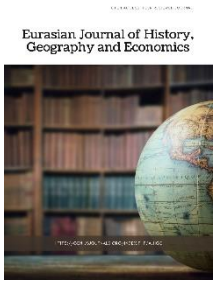

The Economic Efficiency Analysis of Digital Currency Markets

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ABSTRACT

This work studies the influences of the first 10 digital currency markets. It utilized two main approaches. The first is inductive while the second is deductive. The latter starter from general to specific. Also, the first is theoretical and conceptual in structure and is the basic foundation for this research. This structure is examined and compared to empirical interpretations. This increased uncertainty period caused non-annualized every day stock returns of more than 5% with 10% returns and loses, respectively. The most digital currency one-half values were lost, yet 10% equity was disappeared due to COVID-19. Despite the rapid price decrease because of COVID-19, the digital currency markets have conserved their economic efficiency. The results have shown different fascinating insights facilitating understanding the influence of the crises on the investor's behaviors. Yet, digital currency markets have retained their economic efficiency. Also, the initial concept showed with the beginning of volatility, investors aims at departing from traditional markets entering alternatives including the digital currency, at least in the early crisis stages.

Keywords: Blockchain ; Bitcoin, cryptocurrency ; digital currency ; ICO

1. Introduction

Unregulated digital money refers to the digital currency accepted and utilized by a certain virtual people and often produced which its developers controlled (European Central Bank, 2012).Also, the EU Parliament defined it as middle solutions considering digital currency as a digital representation of a value aimed at making up a peer-to-peer (P2P) alternatives to legal tenders which the administration issues and, the mechanism secures, i.e., cryptography for exchanging overall central bank medium frees moving it into legal tenders and the opposite is true (Katarzyna,2019). Digital currency as financial assets have not shown any safe haven features in any major economic crisis and recession. For the first time in the money history, Satoshi Nakamato has made a private digital currency where a user empowers a decentralized peer-to-peer payment networks with no intermediaries or central authorities (Nakamato,2009).

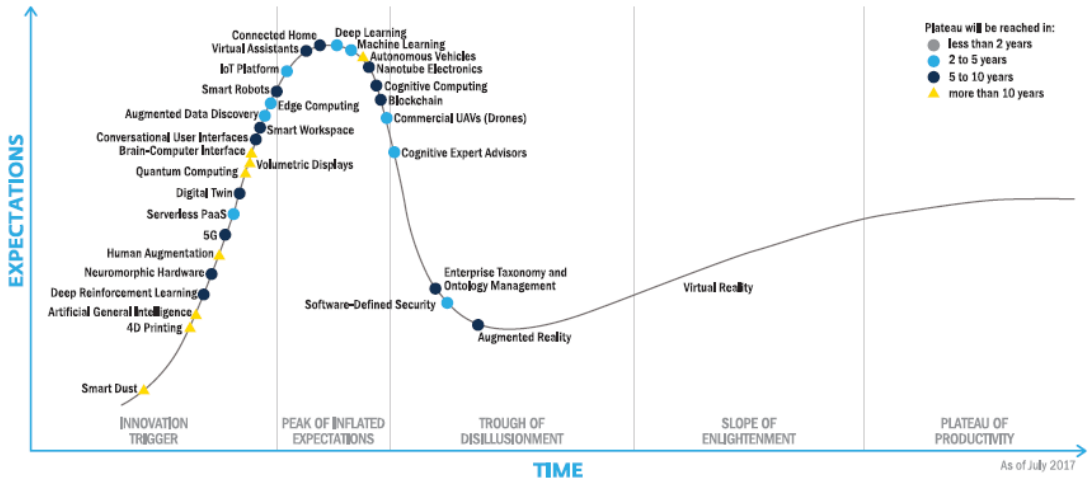
A digital currency (known virtual currency) usually means digital entries in a distributed ledger or databases in a networks of computers or node (Kulkarni, Schintler, Koizumi, Olds & Stough,2019).According to Perkins (2020), the validation of the payments is through a system of users' decentralized networks and cryptographic protocols not by a centralized ones including banks in an electronic payment system in which digital currency is digital money. Until now, economics research has supplied little knowledge on the economic relevance of digital currency. In addition, the economic studies on the influence of digital currency is scarce. This

study proposes a framework for scholars to analyze similar cases. It analyzes the influences between top ten digital currency market. This study is divided into: Section 2 with the theoretical background. In Section 3, the data is discussed in addition to methodology while Section4 is the results, and conclusions.

2. Theoretical background

The digital currency operation as money depends on its operation as a unit of account; an exchange medium; and a value store. Digital currencies have many features that prevents the performance of these three interlinked operations in the USA and other countries (Perkins, 2020).Yet digital currencies grow quickly, the blockchain has drawn much attentions as vital technologies. Blockchain as a new technology enabling the re-engineering an economic model and makes product and markets unavailable unprofitable in the past or in the new markets (Miller et al.,2019).To proliferate digital coins, known as digital currencies. Blockchain technology was made. It is the key Bitcoin variations with extra functionality (Harvard.edu,2020).Most fundamentally, digital currency- virtual currency is an exchange medium which works like money for exchanging with services and merchandises. Different from traditional currencies, it is free from the central banks, sovereigns, national borders, or fiats. When states stay away and prices are not stable in the digital currency risk for investing will emerge. Bitcoin fluctuation is strong in the previous few years. Is this technology generally related to cooperating finance and economics, outside the new effectual book-keeping and motivating crypto-assets? Although attention to the endogenous economic of technology in academia increased, any economic shifts seem an entropic system in ecological atmosphere. Paul M. Romer's study of "Endogenous Technological Change'' (1990) is the most cited work in this field seeking finding the equilibrium state in technological changes (Bheemaiah, 2017).World Bank Group(2019) stated that blockchain technology remain a nascent phase of development, yet signs exit showing the hype-cycle of inflated opportunities and enter a more exploration pragmatic stage (Figure 1).In fitting with the famous Gartner Hype Cycle", technology is usually overhyped in its initial stages, and under hyped in the long term at the tech actually progresses. Gartner (2018) states that the world's pioneering study and advisory company reported on blockchain technology "How to Position Blockchain Platforms to Increase Adoption."Adrian Lee, Gartner Senior Research Director, and other have report which is rich with concepts of blockchain technology and its trajectory in subsequent decades. It is "{m}any CIOs overestimate the abilities and short-term benefits of blockchain as a technology for helping them in the achievement of their business goals.

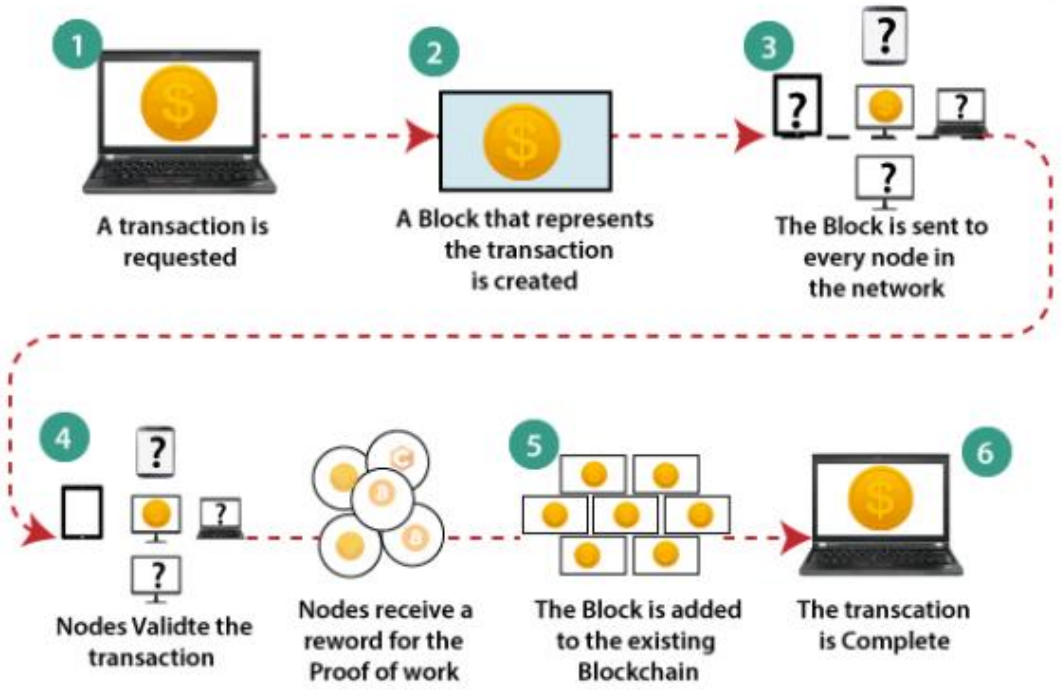
Figure 1. Blockchain Maturity Cycle



Source: World Bank Group,2019

Conventionally, mining is extraction of valuable items, for example gold, coal or diamond requiring a big amounts of resources such money, manpower, tools, and time. The item value relies on how hard are the extraction processes. Likewise, in computer contexts, mining refers to solving complex mathematical problems for some rewards through the use of the computer processing power that consumes electricity to get the results. There is a negative correlation between value and the reward with time and power for processing data (Figure 2).The features of blockchain are persistency, auditability decentralization and anonymity. Decentralization is the validation of each transaction, yet the validation process is not conducted by central trusted agencies including central banks (Ertz & Boily, 2019).For example, Sophia sends Adam 100 Figure 2. How Blockchain Works

Bitcoins, and then she needs to use digital signature for this transaction by her private keys she already has. Then, the transaction is sent to Adam's public keys by her, Adam's Bitcoin addresses on the networks. After that, the transaction is combined as a "transaction block" which Bitcoin network nodes verifies. Then Sophia confirms her signature by the public keys. When Sophia's signature is validated, the processing of this transaction in the network occurs, which adds the block to the chains and 100 Bitcoins transference to Adam from Sophia. The cryptocoins' owners can use and have blockchain technology. This payment system is because it belongs to all network participants, including decentralization principles. Here, a single network users are not able of regulating, developing, maintaining it, etc.



Source: Shishirkant,2020

The appearance of digital currency stresses the lacks in a fiat currency: the peer-to-peer payment quick necessities, assured, cheap, and secure services. Corporations in Western Europe could utilize blockchain technology for saving $450 billion as logistic costs through the

distribution and control of their data instantly with safety (Tunali,2020).This technology is mainly utilized alongside the digital currency and greatly used in other sectors in addition to the financial and economic realms such as trades, government services, chain managements, and health sectors. PwC's analyses show a latency of blockchain technology for increasing universal GDP by $1.76 trillion in the coming ten years. This report examined using the technology currently applied. It also explores the influence of blockchain on the economy of the world (Helpnetsecurity.com,2020). Yet, the extensive and very significant blockchains are made on the basis of Satoshi's bitcoin models. Digital currencies appeared in nearly ten years. Still, they drew a attention universally not until 2017, as Bitcoin price reached $20,000 (Laboure & Reid, 2020). Since 2014, the total capitalization of the digital currency market has intensely risen to1000 folds in six years. It became less 1 trillion Euros by the end of 2019, with the same magnitudes to all circulation of currenciesin October, November and December 2019 1.2 trillion Euros (Gerba & Rubio, 2019).Recorded transaction data are tracked by blockchain as open and distributed registries. Their verifiability and security are because of the cryptography principles. This registry can help solving the double-spending problems and remove the risk of shared and copied digital files infinitely. Blockchain technology was first used expressively in the coin, token trading and crypto-finance. About 3,000 ICOs and 200 crypto-exchanges started to date because of the crypto asset market capitalization of about $300 billion if the government worker and market leaders made up their mind (Casey, Crane, Gensler, Johnson, & Narula, 2018).According to Laboure & Reid (2020),USA, France, Germany, China and Italy, the unique 3,600 customer survey in the UK showed that millennials planned only digital currency. About one-third of the millennials think that digital currencies could replace cash. Aside from the instability of digital currency prices, regulators are worried about criminals progressively by the use digital currency for trading with no official channels including manipulations, frauds, tax evasions, money laundries, hackings, and funding for terrorist activities. The market manipulations are not banned no restricted with ratios of digital currency ("pump and dump" technique), and financial intermediaries undergoes different bans by the use of digital currency for financing illegal activities, tax evasion, and additional illegal actions. Cyber-attacks are frequent. Other noticeable platforms and crypto assets make tokens, as new digital assets such as in the Ethereum platform, as essential inputs to create 'smart contracts' is the Ethereum coin that use Ethereum platform. This platform can help several firms to increase financing for exchanging the 'token rights,' called initial coin offerings (ICOs). ICOs increased the whole money, only $16 million in two deals and $6.1 million in three in 2014 and 2015 respectively yet raising exponentially in the two following years. Until the middle of 2018, the price of EOS was the largest ICO, $4.1 billion (Allen et al., 2021). The digital currency exchange Coincheck in Tokyo showed in January 2018, 400 million GBP was stolen by hackers. Yet, the transaction public nature to several digital currencies nameless is about ending 523 million stolen coins (Laboure & Reid, 2020).

3. Methodology

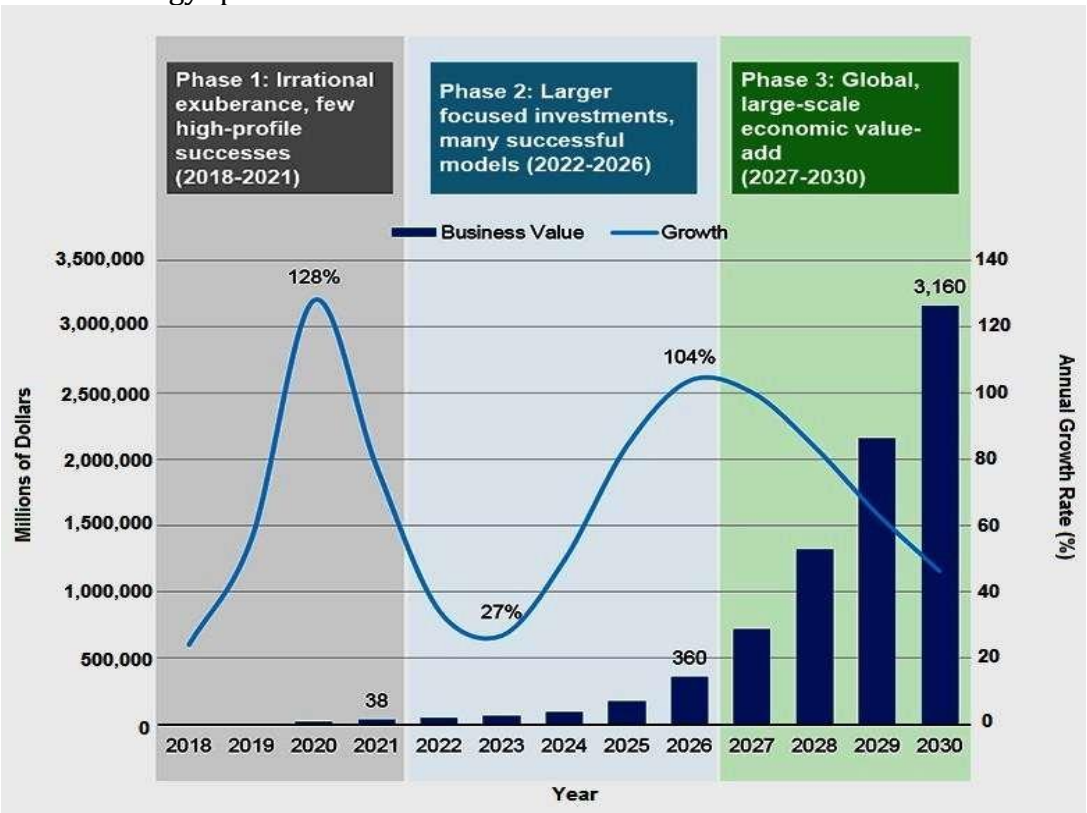
The inductive approach and the deductive approaches are used in this work. The former is from general to specific. Also, the latter is theoretical and conceptual as the basis of the study. However, they are different. The inductive approach is the specific to the general utilized in interpretivism, introducing the inductive logic by theories for drawing conclusions. The qualitative analyses rely on quantitative extrapolations. Log-returns of the top ten digital currencies can be weekly, daily, and monthly, ranked by market capitalizations in our data sets. These ten digital currencies were ordered form the highest to lowest according to market capitalization including: the first is Ripple (XRP). The second is Bitcoin (BTC) while the third and fourth are Ethereum (ETH) and Tether (USDT) respectively followed by Bitcoin_sv (BSV), Bitcoin_cash (BCH), Litecoin (LTC), Binance_coin (BNB) EOS, and

Tezos (XTZ).The Coinmarketcap.com website could be used for providing the data (which Tables 1 shows). These digital currencies were examined, averagely depicted about 92% of the digital currency market capitalizations, and 66% domination Bitcoin in this market. An examination of the ten digital currencies with the highest market capitalizations could see digital currencies as benchmarks in this work and confirm the suitability of the next and current analytical frameworks. From January 26, 2015, to February 02,2018data exist in the sample.

4. Result and discussion

To overcome the challenges are to the opportunities technology provides. Here the technology could finally make it difficult to examine for the moment. According to Ganne (2018), in we are "irrational exuberance, few high profile successes" (see Figure 3). Most interestingly, Gartner (2018) reported the future increase of blockchain technology to than $176 billion and $3.1 trillion dollars' business in 2025 and in 2030, respectively. Yet, the future blockchain indications could be strong happen in many industries. In accomplishing that, Gartner report (2018) indicate 2021, 90% of existing initiative blockchain platform operations could be need substitutions within in a year and a half to stay competitive, secure and prevent obsolescence.

Figure 3. Blockchain Business Value



Source : Gartner,2018

Digital currencies or coins enable owners to place, and have, the virtual value in the network according to blockchain technology. Thus, the blockchain is a network agreement to all transactions occurring as a distributed ledger. The World Wide Web of information is similar to the World Wide Ledger of value, a distributed ledger which any one is able to download and operate it on their personal computers (Tapscott & Tapscott,2016).The digital currency is highly monitored with the dependence on data from the public combined from third parties. The combined information often exists on public websites. The instances indicate market capitalization evaluations, trade volumes of, blockchain networks, pricing, and funding from the initial coin offerings (ICOs). Different sources are available

according to the methodologies and basic source information coverage and access. The innovations are created in the payment system assist customers accessing to them. Technological developments influence modification of the payment systems patterns. Each past physical transaction records have shifted to electronic forms which increase the transaction speediness and reduce the operational errors. According to Adiyatma & Maharani (2020) many signs measure it: a. user value movement: more offers are provided. Also there is more demand on users against the its value movement. Various digital currency operators in each country are available. So, judging the operator quantity movement in any state shows that its digital currency is legalized in governmental regulations. b. The digital currency transaction number: Various transactions are available in all countries. The transaction numbers in a country is consistent with the users of the number, so the number of user increase improves the number of transactions. c. digital currency trading: digital currency acceptance in a country which is not separable from the high digital currency trading, digital currency exchange activities for domestic currencies and the reverse is true. The operations are conducted in the digital currency markets where digital currency is substituted with fiat money or different digital currencies. d. digital currency rice: values of pricing changed with ease in exchange market of digital currencies. Prices are affected by the market being accepted and supplied logically. The price of digital currency is paid for taking a unit of digital currency focusing on the ten Altcoins with the maximum market capitalization (as in Table 1). This select is because of present popularities of these Altcoins in the "crypto-community" and their various characteristics some of which accord to a complete new platform or ecosystem or are according to Bitcoin's original open-source protocols. The first sample in this work begins from 26 January 2015 to February 02, 2018, producing 267 every week, 1868 every day, and 61 every month data notes. The whole digital currency market capitalization was nearly $400 billion in December 2018, according to Coincodex.com (2018),there are more than current 21000 markets and more than 5000 digital currencies worldwide, in which these digital currencies could be matching the standard reference currencies which the USD control. On average, total market capitalization is nearly $250 billion with a dominances of shares of the markets of the most important digital currency in the whole market capitalization which Table to explain showing Bitcoin creation of 64% of the total values. These top ten digital currencies did not exist at the same time. Column 7 of Table 1 is the date that every digital currency begins. So, Bitcoin_sv and Tezos, as the newest digital currencies add less data monthly for the empirical analysis.

Table 1. Top 10 digital currency in Market Capitalization

Name	Market Cap (Billions)	Volume (24h- Billions)	Price	Change (24 h)	Circulating Supply	Starting Date
Bitcoin	$166,743,993,933 $106,591,196,069	$47,868,579,352 $40,099,664,740	$8887.80 $5830.25	-0.21% -5.73%	18,238,800 BTC 18,282,425 BTC	01/26/2015
Ethereum	$26,966,016,878 $13,590,860,527	$25,206,666,119 $12,497,707,224	$237.32 $123.32	2.07% -7.05%	109,863,231 ETH 110,207,055 ETH	03/10/2016
Ripple	$10,688,702,708 $6,585,765,149	$3,252,412,868 $1,864,979,798	$0.23624 $0.150214	-0.88% -5.02%	43,749,413,421 XRP 43,842,625,397 XRP	01/26/2015

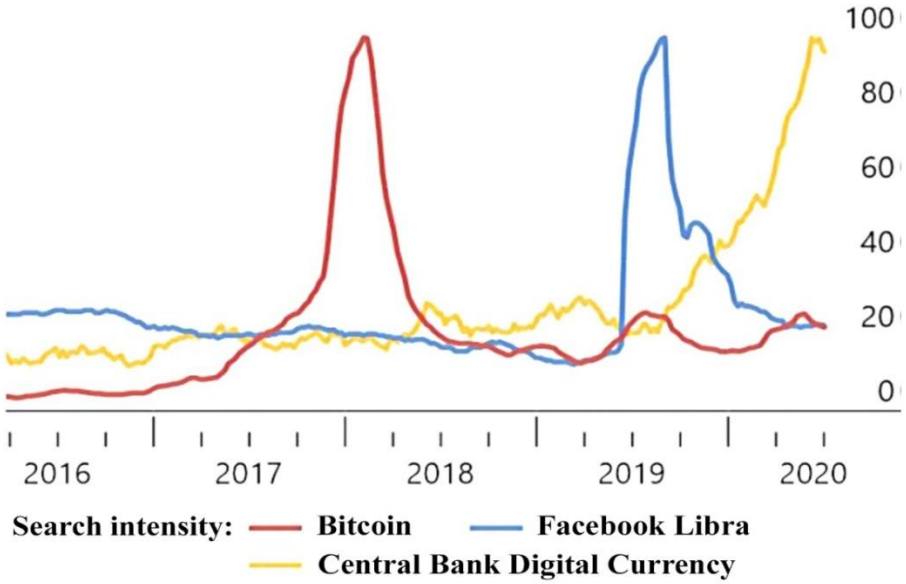
Bitcoin_Cash	$6,364,459,307 $3,736,418,941 (5)	$6,617,099,625 $4,015,953,536	$330.77 $203.67	-0.25% -7.47%	18,300,000 BCH 18,345,250 BCH	08/03/2017
Tether	$4,641,437,047 $4,637,871,717 (4)	$66,519,050,406 $49,036,623,749	$1.0047 $0.99903	0.16% -0.21%	4,642,367,414 USDT 4,642,367,414 USDT	04/15/2017
Bitcoin_SV	$4,439,960,724 $2,894,145,363	$3,344,789,290 $3,365,019,330	$233.95 $157.78	-1.66% -6.35%	18,297,290 BSV 18,342,440 BSV	11/19/2018
Litecoin	$4,072,866,599 $2,292,391,578	$6,342,837,357 $3,148,219,029	$60.45 $35.63	-0.77% -7.34%	64,168,987 LTC 64,342,318 LTC	08/24/2016
EOS	$3,526,893,934 $1,965,191,547	$6,064,573,978 $2,921,411,201	$3.64 $2.13	-0.47% -6.45%	920,452,308 EOS 921,045,767 EOS	07/02/2017
Binance Coin	$3.292,877,236 $1,735,514,181	$427,799,971 $308,670,064	$20.24 $11.16	-1.68% -7.48%	155,536,713 BNB 155,536,713 BNB	11/09/2017
Tezos	$2,250,710,445 $1,038,511,561	$317,321,520 $113,589,399	$2.98 $1.47	-0.04% -11.11%	702,028,555 XTZ 704,565,511 XTZ	02/02/2018

Source: Prepared by the author using information from CoinMarketCap.com,2020

So, the top ten digital currencies used this work had suddenly reduced market capitalization from 53.8% for Tezos on March 8 to 38.3% for Ripple. Yet, Bitcoin continued a smaller 36% loss although it was not 34.7% for Bitcoin_sv. Tether is an outlier with a small loss of 0.065%.The virtual currencies market size shave risen considerably in the past years with aboy $12.6 billion of total market capitalization by the end of 2016 (Ciaian, Rajcaniova, & Kancs, 2017).These digital currencies on average are 92% of the market capitalizations. 37% of the digital currency markets was the Bitcoin capitalization on 1 May 2018 but the Bitcoin market share is currently about 66% on 7 March 2020remaining as it is after 24 months (González,Jareño,& Skinner, 2020a).Digital currency as financial assets shoed no their safe haven features in any major economic crises and recessions, and early evidences suggest that Bitcoin did not display hedging features and flight for safety features when COVID-19 pandemic was there. Because of this finding, it is assumed that COVID-19 could be a black swan influence on digital currency, causing behavioral anomalies. The starting point to some digital currencies price and this duration ended precisely prior to the massive sold market on 8 March 2020, and the stock markets drop sharply on 9 March 2020 because of the COVID-19. This big selloff caused a loss of $21 billion market capitalization in the digital currency market in a day of Saturday, 7 March 2020 to Sunday, 8 March 2020, i.e., from $251.5 billion to $230.8 billion (CoinMarketCap.com, 2020).To digital currency markets, relatively new and unexamined financial assets, the COVID-19 confirmed unprecedented shocks. A decade ago, the Bitcoin has conventionally effaced a

period of high volatility with no susceptibility to any main systematic crisis. CoinMarketCap.com (2020)stated a digital currency with total market capitalizations from March 07, 2020, to 22 of the same month getting at $251.5 or $167.1 billion. The loss was more than $84 billion in the digital currency market on 22 March 2020 because of the COVID-19, decreasing to $167.1 billion. It is essential to note that despite the current digital currency market capitalization drops, Bitcoin remained dominating this market 65.1% on 22 March 2020. These digital currencies did not exist at the same time. In Table 1,column 7 is the starting date of every digital currency. So, Bitcoin_sv and Tezos are the newest digital currency providing fewer data monthly to the empirical analyses. González, Jareño,& Skinner, (2020) showed the time progress of every day prices of the digital currencies till the end of March 2020 to the COVID-19 incorporation on 8 March 2020 happen. Thus, the top ten digital currencies had abruptly dropped market capitalization on March 8, from 53.8% for Tezos to 38.3% for Ripple. Yet, Bitcoin retained a lower loss of 36% although it not as small as 34.7% for Bitcoin_sv. Here, Tether experiences a little loss of 0.065% as outlier in a day. Table 1 is the decrease of the total digital currency market capitalization fourteen days after COVID-19 by about 40%, from $251.5 billion to $167.1 billion. Their value had dropped by about32% and 50%. Still this reduction is only 0.5% for Tether (CoinMarketCap.com ,2020).According to Brühl,(2019) 25% of the current 2.41 billion active people on Facebook (every month like June 30, 2019) can be transformed into Libra consumers in the five years after the Libra launch. An average Libra request (about 1,000 Libra annually) causing every year Libra request of nearly 600 billion Libra. After Covid-19, measures of social distances, by cash Covid-19 virus spread public fear, and new government-to-person payment systems catalyzed shifts to digital payments with additional drive to CBDC. As a consequence, CBDCs have attracted universal attention with extensive in the communications of central banks and interest public searches (see Figure 4).In Auer, Cornelli, & Frost, (2020),no main jurisdictions ordered a retail CBDC regardless of the many questions. In the increasing CBDC-oriented works, the discussions concentrated on certain main essentials (money generation by the central banks and the attractiveness of CBDCs) in the work under investigation.

Figure 4. Bitcoin, CBDC, and Libra in Central Bank Communications and Search Interests



Source: Auer, et al. 2020

5. Concluding remarks

The study showed several interesting insights to help getting information on the

effects of the crises on the investors' behavior. This work comes up with the conclusion of the world economy as vulnerable to a global recession daily because of uncontrolled volatility. The is because of the interrelation between stock markets and digital currency exchanges by sophisticated ICT, because their inherent volatility, such as their inelastic supplies that limit their extensive adoption as exchange media of and units of account. Despite the significant drop of digital currency, Bitcoin stills controls this market by 65.1%.In this work digital currencies fulfilled the three main operations of money, i.e., the performance of a medium of exchange, as value stores and units of accounts, still more resembling the notional assets than money. This increased doubtful period caused non-annualized every day stock profits of more than5% and more than 10%losses.There were losses50% value of most digital currencies, yet the 10% lost equity was because of COVID-19. despite the rapid decrease of prices caused by COVID-19, the digital currency markets conserved their economic competence. This means when crises start, investors move from traditional and enter the alternative market as digital currencies, at least at the beginning of the crisis stages. Also, the Funds Transfer Regulation scope is expandable in the digital currency exchanges for ensuring the existence of related data about digital currency transactions permitting adequate money laundry and financing checks of terrorist. In addition, the ground-breaking blockchain technology ecosystem could solve anonymity problems and future scalability that support the permissionless blockchain reducing the permissioned blockchains values of increment. In some countries, the systems of finance could be examined because of the higher connections of digital currencies to our daily social life. For instance, a study on integrating digital currencies into the intricate payment systems of the homes, autos, and investing loans. Yet, the fiat currency loans are given with digital currencies as collateral.

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