Comprehensive Analysis and Comparison of Leading Cryptocurrencies

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Comprehensive Analysis and Comparison of Leading Cryptocurrencies

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Abstract

With the increasing demand of virtual currency, cryptocurrencies are gaining popularity throughout the world for transactions be it legal or illegal. The yields returned from investment in crypto currency these days are huge but their existence and reliability has always been questioned. A cryptocurrency uses cryptography for implementing security. In spite of several problems in crypto currencies, the growing success of Bitcoin since its launch has emerged in a number of organizations coming forward with substitute cryptocurrencies. This study tries to present a comparison of six famous cryptocurrencies - Bitcoin, Ethereum, Litecoin, Dash, Monero and IOTA in the light of their volatility and strengths in present times and also discusses their current trends. A thorough study of literature showed that no paper has been presented keeping in mind only these six currencies, so this article is the first of its kind to present a comparison of technicalities of these cryptocurrencies.

Keywords: digital currency, cryptocurrency, bitcoin, Ethereum, Lltecoin, bash, monero, iota, comparison of cryptocurrencies.

Introduction

Since the early days of the Web and the introduction of electronic payment systems, there have been ideas to avoid transaction costs and payment uncertainties on the Internet. It was primarily a theoretical concept until an electronic payment system based on crypto-proof was introduced. The system allowed two consenting parties to negotiate openly among themselves without the need for a trusted third party [1]. Blockchain is a technology that is used in all domains related to currency like banks, businesses and public bodies. It is not only limited to coverage, but also engages in government projects. It is used for change in almost all the faces of our digital lives of how we send money into the everyday base.

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Blockchain is a software product which has secure storage, and a convenient transaction medium. It has a large traceability characteristic. This is a product that is fully traceable and tamper-proof. [2] Cryptocurrencies have received significant public attention since 2017. It wasn't just bitcoin, but many other cryptocurrencies (altcoins) and tokens that experienced astronomical growth mainly in the second half of 2017 [3]. Innovations in digital systems have changed the mechanics of the global trading economy and, consequently, virtual currencies are gaining huge popularity. Cryptocurrency provides a decentralized system without intermediaries, which keeps people in control of the management of their funds. Furthermore, as currencies such as the Venezuelan bolivar rapidly lose value, cryptocurrencies have the potential to provide a better store of value than currency trusts. Cryptocurrencies are increasingly accepted because of their low cost, high-speed portability and a decentralized tracking network that provides secure transactions and anonymity. Among virtual currencies, cryptocurrency has shown faster growth and acceptability, with tremendous potential [4]. Cryptocurrencies are digital financial assets whose ownership and transfers of ownership are guaranteed through decentralized cryptographic technology. The increase in the value of cryptocurrencies in the marketplace and the growing popularity worldwide open up a number of challenges and concerns for the commercial and industrial economy. Cryptocurrencies keep on drawing a great deal of consideration from financial backers, business visionaries, controllers and the overall population. Much late open conversations of cryptocurrencies have been set off by the significant changes in their costs, asserts that the market for cryptocurrencies is an air pocket with no basic worth, and furthermore worries about avoidance of administrative and legitimate oversight. [5].

All of the above study focused on different types of currencies. In our study, we discussed digital currencies and their comparisons. When you look at last year's momentum, there are a lot of currencies and tokens that can be seen as effective. The least efficient one is Ethereum and Litecoin. For others, the results depend heavily on the currency of the name, i.e. If we look at prices in the United States dollar or bitcoin. Overall, we show that the results are not straightforward and simple such as “all cryptocurrencies are inefficient” but one needs to go deeper into the dynamics of specific coins and tokens.

Literature Review

Valdeolmillos and Mezquita [6] presented a review in which they discussed that consensus algorithms of existing cryptocurrencies are facing the problem of impossibility to acquire a globally expansible, consistent and totally decentralized platform. All of them contain their own set of issues. Moreover, governance of the network is another challenge that lies within Bitcoin platform. Some of the newer currencies offer their users the option to create and deploy dApps that implement Turing-complete among their economic ecosystem, providing added capability to them along with the exchange of assets but not all cryptocurrencies allow it. However, if people keep their assets in the form of cryptocurrencies, they would be tougher against the risky actions taken by the administrators of sole significant fortunes.

Torpey [7] discusses how Bill Gates, the found of Microsoft, reviewed the negative effects of the cryptocurrency's feature of anonymity: The basic characteristic of cryptocurrencies is anonymity. I don't feel this to be a positive thing. The capability of Government to find schemes of money laundering and funding for terrorism is a good thing. Crypto currencies can be used for buying various drugs so it is a rare technology that can cause deaths quite directly. I believe the crypto currencies are very risky for those who go for it, in long term.

Rosic [8] describes that blockchain of bitcoin's is similar to a large database of property entitlement. Bitcoin contracts can be created and imposed to add or remove thirty party consents or be enforced to complete at a date or time that is just a fraction of the amount and time required in the conventional structures.

Bach [9] reviewed that an American Nobel Prize winner for the field of Economics, Joseph Stiglitz, had views alike Gates, describing, popularity of cryptocurrencies is from lack of laws and regulations.

Hughes and Middlebrook [10] discussed several regulatory choices and foundations that can be used for regulating cryptocurrency in spite of their decentralized structure. Due to this distributed nature of currencies, authorities worry of their own significance in the matter.

Scott [11] discusses how cryptocurrencies can help increase social harmony. Gandal and Halaburda described [12] that how with its rapid growth, the market of cryptocurrency is constantly being targeted by competitive forces. This leads the stakeholders to repeatedly question about their indulgence in the world of cryptocurrency.

[13,14,15] stated that unlike traditional means of handling finances, cryptocurrencies are not sponsored by the governments and their worth is also not normally connected to any concrete asset. These characteristics may create doubts in terms of their administration and accountability and hence, may hurt their attraction as a functioning instrument for monetary implementations.

[16,17,18] described that industry inconsistencies are bothersome and may inquire of the recognition of the basic merit of cryptocurrencies. The work of [19,20] focuses on the financial stance of application of cryptocurrencies, adding to the current literature by providing a particular review of studies in relation to their use in financial situations. This helped to investigate the part of cryptocurrencies in present world economics and transactions.

Several financial establishments capitalize blockchain to develop financial technology startups (termed as FinTech) to use blockchain for providing financial utilities and promote the cryptocurrencies [21]. Dorfleitner & Lung [22] documented that the financial acceptance of cryptocurrencies is visible by exponential growth in the size of market.

[23,24] published reviews lately, describing the relationship between cryptocurrencies and privacy. However, they were not able to provide a detailed analysis of other factors involved in affecting the growth of cryptocurrencies in the financial environment. Davidson [25] claimed that cryptocurrencies may compete with several economic organizations due to their extensive uses.

The evolution of new currencies such as Bitcoin cash, IOTA, NEM etc. has improved extraordinarily in the region of Asia-Pacific, which has over 700 out of an 1,876 people going towards or employed in this field. Also, this specific region donates almost 20% of wallet users, majority of whom appear to be using large wallet providers, hence affecting them more to changes in the global market of cryptocurrencies [26]. An interesting

occurrence once came from prosecutors in Utah, who planned to start selling bitcoins that were captured previous year in a drug ring bust. The worth of the seized coins was almost $8.5 million in December'17 [27].

[28] Discusses how as miners tend to set up server farms, the increasing demand of technology has resulted in a price increase for GPUs. Prices of parts have gone up to twice the recommended retail prices, as a result generating a black market for the sale of parts of computers needed for mining and hashing. Although mining is becoming more power-efficient with the growth of currencies, energy consumption will still climb up to become unprofitable for the miners [29].

Pinna and Ruttenberg [30] discussed that how the journey of cryptocurrencies started from bitcoin at the start of 2009, and now, the decentralized framework of block chain is widely accepted as an advanced distributed platform used in finance based institutions. Bitcoin makes use of special encryption techniques to produce funds. Now, various cryptocurrencies are launched along with their respective structures for nurturing and managing transaction. These systems make use of the technology of distributed ledger.

With the rapid development of cryptocurrencies, the governments of China and Germany are trying to handle them by imposing taxes and banning initial coin offerings [31]. [32] Addresses the various risks associated with an un administered cryptocurrency industry and also talks about feasible avenues of regulation and utilization of this technology in Pakistan.

As per Coin Market Cap [33], there were 914 cryptocurrencies present in 2018 in the market. The merged market value of all cryptocurrencies was almost $371 billion with the top 5 currencies representing around 83% of the whole value. At the time of writing this paper, in 2021, there are 5605 currencies present at the moment with their combined worth standing at a whopping $2.48 trillion. This gives an idea of the value and growth of digital currencies.

Radovanov and Marcikić [34] attempted to present some general facts related to major cryptocurrencies and their prospective relations. Their research presented key statistical properties of four cryptocurrencies i.e, Bitcoin, Ethereum, Ripple and Litecoin. They also explained the volatility

fluctuations in daily returns of those currencies and introduced three GARCH like models to do so. Brada and Sedláček [35] claimed that the most of the cryptocurrencies are somehow clone of bitcoin and different in some particular parameters only like supply and block time etc. These currencies are also called altcoins. There is a very limited number of currencies which introduce any new feature. Currently, Ethereum is present at second position of cryptocurrencies as per market capitalization report. It was released in 2015 and since then it has seen very notable growth. Now, its market value is between 2/5 and almost 1/2 that of bitcoin. Litecoin stands on 13th position and is among the oldest currencies created after Bitcoin (in 2011). It is quite alike to Bitcoin but having some technical upgrades over it. It has both current and planned final larger flow supply. Dash was first created in 2014 with the name of XCoin and was then renamed to Darkcoin and then to Dash. Like Litecoin, it also contains features alike Bitcoin but also has advanced attributes like instant/ private transactions and decentralized governance. During 2017 its capitalization increased significantly in market. Monero was also introduced in 2014 named as BitMonero focusing strongly on privacy along with scalability and centralization. Its design is quite unlike Bitcoin. IOTA was created in 2016 with a distinguished feature of using directed acyclic graph (DAG) in place of blockchain. It utilizes different cryptographic functions than majority of other systems. Currently it is at number 45 [33].

Klein and Hien [36] presented a study to compare bitcoin with gold and indicated that bitcoin cannot be referred to as the new gold. Its dynamics of volatility share few characteristics with silver and gold, however, bitcoin still does not act as a shelter which is a well-known feature of gold.

The area of interdisciplinary examination of cryptocurrencies is usually new. The overall prologue to crypto economy, bitcoin and cryptocurrencies were posted by Antonopoulos [37], Narayanan et al. [38] and Jud Mayer et al. [39]. Specialized investigation of the Bitcoin part in the money market and suitability of the business was conducted by Buterin et al. [40]. They have implied that the cost of bitcoin would be down, so there will be no restitution. So, there are neither opportunity for a wise venture nor an opportunity for protecting the worth of the cash, yet a dependable and modest method of moving the cash will remain. Nahorniak et al. [41] regarded as a guideline of the Bitcoin law and saw no presence of a guideline on the cryptocurrency

market. They proposed a new enactment that would take into account virtual monetary standards as the basis for the Cryptographic Economy Management Board [42].

History of Cryptocurrencies

The history of experiences begins in 2008 when the article named "Bitcoin: A Peer-to-Peer Electronic Money System" was distributed. The name Bitcoin can be utilized for the cryptocurrency as well with respect to the organization in which Bitcoin capacities. The entire venture is brought about by the individual called Satoshi Nakamoto (the name utilized by the pseudonymous). The fundamental thought was to make a protected and stable currency to get full control over the individual budgets with no interference of the focal organizations. What's more, he additionally consolidated undertakings, for example, "bMoney" and "Hash Cash" (electronic compensation framework) recently made. The advancement of computerized cash is persuaded by the thought to hold every one of the upsides of customary cash and to eliminate all the weaknesses of it simultaneously. The fundamental benefits of the paper cash are: "all-inclusive acknowledgment, purchaser secrecy, straightforwardness of confirmation, the chance of the non-presence of a ledger, and business capacity and effortlessness of transportation". On the opposite side, the fundamental hindrances of the paper cash are: "the chance of fakes, hardships in transportation of the bigger sums, high expenses of circulation and creation, restricting various designations and presence of something else than *one currency"* [43].

A. Crypto Currencies

Crypto Currencies: Crypto currency is made up of both the words "crypto" and "currency" “Crypto” stands for secret and hidden. In this technology crypto is used as all the transaction records and the front end or background details are to be hidden & any authorized person can access or know the facts. “Currency” considered as part of the virtual currency, it is a kind of digital currency that is available only in electronic form and not in physical form [2]. Cryptocurrency offers numerous advantages to the economy: it is helpful and productive, there are no go-between guidelines, it lessens the hour of trade inside a worldwide market, has high security through its confirmation of-work framework, and ICOs raise capital for organizations. Cryptocurrencies diminish the requirement for mediators and increment the

proficiency of exchanges. For instance, when buying a house, it's anything but a tedious interaction of surveying credit, moving funds, and marking desk work between outsiders and customer. While there is an underlying postponement to move one's fiat currency into cryptocurrency on various stages, trading cryptocurrencies is productive. Inside the economy, these reductions the requirement for outsiders. As per the current Chairman of Bit Pay, the biggest bitcoin checkout processor internationally: Bitcoin's blockchain resembles a huge property rights information base. Bitcoin agreements can be planned and upheld to take out or add thirty gathering endorsements, reference outer realities, or be finished sometime not too far off or time for a portion of the cost and time needed in the conventional framework [44]. Cryptocurrencies are pre-recorded physical files using public/private key pairs generated around a specific cryptographic algorithm. The key confers ownership of each pair of keys, or "piece", to the person who possesses the private key. These key pairs are stored in a file called 'wallet.dat', which is located in a folder hidden by default on the owner's hard disk. Private keys are sent to users using dynamic portfolio addresses generated by users committed to transactions [45].

B. Selected Crypto Currencies

We have included six major currencies in our article for review namely Bitcoin, Ethereum, Dash, IOTA, Litecoin and Monero. Their brief analysis and detailed comparison are given below.

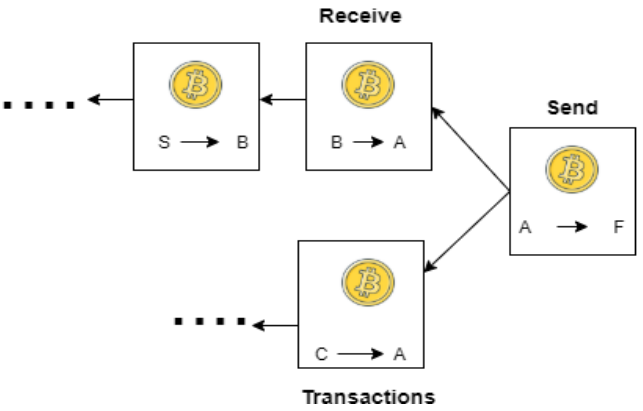
1) Bitcoin

Bitcoin has witnessed broader adoption and more attention than any other pro-posed digital currency so far. One reason for this is the promise of a decentralized and inexpensive currency that is intrinsically independent of governments and any centralized authority [46]. Bitcoin is an online budgetary system that individuals use to send installments starting with one individual then on the next. In different ways, Bitcoin is like traditional installment payment systems like Visa or PayPal cards [47]. Bitcoin is better as compared to a mobile application for ordinary users in the sense that it gives users a personalized portfolio named as the Bitcoin wallet. Users are using Bitcoin for reasons such as political and philosophical ones. Payments are carried out through the Bitcoin network using the bitcoins issued by the network. The data of all transactions are validated with a work proof system

and then updated into a general public book called blockchain, which is maintained by the Bitcoin network. Customers using Bitcoin must first get a Bitcoin wallet and then acquire one or multiple addresses of Bitcoin. A bitcoin address is similar to an email address and needed to transmit or receive bitcoins. Every customer, despite the country, region and geographical location is able to transfer Bitcoin. It can be asserted that Bitcoin is the world's first such currency that does not discriminates users against their citizenship or religion. The system is simple to use and protected. However, the low cost of using Bitcoin has been misused to purchase illegal items. In addition, it is quite effortless to steal the bitcoins out of a bitcoin wallet. Bitcoin is among the major cryptocurrencies in the world, though there are many around. People recognize it as a digital currency, but its usage is undefined to most people. For the convenience of using Bitcoin, this is the first challenge. The conventional banking system is the greatest challenge to be taken up by Bitcoin. As we know, the mainstream banking system offers services and charges for service. Bitcoin does not offer so, and this can tear down the Banking industry. However, this could create a new way of managing money [46]. Figure.1 shows the generation of bitcoin.

Figure 1

Bitcoin Generation



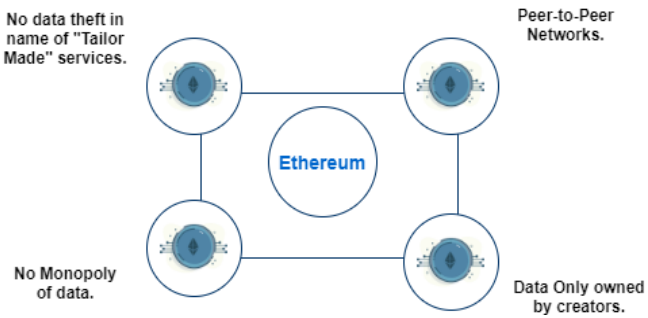
2) Ethereum

Ethereum is an open platform for building decentralized applications above blockchain; it defines a number of protocols for arbitrarily executing

complex algorithms on the network. Such code is executed on Ethereum virtual machines, which are fully turning, these virtual machines are stored on each node participating in the network, and each issued instruction is run on each node. A valid status transition for these VMs is the one that results from a transaction. Ethereum also implements its own security token, called ether, but how it is used depends on the application that is implemented [48]. Ether is the cryptocurrency asset used in the Ethereum blockchain. To a certain extent, ether is the fuel for the exploitation of the applications distributed on Ethereum. By using this cryptocurrency, it is possible to make payments to other accounts or to machines performing a required operation. An Ethereum blockchain is identical to the Bitcoin blockchain. The main difference is that Ethereum blocks contain not only the block number, difficulty, nonce, etc. but also the list of transactions and the most up-to-date status. For each operation in the list of operations, the new statement is created by applying the previous statement. Bitcoin and Ethereum today are the most known and precious cryptocurrency. These are based on blockchain technology which aims to promote a trust mechanism in a peer-to-peer network based on the consensus of the majority of nodes [49]. Figure 2. Shows the structure of Ethereum.

Figure 2

Structure of Ethereum



3) Litecoin

Litecoin is an electronically created and maintained form of digital currency. Nobody can control it. Litecoin are not printed, like dollars or Thai baht; they are produced by many people running computers all over

the world, using software that solves mathematical issues. It can be transferred electronically, more or less instantaneously, with very low transaction fees. Litecoin is a crypto-currency and peer-to-peer free software project released under the MIT/X11 licenses. Powered by Bitcoin, Litecoin is based on a free protocol and is not managed by a central authority [50]. The aggregate sum of Litecoin that is accessible for mining and dissemination is multiple times the measure of Bitcoin, which means there will be fourfold the measure of Litecoin accessible to Bitcoin [51]. Litecoin is the second oldest cryptocurrency after Bitcoin. In the seven years since it was created, Litecoin has been able to piggyback out of a vast Bitcoin infrastructure. But with all its advantages, Litecoin offers no additional security to its owner. Like Bitcoin, Litecoin trades are completely transparent [52].

4) Dash

Dash is the first cryptocurrency based upon the work of Satoshi Nakamoto with built-in confidentiality features. At present, the Dash network has about 4800 active master nodes. By forcing 1000 DASH collaterals to become an active master node, we create a system where nobody can control the whole network of master nodes. For instance, if someone wanted to control 50% of the master node network, they would have to buy 4800000 DASHES on the free market. Currently, the Dash system has approximately 4800 active master nodes [53].

5) Monero

The Monero cryptocurrency, initially known as Bit Monero, was established in April 2014, as a derivative of the Crypto Note concept validation currency. The latter is a cryptocurrency devised by an individual or team under the pseudonym of Nicolas van Saberhagen. This work was published in October 2013. It provided anonymously to the sender and recipient through the use of unique addresses and the untraceable flow of ring signatures [54]. In Traceable Monero, normal transactions can still be conducted anonymously as in the Monero system except that there exists a tracing authority who is able to revoke a payer's anonymity due to his/her misbehavior. It is worth noting that the tracing authority in Trace- able Monero is passive and optimistic, meaning that it will not interfere with any transaction and is involved only when investigation is required [55].

6) Iota

Iota is a crypto-currency that promises great scalability, almost instantaneous transfers at zero cost, focused on internet of Things solutions. The Internet of Things

(IoT) is an enormous worldwide data framework made out of enormous heterogeneous and decentralized gadgets that can be distinguished, detected, and prepared dependent on normalized and interoperable correspondence conventions. The flow unifies frameworks are probably not going to scale enough to help a large number of micro transactions each second proficiently what's more, empower more prominent computerization in unique plant measures, robotic dynamic, and fruitful arrangement and are helpless against numerous issues of safety and security; these problems have been restricting the appropriation of IoT. The system which is decentralized can guarantee confidentiality and scalability, without depending on a administrating authority or specific material. In current context, distributed ledger technology (DLT) can be an important facilitator in the implementation of the IoT economy. The development of Iota technology is primarily linked to two factors, namely, the growth of connected devices and the Blockchain [56].

Comparison of Cryptocurrencies

Figure 3 shows the individual segments of the ten largest crypto assets (tokens and stable coins) with their relativity to the total capitalization of market for all assets. As Bitcoin was the first ever asset introduced, so it has still remained the highest in market capitalization. Many people follow it due to this market dominance.

Figure 3

Individual proportions of ten largest crypto assets

Table I provides a technical comparison between selected currencies and reviews their origin and programming languages used while we compared different features of the cryptocurrencies, like their consensus mechanism, asset type and scalability handling, included in this study. The results are shown in Table II.

Table 1

Technical Comparison between crypto currencies

Currency	Date of Release	Founded by	Programming Language	Hash Algorithm
Bitcoin	2009	Satoshi Nakamoto	C++	SHA-256d
Ethereum	2015	Vitalik Buterin	C++	Ethash
LiteCoin	2011	Charlie Lee	C++	Scrypt
Dash	2014	Evan Duffield and Kyle Hagan	C++	X11
Monero	2014	Nicolas van Saberhagen	C++	CryptoNight
IOTA	2016	David Sønstebø and Dominik Schiener	Solidity & Java	Kerl

Table 2

Technical Comparison between crypto currencies

Currency	Consensus algorithm	Smart Contracts	Coin/ Token	Scalability
Bitcoin	PoW	Non-Turing Complete	Coin	~7 TPS
Ethereum	PoW	Turing Complete	Coin	~ 30 TPS
LiteCoin	PoW	Turing Complete	Token	~ 56 TPS
Dash	PoS/ PoW	Not Present	Coin	~ 48 TPS
Monero	PoW	Turing Complete	Token	~ 1700 TPS
IOTA	PoW	Turing Complete	Token	~ 3-1500 TPS

A statistical analysis was performed on the currencies selected for this study and results are displayed in Table III. According to these statistics, larger the number of active addresses of a currency, the higher the market capitalization ranking it has. We can also see that the most used currencies are those who makes use of PoW consensus algorithm. Ethereum has more circulation supply than Bitcoin because of the usage of dApps.

Table 3

Technical Comparison between crypto currencies

Currency	Circulating Supply	Active Addresses	Current Price	Market cap	Time Confirmation
BTC	18,753,525	785,000	$33,802.09	$634,138,908,170	60 min
ETH	116,647,800	757,859	$33,802.09	$247,860,266,120	6 min
LTC	66,752,415	300,000	$134.78	$8,996,796,932	30 min
Dash	10,225,254	46000	$127.18	$1,300,008,667	5 min
XMR (Monero)	17,950,286	5000	$210.98	$3,799,002,341	20 min
MIOTA	2,779,530,283	45000	$0.8189	$2,278,692,546	Instantly

The trending view chart [33] of all 6 currencies is shown in Figure 4 which gives per day comparison in trending view.

Figure 4

Trending view comparison of cryptocurrencies

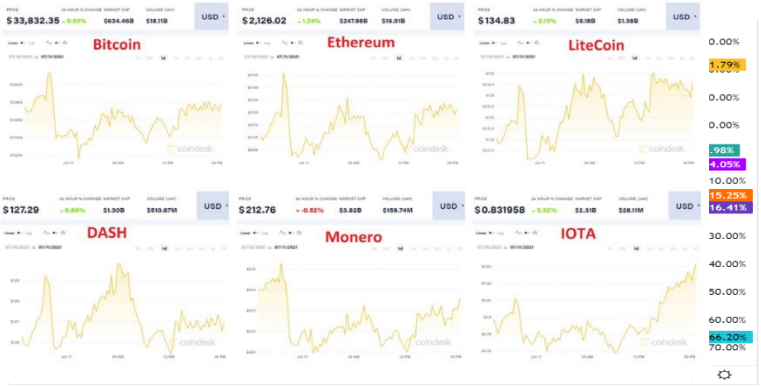


Figure 5

Market cap percentages of currencies

A 24-hour percentage change market cap [57,58,59,60] for all the included currencies is given below in Figure 5

Conclusion

The crypto-currency market has recently grown enormously. Because of the increasing demand and interest in cryptocurrency. We believe that it should not be treated as more than just a novelty. Many authors examined cryptocurrency in terms of financial assets, where most market participants exchange it for investment purposes. However, because cryptocurrencies are both decentralized and primarily unregulated, they will never behave exactly as other currencies in the market. However, their current market position is somewhere between traditional commodities and money because of their decentralized nature and the limited size of the market. The appropriate response to the eventual fate of digital currencies lies in settling promulgation challenges since open square chains are not currently prepared for use in conventional economies. Governments and organizations overall had previously seen that they can profit with block chain innovation, and a ton of examination is being directed to empower block chain frameworks for controlling worldwide use. For the national bank of a country, an incorporated digital currency can be regarded as a retail e-cash for the whole

country. The inspection of the factual properties and instability of cryptocurrencies would be primarily important in relation to the portfolio of the Panel, the Hazard Examination and the Market Hypothesis Investigation. In the event that digital currency's prominence keeps on ascending, there will be numerous progressions later on: ascent of guidelines in regards to digital monetary forms, new position markets, and change in advancements. While cryptocurrencies will computerize numerous positions, there will likewise be new positions expected to direct the new monetary framework. The results presented in this paper demonstrate that the dynamic speculative cycle is well maintained. In view of the importance of dynamic risk capital management, the unpredictability of the measure demonstrates the equivalent importance of the short term and, for some time, elements of quota fluctuation. Also, digital currencies can be utilized as an instrument for hazard disinclined financial backers fully expecting awful news.

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