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***CRYPTOCURRENCIES AS INVESTMENT ASSET***

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## LIST OF ABBREVIATIONS

**AML** – Anti Money Laundering

**ATM** – Automated Teller Machines

**BSA** – Bank Secrecy Act

**CEO** – Chief Executive Officer

**CONSOB** – Commissione Nazionale per le società e la Borsa

**CVC** – Convertible Virtual Currency

**DEFI** – Decentralized Finance

**ECB** – European Central Bank

**ESG** – Environmental Social and Governance

**ETF** – Exchange Traded Fund

**FATF** – Financial Action Task Force

**FBI** – Federal Bureau of Investigation

**FED** – Federal Reserve

**FIFO** – First In First Out

**FINCEN** – Financial Crimes Enforcement Network

**HIFO** – Highest In First Out

**ICO** – Initial Coin Offering

**IRA** – Individual Retirement Account

**IRS** – Internal Revenue Service

**ISO** – International Standard Organization

**KYC** – Know Your Customer

**LIFO** – Last In First Out

**LTDA** – Legal Tender Digital Asset

**MBS** – Money Service Business

**NFT** – Not Functionable Token

**OCC** – Office of the Comptroller of the Currency

**US** – United States

**USA** – United States of America

**VASP** – Virtual Asset Service Provider

**VAT** – Value Added Tax

## FOREWORD

Before the beginning of the world financial crisis in 2008, people were living with serenity: on average, they were full working, they were able to sustain the needs of the family and save part of the monthly salary. The financial crisis broke all the certainties and balances built in the past. Most of the heads of families lost their jobs and started eroding their capital to sustain the household.

Many central banks tried to solve the catastrophic situation by flooding the monetary market with new liquidity and reducing the interest rates. However, as it will be explained later, these moves created further problems bringing inflation and lowering families' purchasing power. It is from the collapse of the financial, economic and monetary systems existing before 2008 that an unprecedented innovation came into life: cryptocurrencies.

People began to show interest on this asset very quickly because it wanted to be adopted as a new mean of exchange and surprisingly, it did not have any owner to control it and to increase its supply. Essentially, crypto characteristics were the opposite of the traditional system that was just collapsed. From their introduction, cryptocurrencies have become very popular, however, there is a lot of bad information spread around the world since there is no central institution dealing with them and writing an official functioning statement. Cryptocurrencies are not regulated by any jurisdiction, therefore, there are neither official rule to follow. However, curiosity and misinformation are strongly connected and many people are searching online and for experts' opinions. Unfortunately, traditional experts of the financial field cannot be considered experts of cryptocurrencies and they cannot provide the demanded information because sometimes they do not even know about their existence.

Considering the popularity of cryptocurrencies, the traditional financial system must find a way to integrate them as investment asset for retailers. Nevertheless, it is important examining their volatility because they assume investors to have high tolerance of risk. For this reason, it is essential trying to adopt different methods to evaluate the introduction of assets considering different characteristics other than the return.

## INTRODUCTION

The thesis deals with the new world of the cryptocurrencies. The phenomenon is drawing the attention of a lot of people distributed all around the globe: without distinctions in geographic area or usage limits for national borders. Cryptocurrencies are operating online and as such, anyone with an internet connection can reach, hold, and use them anywhere. The key point of the thesis is the study of the cryptocurrencies' volatility and their introduction as a new investment asset in retail portfolios.

The document starts describing the history of the traditional monetary system, highlighting its points of strengths and mostly the weaknesses. It illustrates the required characteristics of a medium of exchange, explaining the reason why cryptocurrencies will improbably become the next one. Moreover, the first chapter explains the world future vision about this disruptive technology, why it should be adopted, how and by whom.

The second chapter deals with the description of the blockchain, the technology on which digital assets are based, allowing to better discover the working system and the people involved in the mode of operation. It introduces the sustainability concerns of national states for the high processing power required by the network to ensure the correct functioning of the system and what could be possible solutions by using more green energy.

The third chapter wants to answer to two of the most important questions related to crypto as investment asset. Is there any regulation to protect the investor? What about the tax rate over the capital gain? The answer may change according to the different uses and applications that cryptocurrencies can have.

Chapter four discloses the characteristics needed by the retail investors to be allowed to invest in cryptocurrencies. It explains what investing in digital assets means stressing the level of riskiness and the importance of strictly following a strategy to protect the capital invested. Moreover, it analyses how central banks and asset management companies are behaving to launch cryptocurrencies as investment asset to their customers.



In the last chapter, the thesis illustrates how to introduce cryptocurrencies in retail portfolios by using an innovative approach: the risk parity method which has a different functioning from the traditional method of weight allocation. The chapter analyses the building of a hypothetical portfolio investing in equity, government bond, corporate bond, commodities and cryptocurrencies equally distributing the risk according to their standard deviation. Tables, graphs and equations illustrate the basic statistics of each asset and the ones of the portfolio.

Overall, the thesis describes how cryptocurrencies can be introduced in a retail portfolio by considering the asset's variance and how much they can positively or negatively influence its performance.

## CHAPTER ONE: cryptocurrencies foundation

### GOING THROUGH THE HISTORY

In 1950, the first fully programmable computer was produced and, from that year on, many banks and companies started to use them to make recordkeeping and payments substituting physical money transfers. Nevertheless, this innovation was not enough to solve monetary problems of the time and just in the last few decades some attempts have been made to provide a new form of money. From those trials, cryptocurrencies were born to help people transferring value across time and space, fostering technological knowledge.

Starting from the beginning, the best way to understand what cryptocurrencies are, is to study the word and it is easy to notice that it is made by two parts:

- crypto: is the abbreviation of the word “cryptography”, which is a branch of cryptology and deals with “hidden communications”. It is the practice to obscure the meaning of a message making it incomprehensible to everyone else other than allowed people. This guarantees confidentiality and information security.
- currency: refers to any kind of money in circulation that is considered as medium of exchange and store of value.

Explaining the term in better words, cryptocurrencies are digital money used as a medium of exchange where any transaction is recorded on a ledger using cryptography to ensure information security and to verify the truthfulness of any operation.

Before going into the details, it is necessary to fully understand the role of money in the daily life.

Across the times, prior to the introduction of money, people used to directly exchange goods with one another. This practice was called barter. It was working well because people were not specialized in the production of goods and cities were small enough for citizens to get to know each other. As soon as societies started to change with the creation of larger communities and the specialization in jobs, barter

was not comfortable anymore. People began to use the outcomes of their jobs to barter, but the use of different objects as payment system did not allow them to exchange value in a fair and correct way.

Barter highlighted three different problems:

1- Lack of coincidence in scale, imagine buying a house and paying for it with kilos of tomatoes. The buyer might not have the required kilos of tomatoes as the seller might not want all tomatoes.

2- Lack of coincidence in time, tomatoes are perishable, and the buyer might not have enough time to accumulate the necessary kilos of tomatoes to buy the house or, on the contrary, the seller might not have the time to consume tomatoes before they perish.

3- Lack of coincidence in location, the buyer and the seller may want to exchange the house with tomatoes in the same place, but this would be impossible since houses are not transportable.

As people started to feel these problems, they recognized the need for a common good that would have allowed them to easily exchange commodities. If the good is widely accepted as a medium of exchange, then it is called money.

But what is the most important characteristic that a good has to own to be considered money? Salability. It is the ease with which a good can be exchanged in the market whenever people desire to. Any kind of product could be a good candidate to be the medium of exchange just if it is able to fulfil and solve the three problems of barter highlighted before. In fact, throughout history, several goods have been used as money: gold, silver, copper, seashell, stones, salt, cattle, government paper and even alcohol and cigarettes.

Being salable means that the good can store and keep its value for the future with a small probability to lose it and consequently be depreciated. Therefore, people have noticed that in order to hold value, the good must not be perishable and it has to last in the long term.

Another essential feature for the good to keep its value, is the control of its supply. This will allow people to control the quantity available inside the market to avoid the increase or decrease of the good's value damaging its ability to store value. The difficulty of increasing the production of the good determines its hardness. The harder to influence the supply, the better would be for the good to be considered hard money.

The hardness of money is related to two concepts: the stock and the flow. The stock is the existing quantity of money in the market, specifically, it is the quantity produced in the past minus the quantity that has been consumed or destroyed. The flow is the extra production of money that will be made in the future. The ratio between the two is the indicator of the hardness. The higher the ratio, the harder the money and thus, it will better maintain the value over the time and will be more salable.

It is better to choose hard money because the easy one is very simple to be produced, and, as a consequence, it would be simple to create a sort of easy money trap. It means that in the moment in which the supply of the money increases, it loses its value. On one side, the greatest amount of money in circulation creates easy access to it but, on the other side, it will decrease its value destroying the value that people have already stored in it. Consequently, any natural or artificial good used as money has to have a mechanism that prevents people from modifying the supply. Hence, the best way to solve this problem is to find a good whose production is very difficult to reproduce.

In fact, the higher the hardness ratio of a national currency, the more people are pleased to hold that money which allows them to store the value they earn or save. It has been noticed during the past that people who choose to use hard money will benefit more in comparison to those who choose easy money. This is because the former is more able to keep its value given the stable supply. By the way, with the change of times and the arrival of new technologies, the hardness and salability of money have changed too, driving people to look for other forms of money.

Another important aspect of money that could affect its value is acceptability. The higher the acceptability, the lower the willingness of people to give away the money, the lesser the supply changes and the higher the gains to take part in the network. If acceptability of the good is high, the society will be able to express prices in its terms creating a new unit of account. Deciding for a single money as payment method allows people to fairly exchange value leading the society to grow faster and to increase the opportunities for gains from further exchanges and specialization.

Summing up what has been discussed so far, if cryptocurrencies want to become a medium of exchange, they should have three important characteristics:

- fixed supply to be classified as hard money;
- salability to give the possibility to store value;
- great acceptability by the society.

To understand the future evolution of the role of cryptocurrencies and if they could become the next medium of exchange, it is necessary to have a look at the history, at what have been the past money, why they got the role and suddenly lost their function.

Historians have discovered that the first goods to be used as money were: stones, seashells, beads and cattle.

Stones were used on Yap Island of Micronesia. They were very difficult to be found since they were not available in the territory of the isle and they had to be imported from neighbouring territories. Stones were problematic to be imported because the population did not have solid boats to transport them. This difficulty in supplying the stones was very precious to determine the hardness of the good making them the best choice to become the official medium of exchange. The stones were not comfortable to transport because they were heavy to be moved and were not divisible, but Yapese adopted and implemented an easy system of use whose characteristic was transparency. In fact, everybody's stones were in the central square of the village so that all people could see them, and everybody knew their ownership. Once payments had to be made, any person of the village was aware about the transfer of property and the specific number of stones each person owned.

The scarcity of the supply was key to the system because nobody could increase the quantity available by inflating the intrinsic value of each stone. This monetary system worked well until when an Irish captain came with a bigger boat that enabled him to import a huge number of stones into the island to buy coconut oil. Yapese were very happy about the possibility of increasing the number of stones they could own but they did not take into consideration inflation. As a matter of fact, as the higher number of stones came into circulation, they lost drastically their value. Therefore, stones were not salable anymore and were not able to store value. In the end, they lost their function as a medium of exchange.

Seashells and beads have a similar story: they were very small but extremely valuable because they were difficult to find in Africa and North America. These characteristics gave them hardness and salability. However, seashells and beads were not uniform units, hence, it was difficult for the society to express prices in those terms. This created obstacles to the specialization of the production and growth of the economy. Once Europeans came in Africa and North America to build new colonies and understood how the monetary system was functioning, they started to import a huge number of beads and seashells from European coasts to buy the goods produced by indigenous populations. Europeans' good intention was to create a sort of international market but by flooding the African and American monetary system with new seashells and beads, the medium of exchange lost its value. They just created a slow transfer of wealth, making native population poorer and Europeans richer. Wealthier Europeans took the control of the monetary system, and they exploited the situation using cheap beads to start the slavery trade of Africans to North America buying the children of the poorest families in exchange of money. In the end, with the introduction of metals, seashells and beads lost their monetary role.

The last good that has been mentioned before is cattle which are still used nowadays in some countries to pay the dowries. Sometimes cattle are even exchanged among families as a sort of payment for the bride. The main problem of cattle is indivisibility which means that there must exist another form of money that enables people to pay for small purchases. In the past, it was salt.

As the time goes by, humans discovered the importance of metallurgy and introduced new forms of money made by metal. The new medium of exchange was far better than the previous ones because metals were easier to transport and could be divided into small units which allowed people to pay for small amounts. As consequence, stones, seashells, beads and cattle were replaced with a harder good whose stock-to-flow ratio and acceptability were higher.

As the knowledge about metals improved and the increasing industrial production was able to supply them at large scale, metals became highly demanded and accepted by people gaining a good level of salability. Moreover, metals were durable, they did not perish with the time or ran the risk of being ruined. In addition, people started to understand the negative correlation between the value of metal and the ease of its supply: the lower the availability in the market, the higher its value. For this reason, the most used metals were gold, silver and copper for their rarity.

Initially, the value of the purchase was paid by exchanging the corresponding value of raw metals with respect to their weight but as soon as people learnt how to mint money, they started to produce coins in circular forms and brand them according to weights. The new coined money facilitated the purchase of goods and the exchange of value among people. The use of three different metals reflected the value and the size of the purchase, meaning that the purchase of a house could have been paid with gold, the purchase of clothes with silver and the purchase of bread with copper.

There were three main advantages for people to use metals:

- 1- they held value over the time without being ruined;
- 2- they were salable across scale because, with different values, people could afford small transactions;
- 3- they were easier to transport because small weights could hold a lot of value.

Contextually, there were also disadvantages, because the employment of three different metals created confusion for people in terms of usage. There were no fixed rules to determine what had to be paid with gold, silver and copper, so people did

not know how to manage the payment ending up by using different metals anytime. This led to high fluctuations of their demand and supply which affected the value of the metal itself. However, people had to deal with another problem whose consequences were unknown: governments could change the weight of metal during the mint of the coins causing a decrease in their value. So far, this point has never been solved because later in times, with the centralization of gold and the mint of coins, governments started to supply more money beyond the quantity of metals they owned. Naturally, this move brought inflation devaluing coins.

However, ancient civilizations started to use first of all copper and silver as medium of exchange because they were more difficult to manufacture with respect to all the other available metals and therefore, they got their high salability across time and space. Gold was still too precious to be widely accepted and used. The first show of golden coins occurred in the Greek civilization under King Croesus.

At the time of the Roman Republic, under the dictator Julius Caesar, the aureus coin began to be widely spread around Europe and Mediterranean increasing the possibility to trade with other populations. The introduction of the new monetary system allowed civilizations to flourish for many years ahead during Augustus time and the reign of the emperor Nero. The Roman Empire was prospering thanks to continuous conquests of new territories. Initially, the emperor had high consensus and popularity because with the loot of the wars, he was able to provide free grain to people living in the city of Rome. By doing so, many farmers living in the countryside decided to move into the urban area to look for better living conditions. The increasing number of citizens in the city made the need for grain raising, but the emperor did not have enough money to sustain the higher demand. So, Nero was the first to fall into the temptation to collect money from the population and mint them into new ones lowering the weight of metal in each new coin and therefore, devaluing the currency. This move enabled him to reduce wages and government expenses and to fix the price of basic goods. The devaluation of the money lasted for many centuries until when the Romans became poor and hungry. Consequently, they decided to leave and move outside the city where they could live in self-sufficiency. Economic activities started to shut down and trade was always less



profitable. The emperor did not have enough money to pay soldiers and started to lose consensus. In fact, along with the decline of the monetary system, came the cultural, fiscal, spiritual and military decline until when, in 476 AD, the Western Roman Empire collapsed leaving ground to the Medieval Era.

The destruction of the monetary system and the abandon of a hard medium of exchange were crucial in making people servants of feudal lords. Richness was concentrated in the hands of few and the only exchangeable metals available in the market were copper and bronze. Nevertheless, it was mainly during this time that metals started to be manufactured with innovative techniques which led to an increase in their supply in the market and a reduction in their value making them bad stores of value. There came a period of inflation that made Europe fall into the Dark Age whose characteristics were poverty, serfdom and closed-mindedness that brought to the building of city-states.

During the Renaissance, some Italian city-states started to mint their own coins giving them a strong value which was based on the true value of the metal used in the production of the coin. These cities were Florence with the florin and Venice with the ducat. Following the introduction of the new money, people started to store value and increase their wealth by running new economic activities. Trade got back its important role in the economic life of people who decided to increase their routes around Europe. With the adoption of hard money with a high stock-to-flow ratio and salability, the market conquered a strong stability. Right after the economic recovery came the cultural, political, intellectual, and scientific renaissance.

The only problem of this era was the double use of gold and silver as medium of exchange. The use of two different coins for the same purpose made it difficult for people to fix the price of each good in terms of different metals. This indecision led to continuous fluctuations of their value due to fast changes in demand and supply. Any attempt to solve the situation was not sufficient, just the technological advance was able to overcome the problem. The discovery of faraway territories brought the need for faster communication and transportation. Therefore, Samuel Morse invented the telegraph in 1837 and states strongly improved the networks of the

railways. These two innovations allowed banks to communicate and send payments quicker than ever by exchanging documents and debiting bank accounts instead of making physical transfers. The result was the abandonment of the physical use of gold and silver as medium of exchange in favour of bills and checks.

The consequence was that more and more nations started to adopt the monetary gold standard, meaning that people could use printed paper, backed by precious metals that were immediately redeemable. The problem was that nations decided for different metals as base of the monetary system: some states chose for gold, others for silver. This caused difficulties in terms of payments among countries and due to that, nations started to trade just with nations adopting the same monetary metal. It was just after the end of the Napoleonic wars that the strongest European countries adopting the gold standard emerged as superpowers. Given the economic supremacy of these states, many smaller countries decided to follow their path, also because there were greater incentives to start international trade.

Paper receipts, checks and bills printed by banks allowed to store the value of gold without the need of transporting the metal to make payments. This solved the trouble of gold salability across space, turning it the best monetary metal. The new means of payment were far easier to use in real life rather than metal coins with a specific weight. This innovation led to the abolition of the use of silver as medium of exchange. It was completely substituted by gold and lighter paper receipts. The death of silver drove any remaining country to the adoption of the gold standard. The last nations to join were India in 1898 and China in 1935.

The abandonment of silver lowered its price by making the metal losing its value with respect to the time in which it was considered a medium of exchange. For this reason, when India and China decided to switch from silver to gold, silver had already lost 78% of its value. Economists believe that the two countries failed to catch the wave of the economic boom of the West after the end of the two world wars mainly for the enormous value that was destroyed during the shift to gold. Technically speaking, even if silver was considered hard money inside national

borders, it was easy money for foreigners, whose money was harder and took the control of the silver supply in the Indian and Chinese market. (Saifedean, 2018)

After that the greatest countries all over the world had adopted the gold standard, the second half of the nineteenth century was a flourish period for humanity. Gold based money had a very high stock-to-flow ratio which ensured salability. Rich people had conspicuous quantities of money to invest in the discoveries of new technologies. In this period, further improvements into telecommunications and transportations sectors were made to improve trade among countries and to develop new possibilities to increase wealth.

Naturally, the value of national currencies was not the same among states. For this reason, there were conversion tables to understand the correct value of the currencies with respect to the fixed amount of gold used to mint them. For example, the British pound was minted with 7.3 grams of gold while the French franc was 0.29 grams meaning that one British pound was worth 25.17 French franc.

Trade expansion around the world has been possible thanks to the soundness of money which allowed people to build an enormous fortune and raise the saving rate of families. It was precisely during this time that people made huge investments to finance the greatest discoveries in medical, technological, economic and artistic fields. This era of breakthroughs was called Belle Epoque.

Trade and payments became easier with the certainty that paper money was reflecting the true value of gold without the necessity to transport a lot of weight. This created a sort of ideal monetary system. However, the economic and monetary situation of the gold standard could not last forever. In fact, in 1914, everything collapsed. It was the year of the outbreak of the First World War. Nations went off the gold standard to finance the military forces and fight the conflict. Governments started to print more paper money with respect to the gold available in their reserves. It meant that paper money in circulation was no longer redeemable in gold. In the end, paper money resulted to be easier to produce than gold and their

increasing availability in the market created huge problems, from depreciation to inflation.

Initially, banks and central banks were storing the amount of gold for the paper money they were printing. However, it was common thought that the ability of running a bank was based on the possibility to print more paper money than the others. Governments took control of the banking sector centralizing the mint and print of money.

So far, the twentieth century has been characterized by the centralization of gold and the abolition of the gold standard. Even if governments have already declared the end of the gold era as a medium of exchange, they continue to hold reserves of gold. The war between gold and government paper money will result in one winner over the long run.

The end of the First World War proclaimed the end of the gold standard and began the era of government money. Even if gold is still supporting the monetary system, governments from all over the world are ruling over the global monetary system through laws and regulations. Government money is frequently called fiat money. They are the most common form of currency all over the world. The main characteristic of this money is that they are not fully redeemable. This is because the quantity of fiat money in circulation is far greater than the quantity of gold in the national reserves. It means that governments are no more able to convert paper money into gold whenever people desire to. But, on the contrary, governments can control the supply of paper money according to the monetary policy to adopt. This is what the exit of the gold standard has provoked.

Governments are keeping gold reserves just for one reason: paper money is not salable. Originally, it got salability just because it was used as a replacement for gold by fairly reflecting the true value of the metal according to a fixed weight. Today, given that paper money is no more completely redeemable, the gold salability does not sustain the one of fiat money. Therefore, governments are keeping gold reserves to strengthen the value of national currency. The higher the national gold reserve,

the stronger the national currency. The acceptance of fiat money was possible just because it was reflecting gold's value, so, today, if gold reserves disappear also fiat money will lose its acceptability. As it has been previously discussed, if money loses its acceptability, it loses its role as medium of exchange.

Government money is very similar to the primitive sort of money: seashells, beads and stones. They are similar because their supply can be easily increased or reduced by influencing the value of the money which will lead to the loss of salability, destruction of purchasing power and consequent impoverishment of holders. On this point, gold is different from fiat money because the supply of the metal cannot be easily influenced since it depends on chemical characteristics and on the mining of the soul. Fiat money will continue to exist as long as governments will require to pay taxes just in this form and they will be able to control its supply preventing its depreciation.

After the end of the First World War, European countries faced the dilemma of whether to go back to the gold standard and how to revalue the national currency in terms of gold. Going back to redeemable money would mean to declare the devaluation of the currency: the amount of gold at disposal was lower than the paper money in circulation. This decision would have caused mistrust of people toward governments and an increasing demand for gold rather than fiat money. Consequently, to not lose consensus, governments decided to make a political and convenient choice: the value, the supply, the interest rate and the exchange rate with respect to other currencies became a central decision. As long as the government will keep the monopoly of the money, the gold standard will never come back again.

Ammous Saifedean, a professor of Economics at the Lebanese American University, said that "It was the abandonment of sound money and its replacement with government-issued fiat which turned the world's leading economies into centrally planned and government-directed failures. As the government controls money, they control most economic, political, cultural and educational activities" (Saifedean, 2018, p. 51).

The professor wants to explain that by controlling the monetary system of a nation, the government can control any aspect of citizens' life. In fact, soon after the First World War, states wished to go back to levels of wages and prices before the war, but it was impossible because gold was no longer the redeemable base of paper money due to the over printing of fiat currency. To solve the situation, governments decided to fix the level of wages and prices but this move drove states to higher inflation. Indeed, the new price levels were too high to afford: entrepreneurs could not pay the high wages and families without salaries could not buy goods with high prices. Moreover, without gold as a base of convertibility among currencies, it was very difficult to find the correct exchange rate because of the frequent oscillations in value. In order to take advantage with respect to other countries to improve international trade levels, governments started to manipulate the value of the national currency by depreciating it. In this way, political conflicts started to begin among countries by raising trade barriers which caused enormous disasters in economic terms.

The difficult situation in economic, political and monetary terms led to the outbreak of the Second World War. At the end of the conflict, states decided to find an agreement by founding the International Monetary Fund and the World Bank during the Bretton Woods agreements in 1948. These two institutions had two roles: the first was to ensure financial and economic stability allowing free movement of capital all around the world and the second was to keep the exchange rate among currencies within a fixed range. By the way, these good intentions were difficult to put into practice because there was not a common medium of exchange all around the world. To try to solve the situation, many countries decided to move the gold reserves into the United States and exchange them with the US dollar to make it the global currency for trade. The scope was that all countries would change gold reserves into dollars while just the USA had to go back to the gold standard allowing the US dollar to be exactly redeemable. This agreement would have been possible because any citizen could ask to redeem money except Americans, but the conversion would not have been worth it and neither would have influenced the value of gold. In these terms, the USA had huge power because they could finance American debt by inflating the value of the dollar at the expense of everyone all over

the world. With this advantage, USA presidents began to increase the government expenses beyond national possibilities.

As soon as countries understood US tactic, they decided to repatriate the gold reserves that were previously sent to the USA. However, the USA did not have enough gold to pay them back due to the depreciation of its currency. As a result, President Nixon declared the end of the gold standard even for the American dollar, letting the price of gold and the exchange rate among currencies freely fluctuate. This move of the American president ended the transforming process that began with the First World War: the abandonment of the gold standard to accept government issued currencies. The switch took back one of the principal problems of barter: lack of coincidence.

With better telecommunications and transportation, countries built strong economic relationships that were facilitated by payments in gold and the dollar was considered the single currency for international trade. The abolition of the gold standard made it difficult to accept payments in different currencies all around the world which led people to incur in conversion costs to purchase the medium of exchange required by the seller. The gold standard was not just ruling the global monetary system but, above all, it was a precaution because it was ensuring the value of the national currency in relation to the true amount of gold kept in the national reserves. This protection was worth it because the supply of government paper money saw a higher growth rate with respect to the one of gold and this, obviously, drove its value down. The fast growth of paper money's supply brought hyperinflation, meaning a 50% increase in prices over one month.

“The problem with government-provided money is that its hardness depends entirely on the ability of those in charge to not inflate its supply” (Saifedean, 2018, p. 67). The professor of economics specifies this concept because political choices provide the necessary hardness to paper money. There are no political or economic constraints to the quantity of money that each government can produce. “The constantly increasing supply means a continuous devaluation of the currency, expropriating the wealth of holders to benefit those who print the currency, and those who receive it earliest” (Saifedean, 2018, p. 67). These words are supported

by the numerous times in which governments easily gave up to the temptation of depreciating money during the history. This practice will always be the easiest solution to any problem that governments will encounter at the expense of citizens who will be subject to a theft of wealth.

There are four reasons why government paper money is continuously used:

- 1- Taxes are paid with government money, meaning that people accept them and give them away;
- 2- Government controls the banking sector, meaning that the State forces banks to open bank accounts and to make transactions just with government money;
- 3- Regulations forbids payments with other forms of medium of exchange;
- 4- Government paper money is still partially backed by gold reserves.

The twentieth century has been characterized by the production and use of unsound money: the inflated government paper. During the economic boom, after the Second World War, when people started to understand how governments were ruling the monetary and economic sector, the thought of the need for sound money came to life. People referred to sound money as the money whose value cannot be controlled by the government, meaning that its value is freely decided by the market due to interactions among its demand and supply.

At this proposal, in 1984, Friedrich Hayek said: “ I don’t believe we shall ever have a good money again before we take the thing out of the hands of government, that is, we can’t take it violently out of the hands of government, all we can do is by some sly roundabout way introduce something that they can’t stop” (Hayek, 1984).

## WHAT ABOUT THE FUTURE

One century after that governments got the monopoly of the monetary system and subsequently abolished the gold standard and the use of sound money, in 2009, cryptocurrencies were introduced in the monetary world. The first crypto, which is also the crypto that we will take into consideration in this study, is Bitcoin. Cryptocurrencies are proposing themselves as a substitute for the government



paper money. They would be the first sound money after more than one hundred years. Their value is freely chosen by the market and finally they are outside the hands of governments as Friedrich Hayek desired. Cryptocurrencies already have a high stock-to-flow ratio because their supply has a fixed upper limit. This allows them to be highly salable and widely accepted. Moreover, thanks to the innovations in the communication sector and the cryptocurrencies' online use, their acceptability has further increased, becoming a phenomenon spread all over the world which is getting more and more consensus every day.

The hardness of cryptocurrencies is given by the fixed total amount of their supply which determines the impossibility of influencing their quantity and depreciating their value. Also gold has a strong hardness for the same reason, its supply cannot be inflated since its mining is very difficult and expensive. Indeed, these two assets are usually compared to one another because of their limited available quantity. If, on one side, gold supply is finite and depends on the convenience of extracting it, on the other side, the maximum supply of Bitcoin is fixed at 21 million. Crypto and gold cannot be compared to government paper money since their supply is not controlled and inflated by the State. Bitcoin supply is not completely available yet since it must be mined by people using very powerful computers. However, this aspect will be discussed in later chapters. The full amount of Bitcoin is expected to be discovered and released within 2140. Today, the availability of Bitcoin is a bit more than 19 million, but this number changes and slightly increases every 10 minutes. Once miners have mined Bitcoins, the supply will never change. Bitcoin is an irreproachable, decentralized, limitless asset that encourages individual and financial freedom. By the way, the Bitcoin value is too volatile to be considered a money to use in everyday transactions because it would be extremely inefficient (Tessa, Bitcoin, affondo di Powell (FED): "strumento speculativo, non sostituisce dollaro", 2021). Today, Bitcoin is in a transition phase. On one hand, crypto must look for worldwide acceptability in order to minimize the demand oscillations and stabilise its value starting to be considered a valid substitute of fiat money (Blokland, 2021). On the other hand, given people's fear about Bitcoin performance, cryptos are still considered as an investment that help people fighting against

government control over the monetary system and an opportunity to protect the capital from political decisions over inflation and fiat money depreciation.

Ken Moelis, the founder of the Moelis & Company bank, compares the crypto phase to the Gold Rush in 1848. At the time, people did not have anything to lose and they went crazy trying to discover quarries of the precious metal in California to become rich (Stimolo, 2021). Today, people are less confident and brave because they are investing their savings, however, their hope to become rich is always the same. In Moelis' opinion, considering the increasing investors' interest on Bitcoin and its increasing demand, banks do not have to lose the opportunity to make further profits by providing the required services to enable people to trade the asset.

Many other experts of the financial world are expressing their ideas as well. Big investors and asset management companies are entering into the crypto sector, studying and following the phenomenon very closely. For instance, JP Morgan, the greatest bank in the world in terms of capitalization, thinks that even if in the last years the trend of gold and the one of the cryptos have been opposite, the volatility of Bitcoin will converge with the one of gold in the long-term (Cavicchioli, JPMorgan: la volatilità di bitcoin convergerà su quella dell'oro, 2021). This means that he is expecting that Bitcoin will enter in daily life of people and thanks to its higher acceptability, its oscillations will reduce making crypto a less risky investment.

Other famous people are expressing their opinion and sometimes are even influencing the masses in buying or selling cryptos creating huge problems in terms of stability of the value. The iconic case is the one of Elon Musk. In February of 2021, he announced the purchase of Bitcoin and in March he introduced the possibility of paying Tesla cars with the crypto. Following these positive tweets in the social network, everyone wanted to buy the crypto and the price of Bitcoin rose to the stars. However, in May, Elon wrote another tweet related to his concerns about the sustainability of cryptos for the mining activities and therefore, he decided to stop crypto payments for his electric cars. Because of his withdrawal, many people decided to sell and obviously the price went down. The influencing power that Elon is using is not fair. Initially, he decided to enter the crypto market because, as an

early mover, he saw the possibility of making money but as soon as he started being criticized for using a money that requires huge amounts of energy to be mined (in contrast to the green vision of his company Tesla), he decided to give up the project. However, at the end of his ping pong of ideas, Elon kept his Bitcoin portfolio, but he tweeted that Tesla will go back to accept crypto payments as soon as the mining process will require less use of coal which is the worst fossil fuel in terms of emissions. He stated that cryptocurrency is a good project to carry on, it could have good possibilities in the next future but not with such a high cost for the environment. Even if Elon has good intentions to safeguard the health of the world, many people think that he is influencing the crypto world and he is damaging common people's savings that have already been invested in this market.

By the way, Elon is not the only one playing this game. National states are influencing the crypto value by publicly declaring the prohibition to acquire and keep cryptocurrencies in private portfolios or by announcing crypto payments' illegality. States are starting to feel the threat of Bitcoin and their political and economic choices may be a sign that fiat currencies are losing their hegemony in the world monetary system.

El Salvador has been the first State to proclaim Bitcoin legacy. The president of the state Bukele affirmed that "Central banks are adopting initiatives that could cause damage to the economic stability of El Salvador. [...] I will send to the Congress a bill that will make Bitcoin a legal currency in El Salvador. In the short-term, it will create jobs and it will help to provide financial inclusion for thousands of people" (Bukele, 2021). To produce the bill and the plan to help people in using and interacting with crypto, Bukele has been helped by Jack Mallers, the CEO of Strike, a Bitcoin investment and payment company. The president plans to use volcanic energy to mine cryptocurrencies to reduce the carbon footprint. At the same conference, Mallers expressed his hope to see more and more states behaving bravely like El Salvador to finally start a financial and monetary revolution all over the world (Tomasicchio, 2021). The adoption of Bitcoin as a legal tender and not as a reserve currency could solve many poverty problems around the world and provide everyone a bank account. On this point, some analysts are sceptical about El

Salvador move because Bitcoin mining and usage requires internet connection which is not developed in Central and South America. Moreover, they explain that given the high volatility of the moment, it would be very challenging for the economy of the country to make huge steps forward trying to exit from the poverty situation that the country is living (Hughes, 2021). It is common thought connecting Bitcoin to illegal activities, for this reason experts think that there is high probability that it will be used in an unfair manner mostly to make money lauder. They are concerned about the fact that Bitcoin, by being the official currency of the State, will end up by facilitating the organized crime. (Yakubowski, 2021). Bukele's initiative may attract numerous millionaires of Bitcoin looking for a crypto paradise in order to avoid tax payment in their residency country. Many specialists are hoping that Bitcoin will be worth the risk the president is bringing, providing the results he is expecting because citizens will be the ones to pay the price for misleading choices.

Together with El Salvador and South American countries, Switzerland is developing an ecosystem working in favour of cryptocurrencies and its technology. The European country is also named "Crypto Valley" because it is creating strong connections to other international crypto centres in London, Singapore, Silicon Valley and New York. Switzerland is developing a hub where new technologies can find a fertile ground to grow faster (Crypto Valley, n.d.). Many cryptographic companies have already been attracted by this ecosystem thanks to the myriad of collaborations with start-ups, institutions, governments but also to the huge presence of investors and business angels ready to invest in the development of cryptocurrencies, blockchain, distributed ledgers and all the decentralized technologies. Given that Switzerland had been the first European mover in the field, it is hardly encouraging people and other States in believing in cryptocurrencies by allowing tax payments in Bitcoin from natural and legal persons. This happens just in the cantons of Zugo and Chiasso for maximum amounts of 100.000 Swiss franc. Cantons are using an intermediary to allow payments which is Bitcoin Suisse, a bank that converts crypto in Swiss franc. To perform payments, the bank is asking for a 1% commission to protect itself from the oscillations of cryptos' value (Spagnolo E. , 2021). This means that cantons are hedging the risk toward a third party, and they are protecting themselves to receive the exact amount of Swiss franc at the moment of the conversion. It is important to highlight that even if Switzerland is allowing

payments in crypto, it is not giving up the government paper money at all. The country has made the first step toward accepting cryptos, however, full acceptance would mean that institutions will hold crypto payments and not convert them.

Even if there are countries that are supporting and encouraging the use of cryptos in daily life by giving up part of their control over the monetary system, there are countries that are banning them. It is the case of China and Nigeria.

The central government of China prohibited the mining of cryptos and the management of institutional financial transactions for the first time in 2013. By the way, many Chinese decided to undertake a new working opportunity becoming miners of crypto. This has been possible because of the low-cost energy which is an essential element for the mining activity and the availability of specialized hardware that allows computers to mine cryptos. According to new research by Cambridge Bitcoin Electricity Consumption Index, China represents 65% of the global hash rate. In May 2021, the Chinese government declared definitively its negative opinion about digital money for two main reasons: the high volatility that could affect Chinese savings and the huge amount of energy needed to mine the currency. After the announcement, exchangers of cryptos and mining companies had to stop their activity and make serious decisions about their future. Many companies, as well as many individual miners, decided to move their activity from China to North America.

On the contrary, Nigerian people are not organized to mine cryptocurrencies because they do not have enough powerful computers and neither the electricity required, however, they understood that their national currency is highly depreciated and cryptos could be a good substitute as a store of value. Nigeria is one of the countries whose population is giving up the national currency and owns the greatest amount of Bitcoin thanks to remittances from the USA. Nigerian government, scared about this trend, tried to ban the purchase of cryptos. However, after the Chinese case, it decided to allow cryptos trading but to hardly regulate it under national law given that it does not intend to follow the decision of El Salvador of making Bitcoin a legal tender (Spagnolo E., Nigeria e Bitcoin, storia di un rapporto speciale, 2021). Moreover, the Nigerian government is seriously concerned about

the use of cryptos because sometimes there is evidence of its use to finance terrorism and illegal practices.

These different national standpoints and their subsequent announcements are seriously influencing the value of cryptocurrencies. Principally, the opposite point of view of El Salvador and China created high fluctuations in the market causing serious worries to many people. Luckily, there are many experts that look at the oscillations as a moment of transition toward a more stable and prosperous phase of cryptocurrencies. Some of them are defining cryptocurrencies as one of the biggest revolutions of 21<sup>st</sup> century and they predict that Bitcoin came to surpass and substitute fiat national currencies. Therefore, they are sure about the fact that digital assets are here to stay and they will be slowly accepted by the majority of investors.

Experts of the sector consider Bitcoin as a good substitute for government paper money above all for the impossibility to increase or decrease their supply and subsequently inflate their value as in the case of fiat money. During the years, they have noticed that there is positive correlation among inflation and cryptos. When inflation is high, people buy more cryptos as a hedge of inflation. At this proposal, in March of 2021, the American Parliament approved the “American Rescue Plan”. It is a bill that plans to increase the money supply by \$1.9 trillion to stimulate payments in the USA after Covid pandemic and intends to keep the interest rate close to zero until 2024. These factors have caused concerns and many people expect inflation soon. It is through stimulus like these ones that many people get interested in cryptocurrencies and it is just a matter of time that people will start to buy cryptos in mass. After the announcement of Federal Reserve’s plan, experts said that it’s obvious that there will be inflation, and when there is inflation, the only way not to lose money is to invest. In the past, in this kind of situations people were investing in gold as it was considered the asset to store value for excellence. However, today people can choose to invest even in cryptocurrencies. (McIntosh, 2021).

Crypto analysts expect people to be every day more curious about cryptocurrencies for their ability to store the value, a characteristic of fiat money that governments are no more able to guarantee. In the short-term future, there might be huge

fluctuations in crypto's value but they are one of the disruptive technologies of the 21<sup>st</sup> century. They will slowly stabilize their value and they will attract more and more people to adopt them. Nobody knows if they are meant to become the next national currency or will remain an investment asset, but what is sure is that cryptocurrencies will make huge changes in the existing monetary and financial systems.

## CHAPTER TWO: Behind the scenes

### GOING THROUGH THE TECHNOLOGY

This chapter wants to explain what is behind cryptocurrencies. Many times, since their presentation, people have surely heard “what is interesting are not cryptos but the technology on which they rely and its potential applications”.

Cryptocurrencies were born on the wave of the Internet of Value which aims to reach the possibility to exchange value at the same speed with which data is transferred. The mechanism allowing such innovation is called blockchain.

In 2009, Satoshi Nakamoto (an anonymous individual or the pseudonym of an anonymous group of people) introduced Bitcoin into the modern world by publicly publishing the idea of creating a cryptographic virtual asset based on peer-to-peer transactions. In 2008, the international financial crisis broke out. It was caused mainly by the expansive monetary policy of the USA. People started to lose their jobs and to live with the use of savings. The trust toward political institutions, the monetary and financial system was very low and the launch of cryptos as new monetary innovation brought a light of hope into families. The Bitcoin community started to grow fast and the first transaction was made to buy a pizza. Many people started to join the network and in 2012 Bitcoin got 1 billion dollars of capitalization. Unfortunately, from 2012 to 2017, Bitcoin saw its darkest age because many people began to use the cryptocurrency for illegal purposes and make money laundering. Consequently, some people who had bought Bitcoin started to be sceptical about it and began to sell the asset in their wallets, causing a fast decline in its value. However, the initial interest showed for this innovation has never died and people continued to buy and invest in it. On the 14th of April of 2021, Bitcoin reached its highest value.

Bitcoin is the first cryptocurrency to use the blockchain technology which is part of the family of the distributed ledgers. It is a system based on a distributed ledger which is made by different nodes and each of them owns the copy of all information inside the system. Each node has the possibility to read and modify information independently. However, any modification to the ledger must pass through algorithms to get the consensus of the whole network. The main characteristics of the ledger are: the network, the mechanism of consensus and its structure. The



blockchain technology has the same basic features of distributed ledgers but, in addition, it allows to make transfers of value and deal with assets. There are two different types of blockchain: the permissioned and permissionless. The former is the one in which people must be identified, enrolled into the system and authorized by the network to work inside of it. Here, any modification of past transactions and the introduction of new ones must be verified and voted by the majority. In the second type, anyone can take part and work into the network without any authorization. In this case, modifications are more complex because the system must prevent misleading behaviours to influence the job of the network. The Bitcoin blockchain is the ledger that contains the highest number of transactions inside each block of the network. This means that the blockchain needs a high number of people working in the network in order to approve all the numerous transactions that occur. This is the reason why Bitcoin chose for a permissioned blockchain.

In 2016, blockchain technology was defined for the first time as one of the technologies that will revolutionise the digital world in the next few years. In fact, in 2020, more than 20 billion of fiat currencies were invested into the blockchain. This phenomenon is called decentralized finance or most commonly “DeFi”.

There are different types of blockchains and they differ for their characteristics. The first type of technology to be implemented was the blockchain of Bitcoin and the following ones were based on the same features plus some new innovations to solve the highlighted problems of the previous ones. The common characteristics are:

- Digitalization which is the transformation of data in digital format;
- Decentralization because data are registered and distributed into the ledger so that any participant to the network can read them;
- Traceability because the origin of any data in the ledger can be traced;
- Disintermediation because there are no third parties to manage the transaction;
- Transparency because everyone can verify the transactions within the ledger;
- Immutability because data registered into the ledger cannot be modified without the consensus of the network;
- Programmability because there is the opportunity to program some transactions whenever there are some conditions.

For its characteristics, the blockchain technology is attracting the attention of different sectors that could apply it and get some benefits. Many companies all around the world have started to make experiments about its use in order to find out new opportunities and business models. The first mover advantage goes to the Financial and Insurance sector, because it was the first to feel the threat of the introduction of cryptocurrencies and therefore, it had to take remedial actions. The main uses of the blockchain in the sector are: manage payments in order to simplify transfer of money between different currencies, simplify the process of identification of customers, get traceability of checks and donations, manage the long-distance votes in the shareholders' meetings and even manage the exchange of financial assets among people.

Despite these numerous applications, the interest shown for the blockchain technology is simply dictated by the lack of understanding of how it truly works. People just look at the smartest side, but they do not know how inefficient it is.

Centralized solutions of transfers of value would be much more convenient for people if Bitcoin, using the blockchain mechanism, would not ensure the elimination of a third trusted party. What makes the technology so inefficient is the validation process of each transaction to be added into the ledger. Since the network must record everything, the mechanism becomes extremely slow and complex. The situation becomes even worse as the number of transactions increase. As a consequence, it is not a matter of management of virtual coins but it is actually the thrustless feature of the mechanism that makes the system so inefficient. The validation process requires an enormous amount of processing power which is not accessible to everyone. In fact, "a good computer laptop today has a hash rate around 10 mega hashes per second, the Bitcoin network collectively processes around 20 exa hashes per second, or the equivalent of 2 trillion laptops" (Saifedean, 2018, p. 260).

The hash is the unit of measure of the speed at which a computer laptop mines Bitcoin. In this sense, we can understand how much processing power and, therefore, electricity, is required to mine the remaining number of Bitcoins. At this

point, it is necessary to specify that there are two different figures to take part in the blockchain network: the miners and people who are part of the nodes.

Miners are those required to own a performing computer using a huge amount of processing power in order to mine the coin. On the contrary, people that are part of nodes can use normal personal laptops. This is because people in the nodes just maintain a copy of the ledger which is always equal in every laptop. If, in the long run, the storage of copies will require a higher amount of power, it would undermine the decentralized characteristic of the network. People will not be able to afford such an expense to buy better computers and no one will continue to save a copy of the ledger. Consequently, just a few holders will keep recording transactions and the lower number of participants will kill the decentralized characteristic of the system. To avoid this kind of problem, the protocol of Bitcoin has fixed the maximum size of each block of the chain at 1 megabyte. This dimension will allow a common personal computer to maintain its role in the network. Moreover, the small size of the blocks allows the blockchain to grow slowly over time and this is one of the reasons why the mechanism of the blocks has been applied successfully just to cryptocurrencies. It seems impossible that after more than 10 years from its invention and first-time application, the blockchain has not found any other productive implementation in different sectors. Therefore, many experts are sceptical for the interest shown on the blockchain.

Generally, experts give five main reasons why blockchain adoption should be avoided in the traditional financial sector:

- Redundancy: sharing information among intermediaries is useless, there would be no bank or intermediary willing to share data and spending such a huge processing power;
- Scaling: as the number of transactions increases, the chain requires higher space and it would result in a higher cost of joining the network and many nodes will give up;
- Regulatory compliant: governments have no controlling power over the transactions validated by the nodes, therefore, it would be difficult for one country to legislate over a network that works internationally;

- Irreversibility: human and software errors are very difficult and expensive to fix after that they have been validated;
- Security: people in the nodes validating the transactions are paid with the currency of the blockchain to have more incentives in confirming the truthfulness of the operations.

When Satoshi Nakamoto published its Bitcoin protocol, he wanted to find a solution to the government paper money introducing a virtual coin. He found out the best possible technology to achieve its purpose. The blockchain mechanism has been invented with the aim to serve cryptocurrencies and their exchanges, mainly because validating people are paid with the money in circulation inside the system. Perhaps this is the deeper reason why blockchain is very hard to apply in other fields without the use of specific currencies: people do not have any incentive to verify the truthfulness of the operations written on the ledger. There is evidence that all the blockchains without currencies have remained into a prototype stage and they have never been implemented because the original and centralized system that manage operations is more convenient. Therefore, there is no funding reason, except from ignorance, for the interest that politicians and governments have shown for the application of the blockchain technology into other fields.

But how does the blockchain really work?

Satoshi Nakamoto's intention was to create an asset with the ability to overcome two problems: the need of trusting third parties when performing money transactions and the possibility of increasing the asset supply. The digital currency had to have the same characteristics of physical coins with some upgrades. In the end, Nakamoto was able to create an asset, based on the blockchain technology, whose characteristics were exactly the ones he planned.

The blockchain mechanism is based on proof and verification. As it has been said before, the blockchain is a chain made by an infinite number of blocks inside which data is recorded. Any transaction must be registered on the ledger and each node of the chain must keep a copy of what is written inside each block. Any time that a transaction has to be performed, the network must verify its truthfulness. For example, if a person wants to send an amount of money to a friend, the network

verifies that he owns enough value to perform that kind of payment. Nodes compete with each other in order to be the firsts to verify the transaction and to update the chain of blocks. Whenever transactions are verified, they must be added to the ledger inside the last block. Each block contains 1 megabyte of data and when a block is full of information, nodes must close it. This procedure must be approved by the network as a whole and it is at this point that all nodes share the same ledger of information. To record data in the blocks, nodes must spend huge amount of processing power to solve a mathematical problem whose solution is easy to verify. This process is called Proof-of-Work. The solution must be approved by all the other nodes and when the majority of them vote in its favour, consequently, the transaction is recorded. After a node has closed a block, it receives a block reward, which means that the node is paid with the same currency in circulation inside the blockchain. It is the reimbursement for the use of the processing power to verify transactions. In the Bitcoin blockchain, people are rewarded with the release of new Bitcoin.

The procedure just described is denominated “mining” because it is compared to the mining of the soil to discover gold or precious metals. As a result, people working inside each node are called miners.

Satoshi programmed the blockchain to produce a block every ten minutes. If the block is closed earlier, the mathematical problem to solve is harder than the normality to increase the level of safety in the verification process of the transaction. To reward the nodes, in the first four years of its life, the blockchain released 50 bitcoins at any closing block, however, it is programmed to halve the number of coins released every four years. Today miners are receiving 6,25 Bitcoin for each block they close.

Given that Bitcoin supply is fixed and the number of people willing to own the asset is increasing exponentially, the value of each crypto rises, making the mining activity more profitable. Consequently, miners are pleased to use a higher amount of processing power to verify and accept transactions. However, as the processing power increases, the blockchain will automatically increase the difficulty of mathematical problems to guarantee the ten minutes required to close a block. This mechanism allows the control of the network by avoiding damages and a fast increase of the supply.

The Proof-of-Work process is safe because the cost of verification of the validity of the transaction is almost close to zero. On the contrary, the cost for registering the transaction into the ledger is very high. For these reasons, miners do not have any incentive to accept a counterfeit transaction: all other nodes won't vote to accept the transaction to be added on the ledger and they would reject it. As a result, the cheater node would just have wasted processing power. What prevents the network from being dishonest is the fact that unfairness would be much more costly than the rewards. This is because miners would use much more processing power compared to the energy used on the verification of a correct transaction which in the end is even rewarded.

Internal trials to destroy the system would be inefficient because they will just reduce the value of Bitcoin and as a consequence, the value of coins that miners will earn and the one of those they already own. This is the reason why specialists of the network say that the system is basically working well since it relies on incentives that push people to behave ethically. Cheating behaviours would be much costlier than the rewards.

When people want to buy, sell or make transactions with the crypto, they must pay some transaction fees to the node that verifies the truthfulness of the operation. The amount of the fee depends on the speed at which nodes pick the transaction up and process it. So, the faster the recording, the higher the fee. The amount also depends on the overall value of the transaction and on the value of the crypto. If Bitcoin is growing widely accepted, then the fees would be higher and miners will prioritize those transactions with higher fees to get higher rewards.

Actually, Bitcoin is paying people to keep it alive and make it grow by mining new tokens. Satoshi has invented a mechanism that is very difficult to be hacked but, above all, he has introduced a new and unique technology able to satisfy the monetary needs of people. It is quite difficult and almost improbable that people will abandon the network after having tried it.

About this, Ralph Merkle, the inventor of the data structure used by Bitcoin to record transactions, says: "Realistically, the only way to kill it, is to make the service it offers so useless and obsolete that no one wants to use it. So obsolete that no one wants to

pay for it. No one wants to host it. Then it will have no money to pay anyone. Then it will starve to death” (Merkle, 2016, p. 14).

Describing the phenomenon of Bitcoin from a more economic point of view, the first thing we can notice is the fixed total supply. The fixed number of coins available into the market makes the supply inelastic. It means that even if more and more people want to acquire tokens, the number of Bitcoin available cannot increase rapidly. As previously described, the availability of coins rises according to the number of blocks miners are able to close in the chain. The only thing that persuades many people to hold the asset is its value: as the demand of Bitcoin increases, its value will go up. On one hand, this makes owners to sell the asset for a higher price and register a capital gain. On the other hand, coins are very expensive and consequently, people will get a lower amount of Bitcoin leaving the available quantity to someone else. The fact that the price of the asset increases reflects the growing number of people that join the community and start to hold Bitcoin.

Given the fixed supply, it is necessary to spend some words to explain the high volatility of the value due to the fluctuations of the demand. Bitcoin is in the early stages of its life cycle and as all the other innovations or start-ups in this stage, faces a challenging time. People need to get to know the technology and understand how it works. They are curious but also scared about future performance and given that there are few past trends to study, they are more likely to sell at the first optimistic chance. In this early stage, even in the traditional financial markets, the value of any asset is highly oscillating and its demand has an erratic trend very difficult to understand and predict for the future. By the way, as the time goes by and more and more people, maybe even institutions, start to believe in the asset, the volatility will reduce, the demand will start to be more constant and its value will stabilize. It is at this moment that daily oscillations of the asset will reduce and people who bought the asset to hold it in the long term, will make profits. Whenever the crypto market will reach a point in which a lot of people will hold Bitcoin, the market will become liquid and the value will stabilize. At this stage, people will feel more secure, they will buy more crypto assets reducing further the oscillations and appreciating its value. However, as long as the asset keeps being highly volatile, people will use it to speculate. Just when the trend will start to be more linear, cryptocurrencies might

stop attracting only high-risk investors and it might be used as a medium of exchange.

## SUSTAINABILITY

As many people decide to join the network, the higher the requirement of processing power for the functioning of the blockchain. The higher amount of energy needed ensures the good working of the verification process which ends with the transcription of transactions into the immutable public ledger.

Recently the Bitcoin Mining Council, an international volunteer forum of Bitcoin miners and companies based in the USA, has made an important survey to understand the origin of the power that miners use. The Council is supported by Michael Saylor who is the CEO of MicroStrategy. He is very happy to see that the crypto industry has come together into a public and common space to share information all over the world trying to debunk some misconceptions spread outside the core of the community (Bitcoin Mining Council, 2021). Bringing transparency and communicating with people is a clever step to spread the adoption of Bitcoin. At the end of the inquiry, the forum shared the results and information received but, they are just informative because answering to the research was not mandatory and just 32% of the global Bitcoin network has answered. By the way, thanks to the answers received, it has been discovered that 67% of those who gave feedback are currently using green energy (Bitcoin Mining Council, 2021). In North America, people are more concerned about the footprint on the planet, and they pay much more attention to the origin of the energy. Indeed, they are using a high percentage of sustainable energy, demonstrating that the cryptocurrency sector is much more responsible than what people think. The research has noticed that it is mainly in underdeveloped or developing countries that miners are using non-sustainable energy. It is not to blame them since there is lack of education about sustainability and neither the required structures to produce green energy. Moreover, after the decision of China to ban crypto mining activities from its territory, the energy consumption has drastically fallen.



Furthermore, the Netherlands are also thinking about prohibiting the mining of Bitcoin even if the activity is not widely expanded in the country. Dutch people are doubting its sustainability: miners' network is consuming more energy than the annual energy consumption of the Netherlands. In Figure1, it is possible to see the monthly trend of the usage of electricity for mining activities all over the world. In the horizontal axes there is the timeline with monthly data: dates are repeated every four months, and in the vertical axes there is the unit of measure of electricity. In this specific case, Terawatt (Twh) (University of Cambridge - Judge Business School, 2021).

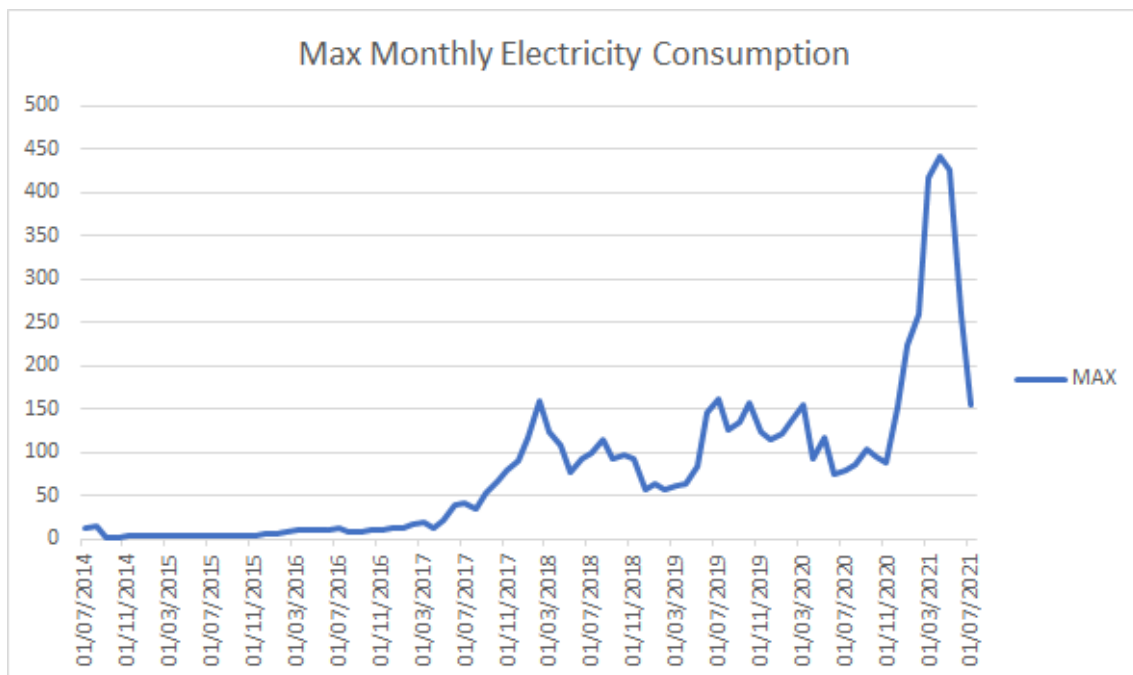


Figure 1 - Max Monthly Electricity Consumption<sup>1</sup>

From Figure1, the consumption of energy for the mining activity has been increasing over the years. But it is just in the last two years that there has been a boom of usage due to the wider acceptance of the asset all around the world. However, it is possible to notice the impact of China's decision to shut down mining farms: the usage of electric power has definitively collapsed.

The Cambridge Bitcoin Electricity Consumption Index has been able to produce a rank of the countries using the higher amount of energy. From the research of the university, it has emerged that China is the country that has the highest monthly

<sup>1</sup> Source: Author's elaboration

hash rate - the unit of measure of the speed at which miners mine Bitcoin. The higher the speed, the higher the use of processing power (Maso, 2021).

Figure 2 is the re-elaboration of data collected by Cambridge university over the monthly average hash rate used from September 2019 until April 2021. On average, China has used 63,74% of the total hash rate. From the coloured lines, after the Asian country, the USA (7,85%), Russia (6,69%), Kazakhstan (6,54%), Malaysia (4,46%), Iran (3,26%) and many others are following. China has definitively the dominance of the mining activity of crypto. (University of Cambridge - Judge Business School, 2021)

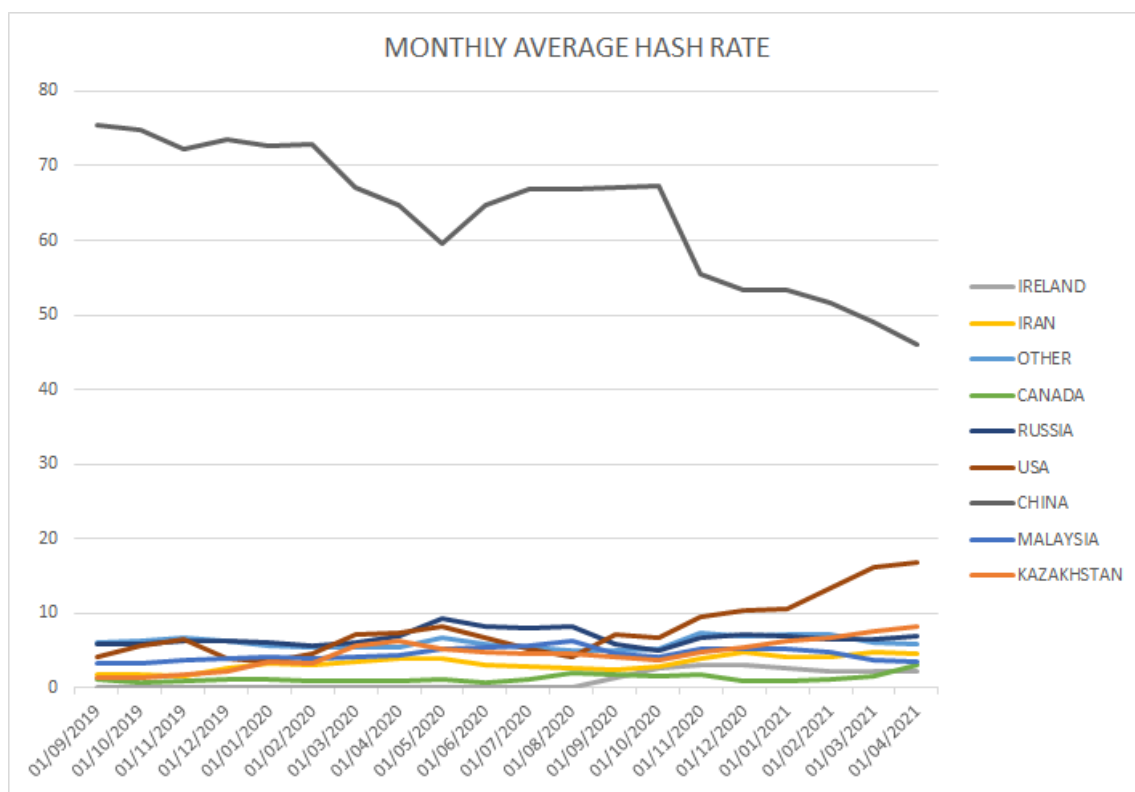


Figure 2 - Monthly Average Hash Rate<sup>2</sup>

In the traditional financial world, the ESG sector is acquiring more consensus every day proving how much people pay attention to sustainability and how much they care about the reduction of CO2 emission. Investors aspire to build green economic activities to save the planet and they are very pleased in investing in them. This trend is particularly notable because Bitcoin has an enormous impact on the use of processing power and, as Bill Gates is highlighting, the phenomenon will worsen

<sup>2</sup> Source: Author's elaboration

given the higher popularity of cryptos and their increasing number of transactions. The millionaire stresses the fact that each Bitcoin transaction is using much more energy than any other traditional payment method (Grassi, 2021). This is due to miners' activity of proving the truthfulness of operations and recording them into the safe and transparent blocks of the system. The peer-to-peer system, which allows people to not trust any third party, is hungry of energy. The problem is even bigger if we think that China, the first country to mine cryptos, is the country with the highest rate of pollution for the use of fossil fuels such as carbon.

Elon Musk is closely controlling the footprint of miners and the type of energy they use. According to some declarations made during recent interviews, Elon said that after the Chinese prohibition and the shutdown of numerous mining farms, the impact of carbon fuel on the planet has diminished. He showed his happiness about seeing an increasing number of miners starting to use renewable energy.

By looking very closely at the operational procedure of Bitcoin, people can notice that the greatest amount of processing power is used when nodes have to verify the accuracy of the transaction by solving the Proof-of-Work. During this phase, the higher the processing power used, the higher is the probability to solve the mathematical problem and be rewarded through the emission of new Bitcoin. In this sense, even if nodes are using high quantities of energy, they are not wasting it. It is through this amount of released Bitcoin that miners get their "salary" which is increased by the transaction fees that senders are paying.

The system keeps working and confers Bitcoin its hardness thanks to its expensiveness and the high requirement of electricity. It is continuously guaranteeing incentives for nodes to be honest and not include fraudulent affairs into the system that other nodes would reject wasting processing power and failing to get the reward.

Similarly to the Cambridge University, the European Central Bank did some research about the sustainability of fiat currencies. The ECB forces the production chain of paper government money to respect some international standards to keep under control the CO2 emissions and the energy used in the production. Above all, the ECB

wants to avoid wastes of raw materials and preserve the quality of the environment as well as the health of people.

Any company involved in the production process must respect the international standard label of ISO14001 which is certifying that the process used is searching continuously to stabilize and/or improve its environmental impact. The compliance with the standard concerns the full process: from raw materials production, print, storage and circulation to the selection of employed paper money and its disposal. The research has examined the usage of electric energy in each step of the production process and transportation too. The calculus base was represented by the volume of paper money in circulation in 2003 which was 3 billion of banknotes, almost 2,5 tonnes. From the study, it has emerged that the environmental impact of government paper money production is equal to the impact of a 60W light bulb kept on for 12 hours by every European citizen (Banca Centrale Europea, 2021).

Ammous Saiffedean, the author of “The Bitcoin standard” book and economic professor, defines Bitcoins as “a technology that converts electricity to truthful records through the expenditure of processing power” (Saiffedean, 2018, p. 219).

As such, even if the network is certainly using an enormous amount of energy, it is organized in the best possible way to not waste. Moreover, given the economic incentives for people to behave honestly, the fraudulent activities and subsequent wastes should be very low. Specialists believe that it is just a matter of origin of the electricity and not a matter of quantity. In the end, the sustainability problem can be translated into a matter of consciousness: if all the miners commit themselves to use green energy, Bitcoin could have a real chance to get its success in the financial and monetary world.

## CHAPTER THREE: The government and the market point of view

### GOING THROUGH REGULATIONS

Since its invention, Bitcoin has strongly relied on the idea “all publicity is good publicity”. The more people talk about this new technology, the more they can get in touch with the new branch of the financial system. In the past, all the bad publicity from people who just wanted Bitcoin to die for the most several reasons, allowed the introduction of new financial words in daily life such as: cryptocurrency, digital asset and Bitcoin. Within a few years, Bitcoin gained strong popularity all around the world but particularly in the developed countries. Consequently, it was inevitable that Bitcoin also drew the attention of worldwide governments. They started to look closely at cryptocurrencies since the beginning of 2011. But only in 2013, governmental bodies have started to introduce laws to regulate the new bubble of the financial world, just after the iconic case of the Silk Road which was a website created to work in the dark web where people could buy anything they wanted - even illegal drugs. So far there is nothing strange: there are thousands of websites like that one. By the way, the distinctive sign of the Silk Road was that people could pay in Bitcoin in order to keep their complete anonymity without having to pay with registered banking credentials. In the moment in which the FBI arrested the owner of the website, the police began to spread the misleading connection between cryptocurrencies and illegality. As for any other traditional asset in the financial market after the release of critical news, people started to sell Bitcoin and its value began to fall. Nevertheless, after a few months, the cryptocurrency recovered the ground lost and its price grew again. The USA government seized all the Bitcoin owned by the creator of the Silk Road and built an auction for American people. By reselling Bitcoin, the government showed interest toward cryptos and this move was a strong evidence that cryptocurrency technology was here to stay. On the contrary, if the government had been against Bitcoin, it would have banned it immediately. In the end of the story, Bitcoin just gained higher visibility and popularity all around the world, creating higher curiosity to people. To support this, according to Crypto.com research, by the end of June 2021, the global number of people using cryptocurrencies is 221 million. That is why governments are strongly concerned

about this disruptive technology that they cannot control and that by definition is self-regulated (Wang, July 2021).

One of the first regulators to show interest on cryptocurrencies was Benjamin Lawsky, The New York Superintendent of Financial Services from May of 2011 to June of 2015. Benjamin thought that bad guys would always behave illegally with any technology at their disposal. Probably, still today there are people doing illegal acts with cryptocurrencies but for sure, it is not the core business of the sector. Therefore, Benjamin did not look at Bitcoin as troublesome and according to his positive opinion, he wanted to be the first to regulate the new world of cryptocurrencies. He wished to formulate fair regulations in order to give Bitcoin a real chance and to allow people to get benefits in the long term by holding the asset. In 2015, after nine months of hard work, he introduced a license for Bitcoin companies to show people their qualifications to mine the currency. Lawsky's intention was to create regulations enabling Bitcoin to freely move around the world. The main positive side of the story was that regulations gave legitimacy to this new financial sector which generated confidence for people on what they were investing. This was a necessary step forward to give further popularity to Bitcoin and make the sector grow.

According to the University of Cambridge Judge Business School, in its research "3rd Global Cryptoasset Benchmarking Study", the year 2019 has been a crucial year in the USA for financial regulations in the crypto sector. Regulations and guidelines have been released at both federal and state level. For instance, the FinCEN has obliged the crypto sector to follow the Bank Secrecy Act (BSA) that was created in 1970 (Blandin & al., September 2020). According to the US National Archives of the Federal Register website, a proposed rule by FinCEN during the Trump administration states that "the proposal would require banks and money service businesses (MSBs) to submit reports, keep records, and verify the identity of customers in relation to transactions involving convertible virtual currency (CVC) or digital assets with legal tender status (LTDA) held in unhosted wallets, or held in wallets hosted in a jurisdiction identified by FinCEN" (Federal Register, 23 December 2020).

As declared by the proposal, decentralized exchangers and companies dealing with cryptocurrencies must comply with AML/KYC regulations to fight against money laundering, terrorist financing and other criminal acts through the ethical requirements of knowing your client. At this proposal, the Office of the Comptroller of the Currency (OCC) is periodically examining accounts to highlight institutions or individuals responsible or suspicious for fraudulent activities. Some crypto platforms empowered to exchange fiat money for cryptos have already implemented KYC practices to verify customers' activities as traditional financial institutions. In this regard, on 19th of October of 2020, the official website of the United States Government for financial crimes, released an article telling the story of Larry Dean Harmon, the CEO of Helix and Coin Ninja. He has been processed for money laundering and for willingly not having implemented the BSA regulations on the transactions of his customers. The civil money penalty that he had to pay was \$60 million (US Treasury, 2020).

In order to keep under control the AML and KYC procedures, the international community is working to find out common methods to follow and to integrate the financial system. This harmonization would also avoid the delocalization of crypto businesses in other countries due to more favouring financial and legal environments.

Consequently to the continuous growth of the crypto sector given the increasing number of private individuals entering this world, the government will pay a higher attention to the phenomenon and it will work harder to produce further regulations under the tax perspective. In fact, according to some experts, the wealthiest nations are starting to develop restrictions not only for cryptos but also for: peer-to-peer transactions, stable coin, private wallets, privacy on decentralized exchanges, ICOs and future products such as NFTs and smart contracts. The new regulation intends to:

- force activities in crypto to be licensed and regulated as banks to be responsible for transaction tracking;
- create full transparency for all the transactions;

- full exclude and freeze assets of persons and activities that are late in complying with the law;
- force the inclusion and use of all information with all the transactions;
- recall license of those who do not comply with regulations.

Summarizing governments' intentions from an operational point of view, they are basically changing the way the crypto world operates. During the past years, people have been hearing so many times about the probability that governments would have banned Bitcoin leading to its shutdown. On the contrary, today they are more likely to create a system based on transparency under the control of a chosen third party and to integrate cryptos in the traditional financial system. This is completely the opposite intention of Satoshi Nakamoto when publishing the Bitcoin protocol. What is unbelievable is that, probably, these regulations will be necessary for Bitcoin to reach the next stage of adoption. According to the characteristics of the current regulation and to the level of control required by governments, the need for new international regulations is arising. But, there is no evidence about who is going to write these regulations, in what terms and how they will be implemented.

Why do regulations come in 2021?

The cryptocurrencies issue has been discussed during the G20 reunion of 2021, the intergovernmental forum between head of states, finance and foreign ministers and central banks of the 19 wealthier nations and the European Union. States are concerned about the possibility of the introduction of a stable coin into the monetary market whose value is fixed one-to-one with respect to fiat currencies. This means that people can use other coins, not controlled by the state, to perform any kind of transaction. This creates alarmism because people can abandon the old and lengthy traditional monetary system. To try to solve the problem, governments engaged an organization called "The financial action task force", FATF. It is an intergovernmental institution that wants to coordinate the actions of the member states to control and regulate cryptocurrencies. The FATF issues regulations and recommendations whose characteristic is soft law; therefore, they are not directly legally binding for member states. This means that countries are not obliged to implement them in the national legal system unless they ratify them through a national law. The organization periodically reviews countries' actions. This



procedure has already been successfully used to harmonize banking and tax law all over the world. Now, it comes for cryptos.

Once countries approve the soft law from the FATF, then it becomes hard law and it is legally binding for citizens inside national borders. Ratifying the soft law is strongly recommended by the organization to build a worldwide harmonized network. Indeed, if a country is not taking part in the institution, then it is listed as a non-cooperative jurisdiction and it could find limited access to the financial system and be isolated from the international community. For this reason, almost all nations will start to implement these recommendations from July 2021. This implies that financial activities in the cryptocurrency sector will start to be affected by the FATF recommendations. International regulation is necessary as the national one would be worth nothing even if it is more specific and prohibitive: people would just perform their transactions in other countries. Moreover, it is worth nothing also the fact that these regulations do not apply to the central banks that are more often talking about issuing national digital currencies.

However, the main question that cryptocurrencies experts and users are asking themselves is: how will crypto be regulated?

First of all, we must understand what FATF means when talking about virtual assets. "A virtual asset is a digital representation of a value that can be digitally traded or transferred and it can be used for payment or investment purposes. A virtual asset does not include digital representation of fiat currencies, securities and other financial assets. They are already covered elsewhere in the FATF recommendations" (FATF/OECD, 2012 - 2021, p. 130).

According to FATF, cryptocurrencies will not be banned from financial portfolios, but they will be regulated via an indirect method that facilitates virtual transactions which is called virtual asset service provider, or commonly known as VASP. They will be subjected to similar regulations as banks. FATF regulations are introducing several requirements such as licenses, registration and customer due diligence necessities. They ask VASP to get, store and transmit precise personal information about customers and beneficiaries. Consequently, FATF recommendations are going to affect more crypto entrepreneurs rather than investors. Before anything else, VASP needs to comply with regulations for working within this space. People need

to exactly understand what activities will be regulated: the peer-to-peer transactions, stable coins, the unhosted wallets, the client information, the transfer of ID information, the categorized clients and their activities according to their individual risk, privacy tools, decentralized exchanges, international cooperation of companies and authorities. Crypto entrepreneurs will encounter several technical difficulties to comply with the regulations. There will be the need to create a common criterion to follow to standardise and transmit all the necessary information in the same manner, as well as the invention of technological solutions for VASP to allow the transfer of information.

Who are the potential winners and the potential losers after the implementation of FATF regulations?

The potential winners will be the biggest exchangers, the banks and institutional investors that will fully comply with these regulations. The winners will be the crypto assets which might succeed in such an environmental project because they have focused on the transparency of the KYC from the start. The losers will be the crypto businesses that will try to elude FATF regulations by performing decentralized exchanges on anonymous servers, anonymous hosting and with anonymous domain names. The ones that will be reluctant to accept this kind of regulations will be shutdown shortly.

Another important regulation that is being discussed during the summer of 2021 by the Senate of the USA takes the name of: Infrastructure Bill. The law has been proposed by the Biden's administration. It is a plan that wants to reconstruct roads and bridges around the country as well as it wants to fight the climate change. To be able to finance and complete this plan of good intentions, the American President proposes to introduce a new fiscal policy. It is properly through the new fiscal regime that the Infrastructure Bill is introducing the official role of the crypto assets in the American society. The plan necessitates about 1 trillion dollars and it foresees collecting 28 billion dollars over 10 years just from taxing the crypto activities of brokers. The bill defines brokers as: "any person who (for consideration) is responsible for regularly providing any service effectuating transfers of digital assets on behalf of another person" (Senate of The United States of America, 2021, pp. 2433 - 2434).

Today, the bill has been approved by the Senate and it is waiting to be discussed by the House of the Representatives. If the plan will be voted twice with these literal words to explain the term “broker” also by the House of Representatives, then, everyone having to do with cryptocurrencies will have to pay taxes: from miners, network validators, hosted wallets, developers of hardware and software. This would be practically impossible because many of them are not natural and neither juridical persons. For this reason, in the past weeks, many Senators have proposed some amendments to the fiscal plan for the crypto sector (Spagnolo E. , Infrastructure Bill, criptovalute con il fiato sospeso, 2021). They do not agree with the above definition of brokers. At first sight there were two different mindsets. On one side senators Portman, Warner and Sinema wanted to include just brokers from Proof-of-Work and in a second moment also the ones of Proof-of-Stake. On the other side, senators Wyden, Toomey and Lummis wanted to explicitly define who must be considered a broker. At the end of the story, the senators against the bill decided to find a compromise to join the forces to form a unique amendment and to fight against this wider definition of broker which is unfeasible and useless. The rule requires brokers to transmit to the Internal Revenue Service (IRS), the tax collection agency, all the information about the purchases and sales of crypto assets by any person in the network. This would be technically impossible for the great majority of those individuals involved in the term broker. They do not have the structure and neither the means to take part and comply with the law. They are required to transmit data that they do not know. Just exchangers such as Coinbase would be able to comply with the rules. The developed regulation is based on the functioning of the traditional financial system, and it presumes to compare crypto working individuals to the ones of the traditional banking sector.

Even if these inconsistencies have been discussed by the Senate, it decided to vote for the original text of the bill and it passed to the next stage of the legislative process (Spagnolo E. , Infrastructure Bill, affossato l'emendamento salva crypto, 2021). The adverse senators are writing letters to the head of the House of Representatives to change the language of the bill and not approve such a text that will just ruin the American fertile soil for the introduction of new technologies. Some Americans believe that losing the opportunity to become the worldwide leader of the cryptocurrency industry would be like to lose the internet bubble in the 2000's.

Even if on one side the USA are taxing the upcoming sector, they are continuously giving it the necessary space to develop. The above-mentioned senators are not against the approval and development of the plan, they would like it to be more precise without creating useless difficulties into a new-born sector. Once the bill will be approved, the IRS will be the appointed institution to write the specific tax requirements.

At this proposal, Senator Lummis reported that the crypto sector has a great potential to create economic opportunities for the country. The USA has always been an innovative country for excellence. The USA must regulate the sector to not to lose the global economic leadership by not implementing the crypto assets inside its economy. Even Brian Armstrong, the CEO of Coinbase, one of the most famous exchangers recently listed on NASDAQ, is in favour of the fiscal policy that the State is developing. He is not questioning the new obligation to pay taxes because, in his opinion everyone must pay taxes, but he disagrees with the fact that the State wants to legislate on something that it does not know enough. By passing the Infrastructure Bill, the only result that the government will obtain is the higher probability to kill an emerging sector with a flourishing future (Spagnolo E. , L'emendamento all'Infrastructure Bill per salvare il settore crypto, 2021).

From the private investor point of view, Bitcoin was initially built to be considered as a medium of exchange, therefore, as a currency it did not require any tax regulation. However, with the times, it has become very popular for people, and above all for traders, to speculate over it because there were no taxes to pay on the capital gain. For this reason, the American government in 2014 stated that cryptocurrencies will be treated as assets like properties. However, only in 2019 cryptos have been introduced into the tax return. According to the same regulation, gifts, donations and inheritance of cryptocurrencies are taxed. Consequently, investors must pay taxes on the capital gain just when it is realized. Tax regulations vary from country to country, there is not an international rule to follow since the tax burden depends on the residency of people. This thesis will just report two cases, the one of the USA since it is the country where the greatest number of cryptocurrencies' owners live and Italy because it is the country where the thesis is written.

In the USA, the federal tax rate applied on the capital gain from cryptos has a range from 0% to 37%. The applicable rate depends on several factors: the accounting method used to assess the capital gain, the holding period and the annual income of people. From the accounting method used point of view, the amount of the capital gain can be calculated according to the HIFO, LIFO and FIFO. The last approach is the most used even if usually is the one that counts for the highest capital gain. In accordance with the holding period, if a person holds the crypto for less than 12 months, then the gain is considered to be short-term. On the contrary, if the person keeps the crypto for longer, then it is considered long-term. In the short-term case, the person has to declare the capital gain inside the tax return following the Form 1040 (Investopedia, 2021). Here, the crypto gain is summed to the annual income of the person. So, the tax rate depends on the bracket in which you are positioned and to the number of the family members. In the case of long-term holdings, then the gain is taxed according to amount of the long-term capital gain tax brackets and to the number of family members. Here, the tax rates are 0% if you earn up to 40.000\$, 15% if you earn up to 441.450\$ or 20% if you earn more. It is very important to highlight that if people will register and realize losses, then they can be used to lower the amount of taxable income in the current year and in the next ones (Chandrasekera, 2021).

According to the Italian tax system, following the Risoluzione Ministeriale n.72/E of 02/09/2016, the Revenue Agency declares that Bitcoin is considered as an alternative currency to the traditional ones, therefore, it is not considered as an investment asset. The purchase and sale of Bitcoin into fiat currency does not deal with the VAT. Moreover, private investors in cryptocurrencies do not have to declare their possession if they do not have speculative purposes. In these terms, an investment in monetary assets (both cryptocurrencies and foreign currencies) is considered speculative whenever the investor owns an amount of coins greater than 51.000€ for more than 7 days. In this occurrence, the investor will have to declare the capital gain and pay a tax rate of 26% on it (Cavicchioli, Bitcoin e Tasse in Italia: Le ultime dall'Agenzia delle Entrate, 2021). The capital gain is realized whenever the cryptocurrency is sold and converted into fiat currencies.

To conclude, even if Bitcoin was never meant to be compatible with recommendations and the legacy of the financial system, the fact that the government is thinking about taxing the crypto sector is not scaring the market. The price of Bitcoin is rising every day. Probably, this is because people view the government approach as a way to accept the new technology and regulate it to protect investors. The Infrastructure Bill is planning the tax burden for the next ten years and this makes people think that Bitcoin and all the other cryptocurrencies will remain available in the market and they will be integrated in the traditional financial and monetary system (Bandman, 2021).

## USES AND APPLICATIONS

Bitcoin purpose was to overcome monetary problems that arose after the financial crisis in 2008 by conquering the loyalty that people were placing in government money. During the last ten years, Bitcoin has created a kind of new financial mentality and it persuaded people to think about the functioning of the traditional monetary system, discovering that many fundamental concepts have been introduced centuries ago. For example, taking into consideration the Infrastructure Bill that is being discussed by the US House of Representatives, the multi trillion plan is going to flood the American monetary market with new print of US dollars. Many citizens commonly think that just a minority of the population will benefit from the plan and, as always, it would be the wealthiest part. The mechanism that increases the inequalities between riches and poors has been formalized during the 18th century by the French economist Richard Cantillon and takes the name of Cantillon Effect. He explained that when a State is going to print a lot of money, only the richest people would benefit from it and the poorest would be the most penalized. Cantillon highlighted that money is not neutral. The same thing occurs for gold when a new mine is discovered inside the territory of a State. De facto, the available supply of gold increases and when it happens, prices start increasing and the value of the money changes consequently highlighting the differences between who is poor and who is rich. In fact, the rich is going to spend the extra money by increasing the prices and the poor will find themselves in the situation of paying higher prices without having benefited from higher salaries creating diversities in the purchasing power.

To sustain the American economy, the Federal Reserve has decided to carry out an unlimited quantitative easing program, meaning that it is going to print US dollars. The European Central Bank and other national banks have already announced that they will follow the same monetary policy. As introduced by Richard Cantillon, banks, hedge funds and private equity markets will be the first to benefit from the new money printed. To support this declaration, people must look at the trend of the Dow Jones or S&P 500 that lost a great part of their value in March of 2020 after the boom of the Covid pandemic and suddenly recovered when the FED announced the new print of money. The Cantillon effect will perfectly play in this fertile soil since the new dollars will bring inflation deflating its own value. The only way to escape inflation is by holding a diversified portfolio investing in real estates, stocks, bonds and gold because it will see an exponential growth during the market bubble created by the new print of money. However, the poors, who just own cash in hand to survive every day, are those that are going to suffer inflation the most and they will look at their purchasing power further decreasing. Consequently, poor people do not have any incentive in saving fiat money. Here, Bitcoin enters as antidote against inflation. Experts say that it is in moments like these that people should buy Bitcoin. It allows to postpone investing decisions as well as to keep the value people are storing in it. On the contrary, they have the opportunity to increase that value. Even if Bitcoin is considered to be a long-term investment to have the necessary time to absorb the up and down of the performance, in the short-term it could be a valuable option to avoid the devaluation of fiat currencies. Bitcoin could be an investment option while people are waiting for inflation to reduce and prices to become reasonable again and when it would be the right time to exchange Bitcoin into fiat currencies and buy real estates. Following this reasoning, people would have protected the value of their savings without having suffered the devaluation as the ones who have kept government money. Someone argues that even gold allows people to hedge against inflation, however, gold is not easily accessible to poors as Bitcoin. Moreover, Bitcoin is considered to be a better inflation medicine for its characteristics of divisibility, durability, comparability, recognizability and scarcity. Nowadays, people connect the concept of scarcity to raw materials because they are considered rare, but anything is scarce enough for the human being. Julian Simon

explains in his book “The Ultimate Resource” that the Earth surface has barely been scratched and, with better technologies, humans could find more resources than what they need. The real limit that the human being must deal with is time (Simon, 1981).

The never-ending problem that people are encountering during their entire life is how to store the value they produce during their working life and preserve it for the future. People are looking for an instrument that allows them to maintain the value they are storing in it. Usually, humans do not aspire to exponentially increase the value they own but, they would like to just preserve it for the moment in which they will be no more able to produce value. Following the above considerations about scarcity, people could choose anything they want to store their value. However, whatever they will choose is not scarce and has an unlimited supply. Therefore, its quantity will always be manageable and people will have the chance to inflate the supply in order to own more value: the starting point for the Cantillon effect. This was the reason why any metal chosen in the past as a store of value was overproduced until its replacement. However, gold has been the only metal impossible to reproduce, whose quantity is considered to be almost scarce because of the difficulties in mining. With this proposal, gold has been a good store of value for people until the moment in which the government took its control and it was replaced by government paper money.

What distinguishes Bitcoin from any good available to store value is its strictly limited supply in the market as in the case of gold. The full quantity of crypto coins was decided by Satoshi Nakamoto in the moment in which he was designing the functioning of the technology. The maximum amount of Bitcoin is 21 million and each Bitcoin is made by 100 million of satoshis. There is no possibility at all to change the available quantity. This means that whenever Bitcoin’s demand increases, the value of the crypto will appreciate. The characteristic about the impossibility to inflate the supply of cryptocurrencies makes Bitcoin a good alternative to store value. It is the only medium able to keep value that will never be depreciated for changes in the supply. If the value stored in it will change, it is just because its demand is fluctuating. However, since cryptocurrencies are to be integrated in the financial and monetary world, investors can expect that more and more people will be attracted by this technology and, at a first sight, its value will



start rising exponentially to become stable in the end. Furthermore, the digital characteristic of Bitcoin allows people to transport their value very easily just by keeping in mind the secret keys to access to the platform. Cryptocurrencies might be defined as the best invention to store the value of savings. Particularly, Bitcoin could become a real solution for all those people that do not have access to bank accounts. All over the world, mainly in the poorest countries, a lot of people do not own a bank account because they do not have the prerequisites. On the contrary, the crypto world provides free access for everybody who wants to operate in it. In this way, people get the sovereignty of their money and other than deciding how to spend them, they can perform any kind of transaction without the need of an intermediary. Bitcoin could be an escamotage for all those people that want to store their savings in assets not directly controlled by the state and/or subjected to government inflation.

Cryptocurrencies have been introduced into the system to substitute government paper money. However, this is technically impossible because the blockchain process is too slow to allow and to register the transactions that occur every day all over the world. For this reason, Bitcoin does not want to compete with fiat currencies in the local market for simple purchases. Cryptocurrencies will be used mainly for online transactions because the blockchain technology allows for fast and secure payments of any amount without permissions. In the case in which people will make small daily payments using crypto, then, these transactions would be recorded off-chain.

Moreover, Bitcoin and all the other cryptocurrencies have the characteristic to be widely accepted, contrary to the fiat money that very often incur in difficulties to allow payments. The government money most used for commercial purposes is dollar, euro and sometimes yen. Bitcoin payments are far quicker and cheaper than the traditional ones. All those people that own a crypto wallet will be likely to accept Bitcoin payments. In this sense, people can say that Bitcoin has reached a good level of liquidity all over the world. Cryptocurrencies are a neutral medium of exchange because no country has the responsibility to issue it, to hold its reserves or has the power to regulate it. In this regard, Hal Finney, the first person to receive the first Bitcoin transaction from Satoshi Nakamoto when testing the technology, wrote in the Bitcoin Forum in 2010 that "Bitcoin itself cannot scale to have every single

financial transaction in the world be broadcast to everyone and included in the block chain. There needs to be a secondary level of payment systems which is lighter weight and more efficient” (Finney, 2010).

Moreover, if a market research is done, it would be possible to say that Bitcoin competitors are not banks dealing with people for small payments, though the direct competitors are central banks and large financial institutions since they are managing huge transactions of money among themselves. Bitcoin could be seen as a good instrument to perform those exchanges of money because the blockchain ledger will ensure a correct and fair transaction. In addition, payments will be of the same cryptocurrency and this will eliminate the need to convert the national currency into others.

However, in order to be considered a global currency to be used in payments, Bitcoin has to reach a stability in its value by being accepted by the greatest majority. The stable value will allow people to perform international payments without the need of converting national currencies and paying useless bank commissions. Bitcoin is becoming very attractive and the main reason for which people are starting to get closer to it is its scarcity due to the fixed supply. Individuals are willing to accept the high volatility of Bitcoin in the short-term because they expect a further increase in its value. Furthermore, people should be used to the concept of volatility because the value of gold is highly variable in the short-term while fiat currencies show volatility in the long-term due to political devaluation of the currency. As a consequence, crypto volatility should not be a problem for worldwide adoption. In the case in which Bitcoin should reach a kind of stability in its price, it would be preferred in international transactions. They will be performed in around ten minutes and they will be immediately verified and recorded into a public ledger at a smaller cost.

Due to the high volatility of Bitcoin, people are scared about making payments in cryptocurrencies. The value stored in the crypto wallets is fast changing and there is the risk to over or under pay the desired object. By the way, even if today it is very difficult to imagine paying anything using Bitcoin, there are many institutions that

are getting ready to accept the introduction of this new mean of payment. Tough, this aspect will be discussed in the following chapter.

The current variability of cryptocurrencies is the main obstacle to their wider acceptance. “As long as Bitcoin continues to grow in adoption, its appreciation attracts more adopters to it, leading to further appreciation, making this drop in volatility further away” (Saifedean, 2018, p. 190). Fortunately, or unfortunately according to the point of view, the growth of Bitcoin demand is required. As soon as more people will start holding Bitcoin and the market will be more liquid, then the demand will be more predictable and stable with lower oscillations in value. In the end, the crypto market will stop being considered as a start-up’s stock to own to make profit and it will no longer attract traders with speculative purposes. Finally, it will be considered as a common monetary asset. In other words, today Bitcoin is considered as a speculative investment asset to daily trade and not as a monetary mean to allow exchanges. Buying cryptocurrencies is judged as a valuable investment in the short-term future for its fast growth due to the volatility of the asset. However, some experts argue that they will become currencies in the long-term for their ability to store value.

It is necessary for the society to keep up with times since cryptos are slowly spreading around the world and some people are already asking retailers to pay with Bitcoin. Most of the time, shops do not have the required instruments to perform the transaction. There are different devices to use in order to pay and to receive a payment. In the first case, the person must own a crypto wallet. It is possible to have one in Revolut which is a platform that allows you to use cryptos by instantly converting them in fiat currencies. In the case of the receiver, he must own the needed device which is a Bitcoin POS (for example Walledo or bitcoinPOS). However, even in the case in which shopkeepers had the device to allow the payment, not every transaction is performed in Bitcoin. This means that the payer has an erosion of his Bitcoin capital but the receiver can freely choose to accept cryptocurrencies or fiat money. Whenever he decides to get paper government, the payer is obliged to convert Bitcoin into fiat currency. The conversion requires paying trading commissions and paying taxes over an eventual capital gain. In the end, the payment would be much more expensive than directly

paying with fiat money. By the way, if retailers would pay higher attention to the choice of the device, there exist some devices that allow crypto payments just by transferring the property of Bitcoin. These kinds of payments are traceable but are anonymous, hence, it is not possible to know who has made the transaction and who has received it. Moreover, it is one of the easiest ways to get Bitcoin without buying them on the official platforms or mining them (Vanni, 2021). Another important introduction that took place mainly in the metropolis is the ATM. Many upgraded automated teller machines allow people to withdraw fiat currencies from a Bitcoin wallet. People are launching new Apps that enable them to search for the closest Bitcoin ATM at their localization. On one hand, using Bitcoin payment is more secure in solvency terms than allowing people to pay with debit and with credit cards. Crypto transactions are instantaneous and they cannot be cancelled by calling the intermediary asking for annulment. Demanding the restitution of Bitcoin is far more complicated and it requires the consensus of the party who received the payment and the consensus of the whole network. Hence, it is impossible for the payer to elude payments. On the other hand, Bitcoin payments are not secure for the high volatility of its value. Receiving Bitcoin as payment is extremely dangerous because if the price falls after the payment, the retailer can lose the value earned.

There are several ways to get the ownership of cryptocurrencies. The most traditional one is by making a direct investment and creating an account in the crypto exchanges where a person can decide to invest through a robot adviser. It means that by paying an initial registration fee you are allowed to have a proposed portfolio and a robot that will manage it. The investing proposal will be based on the answers people give to a questionnaire about their level of experience, time preference, risk aversion and goals. The most famous platform where to get an account is Coinbase that has been recently listed in the New York stock exchange but there are many others such as Binance, Gemini and Bitstamp. However, there are quite different options to enter this world without the need to directly own Bitcoin. A person could buy the shares of a company operating in the crypto environment, for example, the person could buy shares of an exchange (buying the stocks of the platform Coinbase) or of a company accepting payments in Bitcoin. Other options could be investing in a company working with the blockchain

technology. Last but not least, the world's biggest financial institutions are starting to launch new financial products in the traditional market to allow people to enter the crypto world in a more common way. In fact, they are introducing funds that will invest in Bitcoin or other cryptocurrencies. Here, there is a portfolio manager that manages different investment assets in order to over perform with respect to the benchmark. Other than funds, financial institutions are introducing ETF which are the so-called “passive investments” and most of the time they are following the performance of a given index or investment asset. The difference between an active management and a passive one results in the costs to subscribe to a specific investment. Furthermore, for the experts of the sector and the bravest investors, there exist some financial derivatives that allow people to make forecasts about the future value of Bitcoin by taking an up or down speculative position on the future value of the asset. If their prevision is correct, then they can buy the crypto asset at the same price it had at the moment of the bet. In this case, the investor will have already made a profit. Instead, if the prediction is wrong, the contract will expire and the investor will lose just the money to subscribe it. Here, any investment in cryptocurrency will occur.

Many people are also thinking about investing their savings for retirement into cryptocurrencies. Usually, people’s retirement is very far away from the moment in which they start thinking about it and start saving money. Therefore, the time frame of these types of investments is very long as required for crypto ones. The earlier a person starts to save money for retirement the better it is because the more the time, the more the financial instrument can increase its final capital yield. Having a long-time frame allows to diversify the portfolio and there is more time to benefit from the good moments of the market as well as there is time to recover from bad ones. The specific instrument that allows people to invest in cryptocurrencies is named Bitcoin Individual Retirement Account (IRA) inside which people can decide to invest in traditional asset classes but even in alternative ones such as cryptos, real estate and precious metals. An IRA plan works as the traditional one: there are just upfront fees to pay to allow higher yield in the end and there are contribution fees each year. When a person subscribes to an IRA plan, there are three different participant parties in the contract: the custodian that manages the account and

complies with government regulations, the exchange that is the platform that manages the purchases of cryptos and the secure storage that protects the account from hackers. The disadvantage of IRA plans is that capital losses cannot be registered in the fiscal code of the person and cannot be compensated with other eventual capital gains to pay less taxes. The demand to invest in crypto assets for retirement is fast growing, therefore, there exist some options that allow people to invest up to 5% of their retirement funds into crypto assets. In the case in which a person is reluctant to subscribe an IRA plan because it might be quite expensive, he can decide to hold pure crypto assets in his portfolio. However, as for the traditional retirement plans, the IRA ones can have tax relief from the government, on the contrary, this cannot happen for direct investment. (Tan, 2021).

Investing in the crypto market is not as easy as people might think. Even in this new financial sector there are strategies and rules to follow to not lose money. First of all, people should be very informed about the crypto in which they want to invest. It is very important to know how cryptos are working, if they comply with the law, if they are reliable and to buy them in the official platforms to avoid frauds. There are two rules in common with the traditional financial market: manage the risk and diversify the portfolio. Considering the high volatility of the crypto asset, people should decide the maximum amount of money they are willing to lose. Even if the capital loss is not effective until the moment in which people sell, the idea of losing money could have harmful psychological effects. Highly correlated to the concept of risk there is the notion of diversification. The crypto investors, after having decided the maximum amount of money to invest, should decide the different cryptocurrencies where to invest. This move allows them to not be over exposed to the risk of failure of one single currency. People should also keep in mind the importance of automatic purchases. These will allow them to exploit the up and down of the value, this enables them to buy different quantities according to high or low prices. This practice is used even in the traditional financial market and takes the name of dollar cost averaging. Other than giving a financial advantage, it has a positive psychological effect because if the price of the crypto is low investors can buy a higher quantity of coins and it avoids people trying to guess the minimum value of the asset.

It is worth examining the major mistakes that investors make to try to prevent them. People have the tendency to purchase crypto just when the price is low to buy a higher quantity. However, not always low prices are a good sign: they are evidence that the asset is not performing well, and a lot of people are abandoning the boat. People should pay higher attention in the moment of the purchase. All the crypto operations are made online and there are a lot of criminals that can sell people whatever they want. Investors must always remember that not all that glitters is gold. Therefore, it is strongly necessary to do deep research and it is recommended to do the transactions on the official platforms. There are criminals doing phishing to steal personal credentials and get investors' crypto assets. However, the most dangerous mistake a person can make is to forget the key password to access the platform. There is no way to get new credentials for a crypto account, therefore, if people are going to lose them, they are going to lose all their crypto capital.

Having reported some experts' tips and the major errors to avoid, it is correct asking if Bitcoin could be a good investment. Governments and central banks would disagree because Bitcoin is a threat to the fiat currency and they would not be able to control the monetary policy. Moreover, governmental institutions are concerned about the volatility of the asset because just a minority of the citizens have enough financial education to understand how crypto works. A lot of people could just pave the wave of the positive performance by putting in Bitcoin all their money and running the risk of losing the capital. Moreover, until the last few years, public institutions have always looked at cryptos as a speculative bubble that would have disappeared within a few years. However, considering the recent history and the taxes that people are paying over their crypto investments, cryptocurrencies are here to stay and integrate with the traditional market. Bitcoin was invented more than ten years ago and since then it has exponentially grown. By following some necessary and simple rules, Bitcoin could be an interesting mean to increase capital, to diversify the traditional portfolio and to avoid the devaluation of fiat currencies (Rodgers, *Is cryptocurrency a good investment?*, 2021).

## CHAPTER FOUR: Cryptocurrencies' target

### PROFILE OF THE MIDDLE INVESTOR

As it has been explained many times in the previous chapters, cryptocurrencies are a very risky investment asset. People must be carefully informed about them but, most importantly, they must understand how much capital they are willing to lose in the case the sector collapses. The amount they choose is the maximum quantity they should invest in Bitcoin.

Another important aspect when investing in crypto is to understand what type of investor a person wants to be. There are different investor profiles but usually people belong just to one of them. It is essential for investors to understand the proper profile according to his/her personality. Not identifying the investor profile is seriously dangerous because people could take a greater risk than the one they are psychologically able to afford. Moreover, the personal investor profile allows people to design the strategy behind the investment. People should also identify the type of behaviour to adopt in their financial transactions. They can decide to be defensive, commonly said passive, or aggressive, also known as dynamic. The fundamental difference between the two is that the former is not informed about the financial market, the assets and he is not interested in continuously controlling the value of his investments. On the contrary, the latter perfectly knows the mechanistic functioning of the market and the type of assets he wants to own in his portfolio. Investors should make a choice which is or black or white. There cannot be shades in between because they would create a mess in investors' mind. Common people usually do not have the time, the determination and mental resources to understand investments in a professional way. For this reason, most of the time, people should go for a defensive behaviour and be happy with the yields they get without doing too much effort (Graham, 1973, p. 158).

Generally, there are three main profiles with which a person can identify himself: the conservative, the moderate and the trader. Let's go in deeper detail and explain each of them.



The conservative investor is commonly also defined as “hodler”. He is the person who does not like risking his capital and, therefore, he does not want to take unnecessary risk. This investor has the characteristic of being a calm person who does not want to spend his time controlling and looking at his investments. Usually, this person is the one that makes the investment and holds it for a long period. On one side, it is not in his interests to control the results maniacally but, on the other side, he is the investor who thinks that holding an asset for a long period, it will certainly appreciate in value and it will repay a lot of money.

The second type of investor is the moderate one. This profile is a mix between the conservative and the trader. This person is likely to have a well-diversified portfolio made by assets he will hold for a long period because he believes they will have an exponential growth and by assets he will trade daily. Usually, this person is braver with respect to the conservative one. The greatest part of the capital that will generate high yields is located in long-term investments but a small part of the available capital is used to try the fortune.

The last profile is the one of the trader. He is the person who makes more money with respect to the other two. This investor is closely looking at the fluctuations of crypto assets, he makes a huge number of transactions and makes profits in the short-term. However, being a trader is not easy because it necessitates a high knowledge about assets and financial functioning. The best traders all over the world are also known as whales and they earn huge amounts of money.

The discovery of the belonging profile is more important than what people usually think. Other than allowing people to understand the maximum risk they are willing to sustain, it gives them the opportunity to design the strategy to use during the investment. This is necessary because investors should consider the high volatility of crypto assets and the market fluctuations they have shown in the past. Moreover, as the CEO of Binance has highlighted, people have different opinions about cryptocurrencies and they depend on whether people have already invested in them or not. If yes, then they are experiencing different emotional status according to the time in which they entered the market. At this proposal, it is important to explain the different phases investors will go through.

There are people experiencing complacency, they are those investors that commonly think “Bitcoin can still go up”. They are positive investors that always look at the glass half full and they are hoping the cryptocurrency will gain more value and will start to pump again and again.

Others are living the phase of anxiety, they are always thinking that everything will collapse sooner or later. They are waiting to receive the notification of the margin call that automatically warns them that the asset has reached the lowest affordable value according to their risk aversion.

Anxiety is usually followed by the denial phase in which people think “we can still recover when people see the true value”. This phrase is said whenever there are some downs of the crypto value. People want to deny the fact that they might probably lose money if they sell their investment. They want to convince themselves that Bitcoin will recover its value as soon as people will be attracted again by the possibility of making a lot of money.

The last phase is the worst. It is the panic phase in which the value of Bitcoin is falling and a lot of people are selling their coins. If investors are not psychologically strong enough or did not follow the recommendations given by its investor profile, then they will panic and will consolidate the loss.

Crypto experts say that the experiencing path that people follow when investing in Bitcoin as well as their behaviours and expectations are always the same. When entering the crypto market, investors are just doing an attempt and they do not believe in the success of Bitcoin. The only phrase in their mouth is “no way this rally will succeed this time”. But as soon as the chart seems to rise a little bit, their optimism starts to increase too and the euphoria comes. They start looking at their capital gains and consequently, they start believing in Bitcoin. It is at this point that people start investing more and more money because the asset is increasing in value. They want to reach the peak that never arrives: “we can still go up”. Here, it is the moment in which people are proud of the choices made in the past and even if the market starts going down, their euphoria keeps them in a positive mood. When they realize that the Bitcoin value is falling, they enter in the anxiety phase and in the denial one where they start thinking that Bitcoin will recover from the failure. If the market does not behave like they predict and keeps falling, then people go panic

and sell all their Bitcoin capitalizing the loss. When people realize they are ruined and will never earn back all the money lost, the anger and the depression come. Analysts believe that people should be used to the ups and downs of the performances since the crypto market is basically working as the traditional one. However, the feeling of losing money is always a new experience and people seem to never remember the lesson learned in the past. When the market is low and the value of Bitcoin is lower than the value at which they bought it, people do not have to sell. Experts strongly advise them to hold until when the market goes up again. Or better, as crypto veterans say, people must “hold” their investment.

Contrary to what crypto experts keep saying, it is common for people to think that Bitcoin investments are short-term and they should daily trade to make more money. On the contrary, the short-term oscillations are good for those people who keep the investment for the long-term and keep investing during the down phases. This is because oscillations allow investors to make short forecasts about the value that the asset will have in the medium-term. Allowing people to have a medium-term vision about the performance of the investment could have a positive effect on their mind. In the traditional market, stocks and bonds are issued by a real company and people can understand what will be the price of their assets according to the annual performance of the companies. In the case of Bitcoin, it is far more complicated for people to make forecasts about its value since it completely depends on the willingness of people to hold it or not. Moreover, as soon as there are changes in demand, people are likely to follow the mass for the fear of losing the good moment in which to buy or sell. Knowing the psychological efforts that crypto investors have to do to hold the asset, experts strongly recommend relying on mathematical parameters to protect investments from anxiety and panic. When operating in the cryptocurrency world, it is very important to have self-knowledge and not follow tips of other investors. Once they have discovered their correct investor profile, they should follow the suggested strategy and listen to the expert advice.

As in the traditional financial world, even in the Bitcoin investments there are bear and bull moments. Even in the crypto market it will always be difficult to predict them. However, Bitcoin investors are commonly using the classical investment

strategy used in the traditional financial markets. People are playing the game by traditionally thinking that they should buy the crypto when the market is in a bear situation because the value of the asset is low, and many people are selling it. On the contrary, when the market is in a bull situation, people should sell Bitcoin because the value is rising, and many people want to buy it. Jason Zweig, the official commentator of Graham's book "The intelligent Investor", discusses this kind of behaviour saying that people can certainly make profits by following this reasoning because they are going to sell at a higher price with respect to the one of the purchases. By the way, it seems unrealistic that people still use a classical approach to invest in Bitcoin. Even if the trend is very complicated to forecast, by looking at the historical performance of Bitcoin, it is possible to make some hypotheses planning how to behave. However, most of the experts are predicting an increase in value in the next few years advising people to not pay attention to the occurrence of the next bull or bear market. Buying Bitcoin now is worth it because it has a lower value than the one it could have in the future. Using a pricing strategy is usually better than using a timing one (Graham, 1973, p. 172). When investing in Bitcoin, people should learn how to interpret data and keep calm in bad moments. It is widely known that Bitcoin has an extremely high volatility and during its life there can be more negative times than positive ones but it will inevitably continue to grow. If people are not ready to bear the risk, they should not undertake this experience.

Benjamin Graham, the biggest and the cleverest investor of all times, defines how people should behave in order to be defined as intelligent investors. He argues that it is not a matter of intelligence but it is a matter of personality and attitudes. In fact, an intelligent investor is the one that is patient, disciplined and is willing to learn but most importantly he can control his emotions and think with his own head. Graham highlights the necessity to always increase personal intelligence by learning how to control emotions and refusing to follow the irrationality of the masses that operate in the financial markets. (Zweig, 2020)

When Graham wrote the first edition of the book, not even the idea of Bitcoin was existing. However, he emphasizes the never dying difference between investing and speculating. In his opinion, it is all about how people behave with respect to the evolution of the market. The main interest of the speculator is to get benefits from

market's fluctuations while the interest of the investor is finding assets at interesting prices and holding them for their interesting value. Investing means playing a game by respecting the rules and this allows people to earn money for themselves. On the contrary, speculating is when a person bets money on a game of which he does not know the rules and therefore, he is reducing the probabilities to earn money (Zweig, 2020, p. 18). Graham explains that speculation is part of human nature, therefore, it is worth nothing doing everything to kill it. He suggests taking care of it and minimally supporting it. For instance, he proposes to use the maximum 10% of the available capital for speculation but he strongly recommends keeping separated the capital for investing purposes and the one for speculative reasons. People should never mix speculative and investing reasoning because the first one will prevail (Zweig, 2020, p. 28). Traditional investors should never invest more than the 10% in speculative positions. However, Graham's considerations must be held true and should be applied even by crypto investors. If people consider that Bitcoin is itself a risky asset, they should not speculate over it increasing the chances of losing money. However, as seen before, the third investor profile is the trader who could also be defined as a speculator. If he had to count the number of transactions he performs every day, he will build the awareness that he is double risking the amount of money he is putting in Bitcoin. For the safety of his finances, the trader should not use more than 10% of his capital to speculate over risky assets. Considering the fast oscillations in the value of the crypto asset, speculators might not have good expectations about the future value at which they will sell Bitcoin and the amount of profits they will get. Perhaps, investors are those who have better chances to make predictions about the trend since they are more likely to hold Bitcoin for a longer time. By the way, not having expectations about the future value of assets prevents people from risking too much money on the future expectation of a project that may reveal incorrect. Usually, when the financial market situation seems to be one of the worst, it will reveal to be better than what people thought. Graham suggests people to not have illusions about the future and let it surprise them. Moreover, according to his mathematical knowledge and statistical studies, Graham does not recommend investors to make predictions about an investment asset when it has a short life. He considers 50 years enough time to make good studies to be able to fully understand the asset (Graham, 1973, p. 141). If investors

had to listen to his advice, Bitcoin, which is the oldest cryptocurrency, is still extremely too young to make any kind of forecast.

By the way, Jason Zweig suggests that investing in Bitcoin could be a clever opportunity to take to hedge the risk that people are running from investing in the traditional financial system. People are strongly connected to the country in which they are located: they are living and working in a specific country and most importantly they are paid with the national fiat currency of that specific country. If people think about it closer, they can understand that they are betting their life on the good functioning of the social, economic and monetary system of the specific country. For these reasons, experts usually advise investing in foreign securities or funds to get a little bit of protection. However, foreign securities are traditional financial assets and they do not defend people from inflation and devaluation of the fiat currency as Bitcoin can do. Many people have started to show great interest in cryptocurrencies, 35% of European investors have a positive opinion on Bitcoin (Buthoria, 2020, p. 8). The long-lasting presence of zero or negative interest rates pushes investors to look for new types of investments that can generate positive yields. Moreover, the monetary policies of countries are scaring people, and investors are expecting high levels of inflation. For these reasons, people are looking around to find new investment forms to protect their wealth.

The UK Financial Conduct Authority has made the “Cryptoasset consumer research 2020” and it has been able to sketch the profile of the middle investor in cryptos. He is a male, 39 years old with an average income of 35.000£. The research explains that 79% of crypto investors are male because females prefer to protect family wealth. 35% of them are over 35 years old and 27% are a mix between skilled, semi-skilled and unskilled manual workers or even pensioners or unemployed. From the research, it has emerged that among crypto owners 92% of them are able to give a correct definition about cryptocurrencies, 90% made a kind of research before doing Bitcoin investments and 89% is perfectly aware of the regulation absence. Investors are more likely to buy cryptocurrencies from online foreign platforms: the most used one is Coinbase followed by Binance and Kraken. The survey analyses several aspects of crypto investors. They usually invest in Bitcoin and the greatest majority is aware of the riskiness of the investment but they are hoping to make

money quickly. Just 31% of them declared to not be willing to invest in crypto because they consider it too risky. However, the research highlights that 89% of investors currently know that cryptocurrencies are not regulated at all and there is no kind of protection in case digital assets fall. The lack of regulatory protection pushes people to stay away from the crypto world: 73% of consumers are not investing for this reason. By the way, 29% of them declared that if governments will provide rules, they might invest in the future. 91% of current investors have used their own money (disposable income or past gains) to buy Bitcoin and the remaining percentage of people declared to use borrowed money from family and friends (English, Tomova, & Levene, 30 June 2020). However, some of them confirmed to use credit cards. In this regard, there is information that 21% of American crypto investors are using credit cards to buy Bitcoin. In the USA, we can recognize two different types of investors and specifically the Millennials have borrowed on average 500\$ from banks or families, while Baby Boomers more than 4.000\$ (Sarkar, 2021). The research asked people what they do with their digital assets and only 25% of them answered to use them to buy commodities. The remaining investors are just holding the investment for the long-term. Perhaps, this is the reason why on average people control their digital assets weekly or monthly but still 12% of the investors declared that they never look at it. Moreover, almost 30% declared that their investment plan on Bitcoin lasts more than 5 years and 37% do not even know how long they will hold the investment.

Fidelity Digital Assets conducts yearly research over investors in digital assets. The most recent survey has been published in 2020. From the study it has emerged that European investors are more interested in crypto assets rather than the Americans. The president of the institution, Tom Jessop said that “this year’s survey results confirm a trend we are seeing in the market toward greater interest in and acceptance of digital assets as a new investable asset class” (Buthoria, 2020). Going deeper in the research, it has come out that private investors have increased by 5% since 2019. Today, 27% of the US investors are investing in cryptocurrencies where 59% of them own a direct investment in digital assets and 22% hold the investment using future contracts which allow people to hedge the direct exposure to risk. Reading the research, it has emerged that Bitcoin is the first-choice cryptocurrency

for investors. In fact, 26% of them are investing in it and just 11% on Ethereum (Buthoria, 2020). This is probably because Bitcoin is the oldest crypto which has the longest trend to study and thanks to past publicity, it has been able to get a high market capitalization. However, 17% of the Bitcoin owners had a negative experience in the past for high fees in the exchanges, time for a transaction, stolen cryptocurrencies and of course its volatility. It is interesting to notice that 36% of institutional investors are entering the crypto market investing in Bitcoin and they expect to allocate 0.5% of their portfolio. This aspect is particularly interesting because 80% of investors declared that they would like to invest in institutional assets holding Bitcoin with an exposure in other cryptocurrencies. The greatest majority would like to choose an actively managed product or fund because frequently selecting and changing assets would allow them to control their correlation and manage the standard deviation. Of course, this strategy will benefit investors in terms of returns (Buthoria, 2020).

According to the survey, the most attractive characteristics of Bitcoin that fascinate investors are the lack of correlation, the innovative technology and high potential yields. In the first decade of Bitcoin life, it never had a correlation with the performance of the traditional financial market, however, during the Covid pandemic, the two trends seemed to go in the same direction. Though, even by considering the positive correlation, Bitcoin has been the asset with the best performance during the recovery phase. Bitcoin is considered to be one of the best disruptive technologies of the last century and it is drawing a lot of attention worldwide. People want to own the cryptocurrency because they do not want to lose the opportunity to capitalize. This usually happens also with the stocks of promising start-ups in the early stage of their life. But, other than the promise of high profits, 25% of European investors are very pleased by the fact that Bitcoin is free from government supervision which cannot control its value by managing its supply. In the future, if governments introduce new monetary policies, Bitcoin will never be affected.

Jason Zweig makes an astonishing and interesting observation in his comment to chapter 8 of "The intelligent Investor". He says that people are not investing to earn more money than the average, but they are investing to earn enough money to



satisfy personal needs and desires. He argues that the best way to measure the quality and the success of any investment is to understand if it took people a step closer to their goals. In the end, it is not important to cross the finishing line before anyone else and beat the market. The most important thing is to peacefully arrive at the arrival with the certainty of having met self needs (Zweig, 2020, p. 202).

#### HOW BIG INVESTORS ARE ACTING

In the previous paragraph it has been said that many people would be willing to undertake the extra risk of cryptocurrencies in the case in which institutional investors enter the market proposing some products and services dealing with digital assets. Big banks and asset management companies are perceived to be more reliable than direct investments on digital assets in online platforms. Maybe, this is the reflection of the way of thinking and the way of acting in the traditional financial market. Indeed, people prefer investing through mutual funds managed by big companies and expert managers supported by highly skilled teams of people that every day follow the trend of the market and companies' performance. Investors feel safer when their money is managed by competent people rather than building their portfolio on their own. In fact, mutual funds are known to be less risky than direct investments in stocks or bonds. This is because managers can study the correct stock picking according to precise studies on the correlation among assets and their fair market value. There is no reason why single investors should perform better than asset management companies: they do not have all the necessary information and the time to control the market fluctuations. People are expecting banks to supply the same products and services for the traditional financial sector to the crypto one. Investors would like big financial asset management companies to create products investing in Bitcoin. By using this kind of service, investors will be more facilitated because they will not have to create a crypto account in the required platforms such as Coinbase, Binance, Kraken etc. Moreover, they will not bear the direct risk of the direct investment into Bitcoin because the management company will sell a product which is investing into a mix of cryptocurrencies. Furthermore, investing into mutual funds dealing with cryptos prevents people from speculating by frequently buying and selling digital assets in the short-term and consequentially influencing the crypto's price.

Every day, there will be more people talking about cryptocurrencies and asking their financial experts to tell them their opinion about digital assets. The high interest on Bitcoin and the willingness to enter in this new market were unexpected. The crypto sector represents a huge opportunity to make money and increase profits for asset management companies. They should provide their customers the service they desire because people are demanding for new ETFs and mutual funds to be released in the market. The functioning of an ETF is very similar to the one of mutual funds, the only difference is that the formers are based on a passive strategy meaning that they are following the trend of a specific index and their performance just depends on it. Mutual funds, on the contrary, are actively managed, meaning that their managers can buy and sell different assets to try to outperform the value of the index they are following. These kinds of products must perfectly comply with the law and give precise information about their investments to be sold in the market. This is not an easy requirement because cryptocurrencies are not regulated by the state, therefore, crypto ETFs cannot follow the rules of other financial products. This means that, for the moment, the only way for investors to buy digital assets is directly from an exchange. ETFs are not available in any market even if they are dreamed by many investors. By the way, it is important to keep in mind that these products are not protecting people from the high volatility of cryptocurrencies, they just allow people to easily invest on Bitcoin and to diversify the assets in their portfolios. If investors would buy crypto ETFs just to avoid undertaking the risk of the asset, they should not buy crypto at all.

Now, let's consider some specific cases of asset management companies.

Black Rock Investment Institute, at the beginning of 2021, was forecasting high levels of inflation in the medium-term. It reported that according to some studies people were very concerned about whether to invest in equity or bond. It highlighted that investors were not holding cash in hand because they did not want to lose the value stored in it. However, the asset management company chose to keep a higher percentage in liquidity to have the possibility to give back money to people when asking for reimbursement (Antonelli, 2021). Nevertheless, some months after the release of the study, Black Rock declared to have invested just a

small part, around the 0,03% of the global assets of the company, in cryptocurrency futures (Cavicchioli, Ufficiale: BlackRock ha acquistato future su bitcoin, 2021).

Together with Black Rock, also JP Morgan Chase, Morgan Stanley and Goldman Sachs started to offer access to Bitcoin funds to their wealthier customers. These products are directed to the private investors because banks suppose they would be the only ones to tolerate Bitcoin volatility (Tessa, Bitcoin: Jp Morgan scrive ai clienti private “ecco quanto vale la criptovaluta”, 2021). The four institutions are providing active managed Bitcoin funds. Moreover, JP Morgan has declared the issue of its own cryptocurrency in order to use and manage the blockchain technology providing its customers for faster, cheaper and easier transactions.

Morgan Stanley on the 31st March of 2021 has uploaded the “Investment Policies and Strategies” section for 12 of its mutual funds to allow itself to enter the cryptocurrency world. It has been possible thanks to cash settled futures and Grayscale Bitcoin Trust which is a financial product that enables people to invest in Bitcoin and works in a regulated market since it is directly investing in Bitcoin and consequently, it is reflecting the true value of the crypto. It is a regulated product because people are not directly buying and holding Bitcoin but rather, they are holding a kind of stock of the asset. Therefore, whenever they are buying or selling it, they are normally exchanging stocks for fiat money. However, given that this is the only financial product available in the market, it is very expensive and it is asking an annual commission of 2% to its clients. By the way, stocks are exchanged for a higher price with respect to the current value of Bitcoin, this because its value depends more on its demand and supply rather than the ones of the crypto. For these reasons, Grayscale Bitcoin Trust has been highly criticized in the past years (Cavicchioli, The cryptonomist, 2020).

Morgan Stanley is studying some ETFs to offer to its customers. However, the asset management company will allow to enter the crypto market just those people that have more than 2 million in assets under management for the maximum amount of 2,5% of their total net assets (Bourgi, 2021). The developing ETFs are three: Galaxy Bitcoin Fund Lp and Fs NYDIG Select Fund which will require 25.000 dollars as minimum investment, while the other one Galaxy Institutional Bitcoin Fund Lp will require a minimum of 5 million dollars (Ferrari, 2021).

JP Morgan reveals that the demand for cryptocurrencies is not so strong as people imagine but it will be at some point in the future. For this reason, the bank is developing some reports to teach to its private and wealthier customers the risks connected to the cryptocurrencies and what are the investing opportunities. The company specifically highlights that even if crypto can be very useful in order to diversify their portfolios, the ever-true difference among Bitcoin and gold as assets to store value is their difference in volatility (Abuzeineh, 2021).

Goldman Sachs is releasing lesser information with respect to the other most important American Banks. However, it says that even by considering the high standard deviation of Bitcoin, 40% of its total customers are already investing in digital assets. The institution will start providing futures on Bitcoin and non-deliverable forwards to its customers.

By the way, it is important considering that the above-mentioned asset management companies are not the institutions which are ruling the monetary system all around the world. People should pay attention also to what national central banks say about cryptocurrencies and how they are behaving.

On the 9th of June of 2021, Il Sole 24Ore, the Italian economic newspaper, published an article about the thoughts of the Bank of England on cryptocurrencies. The bank is seriously concerned about the financial stability of the English system. A lot of people are closing their positions in mutual funds in order to use those money to buy digital assets in the due platforms. The economic newspaper explains investors' behaviour as the normal consequence of the negative interest rates in banks deposits: people have to pay to keep liquidity in bank accounts. Furthermore, the coming inflationary wave and the increase of prices is scaring people for the erosion of their purchasing power and the devaluation of their savings. These are the reasons why investors are looking for new ways to get higher capital gain. However, banks are worried about the risk of loss that investors are accepting to run: leaving money in the bank accounts will make them lose a bit of value in terms of purchasing power, while, by investing in Bitcoin there is the probability of losing the entire capital. The English bank governor Andrew Bailey warns the citizens about the fact that digital assets cannot be considered as a medium of exchange because they are

extremely volatile. However, even if the Bank of England is strongly discouraging investing in Bitcoin, it is aware that the phenomenon will increase day by day and there is the need to create a regulatory system to protect both banks and investors (Filippetti, 2021, p. 35).

In the same days, the newspaper Wall Street Italia published the words of Stefan Ingves, the governor of the Bank of Sweden. He believes that the regulation is about to come, not just because cryptos are threatening the system but because countries must protect consumers interest, money laundering and terrorist financing which may harm social safety. Cryptocurrencies came to change the way people live in the traditional system, however, whenever larger interests come into play, regulation will not be long in coming. The cryptocurrencies' progress is threatening every country in the world, therefore, the Swedish minister of finance Asa Lindhagen is asking for international standard regulation to come. Though, at the moment, the Sweden parliament is arguing to introduce harder rules to respect for crypto exchanges (Battaglia, 2021).

In this sense, the European Central Bank has already declared that it is working on cryptocurrencies regulation by taking into consideration the different jurisdictions inside its territory. On the contrary, the Chinese Central Bank emphasizes its decision of banning digital assets as a medium of exchange, therefore, they are not recognized as currencies. Not surprisingly, China is the first most advanced country in developing the state digital currency: the digital yuan. The project aims to apply the blockchain technology to a cryptocurrency controlled by the state. It is still in a prototype phase, but this is proof that countries will try their best to keep control of the monetary system.

The Bank of Italy, together with CONSOB, on the 28th of April of 2021 published an official communication warning investors about cryptocurrencies riskiness stressing the need for an international, or at least European, regulation. Still today, the purchase of cryptocurrencies is not subject to transparency requirements and there are no specific forms of rules protecting investors. Crypto activities are not subject to the control of any official authority. The bank of Italy is not releasing

official opinions about digital assets; however, it wants to protect all its citizens from the risk (Consob; Banca d'Italia, 28 April 2021).

There are different mindsets between banks and asset management companies that are working hard in order to provide their customers for valid products to directly invest in Bitcoin or promoting the development of underlying products following the trend of the digital asset. In this way, they will reach a new market segment of the financial sector and thanks to their top rank position among world financial institutions, they could exploit the first mover advantage. National banks at first sight are much more concerned for the lack of regulation and the ease of losing money control. They would like to protect investors from the attractiveness of easy capital returns. However, after having read the first chapter which explains the role of the State in the monetary system, people can understand that governments moves are driven by the necessity to keep fiat money working.

If financial institutions start investing in Bitcoin, they will make its value increase and stabilize its volatility. By introducing more digital assets in their portfolios, cryptocurrencies will become a kind of reserve of value because part of their fiat money will be transformed into digital assets. However, if Bitcoin keeps appreciating and central banks do not own any of it, they will find themselves at an extreme disadvantage: the market value of their reserves in gold will be depreciated because people will prefer Bitcoin. When banks will be willing to buy digital assets, their price would be too high and it would be too late. The first central bank that will accept the future role of digital assets in the financial world and will exploit the first mover advantage, is the bank that will buy Bitcoin for the lowest price. From that moment, all the other banks will be obliged to follow and they will increase the demand of the crypto by significantly increasing its value and making it more expensive for the late comers.

Central banks must understand that their comfort zone guaranteed by government protection is finishing. A new direct competitor is innovating the financial sector and it is going to get the approval by many investors. The main threat is that cryptocurrencies are not controlled by governments and therefore, they cannot manage them as they wish. It is important to highlight that Bitcoin is not something

physical, it cannot be converted into physical assets such as coins, therefore, if the governments want to legislate over it, they must consider a completely new financial scenario. Nevertheless, if central banks do not want to completely lose their role, they should start accepting digital assets and find a compromise between the new and the old monetary system.

## CHAPTER FIVE: Cryptocurrencies in financial portfolios

### ANALYSIS: PAST PERFORMANCE AND VOLATILITY

This chapter deals with a more economic perspective of Bitcoin. The focus is on the past performance of the digital asset with an explanation of its volatility. The study is considering cryptocurrencies as an investment asset because, at the present time, Bitcoin has not the required characteristics to be the next medium of exchange since it is not yet widely accepted.

First of all, it is necessary to explain what volatility is and how it can be calculated. Investopedia defines volatility as “a statistical measure of the dispersion of returns for a given security or market index. In most cases, the higher the volatility, the riskier the security” (Hayes, 2021).

Better explaining this definition, volatility is how much the returns of a security or digital asset can change in value with respect to the average value. For instance, Bitcoin has a high volatility because its value is fast changing. Today, it can have a positive return due to increasing demand and quotation, but there is the possibility that tomorrow it will show a very low quotation registering important losses for investors. On the contrary, there are securities that have a low volatility because their return is expected to be almost fixed and guaranteed by the issuer. It is easy to understand the relation: the higher the volatility of the asset, the higher would be its expected return. This means that if the investor is willing to undertake higher risk to buy stocks or cryptocurrencies, he will have greater possibilities to get higher capital gain with respect to those people investing in less risky securities. However, people must consider the strictly existing correlation between volatility and risk. High volatility always takes a higher risk. Meaning that, when the asset shows a high volatility, the investor is bearing the risk of looking at his investments to lose their value very often in the short period. Similarly, he can watch at their appreciation. As it has been previously explained in chapter 4, the level of volatility is a personal choice. The investor must understand his tolerance according to his own behavioural, psychological characteristics and attitudes toward investments. For this reason, it is extremely important to find the correct investor profile to understand the maximum level of risk people are willing to undertake and the degree of volatility to choose in the asset picking during the portfolio construction.



The investor must know that, according to personal riskiness, there are different securities to consider. Experts usually make a general classification of assets dividing them into four categories: stocks, corporate bonds, government bonds and commodities. In this thesis, cryptocurrencies are considered as an additional asset class.

Starting briefly analysing them, the investor must be aware of the riskiness of each asset. Government bonds are said to be the safest investment because they are guaranteed by the treasury department of the State. However, their expected return is very low and sometimes the investor is committing money for the long-term. Corporate bonds have higher returns because the investment is not protected by the risk of failure of the company, meaning that the bondholder is accepting to run a higher risk. By the way, in the unfortunate case in which the firm goes bankrupt, the bondholder is repaid earlier with respect to the stockholder. Following with the description of the assets ranked for their riskiness, there are stocks. They are the asset with the highest level of volatility in the traditional market for its close relation to the expected performance of the company. Since stockholders are the financiers of the corporate, in case of failure, they are the last ones to have the capital paid back. On the contrary, the market value of commodities does not depend on the value of stocks or bonds. Their value is strictly correlated to the available quantity, to their demand and to different types of risks such as price risk, cost risk, quantity and political risk. Inside the category of commodities, it is possible to put raw materials, agricultural products and precious metals as gold. These kinds of products are usually introduced inside a portfolio to help reducing the inflationary risk. By the way, the introduction of cryptocurrencies has outclassed stocks in terms of riskiness. Nowadays, cryptos are the most volatile asset and in this kind of investment the capital is never insured.

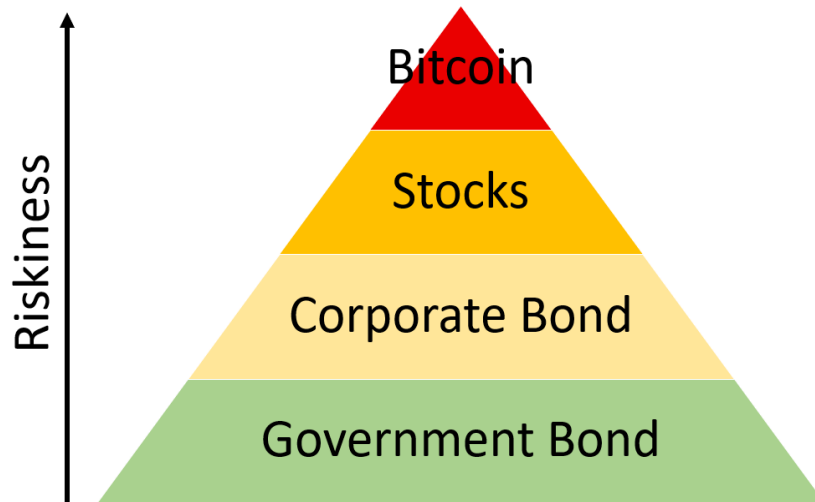


Figure 3 - Securities riskiness<sup>3</sup>

The concept of volatility and its relationship with returns that has been explained so far, comes from the traditional market point of view. The economist Ammous Saifedean innovatively interprets volatility from the cryptocurrency’s perspective as “the reflection of the growing use and utility that the network offers its users” (Saifedean, 2018, p. 185). This sentence can be hold true both for traditional assets and cryptocurrencies: the asset return, and its volatility depend on how much the good or the service provided by the company is useful to the users. Better explained, the higher the quantity sold, the better the corporate performance, the higher its stock market price and the lower the volatility because the demand is more stable, and this allows the company to be better graded in financial markets. By the way, the definition better suits to the cryptocurrency sector since the volatility of the returns is mostly due to the market willingness to hold the asset. The more people want to buy Bitcoin, the more its value increases. It follows that when the value is decreasing, many investors are selling. The high volatility that characterizes Bitcoin is related to two aspects: the first one is the fixed supply and the second one is the continuous increasing number of people joining the network. Considering the fixed number of Bitcoin available in the market, the increasing number of people interested in entering it and demanding to buy Bitcoin cannot make its supply increase, therefore, Bitcoin value will raise as stated by the traditional

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<sup>3</sup> Source: Author’s elaboration

microeconomic rules. Hence, people could notice that, in the case of Bitcoin, the volatility is not correlated to the performance of the asset but rather, it is strictly depending on the number of people willing to own the crypto. The fact that the supply of Bitcoin is predetermined in time, makes it difficult to predict what could be the average volatility of the asset. As long as its supply (until the release of the full amount of Bitcoin) and demand will change in time, volatility will do the same. These oscillations will also make it difficult to forecast the crypto performance in the short-term future. Bitcoin volatility has not to be hardly considered as the one of traditional assets because Bitcoin is still growing in acceptance and therefore, its value is rapidly changing. When the market will be more mature, all Bitcoin will be released and most investors will hold it, then volatility would be lower and more controllable.

Downloading the monthly values of any asset, it is possible to run some easy calculations and get the basic statistics which will be necessary to build a graph showing the past performance. It is important to highlight that people should not base financial decisions just by looking at the past trend; it has to help investors to make further calculations and considerations about what kind of security to choose. In this thesis, it has been decided to build a portfolio made my five assets and for simplicity they are represented by indexes:

- Equity: S&P500 Index – it is the most important North American equity benchmark for listed stocks on Wall Street, furthermore, it is the underlying of an incredible wide range of derivative products such as futures, options and certificates; (Borsa italiana, 2019)
- Corporate bond: Corporate LUACTRUU Index – “The Bloomberg US Corporate Bond Index measures the investment grade, fixed-rate, taxable corporate bond market. It includes USD denominated securities publicly issued by US and non-US industrial, utility and financial issuers” (Bloomberg, n.d.);
- Government bond: Government USGG10YR Index – “The 10-year Treasury note is a debt obligation issued by the United States government with a maturity of 10 years upon initial issuance. A 10-year Treasury note pays interest at a fixed rate once every six months and pays the face value to the

holder at maturity. The U.S. government partially funds itself by issuing 10-year Treasury notes” (Chen, 2021);

- Commodities: Commodity BCOM Index – “It is a financial benchmark designed to provide liquid and diversified exposure to physical commodities via futures contracts. BCOM provides broad-based exposure to commodities, and no single commodity or commodity sector dominates the Index” (Bloomberg, n.d.);
- Bitcoin: Bitcoin XBT/USD Currency – It is the official exchange rate between US dollar and Bitcoin.

The study is based on an American portfolio for an American private investor since it is taking into consideration just US indexes.

The monthly price of each index has been downloaded by Bloomberg. The range of data begins the 31<sup>st</sup> of January of 2011 and finishes on the 31<sup>st</sup> of August of 2021. These data are the starting point of the portfolio building.

The study conducted deals with a portfolio that is investing in stocks, corporate bonds, government bonds, commodities and, of course, a small part in Bitcoin. It has been decided to take in consideration all the different types of securities in order to allow a further diversification of the risk. Investing in the corporate equity allows the investor to own stocks of the most important American companies and to participate to their financing, benefiting from their good performance. As it will be better explained, equity investments have a high volatility, however, they are a good mean to get high returns. The risk of the equity market is partially hedged by investing in commodities and corporate bonds. Even if the capital yield is usually lower, bondholders feel safer to receive back at least the same amount invested and not running the risk of losing the initial capital. “The principal potential benefits of including commodities in a diversified financial portfolio include positive returns over time and low correlation with equities and fixed income. Rather than being driven by micro-economic events affecting one commodity market or sector, the diversified commodity exposure of BCOM potentially reduces volatility in comparison with non-diversified commodity investments” (Bloomberg, n.d.). To conclude, it has been added the cryptocurrency asset by looking at the monthly

conversion rate between dollar and Bitcoin. This security will be the riskiest in the portfolio but also the asset that could pay for the highest return.

The starting point to analyse data is looking at the values of the quotation, which is the price at which investors buy the asset. Here below, the graph is built by using prices transformed into logarithm and it shows the past level of securities' prices:

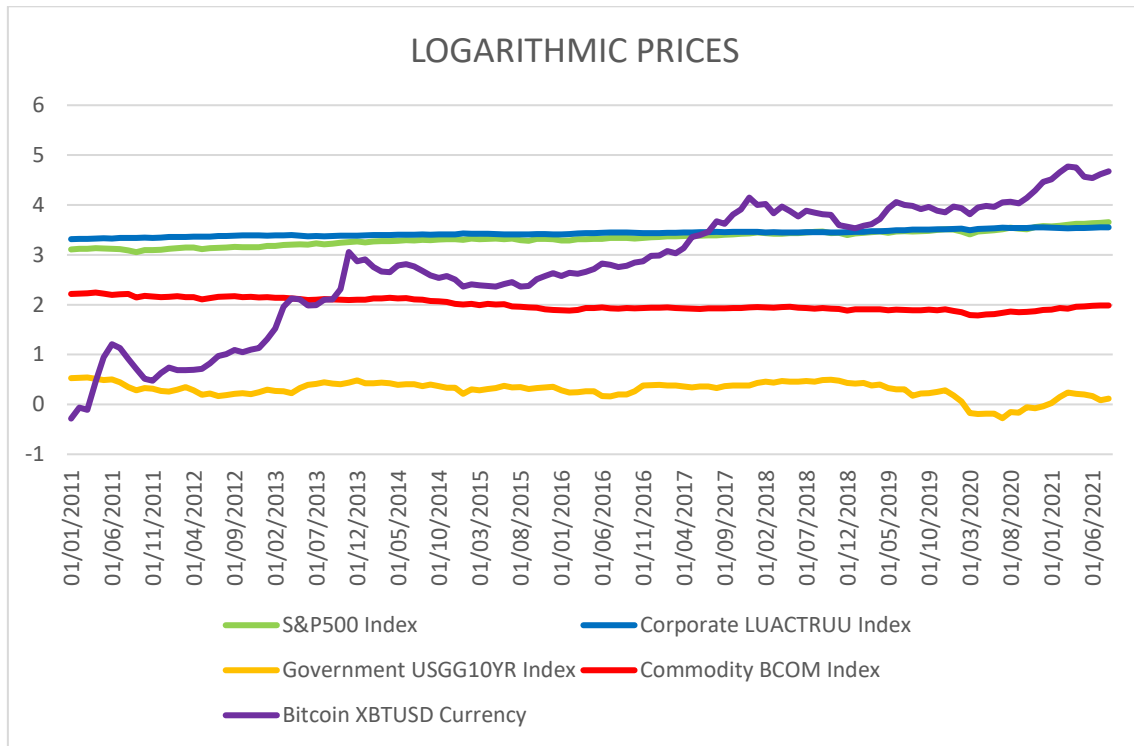


Figure 4 - Prices in logarithmic scale<sup>4</sup>

According to the chart, it is possible to see that traditional assets' prices have remained quite stable even if they show minimal oscillations. The government bond is the security which showed a higher volatility, above all at the beginning of the Covid pandemic and today it has a lower value that the starting one in 2011. While Bitcoin price is exponentially increased over the time showing how much its value has changed in just ten years. This data is reflecting the increasing willingness of investors to enter the crypto market.

<sup>4</sup> Source: Author's elaboration

The basic statistics of the assets have been calculated by analysing the above monthly prices using excel. Firstly, it has been necessary to calculate monthly returns of the securities with the formula:

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

Where  $P_t$  is the final price of the month and  $P_{t-1}$  is the initial price of the same month.

*Equation 1 - Return Formula*

Once the return for each month has been computed, it has been possible to build a graph, showing the monthly past performance of the securities (Figure 5). The indexes representing equity, corporate bond, government bond and commodities have small oscillations: they are roughly following the same path and returns are close each other. What catches the eye is the purple line, the one drawing the past performance of Bitcoin. The cryptocurrency trend is changing very often showing drastic ups and downs. The most volatile period of the security has been in the first years of adoption when it was very unpopular, and people were just betting few money on the functioning of an unknown project. This was the period in which Bitcoin was mainly used in the dark web and the case of the Silk Road came out negatively influencing its reputation. Thereafter, oscillations started to reduce until 2017 when, with the explosion of the phenomenon of ICOs, Bitcoin became famous all over the world. People started to be very interested in the digital asset and its demand significantly increased. This is illustrated even by the continuously increasing level of its price since 2011 as it is shown in Figure 4 in the price trend. However, just at the beginning of the Covid pandemic in 2020, the Bitcoin performance has shown a steep increase in its adoption driving the price to higher levels never seen before. It is interesting to notice that cryptocurrencies' oscillations are more and more similar to each other and therefore, kind of predictable. The high volatility of the asset has been surely consistent during the initial years and it is certainly the most volatile security even nowadays, however, returns are becoming a little bit more constant. Moreover, as previously said, it is possible to observe that, during the last pandemic year, Bitcoin has been positively correlated with the traditional market even if it has shown higher returns.

It is extremely important to remember investors that knowing the past trend has not to be the driving information of the investment decision. The past performance has to be helpful just to try to make some forecasts about the future value. Past performances are not guaranteeing the future returns, investors should not expect a positive result just because the asset has always gone well. The old trend must provide people a sense of future direction but mostly, it has to be the starting point for further studies which will allow people to understand whether the asset could be a good investment or not.

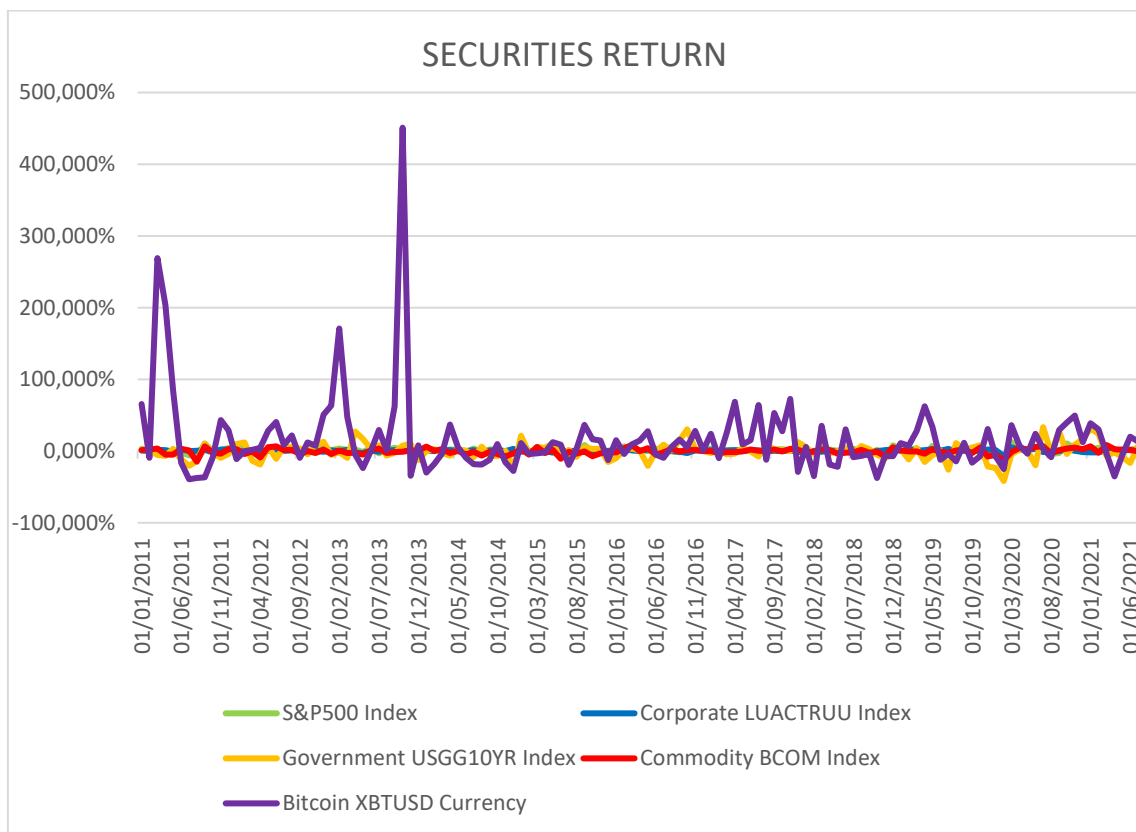


Figure 5 - Securities return<sup>5</sup>

At this proposal, after having calculated the monthly returns, it has been highlighted the maximum and the minimum historical return shown by the asset during the past performance. This was necessary to emphasize the difference in the range of the assets' returns and to compute the average return of the asset which is extremely important to estimate other basic statistics. Furthermore, it allows the investor to build future expectations about its expected return.

<sup>5</sup> Source: Author's elaboration

With the monthly return, it has been possible to calculate the standard deviation ( $\sigma$ ) which is the unit of measure of the volatility of each security:

$$\sigma = \sqrt{\frac{\sum_{i=1}^N (x_i - \bar{x})^2}{N}}$$

Where  $x_i$  is the return of each month,  $\bar{x}$  is the average return and N is the number of observations.

*Equation 2 - Standard deviation formula*

From the calculation of the standard deviation, it is possible to compare the five different assets. The standard deviation defines the dispersion of the return of the asset with respect to the average return. For instance, by looking at the standard deviation on Table1, it is possible to see that the  $\sigma$  of the S&P500 index is 3.834% meaning that its return, on average, is 3.824% above or below the mean of the returns (1.068%). While corporate bond return varies from the average return for a standard deviation of 1.462% and commodities return has a dispersion up or down from its negative average return of 3.984%.

The investor already knows the direct relation: the higher the standard deviation, the higher the risk to bear but also the higher the future returns. These are the basic information the investor must know but most important, as highlighted many times, he must know the maximum capital he is willing to lose.

Following with the description of basics statistics, it is possible to notice that the government bond and cryptocurrencies standard deviations are particularly high. The government bond over 10 years has a negative return for 0.053% but the high value of the standard deviation shows that the asset oscillated up and down for 11.578%. However, even if the standard deviation is high and reflects a higher risk, government bonds are guaranteed by the State, therefore, the initial capital is always repaid at the face value. For what concerns the Bitcoin convertibility in US dollar, the average of its return is 16.715% which is the highest average return among the securities, but the oscillations, measured by a standard deviation of 56,46%, are suggesting that the ups and downs of its value are usually very far away from the mean.



After the calculation of the standard deviation, it has been supposed that the risk-free rate is 0% which is the theoretical rate of return of an investment with zero risk. This data is important to be able to calculate the Sharpe Ratio which indicates the extra return earned by the investor in excess of the risk-free rate for any unit of the standard deviation. This allows to understand the extra return the investor can gain by accepting to increase the standard deviation for one unit. The formula of the ratio is:

$$\text{Sharpe Ratio} = \frac{R_p - R_f}{\sigma_p}$$

where  $R_p$  is the return of the asset considered,  $R_f$  is the risk-free rate and  $\sigma_p$  is the standard deviation of the asset.

*Equation 3 - Sharpe Ratio formula*

The Sharpe ratio compares the return with the risk that the investor is undertaking by investing in the asset. Looking at this data, people can see that the best asset is the corporate bond since it ensures a high return for a low standard deviation. This means that according to the lower level of riskiness, it is the asset that is paying the highest return. Bitcoin is the following asset. It shows a Sharpe ratio of 29.605% - the high standard deviation is significantly reducing the importance of the average return, and this frightens investors. Government bonds and commodities have a negative Sharpe ratio meaning that they are not such a good investment since the average return of the security is not worth the risk people are bearing. Comparing the five assets and looking at the Sharpe ratio, the investor should invest in the equity market, in corporate bonds and Bitcoin since the three percentages are close each other and their average return is equally worth even if they show a completely different level of risk.

Here below, it is attached the table which summarizes all the basic statistics calculated and commented.

	AVERAGE RETURN	MIN RETURN	MAX RETURN	STANDARD DEVIATION	RISK FREE	SHARPE RATIO
S&P500	1,068%	-12,512%	12,684%	3,824%	0%	27,935%
Corporate	0,440%	-7,086%	5,243%	1,462%	0%	30,078%
Government	-0,053%	-41,712%	33,434%	11,578%	0%	-0,455%
Commodity	-0,340%	-14,736%	8,491%	3,984%	0%	-8,528%
Bitcoin	16,715%	-39,259%	451,032%	56,460%	0%	29,605%

Table 1 - Basic statistics summary<sup>6</sup>

## ANALYSIS: THE RISK PARITY METHOD

It is extremely important that people decide how much to invest in cryptocurrencies and in all the other traditional financial assets in order to build a balanced portfolio taking into consideration the risk they are ready to sustain. Using the traditional approach, it is possible to build portfolios according to the covariance between the assets and their expected return. While in this thesis, the portfolio building is based on the risk parity method which allows people to select any type of security. Bridgewater, an asset management company, says that the risk parity method “is about balancing a portfolio’s risk exposures to attain a greater chance of investment success than what is offered by traditional, equity-centric approaches to asset allocation” (Prince, 2011). It suggests identifying uncorrelated assets because they can generate higher returns over the time resulting from long-term stability while the traditional approach is not reliable since correlations are unstable and unpredictable. Moreover, when two securities are negatively correlated, one is earning at the expense of the other, on the contrary, when they are positively correlated, they move in the same direction in both situations of gain or loss, hence, there is no diversification in the portfolio. The risk parity method “recognizes that the only way to achieve reliable diversification is to balance a portfolio based on the relationships of assets to their environmental drivers, rather than based on correlation assumptions, which are just fleeting by products of these relationships” (Prince, 2011). By implementing the risk parity method, it is going to suggest to the investor the maximum percentage of capital to invest in each specific asset. This

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<sup>6</sup> Source: Author’s elaboration

method is interesting because it is not setting limits to people imposing them to not invest in riskier securities. The risk parity “allocates funds to different asset classes and inside the cryptocurrency sector based on two factors. First, it spreads out investments to reduce correlation. Second, it maximizes for the best returns in each of those investments based on the user’s level of risk tolerance” (Murphy, 2021).

The global financial crisis that broke out in 2008 brought the need of managing and optimizing the risk rather than the portfolio return spreading the use of the risk parity approach. This method has become famous for two main reasons: it diversifies the risk among assets and it is less sensitive to estimation errors. Contrary to the traditional approach of asset picking, the risk parity method analyses and equally divides the variance of the portfolio among securities. It means that it forces each asset to identically contribute to the portfolio volatility. The purpose of the risk parity approach is to equalize the risk allocation among assets rather than simply distributing them in the same weight. Put it simple, the traditional approach allocates securities with the same weight and different risk contribution to the overall portfolio, while the risk parity method equally allocates the variance among securities showing different levels of weights according to the intensity of their volatility.

Considering the high volatility of the cryptocurrencies, it has been interesting to introduce them into traditional portfolios by using the risk parity approach which allows to allocate securities giving much more importance to their risk rather than to their return. Therefore, the method is carefully considering the risk because it tries to improve the portfolio behaviour in the negative phases of the market by lowering the weight of the riskiest assets. It follows that, the portfolio overall return is not affected too much by the fast changes of the Bitcoin value given the small weight of the crypto asset.

The portfolio vector  $\mathbf{w}$  denotes the normalized dollar weights allocated to the  $N$  assets which is supposed to follow a i.i.d. distribution with mean  $\mu$  and covariance matrix  $\Sigma$ . The vector of the returns of  $N$  assets at time  $t$  is denoted with  $\mathbf{r}_t$ , such that  $\mathbf{1}^T\mathbf{w}=1$  and the portfolio return is then  $r_t^{\text{portf}}=\mathbf{w}^T\mathbf{r}_t$ , with expected return  $\mathbf{w}^T\mu$  and variance  $\mathbf{w}^T\Sigma\mathbf{w}$ .

The volatility of the portfolio  $\sigma(\mathbf{w}) = \sqrt{\mathbf{w}^T \Sigma \mathbf{w}}$  can be decomposed as:

$$\sigma(\mathbf{w}) = \sum_{i=1}^N \omega_i \frac{\partial \sigma}{\partial \omega_i} = \sum_{i=1}^N \frac{\omega_i (\Sigma \mathbf{w})_i}{\sqrt{\mathbf{w}^T \Sigma \mathbf{w}}} \text{ so that,}$$

the risk contribution ( $RC$ ) from the  $i$ th asset to the total risk  $\sigma(\mathbf{w})$  is defined as:

$$RC_i = \frac{\omega_i (\Sigma \mathbf{w})_i}{\sqrt{\mathbf{w}^T \Sigma \mathbf{w}}} \text{ which satisfies } \sum_{i=1}^N RC_i = \sigma(\mathbf{w}).$$

The relative risk contribution ( $RRC$ ) is a normalized version:

$$RRC_i = \frac{\omega_i (\Sigma \mathbf{w})_i}{\mathbf{w}^T \Sigma \mathbf{w}} \text{ so that } \sum_{i=1}^N RRC_i = 1.$$

The risk parity portfolio ( $RPP$ ) tries to “equalize” the risk contributions:

$$RC_i = \frac{1}{N} \sigma(\mathbf{w}) \text{ or } RRC_i = \frac{1}{N}.$$

More generally, the risk parity portfolio ( $RPP$ ) wants to allocate the risk according to the risk profile determined by the weights  $\mathbf{b}$  (with  $\mathbf{1}^T \mathbf{b} = 1$  and  $\mathbf{b} \geq \mathbf{0}$ ):

$$RC_i = b_i \sigma(\mathbf{w}) \text{ or } RRC_i = b_i.$$

The parity condition  $RC_i = b_i \sigma(\mathbf{w})$  can also be expressed as  $\omega_i (\Sigma \mathbf{w})_i = b_i \mathbf{w}^T \Sigma \mathbf{w}$ ,  $\forall i$ .

*Equation 4 - Risk parity methodology*

Practically, people just have to choose the securities in which to invest. Following the risk parity method and by running the correct data, computer programs will give back the adequate percentage to invest in each asset taking into consideration the equally distributed volatility. “A balanced portfolio offers a higher ratio of return-to-risk and delivers a return-to-risk ratio roughly double than that of the traditional, equity-dominated portfolio. This higher ratio can be exploited to achieve the same return with less risk, or greater return for the same risk” (Prince, 2011). Bridgewater has been the pioneer in applying this approach more than twenty years ago and it is still using it today. Institutions say that the method has been tested enough during the years because it went through calm periods but also global financial crisis, recessions, bull and bears of the equity market with different FED rules scenarios. Moreover, Bridgewater sustains that the risk parity method allows people to have better returns on their investments by being exposed to lesser risk.

Here below, the R Studio script that has been run in the program to build the demo portfolio studied in the thesis. The data used to apply the risk parity method are the S&P500, corporate bond, government bond, commodities and Bitcoin returns that have been previously calculated:

```

> setwd("C:/Users/utente/Desktop")
> library(readxl)
> cartel2 <- read_excel("cartel2.xlsx")
> View(cartel2)
> sigma<-cov(cartel2)
> library(riskParityPortfolio)
> rpp<-riskParityPortfolio(sigma)
> rpp
$w
RETURN sep RETURN corp RETURN gov RETURN comm RETURN bit
0.13662821 0.62325177 0.07756739 0.14823552 0.01431712

$relative_risk_contribution
RETURN sep RETURN corp RETURN gov RETURN comm RETURN bit
0.2 0.2 0.2 0.2 0.2

$obj_fun
[1] 2.235242

$is_feasible
[1] TRUE

```

*Equation 5 - Risk parity script in R*

The code allows, first of all, to upload return data on the computer program: in the first row there is the name of the time series, all the other rows show asset returns. There is no date in correspondence of each value since R Studio does not need the time information. Thereafter, it has been calculated sigma which stands for the covariance matrix of the securities. It represents the asset variation with respect to the other securities and the asset itself. It is a 5x5 symmetric matrix - as the number of the assets taken into consideration - meaning that the number of rows and columns is equal. The following step is to open the risk parity portfolio library and run the code. The risk parity portfolio works on the covariance matrix because it is studying the existing correlation among the assets and the overall variance of the portfolio. "This function designs risk parity portfolios to equalize/distribute the risk

contributions of the different assets, which is missing if we simply consider the overall volatility of the portfolio as in the mean-variance Markowitz portfolio. In addition to the vanilla formulation, where the risk contributions are perfectly equalized subject to no short selling and budget constraints, many other formulations are considered that allow for box constraints, as well as the inclusion of additional objectives like the expected return and overall variance” (Vinicius & Palomar, 2021). From the results of the vanilla formulation used, it is possible to look at the suggested weights for each asset. In this specific portfolio asset allocation: S&P500 index (13.66%), Corporate bond (62.33%), Government bond (7.76%), Commodities (14.82%) and Bitcoin (1.43%). As discussed before in the methodology of the risk parity approach, assets are allocated by equally distributing the overall risk of the portfolio for the five asset classes, resulting a 20% variance for each security. This means that the percentage allocation of each of them depends on the size of its own standard deviation. The higher the asset standard deviation, the lower the weight in the portfolio. It follows that, by using the risk parity approach, the very high volatility of cryptocurrencies is penalizing the weight of the security in the portfolio, indeed, the percentage allocation is minimal, and the minimum is the marginal return. Figure6 shows the equal division of the portfolio variance among the five assets and Figure7 represents the weight allocation of the securities according to the level of their standard deviation.

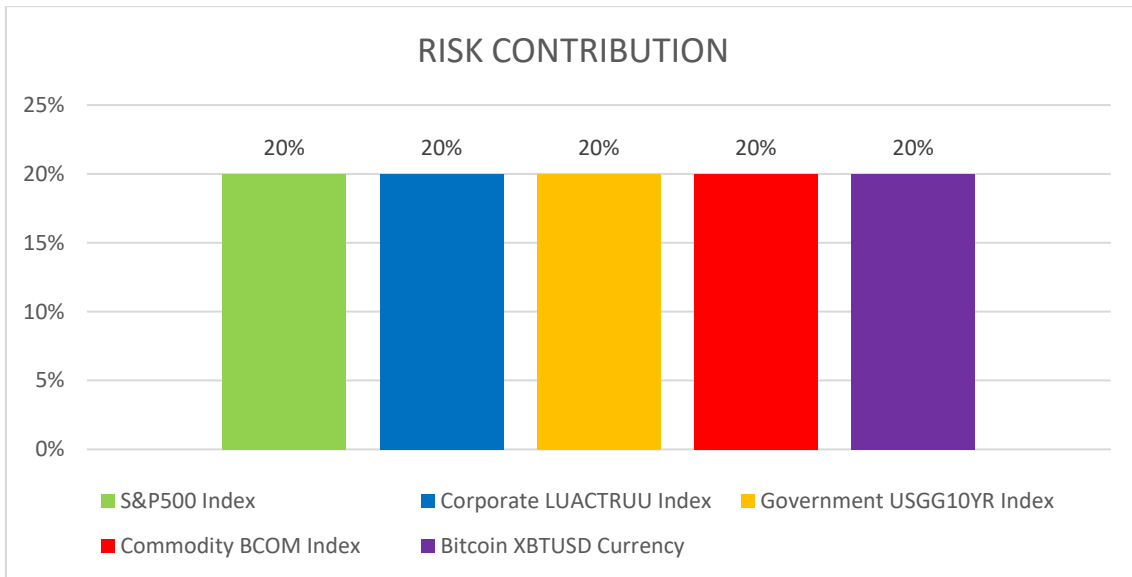


Figure 6 - Asset risk contribution<sup>7</sup>

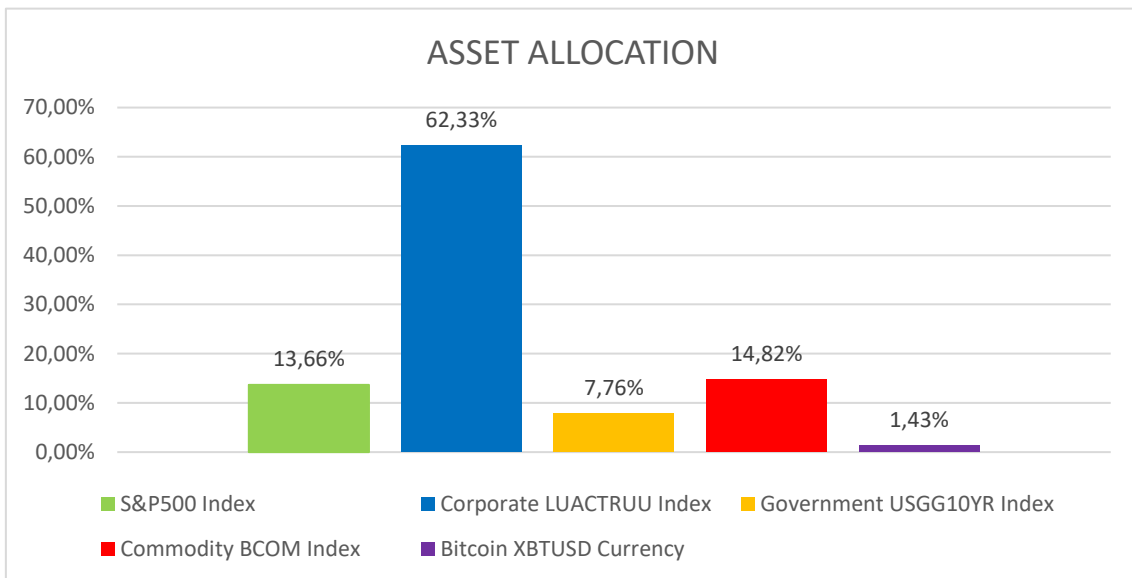


Figure 7 - Asset allocation<sup>8</sup>

The obtained results are perfectly in line with the expectations and the considerations made with the calculation of the basic statistics. Given the high volatility of Bitcoin, it was predictable to get a very low percentage inside the portfolio. However, even if capital allocated in it is very small, it is still the asset with the greatest expected return. On the contrary, corporate bond is the security with the higher allocation percentage and, as the Sharpe ratio confirms (30.078%), it is

<sup>7</sup> Source: Author's elaboration

<sup>8</sup> Source: Author's elaboration

the asset which allows to have better performances with respect to its risk. Commodities have low correlation with the other assets and that is why there is a high percentage allocation even if they show negative average return and Sharpe ratio with a high standard deviation. Though, they are important because their uncorrelation allows to hedge the risk against inflation. The pure equity allocation percentage, represented by the S&P500 index, is quite low since the standard deviation is high. The same reasoning is for the government bond: it has the highest standard deviation among the traditional assets for a negative average return and the Sharpe ratio is advising to not invest on it since the risk-free investment would be more profitable.

By building the overall portfolio and multiplying the weight of each asset for its monthly return, it is possible to understand how the portfolio has gone through the ten years of study. Here below, it is attached the graph representing the performance:

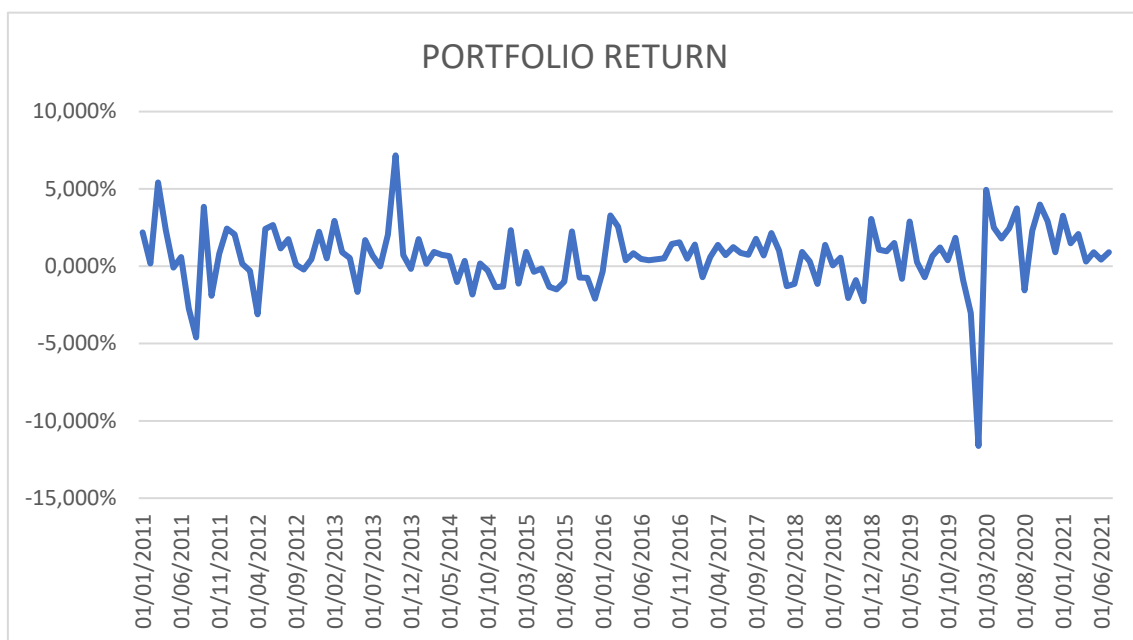


Figure 8 - Portfolio return<sup>9</sup>

The performance of the portfolio shows a fast-changing trend with numerous ups and downs mostly in the first years and it might be due to the high volatility that Bitcoin shows in the same period. However, its little weight in the portfolio does not

<sup>9</sup> Source: Author's elaboration



influence too much the portfolio performance and the presence of more stable assets as corporate bonds and commodities make the portfolio return oscillating between  $\pm 5,00\%$ . The deepest point is dated March of 2020 in correspondence with the beginning of the Covid pandemic which influenced a lot the value of each security. Though, by closely looking at the overall performance, it has been positive most of the times.

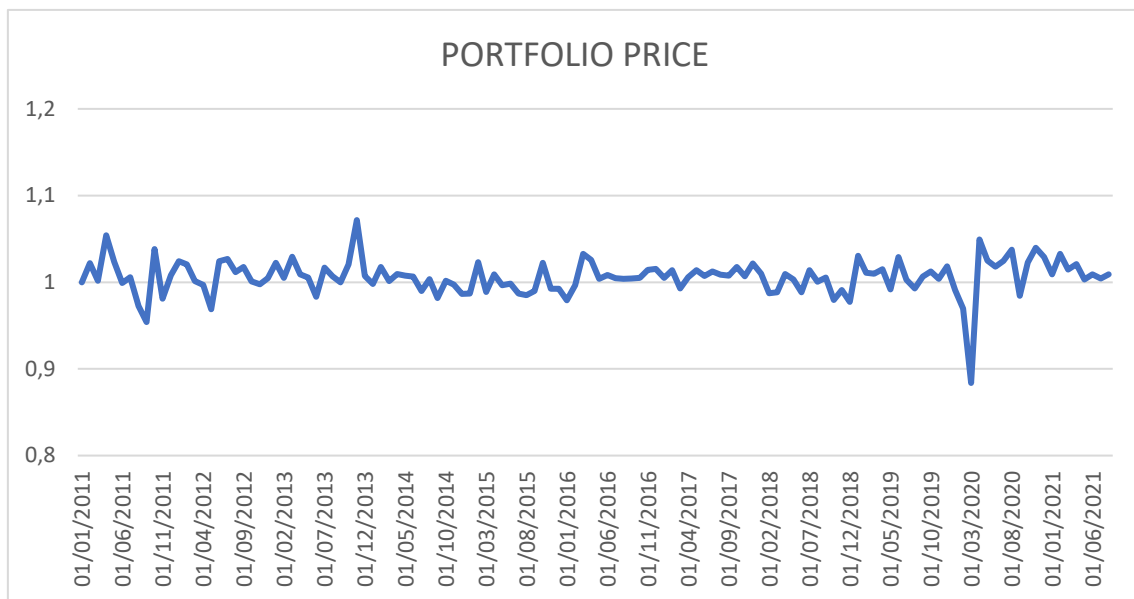


Figure 9 - Portfolio price<sup>10</sup>

Moreover, it has been assumed the price at \$1 for the first purchase. Consequently, by adding to the initial price its multiplication for the value of the monthly portfolio return, it has been possible to reconstruct the portfolio price. Most of the times the portfolio price has been increasing but, apart from the evident influence of the Covid pandemic, it has never drastically oscillated.

It has been supposed to invest \$100 in the portfolio on the 31st of January of 2011. Having computed the specific weight for each asset inside the portfolio, it has been necessary to understand the monetary amount for each security: it is possible to look at them in Table2 which shows the extremely little amount that the risk parity approach has allocated in cryptocurrencies.

<sup>10</sup> Authhor's elaboration

	S&P500 Index	Corporate LUACTRUU Index	Government USGG10YR Index	Commodity BCOM Index	Bitcoin XBTUSD Currency
<b>STANDARD DEVIATION</b>	20%	20%	20%	20%	20%
<b>WEIGHTS</b>	13,66%	62,33%	7,76%	14,82%	1,43%
<b>Capital invested = \$100</b>	13,66 €	62,33 €	7,76 €	14,82 €	1,43 €

Table 2 - Demo portfolio building<sup>11</sup>

Thereafter, the portfolio basic statistics have been calculated, showing an average return of 0.605% over ten years and a 2.044% of standard deviation. Even in this case, the risk-free rate assumed is 0% which allows to compute the Sharpe ratio. According to data, the portfolio excess return from the zero-risk security is 29.577% which means that it has a good chance to register higher capital gains with respect to not risky investments. From January of 2011 to August of 2021, the overall value of the initial capital invested in the portfolio is \$100.90 (+0.9%) meaning that the portfolio has overperformed with respect to the average return calculated.

	AVERAGE RETURN	MIN RETURN	MAX RETURN	STANDARD DEVIATION	RISK FREE	SHARPE RATIO
Portfolio	0,605%	-11,623%	7,168%	2,044%	0%	29,577%

Table 3 - Portfolio basic statistic

Even if the weight of the assets is different among the securities, they are equally participating to the risk of the portfolio, however, the small allocation of capital in cryptocurrencies is not enough to guarantee investors the high expected marginal return and neither the significant result that they might desire. However, the risk parity method which equally allocates the variance among securities, gives the opportunity to invest in the riskier assets, and, on the other side, protects the investor by investing moderate amounts. The risk parity is an efficient method to introduce cryptocurrencies as new investment asset inside traditional portfolios.

<sup>11</sup> Source: Author's elaboration

## CONCLUSION

The thesis had the purpose to introduce the new investment asset of cryptocurrencies considering the increasing number of people joining the network. The first four chapters are describing the characteristics of cryptocurrencies and the ones of the monetary and legal systems. Even if cryptocurrencies initially proposed themselves as substitutes to fiat currencies, their past performance characterized by high volatility makes improbable their adoption as payment method. For this reason, cryptocurrencies have started to become more interesting from an investment point of view. The practical example of portfolio building that has been shown in chapter five is the key point of the thesis. It shows the real introduction of cryptocurrencies in a hypothetical retail portfolio by using the risk parity approach. Given the high volatility of cryptocurrencies, the adoption of the risk parity approach has been considered the best option to build a well-balanced portfolio with equal risk exposure among assets and minimal capital allocation in cryptocurrencies. It has been used this method because it is taking into consideration the risk of each security to introduce in the portfolio. The risk parity approach equally allocates the risk of the assets by dividing in equal parts the overall variance of the portfolio. The weights of securities are changing according to the size of the standard deviation, showing high weights for few volatile assets. According to the study of the portfolio, it was expected that the cryptocurrencies will have had a low weight. The asset is manifesting an extremely high standard deviation which makes considering cryptocurrencies very risky. Indeed, the high volatility, calculated from the monthly returns of the index conversion between Bitcoin and US dollar, allows to allocate on them a minimal percentage of capital. However, the little amount of money invested is not influencing too much the performance of the overall portfolio: even if the amount invested \$1.43 should earn the average return of 16.715%, then, the capital gain would be \$0.24, very marginal with respect to the total investment of \$100. It holds true the same reasoning in the negative scenario, if the cryptocurrency loses 16.715%, then, the portfolio loses \$0.24, hence, the marginal contribution is very minimal. Therefore, cryptocurrencies can be introduced as investment asset in retail portfolios by using the risk parity approach which considers the high volatility of the asset and suggest the adequate amount to invest in each security.

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