta_4 \log(X_{4i}) + \beta_5 \log(X_{5i}) + \beta_6 \log(X_{6i}) + \beta_7 \log(X_{7i}) + \beta_8 \log(X_{8i})] + \varepsilon_i$$

- Time-series data:

$$Log(Y_t) = \beta_0 + [\beta_1 \log(X_{1t}) + \beta_2 \log(X_{2t}) + \beta_3 \log(X_{3t}) + \beta_4 \log(X_{4t}) + \beta_5 \log(X_{5t}) + \beta_6 \log(X_{6t}) + \beta_7 \log(X_{7t}) + \beta_8 \log(X_{8t})] + \varepsilon_t$$

- Panel data:

$$Log(Y_{it}) = \beta_0 + [\beta_1 \log(X_{1it}) + \beta_2 \log(X_{2it}) + \beta_3 \log(X_{3it}) + \beta_4 \log(X_{4it}) + \beta_5 \log(X_{5it}) + \beta_6 \log(X_{6it}) + \beta_7 \log(X_{7it}) + \beta_8 \log(X_{8it})] + \varepsilon_{it}$$

Bitcoin trade volume= 5.57- 0.64 GDP per capita + 0.91 Policy uncertainty index + 0.0032 International migrant stock -1.16 Tariff rate applied + 0.09 Tax payments number + 0.10 Real effective exchange rate + 0.19 Personal remittances received + 0.03 Individuals using the Internet

4.5.3 Regression results interpretation:

Bitcoin Trade Volume	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
GDP per capita	(-0.64)	0.58	-1.09	0.28	-1.80	0.53
Policy uncertainty index	0.91*	0.25	3.66	0.00	0.42	1.41
International migrant stock	0.003	0.01	0.24	0.81	-0.02	0.03
Tariff rate applied	(-1.16)*	0.35	-3.29	0.00	-1.87	-0.46
Tax payments number	0.09	0.70	0.14	0.89	-1.30	1.49
Real effective exchange rate	0.10*	0.18	0.54	0.59	-0.26	0.45
Personal remittances received	0.19	0.05	3.59	0.00	0.08	0.29

Individuals using the Internet	0.03	0.26	0.13	0.90	-0.49	0.55
_cons	5.57	3.05	1.83	0.07	-0.52	11.66

Table 4.5: Regression results

***P<10%, **P<5%, *P<1%

- **Economic policies uncertainty, trade frictions and Personal remittances:**

For Economic Policy uncertainty index, Tariff rates and personal remittances we notice that P-value is quite low which means they are statistically significant under 1% level and there is some evidence to reject the null hypothesis of no linear relationship between Policies uncertainties/trade frictions/Personal remittances and Bitcoin trading volume, consequently we have some evidence to suggest that there is a linear relationship between economic uncertainties/ trade frictions/Personal remittances and Bitcoin trade controlling for the other variables in our population.

Moreover, the positive coefficients for economic policies uncertainties and Personal remittances indicate that their economic significance with bitcoin demand moves in the same direction. This result increases the level of agreement with the statement that investors are more likely to using Bitcoins under economic instability or when the level of their personal remittances is high. The numerical interpretation would be for an increase in uncertainties index/ remittances by one unit, there is an average increase in the Bitcoin trade volume by 0.91 and 0.19 units respectively.

On the other hand, the coefficient for tariff applied is negative indicating that; qualitatively trade barriers moves in the opposite direction of Bitcoin demand. The numerical interpretation would be for an increase in tariff applied by one unit, there is an average decrease in the Bitcoin trade volume by 1.16 units. Another way of perceiving this relation is that, regardless the fact that payments are done electronically via Bitcoin, yet at the end of the day products involved are delivered through regular transportation and shipping channels to the buyer's door, thus having higher transportation cost; due to higher tariff; would adversely affect the demand for Bitcoin.

- **International migrant, Tax payments number, Real effective exchange rate, Individuals using the Internet and GDP per capita**

This model proves that there are strong evidence to accept the null hypothesis when it comes to the international migrants level, tax payments, real exchange rate and number of individuals using the internet in our selected countries, that's due to the significantly high P-values (0.81, 0.89, 0.59, 0.9 respectively).

In the meantime, GDP per capita showed high P-value as well (0.28), which concludes that there is no evidence that the null hypothesis does not hold.

4.5.4 Sum of residuals of the regression analysis:

In statistics, the residual sum of squares (RSS), also known as the sum of squared residuals (SSR) or the sum of squared errors of prediction (SSE), is the sum of the squares of residuals (deviations predicted from actual empirical values of data). A small RSS indicates a tight fit of the model to the data. Shown below our model residual table and residuals plot:

Residuals				
	Percentiles	**Smallest**		
1%	-2.514	-2.514		
5%	-1.331	-1.544		
10%	-0.966	-1.459	**Obs**	75
25%	-0.480	-1.331	**Sum of wgt.**	75
50%	0.004		**Mean**	0.0000
		Largest	**Std. Dev.**	0.8679
75%	0.507	1.388		
90%	1.224	2.047	**Variance**	0.7532
95%	1.388	2.163	**Skewness**	0.2838
99%	2.465	2.465	**Kurtosis**	3.8164

Table 4.6: Residuals Table

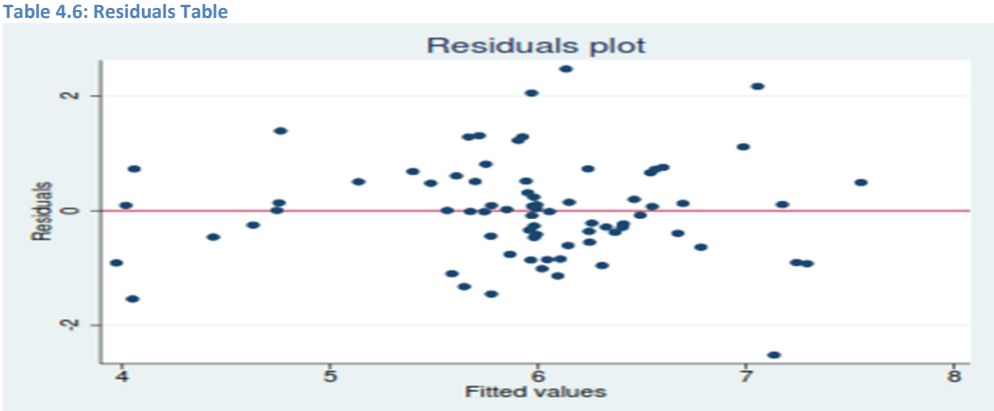


Figure 4.2: Residuals plot

4.5.5 Partial and semi-partial correlations:

In probability theory and statistics, **partial correlation** measures the degree of association between random variables, with the effect of a set of controlling random variables removed. A **semi-partial correlation** indicates the unique relation between an independent variable and the dependent Variable. We are interested in finding whether or to what extent there is a numerical relationship between our independent variables, since using their correlation coefficient might give misleading results if there is another, confounding, variable that is numerically related to other variables used. In order to avoid this misleading information we used partial correlation coefficient to control the confounding variable. This permitted the use of other right-side variables in our multiple regression; but while multiple regression gives unbiased results for the effect size, it does not give a numerical value of a measure of the strength of the relationship between other independent variables used which may result in multicollinearity (also collinearity). Collinearity is a phenomenon in which one predictor variable in a multiple regression model can be linearly predicted from the others with a substantial degree of accuracy. Shown below the partial regression table for our model:

Variable	Partial Corr.	Semipartial Corr.	Partial Corr.^2	Semipartial Corr.^2	Significance Value (P-value)
GDP per capita	-0.133	-0.1015	0.0177	0.0103	0.2796
policy_uncertainty_index	0.4108	0.3406	0.1688	0.116	0.0005
International_migrant	0.029	0.0219	0.0008	0.0005	0.8143
Tariff_rate_applied	-0.3758	-0.3065	0.1412	0.094	0.0016
Tax_payments	0.0166	0.0126	0.0003	0.0002	0.8928
Real_ exchange_rate	0.0664	0.0503	0.0044	0.0025	0.5905
Personal_remittance_received	0.4039	0.3338	0.1631	0.1114	0.0006
Individuals_using _Internet	0.0156	0.0118	0.0002	0.0001	0.8996

Table 4.7: Partial and semi-partial correlation

The squared partial correlation between Overall and policy uncertainty reflects the proportion of variance in overall that is not explained by the other independent variables, 17% is explained by the uncertainty variable.

The squared semi-partial correlation between Overall and policy uncertainty reflects model R-square is added by 0.116 if policy uncertainty variable is included in the model.

For the trade frictions variable, the squared partial correlation between Overall and trade wars shows that 14% is explained by the uncertainty variable. While squared semi-partial correlation between Overall and policy uncertainty shows that model R-square is added by 0.094 if tariff rate variable is included in the model.

Finally, the personal remittances variable would uniquely add up 0.1114 to R^2 of the model if it's included, while it contributes to 16% of the model variances.

4.6 Two-Stage least squares (2SLS) regression analysis:

Two-Stage least squares (2SLS) regression analysis is a statistical technique that is used in the analysis of structural equations. This technique is the extension of the OLS method. It is used when the dependent variable's error terms are correlated with the independent variables. Additionally, it is useful when there are feedback loops in the model. In structural equations modeling, we use the maximum likelihood method to estimate the path coefficient. (Lani J., 2018)

In our model we utilized the 2SLS to account for the endogenous explanatory variables in our regression model while maintaining the uncorrelatedness amongst the explanatory variables.

Formula used:

OLS formula:

$$Log(Y_{it}) = \beta_0 + [\beta_1 \log(X_{1_{it}}) + \beta_2 \log(X_{2_{it}}) + \beta_3 \log(X_{3_{it}}) + \beta_4 \log(X_{4_{it}}) + \beta_5 \log(X_{5_{it}}) + \beta_6 \log(X_{6_{it}}) + \beta_7 \log(X_{7_{it}}) + \beta_8 \log(X_{8_{it}})] + \varepsilon_{it}$$

Stage 1: Regress tax payment number $X_{1_{it}}$ on "Taxes on income, Profit and capital gains", and "other taxes payable by businesses" $(Z_{1_{it}}, Z_{2_{it}})$ to obtain $\widehat{X}_{1_{it}}$, where $(Z_{1_{it}}, Z_{2_{it}})$ are the instrumental variables.

Stage 2: plug in the fitted values of $\widehat{X}_{1_{it}}$ derived from stage one in to the original OLS regression equation:

$$Log(Y_{it}) = \beta_0 + [\beta_1 \log(\widehat{X}_{1_{it}}) + \beta_2 \log(X_{2_{it}}) + \beta_3 \log(X_{3_{it}}) + \beta_4 \log(X_{4_{it}}) + \beta_5 \log(X_{5_{it}}) + \beta_6 \log(X_{6_{it}}) + \beta_7 \log(X_{7_{it}}) + \beta_8 \log(X_{8_{it}})] + \nu_{it}$$

Where V is a composite error term, that is uncorrelated with $\widehat{X}_{1_{it}}$ and other independent variables.

BitcoinTradeVolume	Ordinary OLS (R^2= 0.429)			2SLS estimator (R^2= 0.3833)		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>z
Tax_payments	0.09	0.7	0.89	(-1.50291)	1.115696	0.178
GDP per capita	(-0.64)	0.58	0.28	(-1.06771)	0.61651	0.083
policy_uncertainty	0.91*	0.25	0.00	0.674837**	0.277155	0.015
Intl_migrant_stock	0.003	0.01	0.81	0.00181	0.013283	0.892
Tariff_rate_applied	(-1.16)*	0.35	0.00	(-1.03167)*	0.351311	0.003
R. exchange_rate	0.1	0.18	0.59	0.110929	0.171743	0.518
Remittances received	0.19*	0.05	0.00	0.194772*	0.051378	0.000
Internet_ users	0.03	0.26	0.9	(-0. 06513)	0.260223	0.802
_cons	**5.57**	**3.05**	**0.07**	**9.62383**	**3.721732**	**0.010**

Instrumented: Tax payments number

Instruments: GDP per capita, Policy uncertainty, Intl. migrant stock, Tariff rate applied, Real exchange rate, Personal remittances received, Internet users, Taxes on income profits and capital gains, other taxes payable by businesses.

Table 4.8: Ordinary OLS vs 2SLS estimator

***P<10%, **P<5%, *P<1%

We notice a decrease in R^2 from 0.429 to 0.3833 under 2SLS analysis; after accounting for the feedback loops in the model; round 38% of the variation in Y"Bitcoin trade volume" is being explained by our "X" variables. The remaining residuals would be 62% going unexplained.

Under 2SLS estimator Tariff rate applied and personal remittance received upheld their statistical significance under 1% level, with the same economic coefficients direction as of OLS, regardless the fractional changes in the magnitude of their coefficients.

Economic policies uncertainties shows a slight increase in its p-value yet a p-value as small as 0.015 (0.015 < 0.05) reflects a strong evidence for statistical significance. Thus, we tend to reject the null hypothesis, for this variable, under bother estimators (OLS and 2SLS).

In the meantime, the International migrant stock, internet users, tax payments, exchange rates and income levels upheld their statistical insignificance with noticeable changes in

their economic coefficients (i.e. tax payments and internet users are the only variables that shifted their coefficient's signs under 2SLS)

4.7 Omitted-variables bias:

In statistics, omitted-variables bias (OVB) occurs when a statistical model leaves out one or more relevant variables. The bias results in the model attributing the effect of the missing variables to the estimated effects of the included variables. (Barreto H., 2006)

In order to avoid the effect of potential Omitted variable bias we used fixed effects estimator. Shown below the results of running the fixed effect OLS:

Formula used:

$$Log(Y_{it}) = \beta_0 + [\beta_1 \log(X_{1it}) + \beta_2 \log(X_{2it}) + \ldots\ldots\ldots\ldots\ldots\ldots\ldots + F\mathrm{E}_i + \mu_i$$

corr(u_i, Xb)	**0.1754**
sigma_u	0.16738046
sigma_e	0.92276012
Rho	0.03185462 (fraction of variance due to u_i)
F test that all u_i=0:	F(1,65) = 0.46 Prob > F = 0.4992

Variables	**Ordinary least squares regressions. (R2= 0.429, Adj. R2 = 0.359, N=75)**		**Fixed effect estimator (R^2 = 0.4052)**	
Bitcoin Trade Volume	**Coef.**	**P>t**	**Coef.**	**P>t**
GDP per capita	(-0.64)	0.28	(-0.981)	0.21
Policy uncertainty index	0.91*	0.00	0.894*	0.001
International migrant stock	0.003	0.81	0.0028	0.839
Tariff rate applied	(-1.16)*	0.00	(-1.156)*	0.002
Tax payments number	0.09	0.89	(-0.118)	0.879
Real effective exchange rate	0.1	0.59	0.061	0.742
Personal remittances received	0.19*	0.00	0.1601**	0.019
Individuals using the Internet	0.03	0.9	0.044	0.869
_cons	5.57	0.07	7.661	0.082

Table 4.9: Fixed effect OLS estimator

***P<10%, **P<5%, *P<1%

We notice a slight decrease in R^2 from 0.429 to 0.4052 under the fixed effect model meaning; after accounting for the omitted variables bias; round 40% of the variation in Y"Bitcoin trade volume" is being explained by our "X" variables. The remaining residuals would be 60% going unexplained.

Under fixed effects models, Coefficients kept the same signs reflected under OLS with fractional changes in their econometric "β", except for the tax payments number which shows an opposite sign with a negative economic estimator; despite its statistical insignificance.

Economic policies uncertainties, trade barriers and personal remittance maintained a consistent pattern throughout both models with strong statistical significance to evidently reject the null hypothesis.

Income level, exchange rate, migrant stock and tax payments preserved high p-value throughout both models. For this reason we can't say that they have a significant correlation with Bitcoin demand because our test tends to rejects this hypothesis.

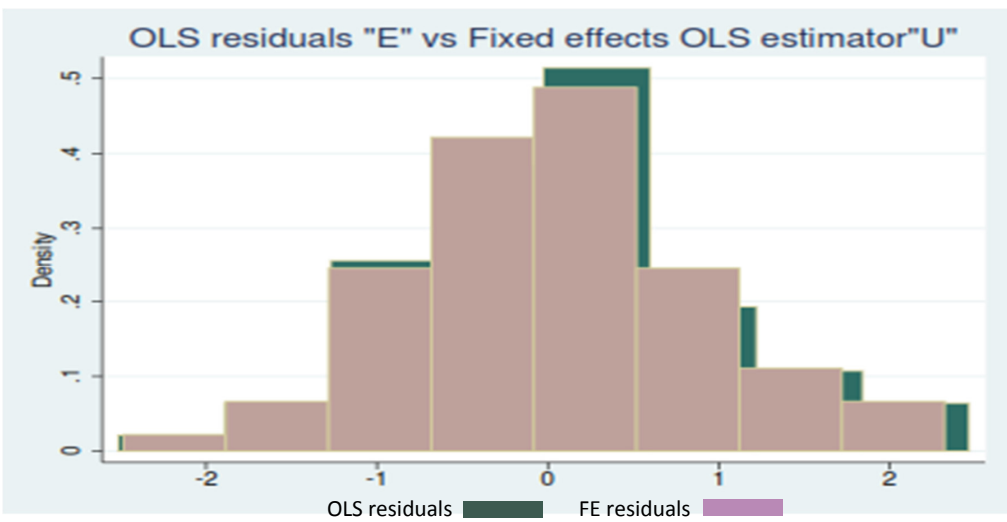


Figure 4. 13: OLS residuals vs Fixed effect residuals

Residuals under the fixed effects estimator tend to be more concentrated compared to the ordinary OLS residuals which tend to me more scattered.

4.8 Developed vs Developing countries:

In order to measure the contribution of both developed and developing countries in the results of our regression we divided our designated countries into two groups according to the United Nations country classification. Shown below are the regression results of each of the two groups, compared with our original aggregate model.

Variables	Aggregate Data (R^2= 0.429, Adj. R^2 = 0.359, N=75)		Developed countries (R^2= 0.68, Adj. R^2 =0.58, N=35)		Developing countries (R^2= 0.5460, Adj. R^2=0.429, N=40)	
Bitcoin Trade Volume	**Coef.**	**P>t**	**Coef.**	**P>t**	**Coef.**	**P>t**
GDP per capita	(-0.64)	0.28	(-4.654)*	0.01	1.232	0.28
Policy uncertainty index	0.91*	0.00	0.188	**0.78**	1.081*	0.00
International migrant stock	0.003	0.81	0.017	0.31	0.003	0.86
Tariff rate applied	(-1.16)*	0.00	(-2.128)*	0.00	(-1.002)**	0.02
Tax payments number	0.09	0.89	(-1.427)	0.28	1.801***	0.09
Real effective exchange rate	0.1	0.59	(-0.504)	0.86	0.046	0.81
Personal remittances	0.19*	0.00	1.704*	0.01	0.249*	0.00
Individuals using the Internet	0.03	0.9	(-0.031)	0.91	(-0.201)	0.68
_cons	5.57	0.07	14.532	0.13	(-4.803)	0.42

Table 4.10: Developed vs developing countries regression analysis

***P<10%, **P<5%, *P<1%

The above regression results shows an increase in R^2 as we divide the countries in to two groups, where R^2 increased from 0.43 to 0.68 and 0.55 for developed and developing countries respectively.

GDP per capita becomes significant; under 1% level; as we narrow down the analysis to uniquely embrace developed countries. In the meantime the coefficient's sign changed to positive for developing countries to reflect a positive relation between income level and bitcoin demand in this particular group.

Economic policy uncertainty lost its significance, with respect to bitcoin demand, in developed countries which reflects investors' indifference to system's stability while

trading using bitcoins. This variable maintained a positive estimator through-out our analysis.

International migrants' stock level is higher in developed countries, which is reflected by the decline in its P-Value in this part of the world, accompanied by positive coefficient indicating that bitcoin demand and number of migrants move together in the same direction, despite the strong evidence to accept the null hypothesis for this variable.

Tariff rates and personal remittances variables maintained a consistent pattern through-out our analysis with higher developed countries coefficient reflecting higher economic significance, thus bigger impact on Bitcoin trade volume.(i.e. notice that tariff rates are significant under 5% level in developing countries)

Tax payments in developing countries are positively correlated and more influential on Bitcoin demand, under 10%, compared with adverse relation and trivial significance in developed countries.

Exchange rates and purchasing power of currencies reflects adverse economic estimators between developed and developing counties with respect to their impacts on Bitcoin demand, despite the fact that both groups show statistical insignificance with high P-value for accepting the null hypothesis.

4.9 Conclusion:

The analysis in this chapter has obviously been suggestive rather than conclusive. It relies heavily on very special assumptions related to certain variables and the analysis of specific countries cases. Nonetheless, the aggregate data analysis does seem to confirm the idea that, in the presence of increasing economic policies uncertainties, trade frictions and remittance transfers investors tend to rely on international currencies that are not backed by certain county's economy even if the transactions they are involved are taking place within their domestic markets.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction:

This study was set to examine the possible opportunities and threats cryptocurrencies might bring about under the assumption of expanded economic uncertainties and unilateral trading system, which imposes protective trade measures, trade barriers, difficult trading environment, less room for economic cooperation and absence of recourse for enforcement and implementation. Particularly, this study sought to respond to the following questions:

- What are the economic implications of crypto-currencies in terms of threats, challenges and future risks, and what are the possible means that can be used to mitigate those risks on the other hand what is the possibility that the potential future opportunities and benefits could outweigh those implications?
- What are the determinants variables for the bitcoin high demand? And is there any significant correlation between its recent skyrocket demand and economic uncertainties and trade wars/frictions?

This chapter seeks to synthesize the findings of my study and provide well analyzed information to policymakers, economists and financial specialists.

5.2 Empirical findings summary and answering the research questions:

The main empirical findings of this study have been discussed throughout data analysis. This section will basically answer the research questions based on the findings of this study.

Our regression analysis tackled the question of whether or not there is a correlation between unilateralism, economic uncertainties, migrants stock, remittance transfers and crypto-currencies. To what extent investors are seeking refuge in cypto-currencies to escape rising trade barriers and protective policies under increasing economic uncertainties and migrants waves. Furthermore we carried out two dimension analysis through classifying designated countries in to two groups (developed vs developing countries) while examining time series data over the period 2013-2017 in order to

measure the contribution of each group to the aggregate results. In the meantime we utilized partial correlation analysis and fixed effect estimator to override any bias that may have occurred due to multi-collinearity or omitted variables effects.

The empirical findings of our model approved that global uncertainty and trade wars/ frictions and increasing personal remittance have been acting as stimulators for bitcoin trading volumes, despite the fact that, the economic policies uncertainties might lose significance in developed countries.

The results of the model show how it is possible to reject the null hypothesis for all the explanatory variables.

The t-test shows relative high p-values for the independent variables International migrant, Tax payments number, real effective exchange rate, Individuals using the Internet and GDP per capita which reflects the strong evidence to accept the null hypothesis of having insignificant correlation to bitcoin demand.

Moreover the coefficients explain the way to which those variables affected the responses variable trading volume.

In answering whether the benefits received from these technological advancements would outweigh its threats, we analyzed cryptocurrency phenomenon use in general and the bitcoin in particular. Our research found that the future of cryptocurrencies could be bright if some institutional – formal conditions are fulfilled. The advantages of cryptocurrency use in facilitating trade, cost reduction, and alike, are clear trophies. Bitcoin and other cryptocurrencies have the potential to compete with traditional and new payment methods. But to achieve that and become a dominant power in the global e-system of payments, they must provide distinctive incremental value, to address and overcome a number of critical challenges, such as formal regulatory issues and fraudulent activities. That is unlikely to happen in the short time period since governments are well positioned to prevent integration of cryptocurrencies within current formal financial institutions. Without these institutions, the hardships cryptocurrencies would face to replacing the current legally privileged and centrally issued currencies appear to be impossible. Furthermore the official regulatory responses should be internationally collective due to the international attribute of those involved in crypto-currencies transactions.

5.3 Policy implications:

Regulating crypto-currencies; within a discrete areas of law; is extremely challenging to policymakers due to their relatively high level of anonymity, which makes it difficult for regulators to identify individuals who use the protocol for illicit value. That is contributed to the fact that the documentation of ownership and transfers doesn't identify the owners themselves, but rather a set of letters and numbers representing their public crypto-currency address.

More importantly, mitigating crypto currencies risks require more collective direct regulatory responses; that are ***internationally coordinated***; from a financial stability perspective. A patchwork of inconsistent national-level regulatory responses to financial stability concerns may not address risks, as the activity of agents in this market may be international.

Recall that; the findings of our regression analysis pointed out that the expanded economic uncertainties, remittances transfers, unilateral trading system, protective trade measures, trade barriers, difficult trading environment, less-economic cooperation and absence of recourse for enforcement and implementation; have stimulated the demand for Bitcoin. From this result, we recommend the policymakers to consider these effects while reforming trade policies given the fact that e-trade occupies a significant portion of the global trade. In the meantime, attempting to regulate trading with cryptocurrencies would add significant hedge against their risks.

5.4 Limitations of the study and recommendations for future studies:

This thesis seeks to provide clarity on the topic of crypto-currencies and tries to address the issue in a structured approach. Such an approach has been absent, at least to some extent, from the existing literature. Moreover, there have previously been limited references to this topic in the publications of central banks, international organizations or public authorities. As a consequence, this thesis largely relies on information and data gathered from material published on the internet, whose reliability, however, cannot be fully guaranteed. This places serious limitations on the present study.

For the regression analysis, this study has focused on certain indicators for economic uncertainties, trade frictions and immigrants waves. My recommendation for future studies would be using alternative indicators while persistently examining for multicollinearity for substantial degree of accuracy. For instance, the correlation between the increased skepticism toward banking systems; after the 2008 subprime mortgage crisis and banks liquidity shocks; and how that may have affected the demand of crypto currencies; can form an interesting argument for future researches.

Additionally, this thesis has concentrated on 2SLS and fixed effect OLS estimators for data limited to fifteen countries of interest. Further studies can be conducted by introducing other econometric techniques with regional and continental level of analysis.

A full inquiry into the regulation of cryptocurrencies is beyond the scope of this Essay. Many important issues-such as regulatory-design choices and behavioral incentives remain for future research. However, the proposed framework offers a rallying point for future discussion seeking to control the use of cryptocurrencies. The Suggested framework also offers two new insights: First, it is conceivable to design regulatory instruments that target only the negative traits of cryptocurrencies while allowing positive traits to flourish. Second, it is possible to enlist legitimate users (by recording ownership and value transfer) as passive participants in regulatory efforts.

Finally, we recommend that academic research in this field should be taken with reserves and caution, since the cryptocurrency market is evolving with an enormous speed and there is a significant dose of confusion about what is going on.

5.5 Conclusion:

This study recommends some structural policies to stimulate the usage of regulatory power to channel crypto-currencies users towards productive sectors that could lead to economic growth. Furthermore it highlights the importance for these regulations to be internationally conducted in order to beleaguer crypto-currencies' implications.

As is evident from these results, our model provides rich predictions about patterns of Bitcoin trade under conditions of uncertainties, increasing trade barriers and personal remittance transfers. Since we laid out the empirical motivation for this study in the

introduction, it suffices to point out in these concluding comments that our approach helps to better appreciate the complexity of e-trade in a world with investors choose endogenously their investment forms. It also should help in designing empirical studies of the ever-evolving world of e-trading system.

Finally, my empirical evidence indicates that channels other than the normal productivity improvements and economies of scale might impact future trade patterns. The incorporation of crypto-currencies within investors' transactions should be a fruitful area for the future theoretical work on gains/losses from trade.

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국문초록

암호화폐의 문제와 위험/위협 요소 분석

-비트코인 대상으로-

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본 연구는 암호화폐의 요소와 문제가 국제법의 틀 내에서 규제되지 않은 경우 물가와 지불제도의 안정성과 더불어 금융안정에 얼마나 큰 영향을 미칠 수 있는지를 밝히는 데에 목적이 있다.

한편, 본 연구는 이 지불 제도가 가져올 기회와 혜택, 그리고 그것이 투자들에게 호소력이 있다는 점을 받아들인다.

무엇보다도, 본 연구는 범죄자, 사기꾼, 돈세탁하는 사람들에 의해 부정한 행위를 하는 데 이용되어 공권력에 큰 도전이 될 수 있다는 점에서 이러한 제도들을 둘러싼 법적 불확실성을 강조한다.

게다가 본 연구는 15개 국가의 연간 데이터를 이용해 2013-2017 기간 내에 가장 널리 거래되는 암호화폐 '비트코인'의 수요에 영향을 미치는 요인을 분석한다. 본 연구는 2SLS 방법을 이용해 다음과 같은 결론을 내렸다. 첫째, 거래 규모와 시장 변동성과 같은 비트코인 시장과 관련된 시장 요소들이 경제적 정책 불확실성, 무역장벽, 선진국과 개발도상국에게 송금과 상당한 연관성이 있는 것으로 나왔다. 두번째, 이민자의 규모는 전체적으로 무의미한데도 선진국에서 낮은 'P-value'로 나온다. 그래서 경제적 불확실성과 무역 마찰에 대한 인식은 국가 분류에게 영향을 받지 않다는 것을 추론할 수 있으며 전체적으로 의미가 있다는 것으로 간주된다.

한편, 소득 수준, 납세 변수는 비트코인 수요와 관련하는 국가의 분류에 의해 크게 영향을 받는다. 마지막으로 인터넷 사용자의 수, 환율과 같은 변수는 통계적으로 아무 의미가 없는 것으로 나왔다.

주요어: **암호화폐,** 비트코인, 보호주의, 무역장벽, 송금, 경제적 불확실성, 비트코인 분석, 비트코인 수요 결정 요인.

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