

**T.C.  
ISTANBUL AYDIN UNIVERSITY  
INSTITUTE OF GRADUATE STUDIES**



**A RELATIONSHIP BETWEEN BITCOIN AND FOREIGN EXCHANGE  
RATES: A QUANTITATIVE RESEARCH ON BITCOIN, AND SELECTED  
FOREIGN EXCHANGES.**

**MA. THESIS**

**Ala Aldin Shuaib Manaserh**

**Department of Business  
Business Administration Program**

**October 2020**

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**October 2020**

## ONAY FORMU

## **DECLARATION**

I hereby declare with respect that the study “A Relationship Between Bitcoin And Foreign Exchange Rates: A Quantitative Research On Bitcoin, And Selected Foreign Exchanges.”, which I submitted as a Master thesis, is written without any assistance in violation of scientific ethics and traditions in all the processes from the Project phase to the conclusion of the thesis and that the works I have benefited are from those shown in the Bibliography. (.../.../20...)

**Ala Aldin Shuaib Manaserh**

This thesis is dedicated to: My father Shuaib, My Mother Ameenah, Sisters Hend, Wala' & Ala', & Brothers Mohammad, Yahya & Saif, as well as to my brother and friend Khaled and to my love Mediha Nur, who keep supporting and encouraging me. May god bless them with his mercy and forgiveness.

## **FOREWORD**

When everything around suddenly changed, you find yourself having difficulties in adopting in the new situation, but now I realized that such changes were for the better, so thank you God for changing my path and plans and helping me assigning new targets in my life.

Family support is essential, and I am blessed with my family back there in Palestine, who was following up with me in my daily life in Turkey and my studying at Istanbul Aydin University, supporting me encouraging me and believing in me. As well as I want to thank my lovely wife Mediha Nur who supported me here, and never forget my brother and near friend Khaled Alnimer who I will not find supporter like him all over the world, he was more than a brother to me in foreignness.

With my regards, appreciation, and sincere thanks to: Dr. Öğr. ÜYESİ MUSTAFA ÖZYEŞİL, thesis advisor, for his guidance, worthy suggestions, deep cooperation, and encouragement during my preparation of this thesis.

I am so proud of doing my master's degree at Istanbul Aydin University, I had such great professors who were always there for me and encouraging me to do a thesis, guiding me in my analysis and being there for me. I will miss this university and its library as I have a lot of good memories there.

Finally, I realize that GREAT THINGS NEVER COME FROM COMFORT ZONE.

**October, 2019**

**Ala Aldin Shuaib Manaserh**

## TABLE OF CONTENT

<b>FOREWORD</b> .....	<b>v</b>
<b>TABLE OF CONTENT</b> .....	<b>vi</b>
<b>ABBREVIATIONS</b> .....	<b>vii</b>
<b>LIST OF FIGURES</b> .....	<b>viii</b>
<b>LIST OF TABLES</b> .....	<b>viii</b>
<b>ABSTRACT</b> .....	<b>x</b>
<b>ÖZET</b> .....	<b>xi</b>
<b>1. INTRODUCTION</b> .....	<b>1</b>
1.1 Problem Statement.....	5
1.2 The Aim of the Study.....	6
1.3 Significance of the Study.....	6
1.4 Research Questions.....	7
1.5 Research Hypothesis:.....	7
1.6 Limitation of the Study.....	8
1.7 Organization of the chapters.....	8
<b>2. THEORETICAL FRAMEWORK OF CRYPTOCURRENCY AND FOREIGN EXCHANGE RATES</b> .....	<b>9</b>
2.1 Basic Concepts of Cryptocurrencies.....	9
2.1.1 Blockchain technology.....	11
2.1.2 Traditional Money vs Cryptocurrency.....	15
2.1.3 Government Cryptocurrencies Applications all over the world.....	20
2.2 Fundamentals of the Foreign Exchange Rates.....	22
<b>3. LITERATURE REVIEW</b> .....	<b>24</b>
3.1 Risks and Volatility of the Cryptocurrencies.....	24
3.2 The determination of Cryptocurrency exchange rate.....	28
3.3 The Interaction between Cryptocurrencies and Other Financial Instruments..	30
<b>4. AN INTERACTION ANALYSIS BETWEEN BITCOIN AND FOREIGN EXCHANGE RATES</b> .....	<b>33</b>
4.1 Data & Methodology.....	33
4.2 Test results.....	33
4.2.1 Descriptive Analysis.....	34
4.2.2 Unit Root Test.....	35
4.2.3 Cointegration Test.....	37
4.2.4 Regression Analysis.....	38
4.2.5 Vector Autoregressive Analysis.....	41
4.2.6 Granger Causality.....	45
4.3 Discussion of Findings.....	47
<b>5. CONCLUSION AND RECOMMENDATIONS</b> .....	<b>49</b>
5.1 Conclusion.....	49
5.2 Recommendations.....	50
<b>REFERENCES</b> .....	<b>51</b>
<b>APPENDIX</b> .....	<b>56</b>
<b>RESUME</b> .....	<b>59</b>

## **ABBREVIATIONS**

<b>ADF</b>	: Augmented Dickey Fuller
<b>BTC</b>	: Bitcoin
<b>BTCP</b>	: Bitcoin prices
<b>EURP</b>	: Euro prices
<b>SATS</b>	: Satoshi
<b>USD</b>	: US Dollar
<b>USDP</b>	: US Dollar prices
<b>VAR</b>	: Vector Autoregressive Analysis



## LIST OF FIGURES

	<u>Page</u>
<b>Figure 2.1:</b> Representation of the three main types of cryptocurrencies. ....	11
<b>Figure 2.2:</b> A look at blockchain technology .....	14
<b>Figure 2.3:</b> Advantages of blockchain Technology. ....	15
<b>Figure 3.1:</b> Chart of exchange markets for BTC.....	25
<b>Figure 4.1:</b> Report of Normality Test.....	40
<b>Figure 4.2:</b> BTCP Impulse Response From USDP .....	42
<b>Figure 4.3:</b> BTCP Impulse Response From EURP .....	42

## LIST OF TABLES

<b>Table 1.1:</b> Summary and ranking of the five most valuable cryptocurrencies.....	4
<b>Table 1.2:</b> Summary of the three most valuable fiat currencies.....	4
<b>Table 2.1:</b> A comparison between Gold, Fiat currency and cryptocurrency.....	19
<b>Table 2.2:</b> Summary of reasons to invest and to not invest in BTC.....	19
<b>Table 2.3:</b> A summary of exchange rate types.....	23
<b>Table 3.1:</b> Ranking of exchange markets for BTC .....	25
<b>Table 3.2:</b> Summary of existing studies on BTC exchange rate. ....	29
<b>Table 4.1:</b> Descriptive Report .....	34
<b>Table 4.2:</b> ADF Unit Root at Level Values.....	35
<b>Table 4.3:</b> ADF Unit Root at First Difference .....	36
<b>Table 4.4:</b> Integration Order.....	36
<b>Table 4.5:</b> Trend assumption: Linear deterministic trend .....	37
<b>Table 4.6:</b> Unrestricted Cointegration Rank Test (Maximum Eigenvalue) .....	38
<b>Table 4.7:</b> Regression Results .....	38
<b>Table 4.8:</b> Serial Correlation Test .....	39
<b>Table 4.9:</b> Heteroskedasticity Test: Breusch-Pagan-Godfrey .....	40
<b>Table 4.10:</b> Report of VAR Analysis .....	41
<b>Table 4.11:</b> Variance Decomposition of BTCP .....	43
<b>Table 4.12:</b> Variance Decomposition of USDP .....	44
<b>Table 4.13:</b> Variance Decomposition of EURP .....	45
<b>Table 4.14:</b> Pairwise Granger Causality Tests .....	46

# **A RELATIONSHIP BETWEEN BITCOIN AND FOREIGN EXCHANGE RATES: A QUANTITATIVE RESEARCH ON BITCOIN, AND SELECTED FOREIGN EXCHANGES.**

## **ABSTRACT**

Cryptocurrency is one of the most discussed topics in today's financial world. Especially with the emergence of Covid-19 pandemic process, it is thought that the increasing digitalization process will affect cryptocurrencies increasingly. Bitcoin is the first and most famous cryptocurrency. It is based on blockchain technology and it is a peer-to-peer digital decentralized cryptocurrency that is not subject to the control of central authorities. This study conducts an analysis to clarify the interaction between Bitcoin prices (in US Dollar), and selected foreign exchange rates using US Dollar prices (in Turkish Lira) and EURO prices (in Turkish Lira) by analyzing causal-effect relationship. Average monthly data is used for the period from August 2010 to June 2020 with a total of 357 obs. Some econometric techniques are used ranging from descriptive analysis, unit root test, regression analysis, cointegration test, vector autoregressive analysis, and granger causality test.

This study finds out that USD prices (USDP) move in a negative and significant direction to Bitcoin prices (BTCP), that is, a unit increase in the USDP will lead to decrease in the in BTCP while Euro prices (EURP) influences BTCP in a positive and significant direction, and a unit increase in EURP will lead to an increase in BTCP.

According to co-integration test results, it is further revealed that there is no cointegration relationship long-run between Bitcoin price, USD prices, and EURO price. As a result of the Granger causality test conducted, the Bitcoin in the long run, may become a good alternative investment tool for the foreign exchange rates.

**Keywords:** *Bitcoin, USD, EURO, Cryptocurrency, Foreign Exchange Rate, Unit Root, Cointegration, Vector Autoregressive Analysis, Granger Causality, Causal-Effect Relationship.*

## **BITCOIN İLE DÖVİZ KURLARI ARASINDAKİ İLİŞKİ: BITCOIN VE SEÇİLMİŞ DÖVİZ KURLARI ÜZERİNE KANTİTATİF BİR ARAŞTIRMA**

### **ÖZET**

Kripto-para birimi, günümüz finans dünyasının en çok tartışılan konularının başında gelmektedir. Özellikle Covid-19 pandemi süreci ile birlikte artan dijitalleşme sürecinin kripto paraları da artan oranda etkileyeceği düşünülmektedir. Bitcoin, ilk ve en ünlü kripto para birimidir. Blok zinciri teknolojisine dayanır ve merkezi otoritelerin kontrolüne tabi olmayan, eşitler arası dijital merkezi olmayan bir kripto para birimidir. Bu çalışmada, Bitcoin fiyatları (ABD Doları cinsinden) ile önemli döviz kurları arasındaki etkileşim ölçülmüş, Bitcoin fiyatları ile ABD Doları fiyatları (Türk Lirası cinsinden) ve EURO fiyatları (Türk Lirası cinsinden) arasındaki nedensel etki hesaplanmış ve bu şekilde Bitcoin'in yabancı kurlar için alternatif bir yatırım aracı olup olmadığı analiz edilmiştir. Analiz dönemi olan Ağustos 2010 ile Haziran 2020 arasında toplam 357 gözlemi kapsayan bir analiz gerçekleştirilmiştir. Analizde; tanımlayıcı istatistikler, birim kök testi, regresyon analizi, eşbütünleşme testi, vektör otoregresif analiz ve granger nedensellik gibi çeşitli ekonometrik teknikler kullanılmıştır.

Bu çalışmada, USD fiyatları (USDP) ile Bitcoin fiyatları (BTC) arasında negatif ve istatistiksel olarak anlamlı bir şekilde hareket ettiği tespit edilmiştir. Diğer bir ifadeyle, USDP'deki bir birimlik artışın BTC'de düşüşe yol açacağı tespit edilmiştir. Euro fiyatları (EURP) ile BTC arasında pozitif ve istatistiksel olarak anlamlı bir ilişki mevcuttur. EURP'deki bir birimlik artışın BTC'de de bir artışa yol açacağı gözlemlenmiştir.

Yapılan eş bütünleşme testi sonucuna göre; Bitcoin fiyatı, USD fiyatları ve EURO fiyatı arasında uzun vadeli bir ilişki olmadığı da ortaya çıkmıştır. Granger nedensellik testi sonucuna göre Bitcoin'in, uzun vadede döviz kurları için iyi bir alternatif araç haline gelebileceği tespit edilmiştir.

**Anahtar Kelimeler:** *Bitcoin, USD, EURO, Kripto Para Birimi, Döviz Kuru, Birim Kök, Eşbütünleşme, Vektör Otoregresif Analizi, Granger Nedensellik, Nedensel-Etki İlişkisi.*

## 1. INTRODUCTION

Since there was a live for a human the need for communication arise, and a need for finding a good and trustable medium for exchange was being a necessity. This medium of exchange is an intermediary tool or mechanism used to promote the selling, acquisition, or trade of products between others. (Investopedia, 2020). Nevertheless, the medium of exchange should have some criteria, like: It should have to be acceptable between others, trustable, accepted, storing value, etc.

In the first there was barter system which is based on trading goods or services for another. People in the barter system would entail a convergence of demands on two sides. It's a situation in which two sides should be demanding the goods or services that the other side can provide. Throughout the History, a variety of things have been used as a medium of exchange, like shells, gold, silver, cattle, rum, etc. (Aghalibayli, 2019)

A mechanism for exchanging goods and storing value is needed in a dynamic modern economy in which thousands of services and products are exchanged, so the barter system is not appropriate, and "currency" is required. The boundaries and differences between countries' cultures and economies created differences in the value of their currencies in different parts of the world. In modern times, currency has usually been divided into two groups based on the currency's geographical use, namely domestic and foreign currencies. Domestic currency in a specific region is the currency issued as a legal tender in a single country or community in countries, while all other currencies in that particular area are not issued as legal tender are foreign currency. In modern economies, the medium of exchange is fiat currency. (Fiévet, 2004)

As economies become more complex and the paper and coin currency become unable to convoy the changes and the complexity in the economies and transaction. So, the need for a more powerful up to date solution had been arise

and become an important thing and for that many ways emerged to facilitate transactions like: Mastercard and PayPal.

After 2008 financial crises people were seeking a currency that which would not be regulated by a central authority. When the citizens placed their trust in a bank, the bank lost the money of the consumers and to solve this big problem, the government printed more currency, which in effect decreased the money's value already in circulation. While there was no upper cap on the amount of money that the government could print, the unpredictability and confusion over the decrease in people's money value always were there. (BAGHLA, 2017)

After those crises and to solve the problem that hit the whole financial system, Furthermore, as markets and human society developed, more sophisticated tools for the exchange of commodity were needed. In this respect, the introduction of cryptocurrency has revolutionized the international payment system to a size that was unimaginable only a few years ago. (Boshkov, 2019)

On October 31, 2008 a computer scientist whose identity is still unknown under the pseudonym Satoshi Nakamoto published a paper that introduced and explained the operation and the idea of the BTC system. His paper tried to prove that it's impossible to spend the same BTC many times in the same place or in two different places, and if two different transactions are spending the same BTC, one must decide which one of the two is valid. Any attempt to spend the same BTC twice in the Bitcoin world is called a "double-spending attack," and would be invalidated.

The framework was published as an open source on 9 November 2008, and finally the first virtual currency 'Bitcoin' was developed on 3 January 2009 and was first used as a virtual currency in a transaction on 12 January 2009. (Haşlak, 2018)

Bitcoin is an autonomous digital currency and is not subject to central authority regulation and without inflation. It had been constructed on a peer-to-peer network called Blockchain.

By fixing the maximum number of Bitcoins that might ever be in circulation and the rate at which new Bitcoins would be produced, Bitcoin resolved the 2008 crises problem. Owing to the coding used in its architecture, the maximum

number and the production rate cannot go above the specified limit. Also, this code is made visible to everyone for easy verification to ensure that no more Bitcoins would be produced. Bitcoin's value was dependent on the supply and demand in the market only and was a way from government intervention, like when the government artificially alters the value of a currency for various reasons.

After its launch in 2009, a new era of blockchain technology had been ushered by BTC. Blockchain technologies and cryptocurrencies, for instance Bitcoin, Ethereum, and XRP, have attracted significant attention in recent years. To date, Bitcoin is the most significant example of blockchain-based cryptocurrencies. According to some recent reports, \$172.3 billion was the worth of all BTCs in the world as of 22 July 2020. While its price in that date was \$9,345.96 (coinmarketcap, 2020). Bitcoin accounted for just 0.4% of the world's money. While it was worth only about 1.6% as much as the world's gold supply. All cryptocurrencies jointly accounted for less than 0.7% of the world's money. (How Much of All Money Is in Bitcoin?, 2020)

Cryptocurrencies are created by mining, mining means that computers solve complex equations and get a certain number of coins as a reward. A massive pool of computers solving complex equations holds the whole Bitcoin network, where new coins are being mined and transfers are sent. This means without the internet network, there would be no Bitcoins. The Bitcoin digital money essentially functions the same way as a regular currency; it has much of the currency on the Internet, so you can buy various products or services using the currency.






The primary motive and goals behind Bitcoin's creation was to achieve a cryptocurrency where a person could transfer the currency to another person anywhere in the world without costing high transactions and without the trustworthy third party.

Cryptocurrencies are built in a way that no one can hurry up the volume of cryptocurrency on the market, because they have their variables that dictate how many cryptocurrencies can be mined or released. Which is means that no one can actually control the currency. But since the cryptocurrency 's value is dependent on supply and demand, it will dramatically rise or decrease whether

the coin is unexpectedly bought or sold at a massive price. A sharp increase in BTC demand and the slow rate at which new BTCs are mined resulted to a huge increase in value from US\$ 10 in January 2012 to US\$ 100 in March 2012. After that, between March and December 2012 the Bitcoin rose from USD 100 to USD 1000. (Brander, 2014) while its value in July 2020 was 9,345.96 USD, now in August is 11,749\$

After BTC's success, many attempts to make a copy or a better version of the BTC had been done. Some have succeeded, but most of them have failed. Today, 21st August 2020, we have more than 5,700 cryptocurrencies with Market Cap more than \$216 billion. The five most valuable cryptocurrencies are; (coinmarketcap, 2020)




**Table 1.1:** Summary and ranking of the five most valuable cryptocurrencies

Rank	Name	Price	Market Capitalization	Supply	Volume
1	 Bitcoin	\$11,749.62	\$216,980,740,397	18.47 M	\$21.45 B
2	 Ethereum	\$405.96	\$45,578,745,001	112.27 M	\$10.22 B
3	 XRP	\$0.286509	\$12,876,475,054	44.94 B	\$1.77 B
4	 Tether	\$0.999856	\$9,996,780,642	10 B	\$37.79 B
5	 Bitcoin Cash	\$292.97	\$5,418,740,152	18.5 M	\$1.5 B

Source: (Coinmarketcap, 21/8/2020)

Although cryptocurrencies like BTC, have many advantages over fiat currencies, they have many other disadvantages. Those will have been taken about in chapter 2.

**Table 1.2:** Summary of the three most valuable fiat currencies

Rank	Currency	Market Cap	Price	Circulation Supply
1	 CNY	2,623,278,113 BTC	1,234 SATS	212,550,000,000,000 CNY
2	 USD	1,576,936,635 BTC	8,540 SATS	18,465,297,222,000 USD
3	 EUR	1,306,319,039 BTC	10,054 SATS	12,992,901,000,000 EUR

Source: (FiatMarketCap, 21/8/2020)



SATS refer to Satoshis, which is the lowest unit of BTC. One sat is equivalent to 0.00000001 BTC (one hundred millionth of a BTC). In other words, there are 100,000,000 satoshis in a BTC. The name of the unit is taken from BTC Satoshi Nakamoto's founder. (What are Sats, n.d.).

Market capitalization (Market Cap) is the latest market value of a company's outstanding shares . it is calculated by multiply the actual share price by the number of outstanding shares. (CHEN, 2020).

Many papers had been published on BTC and how it operates, which is why this paper won't go straight into the BTC basics and roles. A lot of papers and articles with general knowledge about currencies and their use are already published.

### **1.1 Problem Statement**

Cryptocurrency has eliminated the need for banks and intermediaries between the sellers and the buyers. We are maybe entering a new era of financial system. People no longer trusting in the exist financial system. Banks, governments lost individuals' trust. With world-wide day by day changes and the problem that happening because of the exist financial system like: Inflation, there is a huge need for a new model or system that can solve the current problem as well as convoy these changes that are happening.

With a Market cap more than 216\$ billion for BTC only, it's showing how much they are taking investors' attention and concerns.

While Dollar is the second in countries ranking with a market cap 1,576,936,635 BTC, and EURO is the third with a market cap 1,306,319,039 BTC. BTC's market cap is \$216,980,740,397. These numbers show how much BTC is important and taking investors' concerns.

Today 22<sup>nd</sup> August 2020, around \$359 billion was the overall value of all the cryptocurrencies in presence. 60% of that value represent BTC presently. (Global Charts Total market capitalization, 2020)

Because BTC is the currency that began the whole cryptocurrency era it was selected from the cryptocurrencies. Furthermore, BTC is the most commonly

used between cryptocurrencies. However, US dollar and Euro were chosen from fiat currencies because they are two of the most famed, reliable, most valued between fiat currencies. Moreover, US dollar has its distinctive history when it was pegged to gold, and that is a good example of a commodity that its price had changed quickly after the pegging has stopped. (Brander, 2014)

However, BTC prices are very fluctuant and changing fast. Investing in cryptocurrency has a lot of profit as well as it has a big risk, and beyond investors can gain a lot of money, they can lose a lot if they didn't have right and enough information. This study tries to see and conclude if BTC is becoming a good alternative investing tool for Key Foreign Exchange Rate, like: US Dollar and Euro. Furthermore, it's trying to see the relation between BTC, USD and Euro.

This study takes prices of BTC in USD, USD in Turkish Lira and EURO in Turkish Lira to try help investors in Turkey.

## **1.2 The Aim of the Study**

As cryptocurrencies and specially BTC day by day gaining an attention of investors, banks, and even government and individuals all over the world. The need for studying cryptocurrencies world became more important than it was in the past. Day by day new investors put their moneys in them. Who knows?! Maybe after some years will not be fiat currencies?

This research analyzes the relationship between the BTC prices (in US Dollar), and selected foreign exchange rates using US Dollar prices (in Turkish Lira) and EURO prices (in Turkish Lira) analyzing causal-effect and whether BTC is becoming a substitution or alternative investment instrument for foreign exchange rates or not.

## **1.3 Significance of the Study**

The key reason behind the subject area is that a new era might being started in which cryptocurrencies will be the new form of money rather than the current currencies.

Whether BTC will be the new world-wide currency used by all, there are no right or incorrect answers for this question, but it can be evaluated based on BTC history and comments by experts.

BTC has been in the media of several publications and several nations have had significant discussions over adopting BTC as a currency. Those who initially invested a few USD in BTC became millionaires in a couple of years or even fewer. A new era may be starting which cryptocurrencies will change the entire idea of money.

Bitcoin is a wonderful concept because the transactions do not require third parties, which means it is hard to know who sent money to whom. In fact, transaction prices are considerably smaller compared with the initial forms of transaction.

There have been numerous cyber scams of Bitcoin lately, for instance MtGox was lost almost all of its assets and ended up in bankruptcy. If BTC is a modern bubble that will launch a global financial crisis in the coming years has a lot of arguments, that's why BTC and this research is important.

#### **1.4 Research Questions**

- Is BTC a good substitution or alternative investment tool for USD?
- Is BTC a good substitution or alternative investment tool for Euro?
- What's the relation between BTC, USD and Euro?

#### **1.5 Research Hypothesis:**

There are 4 Hypothesis this study trying to test:

H0: bitcoin is becoming a substitution for dollar foreign exchange rate.

H1: bitcoin is not becoming a substitution for dollar foreign exchange rate.

H2: bitcoin is becoming a substitution for euro exchange rate.

H3: bitcoin is not becoming a substitution for euro exchange rate.

## **1.6 Limitation of the Study**

- This research is limited to just BTC from Cryptocurrencies, and USD and EURO from fiat currencies.
- This research is limited to monthly data between 2010 to 2020 with a total of 119 months
- This research is limited to the tests that used in chapter 4 which its name is Application.
- This research is conducted an analysis and tried to build future expectation which is maybe not precise.
- This research is conducted in a time of spreading of Corona Virus (COVID-19) all over the world.
- This research will not go deep in BTC and its function because there are a lot of articles and papers who talked already about that.

## **1.7 Organization of the chapters**

This research has been divided Five chapters as follow:

Chapter one: The first chapter contain an introduction to the research subject, aim of the research, defining the problem, and the research question.

Chapter two: The second chapter divided to three parts as follow: Cryptocurrency Concept, Blockchain Technology, Traditional Money vs Cryptocurrency, Government Applications all over the world.

Chapter three: This chapter contain the literature review

Chapter four: This chapter contain the methodology that has been used, the tests that used to test the hypothesis, and the tests results

Chapter five: This chapter contain the conclusion.

## **2. THEORETICAL FRAMEWORK OF CRYPTOCURRENCY AND FOREIGN EXCHANGE RATES**

In this chapter, basic characteristic properties related to both cryptocurrencies and foreign exchange rates will be provided.

### **2.1 Basic Concepts of Cryptocurrencies**

One would believe cryptocurrencies have recently been discovered by looking at Bitcoin's current success. Cryptocurrency, though, is a phenomenon that has been debated for more than 30 years even though they have not received much media interest. A few economists brought a long-forgotten essay to the spotlight again, "Denationalization of Money-The Argument Refined: An Analysis of the Theory and Practice of Concurrent Currencies" published by Friedrich August von Hayek, Nobel Laureate in Economics in 1974. Hayek began from a concept that emphasized the surplus / deficit occurring on the monetary system, which indicates that inflation and its socio-economic implications are generally viewed as the result of the surplus attributed to the money in the market, where the steps for economic recovery need corrective policy intervention. Hayek concluded that the market gap created by the state's control on currency, so the solution should be to denationalize currency. (Rogojanu & Badea, 2014)

In 1982, the concept of cryptocurrencies has been hypothetically and academically debated in "Blind Signatures for Untraceable Payments". Which talked about the idea of untraceable electronic payment. This article refers to "David Chaum" who in 1990 established an electronic money corporation called "DigiCash" to achieve his ideas. He aimed to introduce an electronic payment mechanism which would guarantee the user's privacy. But his company didn't succeed to introduce cryptocurrency. (aghalibayli, 2019)

After that some After that, many attempts were made, but they failed. It wasn't until 2008 that "Satoshi Nakamoto" discovered a way to introduce the cryptocurrency, along with this, he even developed a program that would be

included in the cryptocurrency transactions called Blockchain. The online cash network has been dubbed Bitcoin.

A cryptocurrency is a digital currency protected by cryptography which makes counterfeiting or double-spending almost impossible. Most cryptocurrencies are decentralized. Or, it is a modern type of network-based digital asset that is spread through a wide number of computers. This autonomous system allows them to operate beyond the influence of the central authority and governments.

Cryptocurrency enables for encrypted electronic transfers between two persons and without the need of central authority. Furthermore, these transactions represented in special internal ledger which. cryptographic techniques safeguard such entries, by using public-private key pairs, and hashing functions. "Crypto" refers to the different encryption algorithms that used.

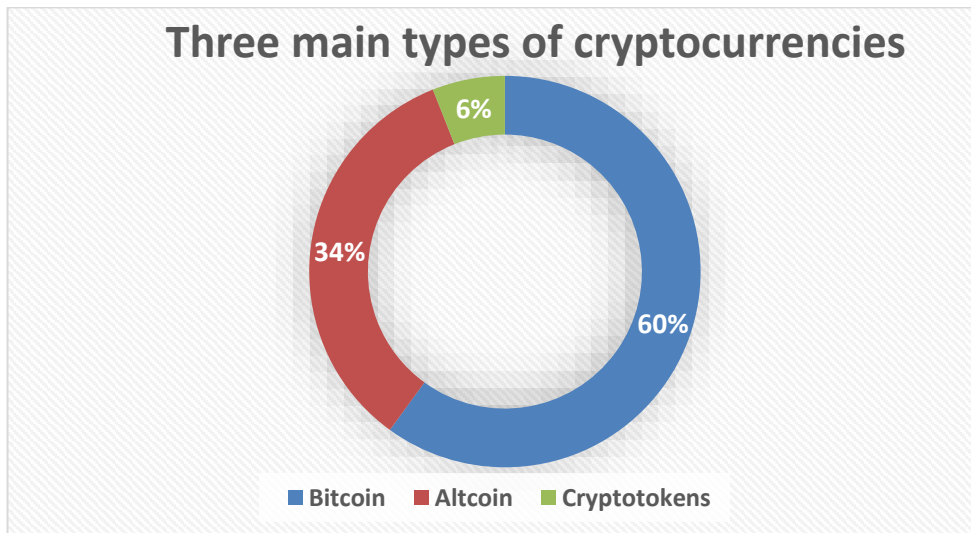
Cryptocurrency has been built on a system called Blockchain. Blockchain is a global database operated by a fragmented computing network. There is no central authority that distribute the cryptocurrencies, and that is the main characteristic of cryptocurrencies.

Cryptocurrencies are designed in such a manner where no one will increase the volume of bitcoin on the market, as each has its factors where decide how many coins will be produced or published through some form. It means that in fact no one can regulate the money. Yet since the cryptocurrency 's value is dependent on supply and demand; it will dramatically rise or decrease if a large volume of the coin is unexpectedly purchased or sold.

There are three main types of cryptocurrency

- 1. Bitcoin:** is the first and the most famous and it has the most percentage of the cryptocurrency market with nearly 60%.
- 2. Altcoin:** which are cryptocurrencies lunched after BTC's success. They had been seen as better alternatives to BTC. This term "Altcoin" refers to all cryptocurrencies other than BTC. Nowadays, they exceed 5,000 types of cryptocurrencies. According to CoinMarketCap, Altcoins accounted for over 34% of the total market in February 2020. for example: Litecoin, Cardano. (Frankenfield, 2020)

3. **Crypto tokens:** which are specific fungible and tradable assets or services generated by an initial coin offering (ICO) and are also found on a blockchain. For example: Tether, Chainlink, Civic (CVC), BitDegree (BDG), and WePower (WPR). (Understanding the Different Types of Cryptocurrency, 2020)



**Figure 2.1:** Representation of the three main types of cryptocurrencies.

### 2.1.1 Blockchain technology

Blockchain is Bitcoin network 's core invention, and the foundation of the cryptocurrency scheme. Miners are being credited with holding the network up to date with bitcoin. Satoshi's system is based on blockchain that acts as public ledger to keep all tracks of transactions.

Through an economic standpoint, the blockchain allows for greater efficiency when dealing with two-person transactions without mediators. The blockchain tracks the transaction immediately, which makes it possible to audit all transfers and transactions . In the case of real estate, for example, using this technology "reduces costs, raises transaction speed and enhances security. (Remeika, Amano, & Sacks, 2018)

Each time a new user attempts to update the device, the program saves all the purchases before the date of deployment. Every block has cryptographic algorithms connected to each other, which is Elliptic Curve Cryptography.

Such blocks can not go backwards, which means that if a block is accepted, there is no other way to modify this block except by bringing huge computing resources to annul this particular block and the blocks that follow. Some argue that even the US National Security Agency ( NSA) 's strong machines can't undo those blocks.

This operation does, however, bear a major drawback. If a customer accepts a purchase, there's no way to book it. Let 's say a customer mistakenly transfer a bitcoin to another customer. There is no way to get back this bitcoin without assurance from the former owner, if the current user rejects wholeheartedly.

How's the blockchain working? Suppose that Mohammad would like to buy Laila's car with a bitcoin. First of all, the agreement should be accepted by the both. supposing that Laila accepted bitcoins as a payment, Mohammad makes an announcement on the network that he will purchase Laila's car for five bitcoins.

Along with this announcement, Mohammad will sign this document with his private key to ensure that this declaration truly emerges from Mohammad.

The wallet of Mohammad doesn't reveal he has that much bitcoin; it's packed with data showing he has so much bitcoin he wants to have. This has to be translated to a hash before sending Mohammad 's message to the network. If Mohammad makes an announcement to the network, – I will buy a Laila’s car for five coins, "this message's hash function runs like this:

“819344362emmc5ec43619b6e4da3ebdbd7355t85321f88e76393e482a663ead”

Any update to the original message switches the hash function absolutely.

Such hashes are put into a block by the program, along with all transactions that took place within ten minutes directly after the last confirmed block. This is to say, a lot of transactions have to be verified. Let 's say all such transfers are set in order in Digital Padlock boxes . Miners run algorithms to locate the key to unlock the padlock. When they discover it their machine can verify the transactions.



The miner gets a reward of newly generated bitcoins for finding the key which is in a massive pool of keys. After opening the box, miners began checking transactions in order to receive the transaction fees. once miners approve Mohammad's argument that he has five bitcoins to buy Laila's car, the transaction is done.

They broadcast the solution as they find it, including prior solutions. Another tour continues with users seeking the key to another round of transactions. Then all blocks are inserted. This method also guarantees complete historical ordering of the whole network on all blocks decided upon. A bitcoin exchange is not complete until a consensus is reached.

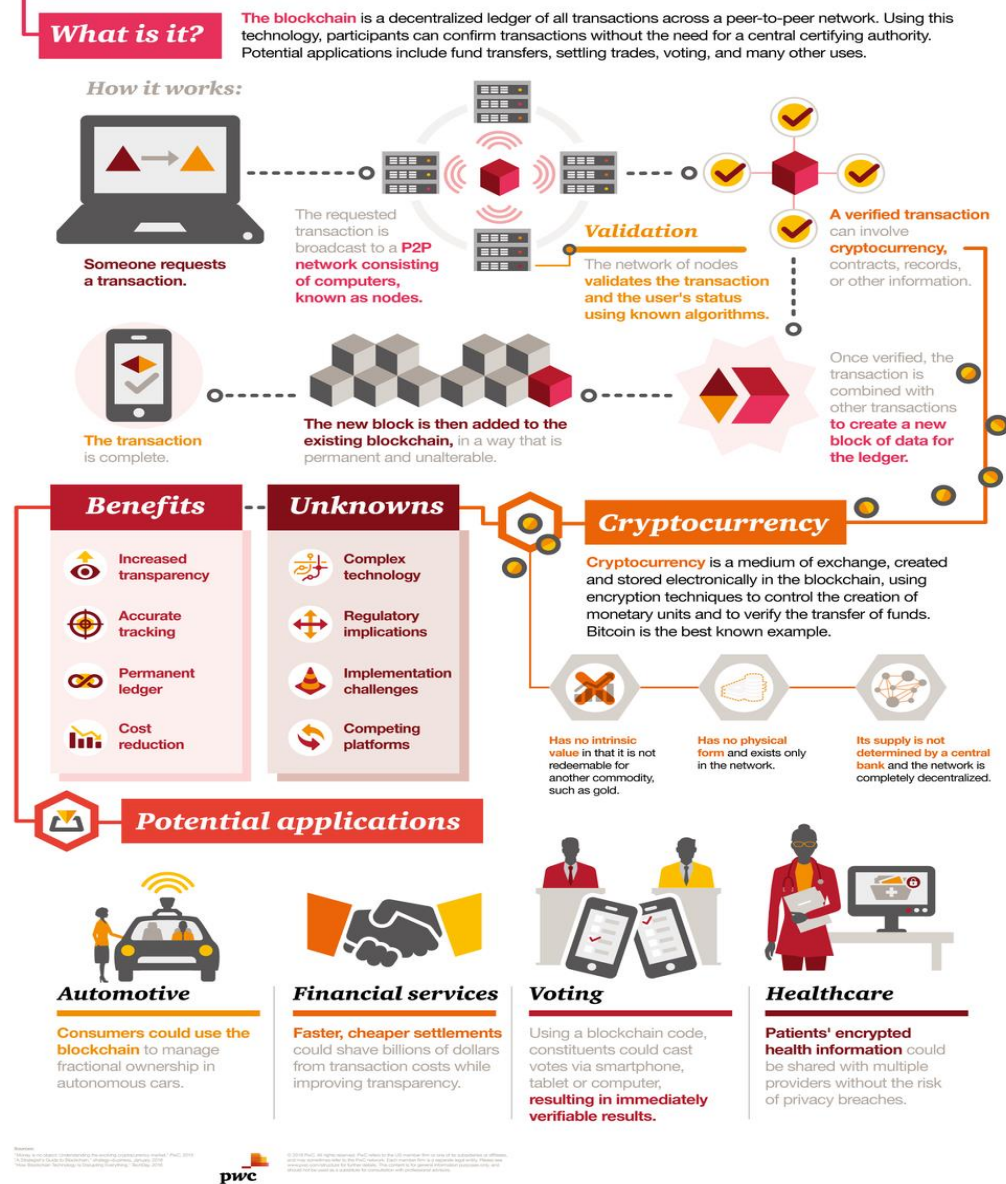
Many miners approve of this option as the correct one for the consensus. This block is accepted by connecting the block to the consensus chain.

Other miners often come up with different answers, making it useless as the previous effort, practically revoking the assertion of compensation. That's why Bitcoin 's final transaction comes after six confirmations, to guarantee it's properly registered in a permanent section of the block chain.

According to Blockchain.info which is a leading source with the latest real-time bitcoin transactions, the total number of attempts to locate the correct key is about 1,789,546,951.05, The 12,5-bitcoin reward is paid out about every 10 minutes, considering that many attempts. (Bahçeli, 2018).

Figure 2.2 gives a general look at Blockchain Technology.

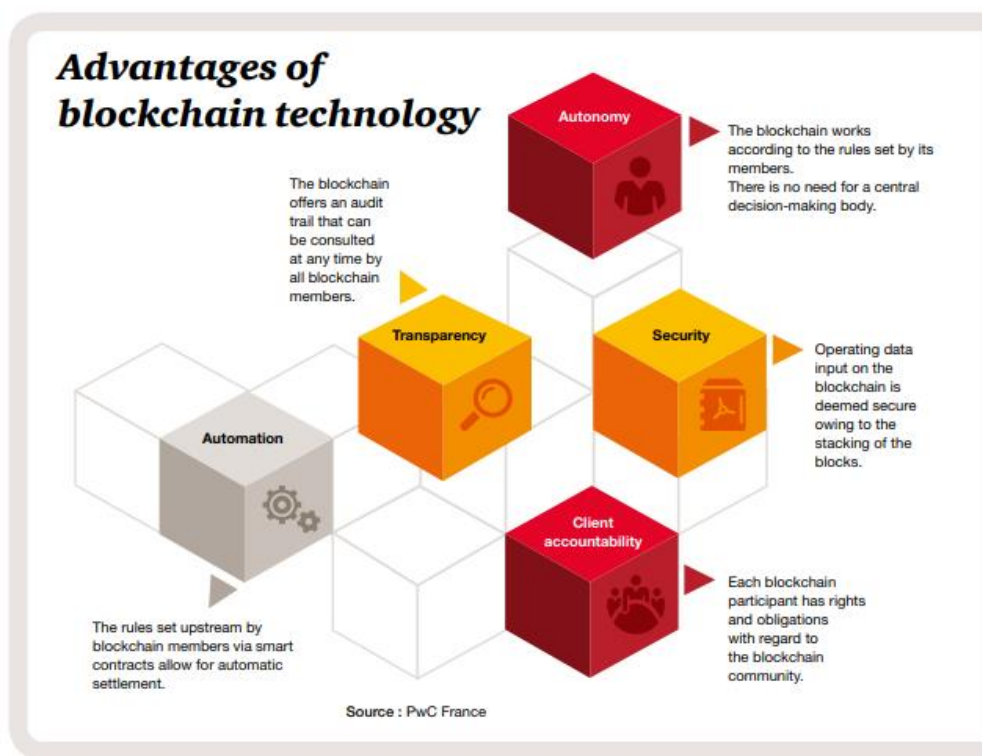
# A look at *blockchain technology*



**Figure 2.2:** A look at blockchain technology

Source: PwC, Blockchain, a catalyst for new approaches in insurance (2016).

Advantages of the blockchain technology can be outlined in Figure 2.5 as follows:



**Figure 2.3:** Advantages of blockchain Technology.

Source: Pwc, Blockchain, a catalyst for new approaches in insurance (2016).

As it shown in figure above, the most important benefits of the blockchain technology is bringing full transparency and eliminates intermediaries during operations by establishing peer to peer transactions.

### 2.1.2 Traditional Money vs Cryptocurrency

here are a lot of argues in the advanages and disadvantages of cryptocurrencies and Tradional money, and which is better. Here in this part, a review has been conducted.

**The advantage** of BTC can be outlined as follows (Rogojanu & Badea, 2014)

- The digital currency saves time through there is no need for traders to be physically presense.
- Transactions can be made at any time and wherever, and with flexibility.
- Issuance cost, transportation, security and storage costs are prevented. Those that can arise when putting traditional money into circulation. For

example: Just in the USA 60 billion dollars are being spent for such activities. (Plassaras, 2013). Also, bureaucracy had been avoided for the money issuance.

- Facilitates trades anywhere in the world and thereby prevents foreign exchange-related costs. Possessing a quantity of Bitcoin is enough to conduct operations in Turkey, China, Spain etc.
- Cryptocurrencies have the same properties as gold, which very well simulates rareness. Equipment and power are required for producing a Bitcoin, and the amount of Bitcoin is limited to 21 million.
- Don't expect payment of fees normally paid to banks. Transfers are allowed directly between nodes, without requiring a payment server. The Bitcoin client transmits the transaction to the nearest nodes and, in effect, propagates the network transaction. Efficient nodes deny fraudulent or null transactions. Transactions are typically safe, but there would definitely be a charge for prioritizing transaction processing in the case of other nodes.
- Using Bitcoin does not carry about inflation. It is well known that controlling money supply can be used as an advantage in countering inflation. The overall volume of Bitcoins which is 21 million, was calculated using the technology of generating.
- It keeps investors' privacy and anonymity involved in the transactions.
- Answers a normal human desire-impatience, the speed of Bitcoin transfers is fast and the operators are given the chance to complete their operations rapidly.
- Due to the lack of government interference on the exchange rate, it is not subject to central bank intervention which generates confidence for a specific category of individuals.
- Using the virtual world can be an opportunity for certain people to update the use of different types of software .

Therefore, the digital currency contains a range of advantages and strength, not to be overlooked, but their proof does not rule out the risks and drawbacks of the cryptocurrency.

Similarly, disadvantages of Bitcoin circulation can be listed as follows (Rogojanu & Badea, 2014)

Cryptocurrency, like any other money in use, poses a number of concerns about its potential to update drawbacks and related risks. For example:

- Too much fluctuant and volatile.
- Everyone has access to the number and size of transactions from any address in the network. It is advised that the customer should use a different address for each transaction to maintain the anonymity.
- Uncontrollable transactions, no central authority exists to be able to regulate and monitor Bitcoin transactions.
- Can be under speculative attacks which may generate large negative effects, and there is no international agency or organization like, IMF can intervene.
- Limited confidence in Bitcoin, which is due to incomplete information.
- Increased risk arising from use of the online world. The breaches of security will lead to the loss of the Bitcoin savings. There is no intermediary institution to get the stolen bitcoin back.
- Serious initial investment and electricity generation costs.
- The Bitcoin is held responsible as it is used in illegal activities - encourages tax avoidance, fraud, extortion, enabling exchanges of forbidden products.
- Through Bitcoin a growing number of people find a currency that will help them escape from tax.
- Bitcoin creates some confusion among bank members, as it competes with the conventional currency.

- According to (Çarkacıoğlu, 2016), Bitcoin varies from traditional money as follows:
  1. Bitcoin is decentralized, which is mean no intermediary institution exist.
  2. There is no need for a broker.
  3. No authorisation or permission needed.
  4. Transactions cannot be undone.
  5. 5. No authority can alter or retrieve a transaction made by a miner and approved by the others and submitted to Blockchain
  6. Transactions are simple, fast and globalized.

According to (Böhme, Christin, Edelman, & Moore, 2015) What BTC Doesn't Have:

BTC lacks a legal framework when be compared with conventional payment systems. That has a lot of implications for the functionality of the system. Secondly, Bitcoin imposes no duty on a financial company, payment provider or any individual to verify a customer's identification. Third, Bitcoin does not impose a ban on the selling of individual items; in contrast, for example, for credit card networks, all sorts of unauthorized transactions at the point of sale are typically refused. Ultimately, BTC payments are permanent in such a manner that a payer does not have a means of canceling an accidental or illegal exchange, while other forms of payment, such as credit cards, do have such mechanisms. These design decisions are deliberate — simplifying the BTC structure and reducing the need for central arbitrators, while some consumers are worried because of this thing.

This figure makes a comparison between Gold, Fiat currency and cryptocurrency.

Traits of Money	Gold	Fiat (US Dollar)	Crypto (Bitcoin)
Fungible ( <i>Interchangeable</i> )	High	High	High
Non-Consumable	High	High	High
Portability	Moderate	High	High
Durable	High	Moderate	High
Highly Divisible	Moderate	Moderate	High
Secure ( <i>Cannot be counterfeited</i> )	Moderate	Moderate	High
Easily Transactable	Low	High	High
Scarce ( <i>Predictable Supply</i> )	Moderate	Low	High
Sovereign ( <i>Government Issued</i> )	Low	High	Low
Decentralized	Low	Low	High
Smart ( <i>Programmable</i> )	Low	Low	High

**Table 2.1:** A comparison between Gold, Fiat currency and cryptocurrency

Source: Investopedia

Accordinging to (Haşlak, 2018), although there is a lot of reasons to invest in BTC, there's some other reasons to NOT invest in BTC, here a summary of both had been provided:

**Table 2.2:** Summary of reasons to invest and to not invest in BTC

Reasons to invest in BTC	Reasons to not invest in BTC
No Existence of Third Party	Extreme volatility
No Taxes	Lack of Clarity
No Monitoring	The uncertainty about the underlying mechanism
Reversal of Payment	An unregulated space
No Paperwork	The issue of legality
Accessibility to Markets	No issued licenses to companies for trading
Transaction costs are less	Prone to illegal activity
Transactions' time are very short	

As (Ciaian, 2016) explains what makes BTC appealing to buyers. Accordingly, first is the risk and uncertainty which could affect the BTC 's price. Provided that BTC is a fiat currency, and thus essentially useless. Being fundamentally worthless means no intrinsic values are resulting from use or its use in the cycle of production. So it makes sense to conclude that BTC 's valuation depends on the confidence from its exchange medium function.

### **2.1.3 Government Cryptocurrencies Applications all over the world**

Bitcoin 's idea is to become a method of payment that doesn't require any central authority. It's a peer-to - peer method and no intermediary or central authority is needed. Bitcoin doesn't require any central authority so that's the main explanation why governments hate bitcoin and other cryptocurrencies. Governments have the fiat currencies under regulation. They entitle their central banks to implement their monetary policy. Such tight power will be broken if, as with cryptocurrencies, non-government groups build their currencies.

Monetary regulation has numerous impacts on economic policy and market conditions. Governments can raise or reduce the volume of cash that circulates in the financial system, and they can impose other laws for that circulation. This is significant in the area of inflation control, recession and other economic policy principles (Çarkacıoğlu, 2016)

With regard to the banking system, if bitcoin or other cryptocurrencies are commonly used, certain services could become obsolete, such as keeping accounts and exchanging currency. But there might also be certain programs people need like credits. So it is a fact that once cryptocurrencies are commonly adopted the banking industry will adapt itself to the modern technology. (Toprak, 2019)

Policymakers should not neglect cryptocurrencies and therefore should not prohibit them in order to grant fiat currencies power. It seems that central banks will continue monetary dominance and control on the money markets in the near future as bitcoin and other cryptocurrencies are very volatile and have low market capitalization. But it should be noted that future development on cryptocurrencies and underlying technologies will place them in a strong



position and be able to contend with fiat currencies (Dabrowski & Janikowski, 2018)

Now we're going to take a look at several countries like Turkey on the future of bitcoin:

- United States of America (USA)

Generally, digital currencies have no legal tender status in any jurisdiction, according to Financial Crimes Monitoring Network (a Treasury Department office). However, It is legal to purchase or sell bitcoin on exchanges. US regulators differ in how to define and handle it. Nevertheless, bitcoin usually is related to illicit or fraudulent actions.

According to (USA Is Looking Closely To Launching Its Own Cryptocurrency, 2020) the USA Federal Reserve is working with blockchain technology to authorize a central bank digital currency (CBDC).

- Turkey

The Financial Crimes Investigation Board of Turkey ("MASAK") had regarded cryptocurrencies transactions as suspicious transactions. Recently, MASAK has recently updated its strategy and with the new Suspicious Transactions Notification Guide cryptocurrency transaction is no longer considered as fraudulent unless other motives are concealed in transactions such as money laundering etc. (Evaluation on the Legal Status of Cryptocurrency Trade in Turkey, 2020).

However, the Turkish government plans to introduce a digital currency based on a blockchain-driven central bank over the next four years.

The concept of a national crypto-monetary is not new. Some Turkish officials called for a state-controlled and supervised national bitcoin called 'Turkcoin' to be released in the near future.

In recent years, however, cryptocurrencies have become increasingly common in Turkey, with an estimated 20 per cent of the population now invested in some sort of digital currency. The country now has the "highest per capita rate of all nations surveyed crypto-currency ownership," Cointelegraph posted, citing Statista's study. (Turkey to introduce national blockchain currency, 2019)

- Venezuela

In 2018, Venezuela announced its own Cryptocurrency, called The Petro. According to the government of Venezuela, a total of 100 million Petro coins-with an approximate value of US\$ 6 billion-will be issued. (Venezuela Has Launched its Own Digital Currency: The Petro, 2018)

- China

China's central bank is planning to issue digital currency called "Digital Yuan" by the mid-2021. They said, however, that in the short term "will not be issued in large quantities" for public use, and that the circulating of digital currency would "not lead to an inflation surge". (China to test digital currency in four cities, 2020)

- Senegal

Senegal is one of the first adopters of a national digital currency in December 2016, having launched the blockchain-based eCFA - named after the standard Senegalese currency CFA franc -. (State-Issued Digital Currencies: The Countries Which Adopted, Rejected or Researched the Concept, 2018)

- Tunisia

Tunisia was the world's first government to launch a blockchain-based national currency named eDinar-also known as "Digicash and BitDinar" which is happened in 2015 (State-Issued Digital Currencies: The Countries Which Adopted, Rejected or Researched the Concept, 2018).

## **2.2 Fundamentals of the Foreign Exchange Rates**

An exchange rate is the amount of the currency of one country vs. that of another country. (Exchange Rate Definition, 2020). For instance, how many U.S. dollars does it take to buy one euro? As of April 17, 2019, the exchange rate is 1.09, meaning it takes \$1.09 to buy €1. The exchange rate in 25 August 2020 for Bitcoin is \$11,614.90 which is mean we need \$11,614.90 to buy 1 Bitcoin while this rate wasn't like this, (In July 2010, was the first major price spike happened for BTC when the its' value rose from about \$0.0008 to \$0.08

for a single coin. Since then the currency has seen a few major rallies and crashes.) (Bitcoin's Price History, 2020)

Type of exchange rate	Description	Examples
No separate legal tender	Countries have no legal tender of their own. Shares currency with other countries.	<i>Ecuador</i> <i>El Salvador</i> <i>Panama</i> <i>Zimbabwe</i>
Currency board	This system exists where a country only issues its own currency at a fixed rate against another one.	<i>East Caribbean Currency Unit</i> <i>Bulgaria</i>
Conventional fixed peg	These systems peg a country's currency at a fixed rate to another currency or basket of currencies. The exchange rate is allowed to fluctuate by a small amount, usually less than 1%.	<i>Barbados</i> <i>Cameroon</i> <i>Jordan</i> <i>Saudi Arabia</i> <i>Venezuela</i>
Crawling peg and 'crawl-like' system	In this system, the currency is adjusted when required following changes in economic circumstances such as inflationary pressures relative to trading partners.	<i>Argentina</i> <i>Botswana</i> <i>China</i>
Managed floating	This is where the rate is allowed to adjust and where no specific rate is targeted, but where a particular objective may be targeted, such as trying to achieve a balance of payments with trading partners.	<i>Afghanistan</i> <i>Brazil</i> <i>Kenya</i> <i>India</i>
Free floating	This is where a national currency or a 'single' currency is free to find its own level against other currencies, and where any intervention is simply to remove volatility.	<i>Australia</i> <i>Chile</i> <i>Euro-zone 19</i> <i>Japan</i> <i>UK</i> <i>USA</i>

**Table 2.3:** A summary of exchange rate types.

Source: International Monetary Fund

### **3. LITERATURE REVIEW**

In this part, the studies published in existing literature will be discussed in detailed.

In Investment terms being a substitution have two meanings: medium of exchange and alternative investment tool. However, this study carried out and meant about the second meaning.







#### **3.1 Risks and Volatility of the Cryptocurrencies.**

(Moore & Christin, 2013) conducted a work which explored two risks associated with BTC exchanges. On 40 BTC exchanges, they performed a survival study, which showed that the total transaction rate of an exchange is adversely associated with the chance it would close prematurely. Moreover, A regression study was done and showed that transaction volume is positively associated with witnessing a violation. Therefore, an exchange's continued activity depends on operating a high volume of transactions which makes the exchange a more attractive target for thieves.

In spring 2012, over 80 per cent of all BTC transactions were represented by the Japan-based Mt. Gox exchange. However, Mt. Gox collapsed in early 2014, reporting a "loss" of 754,000 of the BTCs of its customers worth about \$450 million at the time of closure in its bankruptcy filing (Abrams, Goldstein, & Tabuchi, 2014)

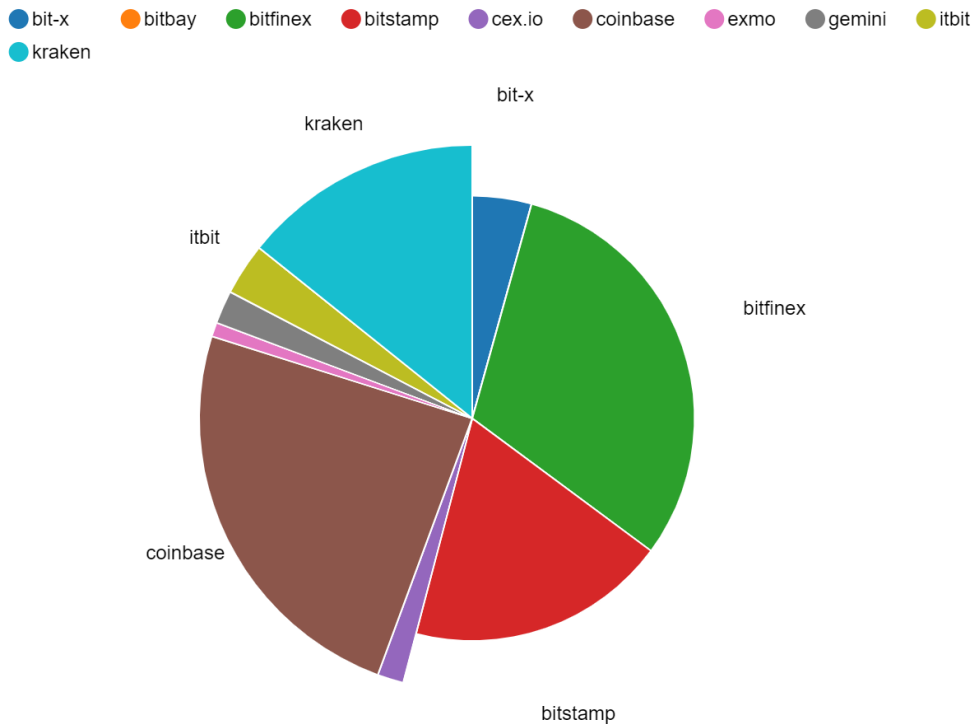
In June 2020, the six largest exchanges were Bitfinex, Coinbase, Bitstamp, Kraken, Bit-x, Itbit

that jointly represented over 95 percent of all BTC exchange between November 2019 and May 2020.

Exchange	Rank	Market share ▾
 bitfinex	3.69k	30.84%
 coinbase	2.90k	24.24%
 bitstamp	2.26k	18.93%
 kraken	1.70k	14.27%
 bit-x	514	4.31%
 itbit	367	3.07%

**Table 3.1:** Ranking of exchange markets for BTC

Source: BTCity.org



**Figure 3.1:** Chart of exchange markets for BTC.

Source: bitcoinity.org

(Möser, Böhme, & Breuker, 2014)

(Catania, Grassi, & Ravazzolo, 2018) conducted a study to predict the four famous cryptocurrencies' conditional volatility. Those which are the most traded: BTC, Ripple, Litecoin, and Ethereum. In order to forecast volatility levels, they analyzed the impact of accounting for long memory in the volatility phase also its asymmetric reaction to past values of the sequence. their results

suggest that, compared to other alternatives, more advanced models of volatility that incorporate leverage and time-varying skewness will boost forecasts of volatility from 1 percent to 6 percent. These results will benefit applications of portfolio optimizations, hedging and pricing of derivative assets.

(Conrad, Custovic, & Ghysels, 2018) used GARCH-MIDAS model to clarify cryptocurrencies' long and short-term volatility components. Risk and volatility in the US stock market and measure of global economic activity had been taken on account. The results showed that there's a negative relationship between BTC volatility and risks in the US stock market. Also, the findings revealed that the volatility perceived by S&P 500 has a negative and extremely important impact on the volatility of long-term BTC while the volatility risk premium of S&P 500 has a significant positive effect on the volatility of long-term BTC. In addition, there's a clear positive correlation between the volatility of the Baltic dry index and the long-term volatility of BTC and confirm a slightly negative effect on the rate of Bitcoin trading.

(Yi, Xu, & Wang, 2018) Spillover index method and its variations had been used, among eight cryptocurrencies: BTC, Litecoin, Ripple, Peercoin, Feathercoin, Novacoin, Terracoin, & Namecoin. Both static and dynamic volatility relations had been analyzed from 4 August 2013 to 1 April 2018. The findings showed that the overall volatility of eight cryptocurrencies has fluctuated regularly over the study duration and risen when the economy faces uncertain economic conditions or volatile exogenous shocks, the total volatility connectedness increased constantly especially after December 2016. Moreover, volatility connectedness or spillover effect is not necessarily linked to market capitalization. In most cases, major volatility shocks are propagated by cryptocurrencies with high market capitalization (e.g., Bitcoin, Litecoin and Dogecoin), whereas small-cap cryptocurrencies are more prone to obtain shocks of volatility from others. However, significant emitters of volatility shocks (e.g., MAID, FCT and GAME) are also some minor cryptocurrencies. More specifically, the main emitter of volatility shocks in the sector for cryptocurrencies is MAID, which draws fewer media interest. While Bitcoin still plays an important position and brings other cryptocurrencies heavy volatility shocks, it does not control the entire sector.

(Stavroyiannis, 2018) The value-at-risk and related measures for the BTC was examined in this study. GJR-GARCH model was used. The findings showed that rather than most properties and assets, BTC is more volatile currency and it breaches value-at-risk measures. A Bitcoin investor is subject to higher capital standards and capital distribution levels with respect to the Basel Committee on Banking Regulation Accords.

(Wang, Xie, Wen, & Zhao, 2019) Multivariate quantile model and the Granger causality risk evaluation were used in this study. Risk spillover effects from economic policy uncertainty (EPU) to BTC was studied. The result showed that risk spillover impact from EPU to Bitcoin is observed to be marginal under most circumstances. Furthermore, Bitcoin can be acted as a safe-haven or a diversifier under EPU shocks for investors who have investment strategies in BTC.

(Walther, Klein, & Bouri, 2019) In this study GARCH-MIDAS model has been applied in this study to forecast monthly, weekly, and daily volatility of five cryptocurrencies: BTC, Litecoin, Ethereum, Stellar, and Ripple, also for CRIX cryptocurrency index. The results showed that the most important external factor of volatility was Global Real Economic Activity. For both bull and bear markets, the Global Real Economic Activity gives superior estimates of volatility. Rather than country-specific economic or financial factors, the volatility of cryptocurrencies tends to be driven by the global market cycle. It shows that significant trading practices and market share do not have a steady influence on the performance of cryptocurrency markets in emerging markets. While Global Real Economic Activity is the strongest overall indicator, the output of the average forecasting mix indicates that other exogenous variables, such as the Global Financial Stress Index or the Chinese Policy Uncertainty Index, provide valuable knowledge and diversify the impact. This underlines the theory that there is not a single cause, but rather a network of guiding forces interfering with each other, considering the decentralization of cryptocurrency markets.

(Koutmos, 2019) according to his study, there are some factors which are important determinants of BTC returns: interest rates and implied stock market and foreign exchange market volatilities. As well as, the high volatility regime

is related to a higher mean return compared to the low volatility regime. Bitcoin values can also be subject to the same kinds of market risks that influence the output of traditional financial assets, considering their seemingly favorable independent actions compared to equity and economic variables. The regime-shifting dynamics seen here are important to consider for investors looking to diversify their investments with BTC, since the utility of BTC as a diversification tool is time-dependent rather than constant over long-term horizons. The diversification advantages of BTC during the low volatility system could be smaller in certain ways compared to the high volatility system. Markov regime-switching model was used to differentiate between regimes of high and low Bitcoin price volatility.

(Troster, Tiwarib, Shahbaz, & Macedoc, 2019) General GARCH and GAS analysis were applied for modelling and forecasting BTC risk and returns. For risk management and customers, the results have significant consequences for the use of bitcoin in optimal hedging or investing strategies. According to its hedging, liquidity, and diversification capacity, Bitcoin can act as a commodity instead of a currency. Along with gold, Bitcoin can also be seen as a safe haven against market threats.

### **3.2 The determination of Cryptocurrency exchange rate**

Several recent studies have performed econometric analytics of the BTC exchange rate determinants. According to (Kristoufek, 2013) the impact on Wikipedia of Google Search Volume and Daily Views was studied. Found that a considerable correlation between search and price. Wavelet coherence analysis had done in a subsequent study to identify the correlation between BTC exchange prices and various factors (Kristoufek, What Are the Main Drivers of the Bitcoin Price? Evidence from Wavelet Coherence Analysis, 2015) The result of the estimation found that such as the exchange trade ratio and speculative behavior play an important role at lower frequencies. Researchers have also indicated that the Chinese market index may be a big driver of BTC prices. Garcia et al. also looked at the online word-of-mouth (Twitter and Facebook) effect on top of the search (Garcia, Tessone, Mavrodiev, & Perony, 2014). (Bouoiyour & Selmi, 2015) defined a range of determinants using the ADRL



boundary test method, including Google Search, exchange-trade volume ratio, hash rate and stock market. (Ciaian, Rajcaniova, & Kancs, 2016) found that the volume, user frequency, and popularity of the transactions (measured by Forum posts and Wikipedia views) had a large effect on the price of BTC. (Polasik, Piotrowska, Wisniewski, Kotkowski, & Lightfoot, 2015) analyzed the effect on BTC's monthly return of news articles frequency, perception, search on google, transaction size, amount of BTCs, and economic factors (industrial output growth, unemployment, and inflation) and found that returns are primarily guided by news.

Figure 3.3 shows the existing BTC trading market literature. Many variables were defined including public perception and interest assessed by the views of Google Search and Wikipedia, market trading practices, and economic fundamentals. The current thesis builds on this basis and strives for a structured debate that is guided by theory. The paper not only contributes to the array of scientific data but also builds on significant aspects of previous studies. Theoretically, the present research sums up empirical facts and offers a detailed debate guided by theory.

Studies	Examined factor											Model
	News	public interest (Google search, Wiki views)	WOM (Twitter, Facebook, Forum)	User volume	Trading (volume, frequency)	Bitcoin amount	Hash Rate	Difficulty	Other markets (Gold, stock)	Financial stress	Economy fundamentals	
Kristoufek		✓										VECM
Garcia et al.		✓	✓	✓								VAR
Bouoiyour and Selmi		✓	✓		✓			✓				ARDL bounds testing
Kristoufek		✓	✓		✓		✓	✓	✓	✓		Wavelet analysis
Ciaian et al.		✓	✓	✓	✓	✓			✓			Var, VECM, ARDL
Polasik et al.	✓	✓			✓	✓					✓	Regression

**Table 3.2:** Summary of existing studies on BTC exchange rate.

Source: (Li & Alex Wang, 2016)

(Li & Alex Wang, 2016) conducted an empirical theory-driven analysis of the determination of the BTC exchange rate (against USD), taking into account both technical and economic factors, the study estimated their empirical model on two periods separated by the closure of Mt. Gox (one of the largest BTC exchange markets). BTC's exchange rate, according to their report, is

responding to shifts in economic dynamics and business conditions in the short term. Since Mt. Gox has closed, the long-term BTC exchange rate becomes more responsive to economic conditions and less prone to technology factors. They also considered a major influence of mining technology in the determination of exchange price for BTC and a decreasing significance of mining difficulty in the BTC exchange price determination.

### **3.3 The Interaction between Cryptocurrencies and Other Financial Instruments**

(Brière, Oosterlinck, & Szafarz, 2015) A BTC investment was examined from the point of view of a US investor with a diversified portfolio comprising both conventional assets (worldwide currencies, bonds, stocks) and unconventional investments (real estate funds, commodities, hedge funds). Weekly data over the 2010-2013 period was used. However, findings should be treated with care since the details might indicate early-stage activity that does not last in the medium or long term. There were extremely distinctive characteristics of BTC investing, including extraordinarily high expected return and uncertainty. Its connection was relatively small with other assets. Also Spanning tests demonstrate that BTC investing provides major advantages in diversification. The addition of even a limited proportion of BTCs will significantly boost well-diversified portfolios' risk-return trade-off.

(Dyhrberg, 2015) conducted a study using GARCH models to examine the financial asset capabilities of BTC. The study showed that BTC has many similarities to both dollar and the gold, especially in hedging capabilities and Medium of exchange characteristics. Furthermore, BTC reacts significantly to the federal funds rate which Indicates BTC acting like a currency. Though, decentralized and largely unregulated characteristics make that BTC will never behave like the currency exactly. BTC is similar to gold in most aspects like it is possess similar hedging capabilities and react symmetrically to good and bad news. Furthermore, the end result indicates that because of its decentralized existence and small market size, BTC is somewhere in between a currency and a commodity. This does not, however, mean this BTC is less valuable than existing market assets.

(Baur, Dimpfl, & Kuck, 2018) did a study and disproved the study of (Dyhrberg, 2015) and they found that BTC is very different from fiat currencies and gold. They said that BTC has special features of risk-return, follows a different volatility process as compared with other assets and is uncorrelated to other assets. These empirical findings could be surprising given BTC 's design as a Peer-to - Peer Electronic Cash System (Nakamoto, 2008). Furthermore, they said that BTC's excess returns and volatility look like a highly speculative asset than gold or the US dollar.

(Corelli, A. 2018) did a study for the causality analysis as well as for the relationship or the interaction between some types of fiat currencies and most popular cryptocurrencies. The variables were Bitcoin, Ripple, Monero, Dash, Litecoin, Ethereum from the cryptocurrencies' side, while from the fiat currencies' side were Euro, Japanese Yen, Australian Dollar and some other fiat currencies. The results are very interesting. First, according to the analysis that conducted; cryptocurrencies were being driven by Asia countries' currencies. Thai Baht, Chinese Yuan, and Taiwan Dollar are closely related to six major cryptocurrencies that had been mentioned above. Second, a summary of the findings reveals how all the cryptocurrencies analyzed rely on selected major fiat currencies. Third, granger causality test showed a consistent causality effect of Asian fiat currencies on three cryptocurrencies (BTC, Ripple, Ethereum).

According to (Ozyesil, 2019) while he did a study to expose the interaction between BTC and Exchange Rates of USD and EURO to find out whether BTC is becoming a substitution for these exchange rates. He Found that BTC and Exchange Rates of USD and EURO have not become an alternative tool for each other yet. In more explanation he founded that USD prices not significantly affected BTC and Euro prices, while he founded that USD exchange rate was found to be significantly sensitive to the Euro. He used daily data between 27.10.2017-25.02.2019. and He used Unit root test, VAR Analysis, and Variance Decomposition method for his study.

(Corbet, Larkin, & Lucey, 2020) the contagion effects related to Corona pandemic on the cryptocurrencies, gold and Chinese financial markets (Shanghai and Shenzhen Stock Exchanges) had been studied. Hourly, and daily returns were used to analyze the dynamic correlations between this range of

financial assets. The results showed that considering both the Shanghai and Shenzhen Stock Exchanges, COVID-19 is found to have a strong, significant positive impact on the volatility of each exchange. It is quite important to notice that, when calculated by Bitcoin's price dynamics, neither gold nor cryptocurrencies are found to have a substantial connection with Chinese stock markets. Furthermore, Cryptocurrencies do not serve as hedges or safe havens in periods of extreme financial and economic instability, but perhaps as amplifiers of contagion. Moreover, a strong inverse correlation between cryptocurrencies and gold coin sales.

## **4. AN INTERACTION ANALYSIS BETWEEN BITCOIN AND FOREIGN EXCHANGE RATES**

### **4.1 Data & Methodology**

In this part of the study, an interaction between BTC and foreign exchanges is investigated to find out whether BTC is becoming an alternative investment tool and can be a substitution for key foreign exchange rate (USD & EURO). In order to conduct analysis, monthly data include BTC prices in USD, USD in Turkish Lira, Euro in Turkish Lira for the period between August 2010 until June 2020 with a total of 119 months are obtained. In analysis, to eliminate daily price volatility problem, monthly average closing prices are used.

In the analysis, the first step is measuring whether the series are stationary or not through unit root test. Depending on unit root test results, Cointegration test is applied to find out whether the series move together in the long-run or not. Also, in order to clarify interactions between the series, VAR analysis is performed. Under the VAR analysis, variance decomposition and impulse-response analyses are completed respectively. Finally, to see causality relationship between series, Granger causality test is performed.

All analysis are performed in Eviews 9.5 version. Data used in the analysis are obtained from [www.investing.com](http://www.investing.com)

### **4.2 Test results**

Descriptive statistics of the series used in the analysis can be shown in Table 4.1 as follows:

#### 4.2.1 Descriptive Analysis

**Table 4.1:** Descriptive Report

	BTCP	USDP	EURP
Mean	2496.409	3.173212	3.747259
Median	445.6000	2.771000	3.049400
Maximum	13850.40	6.986400	7.697400
Minimum	0.100000	1.433000	1.936800
Std. Dev.	3566.382	1.567162	1.632949
Skewness	1.266890	0.915067	1.005370
Kurtosis	3.186137	2.595448	2.687464
Jarque-Bera	32.00447	17.41890	20.53122
Probability	0.000000	0.000165	0.000035
Sum	297072.7	377.6122	445.9238
Sum Sq. Dev.	1.50E+09	289.8076	314.6497

Source: Author's Computation

The descriptive report presented in Table 1 revealed that BTC price (BTCP) has the average value of 2496.409 with the median value of 445.6000, the maximum value is 13850 with minimum value of 0.100000 and the standard deviation of 3566.382. The skewness value of BTCP is 1.266890 indicating that BCTP is positively skewed. The kurtosis value is 3.186137 showing that BTCP is leptokurtic since it is more than 3, while the Jarque-Bera value and its p-value are 32.00447 and 0.000000 indicating that BTCP is not normally distributed. USD price has the average value of 3.173212, the median value of 2.771000, the maximum value of 6.986400, the minimum value of 1.433000. the standard deviation revealed the value of 1.567162, the skewness value is 0.915067, indicating a positive skewed, the kurtosis value is 2.595448, implying that the kurtosis is less than 3, indicating a platykurtic nature. The Jarque-Bera value is 17.41890 with the probability value of 0.000165, indicating that USDP is not normally distributed. The euro price (EURP) shows the mean value of 3.747259, the median value of 3.049400, the maximum value of 7.697400, the minimum value of 1.936800 with the standard deviation value of 1.632949. the skewness value is 1.005370 showing that EURP is positive skewed and the kurtosis is

platykurtic with the value of 2.687464. The Jarque-Bera shows the value of 20.53122 with the p-value of 0.000035 indicating that euro price is not normally distributed.

#### 4.2.2 Unit Root Test

In statistical calculations, to obtain reliable findings the first thing that it should be done is getting stationary series that is moving around its average. The Augmented Dickey Fuller (ADF) test was used to test the stationarity of the variables. However, the results are presented in level, first difference, and order of integration. To execute unit root test, the following formula will be applied:

$$\Delta Y_{it} = \delta_i Y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta Y_{it-j} + X_{it}' \theta + \varepsilon_{it} \quad (1)$$

Where:

$p_i$ ; optimum lag length,

$X_{it}$ ; refers to exogenous variables that contain any fixed effect or individual trend component.

- Related Hypotheses of this test:

$H_0: |\delta_i| = 1$  The Series are not stationary.

$H_1: |\delta_i| < 1$  The Series are stationary.

ADF test is applied in Eviews and related findings are represented in the following table.

**Table 4.2:** ADF Unit Root at Level Values

Variable	ADF Test Statistic	95% Critical Value	ADF Decision
BTCP	-1.044230	-2.886074	Non-Stationary
USDP	0.894510	-2.886074	Non-Stationary
EURP	0.730046	-2.886074	Non-Stationary

Source: Author's Computation

The report of the ADF unit root at level reveals that BTC price (BTCP) has the ADF stat of -1.044230 with the critical value of -2.886074, the USD price (USDP) has the ADF stat value of 0.894510 with critical value of -2.886074, the euro price (EURP) reveals the ADF value of 0.730046 with critical value of -2.886074. This indicates that all the variables are not stationary at level.

**Table 4.3:** ADF Unit Root at First Difference

<b>Variable</b>	<b>ADF Test Statistic</b>	<b>95% Critical ADF Value</b>	<b>Decision</b>
BTCP	-10.74264	-2.886290	Stationary
USDP	-10.16042	-2.886290	Stationary
EURP	-10.62931	-2.886290	Stationary

Source: Author's Computation

Table 3 reported the ADF unit root at first difference and reveals that BTC price (BTCP) has the ADF stat of -10.74264 with the critical value of -2.886290, the USD price (USDP) has the ADF stat value of -10.16042 with critical value of -2.886290, the euro price (EURP) reveals the ADF value of -10.62931 with critical value of -2.886290. This indicates that all the variables become stationary at first difference.

**Table 4.4:** Integration Order

<b>Variable</b>	<b>Integration Order</b>
BTCP	I(1)
USDP	I(1)
EURP	I(1)

Source: Author's Computation

The above table shows the integration order of the unit root report and its revealed that all the variables became stationary at order 1.



### 4.2.3 Cointegration Test

In this study, in order to find out whether variable move in line with each other in long run, X cointegration developed by Johansen (1990) test is performed. Cointegration test will be done based on the following formula:

$$y_{it} = \alpha_i + \delta_i t + \beta_{1ix}1i + \beta_{2ix}2i + \dots + \beta_{Mix}Mi + \varepsilon_i, \quad (2)$$

Where;

Here  $t = 1, \dots, T$ ;  $i = 1, \dots, N$ ;  $= 1, \dots, M$ .

In this test,  $y$  and  $x$  are not stationary at level but they must become stationary when their first difference is taken.

Related Hypotheses of this test:

$H_0: |\rho_i| = 1$  There is no cointegration between series.

$H_1: |\rho_i| < 1$  There is cointegration between series.

- Trace Cointegration Test

**Table 4.5:** Trend assumption: Linear deterministic trend

Series: BTCP USDP EURP				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.203606	33.90423	29.79707	0.0159
At most 1	0.052826	7.950918	15.49471	0.4707
At most 2	0.015353	1.763808	3.841466	0.1841

Source: Author's Computation

The cointegration test of Trace unrestricted ranking test reported in Table 8 shows that the hypothesis of none has the eigenvalue of 0.203606, trace stat value of 33.90423, the critical value of 29.79707 with p-value of 0.0159, indicating that the null hypothesis fail to be rejected that is, there is no long-run cointegrating equation.

- Eigenvalue Cointegration Test

**Table 4.6:** Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max- Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.203606	25.95332	21.13162	0.0097
At most 1	0.052826	6.187110	14.26460	0.5893
At most 2	0.015353	1.763808	3.841466	0.1841

Source: Author's Computation

Table 9 shows the unrestricted cointegration rank test of maximum eigenvalue. The null cointegrating equation at none shows the value of 0.203606, max-eigenvalue of 25.95332, critical value of 21.13162 and its p-value of 0.097, implying that null hypothesis failed to be accepted that no long-run cointegrating equation among the variables.

#### 4.2.4 Regression Analysis

**Table 4.7:** Regression Results

Dependent Variable: BTCP				
Sample: 2010M08 2020M06				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5867.825	539.1941	-10.88258	0.0000
USDP	-3390.790	896.2862	-3.783155	0.0002
EURP	5103.444	860.1772	5.933015	0.0000
R-squared	0.762963	Mean dependent var		2496.409
Adjusted R-squared	0.758876	S.D. dependent var		3566.382
F-statistic	186.6876	Durbin-Watson stat		0.447850
Prob(F-statistic)	0.000000			

Source: Author's computation

The report of the regression analysis reveals the coefficient value of constant is -5867.825 with standard error value of 539.1941, t-stat value of -10.88258 and

p-value of 0.0000, indicating that if all the variables are held constant there will be a negative movement of BTC price significantly. The USD price has the coefficient value of -3390.790, the standard error of 896.2862, the t-stat of -3.783155 with the p-value of 0.0002, implying that USDP moves a negative and significant direction to BTCP, that is, a unit increase in the USDP will lead to decrease of 3390.790 in the BTCP. More so, the coefficient value of EURP is 5103.444 with standard error value of 860.1772, t-stat of 5.933015 and the p-value of 0.0000, indicating that EURP influences BTCP in a positive and significant direction, and a unit increase in EURP will lead to an increase in BTCP with the value of 5103.444. The R-squared which is also known as coefficient of multiple determination shows the value of 0.762963 (76%) indicating that the variables are goodness of fit since it is more than 60% percent. Furthermore, the F-statistic value is 186.6876 with the probability value of 0.000000, indicating that the independent variables can jointly influence the dependent variable since the p-value is less than 5% level of significance

#### 4.2.4.1 Post-Estimation Analysis

- Serial Correlation

**Table 4.8:** Serial Correlation Test

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Breusch-Godfrey Serial Correlation LM Test:

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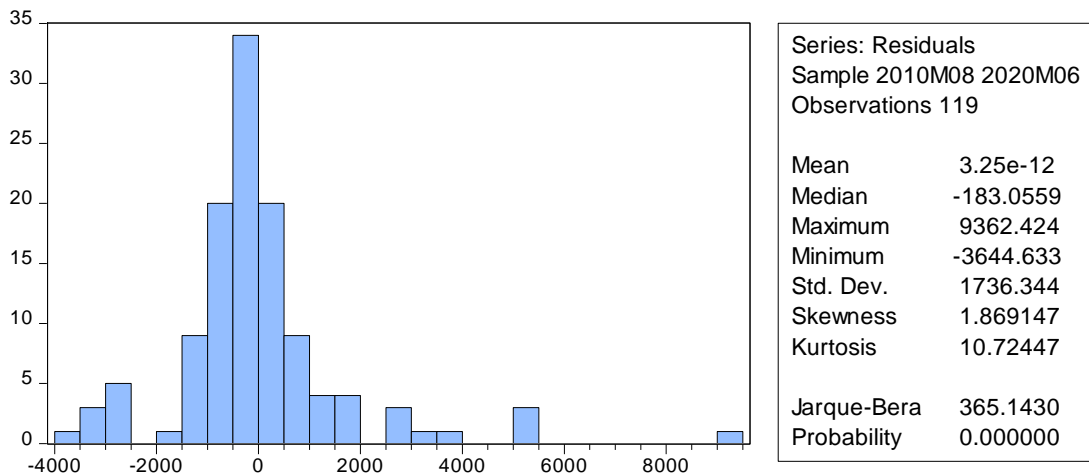
F-statistic	87.45327	Prob. F(2,114)	0.0000
Obs*R-squared	72.04364	Prob. Chi-Square(2)	0.0000

---

Source: Author's Computation

The report of the Breusch-Godfrey serial correlation reveals the F-stat value of 87.45327 with p-value of 0.0000, the observed R-squared value is 72.04364 and the probability of the Chi-square value is 0.0000. This implies that the variables have the possible issue of serial correlation since it is less than 5 percent alpha level.

- Normality Test



**Figure 4.1:** Report of Normality Test

Source: Author’s Computation

The normality report presented in figure 1 reveals the mean, median, maximum, minimum, standard deviation, skewness, and kurtosis. Meanwhile the Jarque-Bera statistic shows that the variables are not normally distributed because the probability value is then 5% level of significance.

- Heteroscedasticity Test

**Table 4.9:** Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	8.101291	Prob. F(2,116)	0.0005
Obs*R-squared	14.58449	Prob. Chi-Square(2)	0.0007
Scaled explained SS	67.38284	Prob. Chi-Square(2)	0.0000

Source: Author’s Computation

The heteroscedasticity report of Breusch-Pagan-Godfrey shows that the null hypothesis fails to be rejected because the probability of Chi-square value is less than 5% Alpha level which indicates there is heteroscedastic issue among the variables.

## 4.2.5 Vector Autoregressive Analysis

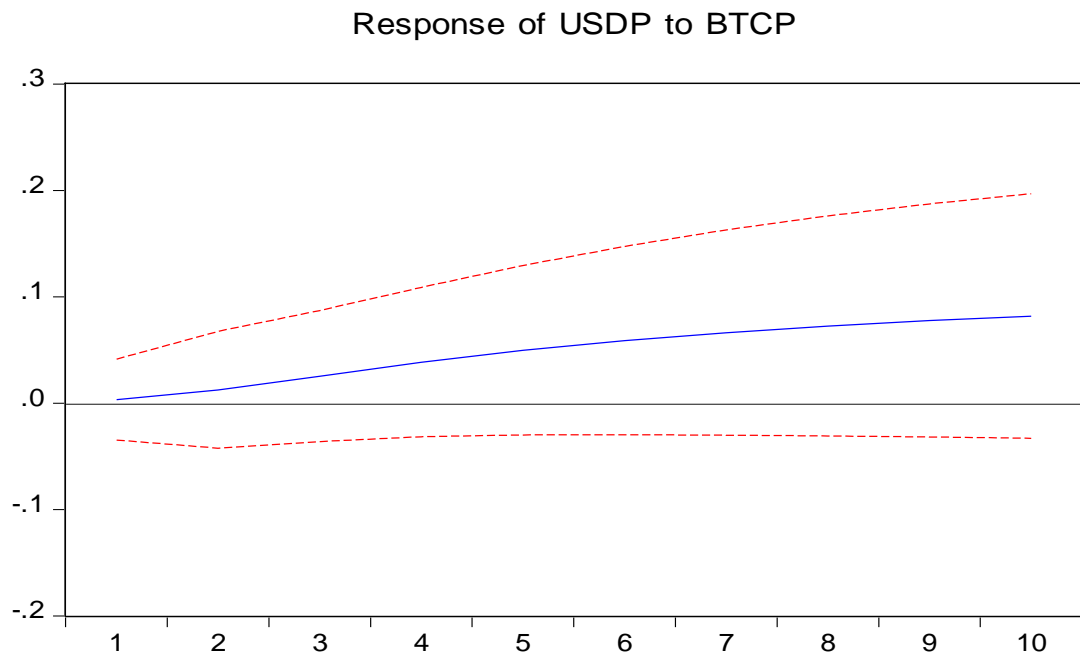
**Table 4.10:** Report of VAR Analysis

Standard errors in ( ) & t-statistics in [ ]			
	BTCP	USDP	EURP
BTCP(-1)	0.918897 (0.09270) [ 9.91292]	1.09E-05 (2.0E-05) [ 0.55112]	2.51E-05 (2.3E-05) [ 1.10503]
BTCP(-2)	-0.073745 (0.09386) [-0.78569]	7.05E-06 (2.0E-05) [ 0.35194]	4.84E-07 (2.3E-05) [ 0.02105]
USDP(-1)	-2614.075 (1447.80) [-1.80555]	1.355800 (0.30904) [ 4.38709]	0.515396 (0.35449) [ 1.45391]
USDP(-2)	2574.199 (1424.95) [ 1.80652]	-0.301147 (0.30417) [-0.99008]	-0.359420 (0.34890) [-1.03017]
EURP(-1)	3185.164 (1264.96) [ 2.51799]	-0.295726 (0.27001) [-1.09522]	0.545528 (0.30972) [ 1.76134]
EURP(-2)	-2840.172 (1235.58) [-2.29865]	0.217903 (0.26374) [ 0.82619]	0.265121 (0.30253) [ 0.87635]
C	-727.6955 (454.758) [-1.60018]	0.117161 (0.09707) [ 1.20696]	0.196390 (0.11135) [ 1.76378]
R-squared	0.931128	0.983558	0.980058
Adj. R-squared	0.927371	0.982661	0.978970
Akaike AIC	16.64067	-0.263483	0.010919
Schwarz SC	16.80593	-0.098224	0.176178
Mean dependent	2539.081	3.202028	3.777885
S.D. dependent	3581.773	1.564762	1.629785
Determinant resid covariance (dof adj.)		207.3840	
Determinant resid covariance		172.3438	
Log likelihood		-799.2927	
Akaike information criterion		14.02210	
Schwarz criterion		14.51787	

Source: Author's Computation

The VAR analysis presented in the above table shows the two lags moving variation against each other. The standard errors and the t-statistics were presented and revealed that the standard errors were not significant to one another.

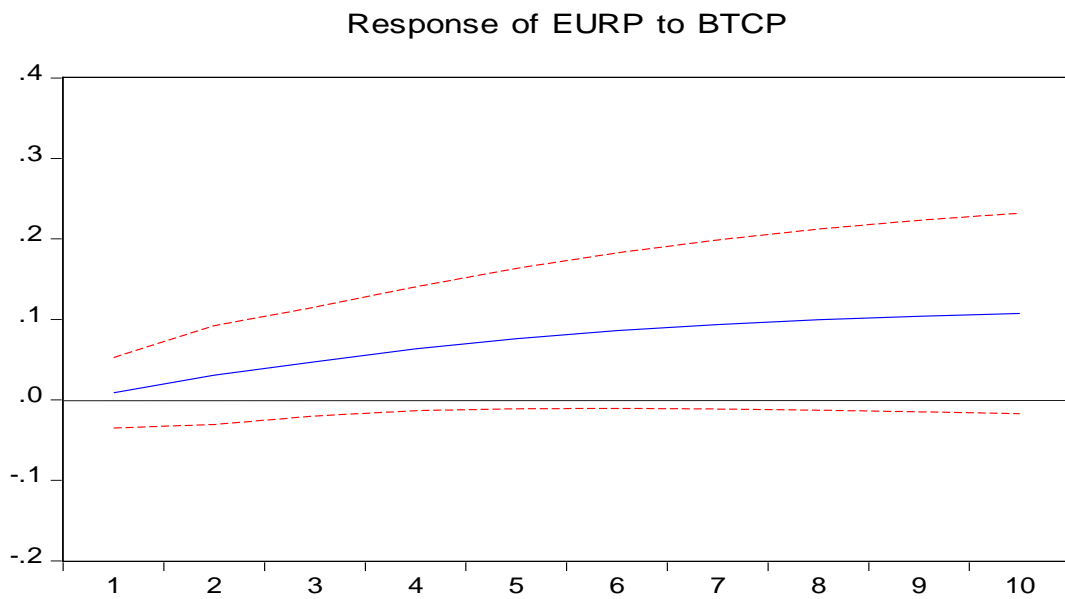
#### 4.2.5.1 Impulse Response Function



**Figure 4.2:** BTCP Impulse Response From USDP

Source: Author's Design

The responses of USDP to BTCP at the beginning of quarter 1 oscillated from a positive direction and move significantly at the early stage of quarter 2 to quarter 10. This implies that the response of USDP to BTCP has been moving positively significant from 2010M08 to 2020M06.



**Figure 4.3:** BTCP Impulse Response From EURP

The response of EURP to BTCP oscillated from positively significant from the beginning of quarter 1 and till experiencing an upward moving direction during the study period.

#### 4.2.5.2 Variance Decomposition

- $BTCP=f(USDP, EURP)$

**Table 4.11:** Variance Decomposition of BTCP

Period	S.E.	BTCP	USDP	EURP
1	965.2767	100.0000	0.000000	0.000000
2	1355.623	95.39053	1.714500	2.894974
3	1606.755	93.34551	3.223472	3.431018
4	1782.126	91.64370	4.759524	3.596778
5	1913.499	90.06392	6.348703	3.587380
6	2017.420	88.48763	8.007931	3.504443
7	2103.392	86.88410	9.728933	3.386969
8	2177.243	85.24873	11.49632	3.254947
9	2242.717	83.58793	13.29281	3.119260
10	2302.299	81.91186	15.10199	2.986141

Source: Author's Computation

The table above shows the variation from one variable to the other. In the short-run period 2, aside the own shock (BTCP shock) which has the value of 95.39053, EURP has the highest value of 2.894974 followed by USDP with the value of 1.714500. However, in the long-run period 9, aside the own shock, USDP has the highest variation value of 13.29281, indicating that EURP has the higher variation in the short-run while USDP has the higher variation to BTCP in long-run.

- $USDP=f(BTCP, EURP)$

**Table 4.12:** Variance Decomposition of USDP

Variance Decomposition of USDP:		S.E.	BTCP	USDP	EURP
Period					
1		0.206045	0.025466	99.97453	0.000000
2		0.297266	0.186240	99.29478	0.518977
3		0.365402	0.604341	98.67564	0.720020
4		0.422557	1.282293	97.90420	0.813508
5		0.473338	2.119921	97.02354	0.856541
6		0.519896	3.034259	96.08768	0.878066
7		0.563419	3.966840	95.14314	0.890020
8		0.604632	4.880191	94.22182	0.897991
9		0.644015	5.751744	93.34357	0.904686
10		0.681903	6.569131	92.51943	0.911442

**Source:** Author's Computation

Aside the impulse of USDP in the short-run period 3, EURP has the highest variation value of 0.720020, followed by BTCP with the value of 0.604341 while in the long-run period 10, BTCP has the highest impulse to USDP with the value of 6.569131 followed by EURP with the variation value of 0.911442. This implies that BTCP could influence USDP in the long-run while EURP influence in the short-run.



- $EURP=f(BTCP, USDP)$

**Table 4.13:** Variance Decomposition of EURP

Period	S.E.	BTCP	USDP	EURP
1	0.236345	0.136691	90.47548	9.387826
2	0.332745	0.918596	92.93562	6.145784
3	0.405765	1.985398	93.11641	4.898192
4	0.467183	3.338697	92.53148	4.129818
5	0.521838	4.799093	91.62391	3.576993
6	0.571917	6.254277	90.60503	3.140692
7	0.618632	7.635945	89.58307	2.780982
8	0.662728	8.908620	88.61348	2.477899
9	0.704704	10.05731	87.72275	2.219934
10	0.744919	11.07953	86.92097	1.999502

Source: Author's Computation

In the short-run period 2, USDP has the highest variation of 92.93562 followed by the own shock (EURP) with the value of 6.145784 and BTCP with the value of 0.918596. In the long-run period 9, USDP has the highest variation of 87.72275, followed by BTCP and EURP indicating that USDP has the highest variation in the short-run and in the long-run to EURP.

#### 4.2.6 Granger Causality

In order to see direction of the casual relationship between the series, causality test is used. The most famous one is Granger test and in this study it is applied.

Related Hypotheses of this test:

$H_0: \beta_i = 0$  There is no causality relationship from variable X to variable Y.

$H_0: \beta_i \neq 0$  There is causality relationship from variable X to variable Y.

Granger causality test is performed, and findings are reported in Table 4.14 as follows:

**Table 4.14:** Pairwise Granger Causality Tests

Sample: 2010M08 2020M06			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
USDP does not Granger Cause BTCP	117	4.49436	0.0133
BTCP does not Granger Cause USDP		0.91903	0.4019
EURP does not Granger Cause BTCP	117	6.07692	0.0031
BTCP does not Granger Cause EURP		1.28351	0.2811
EURP does not Granger Cause USDP	117	0.38286	0.6828
USDP does not Granger Cause EURP		0.70408	0.4967

Source: Author's Computation

The report of granger causality test presented in Table 14 shows that USDP to BTCP has the F-stat value of 4.49436 with p-value 0.0133 while BTCP to USDP has the F-stat value of 0.91903 with p-value of 0.4019, indicating that the null hypothesis that USDP does not granger cause BTCP is rejected that is USDP can cause the movement of BTCP though BTCP cannot cause the movement of USDP. More so, EURP to BTCP has the F-stat value of 6.07692 with p-value of 0.0031 while BTCP to EURP has the F-stat value of 1.28351 with p-value of 0.2811, implying that EURP can granger BTCP though BTCP cannot granger cause EURP. Furthermore, the granger causality result between EURP and USDP reveal that there is no causality between EURP and USDP because the p-values are more than 5% alpha level.

### 4.3 Discussion of Findings

Following the analysis conducted, the study found that the descriptive report revealed that BCTP was positively skewed, and leptokurtic in nature since the value was more than 3, while the Jarque-Bera value indicated that BTCP was not normally distributed. USDP was positively skewed, the kurtosis indicated a platykurtic form while the Jarque-Bera revealed not normally distributed. The euro price (EURP) was positively skewed and the kurtosis was platykurtic while Jarque-Bera showed not normally distributed. The unit root indicated that the variables were not stationary at level, but they retain the shock after first difference, indicating that all the variables became stationary after first difference.

The report of the regression analysis revealed USDP influences in a negative and significant direction to BTCP, that is, a unit increase in the USDP will lead to decrease of 3390.790 in the BTCP. More so, EURP influences BTCP in a positive and significant direction, and a unit increase in EURP will lead to an increase in BTCP with the value of 5103.444. The cointegration test of Trace unrestricted ranking test reported that the null hypothesis fails to be rejected that is, there is no long-run cointegrating equation and the unrestricted cointegration rank test of maximum eigenvalue showed that null hypothesis failed to be accepted that no long-run cointegrating equation among the variables.

The VAR impulse response of USDP to BTCP at the beginning of quarter 1 oscillated from a positive direction and move significantly at the early stage of quarter 2 to quarter 10. This implies that the response of USDP to BTCP has been moving positively significant from 2010M08 to 2020M06. The response of EURP to BTCP oscillated from positively significant from the beginning of quarter 1 and till experiencing an upward moving direction during the study period. The variance decomposition showed in the short-run period 2, aside the own shock (BTCP shock) which has the value of 95.39053, EURP has the highest value of 2.894974 followed by USDP with the value of 1.714500. However, in the long-run period 9, aside the own shock, USDP has the highest variation value of 13.29281, indicating that EURP has the higher variation in the short-run while USDP has the higher variation to BTCP in long-run. Aside

the impulse of USDP in the short-run period 3, EURP has the highest variation value of 0.720020, followed by BTCP with the value of 0.604341 while in the long-run period 10, BTCP has the highest impulse to USDP with the value of 6.569131 followed by EURP with the variation value of 0.911442. This implies that BTCP could influence USDP in the long-run while EURP influence in the short-run.

In the short-run period 2, USDP has the highest variation of 92.93562 followed by the own shock (EURP) with the value of 6.145784 and BTCP with the value of 0.918596. In the long-run period 9, USDP has the highest variation of 87.72275, followed by BTCP and EURP indicating that USDP has the highest variation in the short-run and in the long-run to EURP. The report of granger causality test indicated that the null hypothesis that USDP does not granger cause BTCP is rejected that is USDP can cause the movement of BTCP though BTCP cannot cause the movement of USDP. More so, EURP to BTCP implied that EURP can granger BTCP though BTCP cannot granger cause EURP.

## **5. CONCLUSION AND RECOMMENDATIONS**

### **5.1 Conclusion**

Following the growing economic importance and shared interest, scientific research has begun to emerge on cryptocurrencies. A critical concern about whether a cryptocurrency will be valued in the blockchain development system that is connected to investment decision making. Dramatic price swings in BTC trading markets have led to substantial discussions and concerns about using cryptocurrencies as a mechanism for transactions. Several early studies found BTC rather than a proper currency network as an investment speculation. Also, there is no universal agreement on the actual valuation of cryptocurrencies which can drive investment decisions.

Despite criticism of the institutional, privacy protection and legal problems of cryptocurrency, there is growing concern not only from researchers but from the modern world as well. Although BTC has been widely accepted in nations like Japan, China, the Netherlands, Sweden and Denmark, other national economies have discredited it as the most accessible and unreliable payment method. Due to the obvious multidimensional nature of the international economies, exchange rates and cryptocurrency markets play an important role as they enable participants to trade and assess the prices of products and services generated in various countries and instead use these relative values for the related gains in their activities. Nevertheless, a wide range of cryptocurrencies have been traded globally since BTC became the first untraceable cryptocurrency in 2008. Because BTC is the mixture of elements that form the foundation of the virtual currency ecosystem, BTC has been commonly used in transactions between participants trying to join the cryptocurrency market.

However, this current study concluded that USDP influences BTCP in a negative and significant direction which connotes that a unit increase in the USDP will lead to decrease in the BTCP while the EURP influences BTCP in a

positive and significant direction which infers that a unit increase in EURP will lead to an increase in BTCP. The study also concluded that there is no long run cointegrating equation among USDP, EURP, and BTCP. Furthermore, it was concluded that EURP has the higher variation in the short-run while USDP has the higher variation to BTCP in long-run. Finally, USDP can cause the movement of BTCP though BTCP cannot cause the movement of USDP while EURP can granger BTCP though BTCP cannot granger cause EURP.

According to co-integration test results, it is further revealed that there is no cointegration relationship long-run between Bitcoin price, USD prices, and EURO price. As a result of the Granger causality test conducted, the Bitcoin in the long run, may become a good alternative investment tool for the foreign exchange rates.

## **5.2 Recommendations**

In order to find out material (important) dates that cause huge price movements (volatility) through structural break analysis. Thus, this analysis can be done in more detailed by analyzing each cornerstone (milestone) dates separately.

This study took the Bitcoin from the Cryptocurrencies world and Dollar and Euro from the Fiat currencies or foreign exchange rates. It will be better to take more not just BTC, but take others like Ethereum, XRP, or other types from the cryptocurrencies. And take other than just Dollar and Euro.

This study took BTC in USD prices because it is famous that always Bitcoin is measured by USD, and the source that data has been taken from which is Investing website, prices of BTC in Turkish Lera for the related time in this study has not been found. So, it will be a good move for future studies to take BTC and USD and Euro in Turkish Lera for other time period.

This study used six different types of statistical analysis, maybe for future studies can take other test .

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## APPENDIX

### APPENDIX A. Exchange Rates Historical Data of Btc, Usd And Euro.

"BTC/USD", "USD/TL", "EUR/TL" Exchange Rates Historical Data					
No.	Year	Date	BTC/USD	USD/TL	EUR/TL
1	2010	Aug-10	0.1	1.5267	1.9368
2		Sep-10	0.1	1.4482	1.9744
3		Oct-10	0.2	1.433	1.999
4		Nov-10	0.2	1.5049	1.9533
5		Dec-10	0.3	1.5419	2.0629
6	2011	Jan-11	0.5	1.6045	2.197
7		Feb-11	0.9	1.5986	2.2064
8		Mar-11	0.8	1.5454	2.1894
9		Apr-11	3.5	1.5211	2.2515
10		May-11	8.7	1.5939	2.2946
11		Jun-11	16.1	1.6206	2.3508
12		Jul-11	13.4	1.6887	2.431
13		Aug-11	8.2	1.7162	2.4691
14		Sep-11	5.1	1.8599	2.4896
15		Oct-11	3.3	1.771	2.4543
16		Nov-11	3	1.8294	2.4587
17	Dec-11	4.7	1.885	2.4395	
18	2012	Jan-12	5.5	1.7773	2.324
19		Feb-12	4.9	1.7491	2.3312
20		Mar-12	4.9	1.7825	2.3786
21		Apr-12	4.9	1.7565	2.3257
22		May-12	5.2	1.8661	2.3081
23		Jun-12	6.7	1.8097	2.2911
24		Jul-12	9.4	1.7951	2.2083
25		Aug-12	10.2	1.8186	2.2878
26		Sep-12	12.4	1.7964	2.3095
27		Oct-12	11.2	1.7936	2.3245
28		Nov-12	12.6	1.7873	2.3245
29	Dec-12	13.5	1.7837	2.351	
30	2013	Jan-13	20.4	1.7589	2.3886
31		Feb-13	33.4	1.7985	2.3497
32		Mar-13	93	1.809	2.3192
33		Apr-13	139.2	1.793	2.3609
34		May-13	128.8	1.8756	2.4381
35		Jun-13	97.5	1.9288	2.5094

36		Jul-13	106.2	1.9353	2.5745
37		Aug-13	141	2.0403	2.6978
38		Sep-13	141.9	2.0186	2.7306
39		Oct-13	211.2	1.996	2.7115
40		Nov-13	1,205.70	2.0198	2.745
41		Dec-13	805.9	2.1458	2.9495
42	2014	Jan-14	938.8	2.2607	3.049
43		Feb-14	573.9	2.2093	3.0494
44		Mar-14	444.7	2.1407	2.948
45		Apr-14	445.6	2.1125	2.9295
46		May-14	627.9	2.0971	2.8586
47		Jun-14	635.1	2.1191	2.9015
48		Jul-14	589.5	2.1418	2.8676
49		Aug-14	481.8	2.1639	2.8418
50		Sep-14	388.2	2.2782	2.8778
51		Oct-14	337.9	2.224	2.7854
52		Nov-14	374.9	2.2196	2.7639
53		Dec-14	318.2	2.3345	2.8244
54	2015	Jan-15	218.5	2.4464	2.7616
55		Feb-15	254.1	2.5088	2.8087
56		Mar-15	244.1	2.5978	2.7877
57		Apr-15	235.8	2.6723	2.9995
58		May-15	229.8	2.663	2.9261
59		Jun-15	264.1	2.6816	2.9867
60		Jul-15	283.7	2.771	3.0448
61		Aug-15	229.5	2.9148	3.2687
62		Sep-15	235.9	3.0257	3.3818
63		Oct-15	311.2	2.9151	3.2083
64		Nov-15	378	2.9131	3.0776
65		Dec-15	430	2.9177	3.1688
66	2016	Jan-16	369.8	2.9553	3.2025
67		Feb-16	436.2	2.9654	3.2243
68		Mar-16	415.7	2.817	3.2057
69		Apr-16	448.5	2.7955	3.2025
70		May-16	528.9	2.9495	3.2833
71		Jun-16	670	2.8777	3.1959
72		Jul-16	621.9	2.9883	3.3391
73		Aug-16	573.9	2.958	3.3008
74		Sep-16	608.1	2.9992	3.3714
75		Oct-16	698.7	3.0939	3.3974
76		Nov-16	742.5	3.437	3.6391
77		Dec-16	963.4	3.5277	3.7097
78	2017	Jan-17	965.5	3.7734	4.0743
79		Feb-17	1,189.30	3.6472	3.8577
80		Mar-17	1,079.10	3.6352	3.8726
81		Apr-17	1,351.90	3.5516	3.8702

82		May-17	2,303.30	3.527	3.9663
83		Jun-17	2,480.60	3.5212	4.0233
84		Jul-17	2,883.30	3.5193	4.1676
85		Aug-17	4,735.10	3.4527	4.1121
86		Sep-17	4,360.60	3.5637	4.2101
87		Oct-17	6,451.20	3.792	4.4162
88		Nov-17	9,946.80	3.919	4.6651
89		Dec-17	13,850.40	3.79	4.5473
90	2018	Jan-18	10,265.40	3.7555	4.6646
91		Feb-18	10,333.90	3.7988	4.6322
92		Mar-18	6,938.20	3.9552	4.8738
93		Apr-18	9,245.10	4.0617	4.9059
94		May-18	7,502.60	4.5245	5.29
95		Jun-18	6,398.90	4.5872	5.3601
96		Jul-18	7,729.40	4.9142	5.7454
97		Aug-18	7,033.80	6.538	7.5861
98		Sep-18	6,635.20	6.056	7.0304
99		Oct-18	6,365.90	5.5835	6.3159
100		Nov-18	4,039.70	5.2128	5.8994
101		Dec-18	3,709.40	5.2887	6.0664
102	2019	Jan-19	3,437.20	5.1645	5.9118
103		Feb-19	3,816.60	5.3371	6.0689
104		Mar-19	4,102.30	5.5555	6.2321
105		Apr-19	5,320.80	5.9656	6.691
106		May-19	8,558.30	5.8382	6.5309
107		Jun-19	10,818.60	5.7921	6.5856
108		Jul-19	10,082.00	5.5864	6.1875
109		Aug-19	9,594.40	5.8306	6.4084
110		Sep-19	8,284.30	5.6489	6.1573
111		Oct-19	9,152.60	5.713	6.3711
112		Nov-19	7,546.60	5.747	6.3315
113		Dec-19	7,196.40	5.9489	6.6699
114	2020	Jan-20	9,349.10	5.9822	6.6367
115		Feb-20	8,543.70	6.2427	6.8835
116		Mar-20	6,412.50	6.6143	7.2962
117		Apr-20	8,629.00	6.9864	7.655
118		May-20	9,454.80	6.8202	7.5697
119		Jun-20	9,135.40	6.8525	7.6974

The data has been taken from [www.investing.com](http://www.investing.com)

## **RESUME**

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-English: Advanced

-Turkish: Intermediate

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