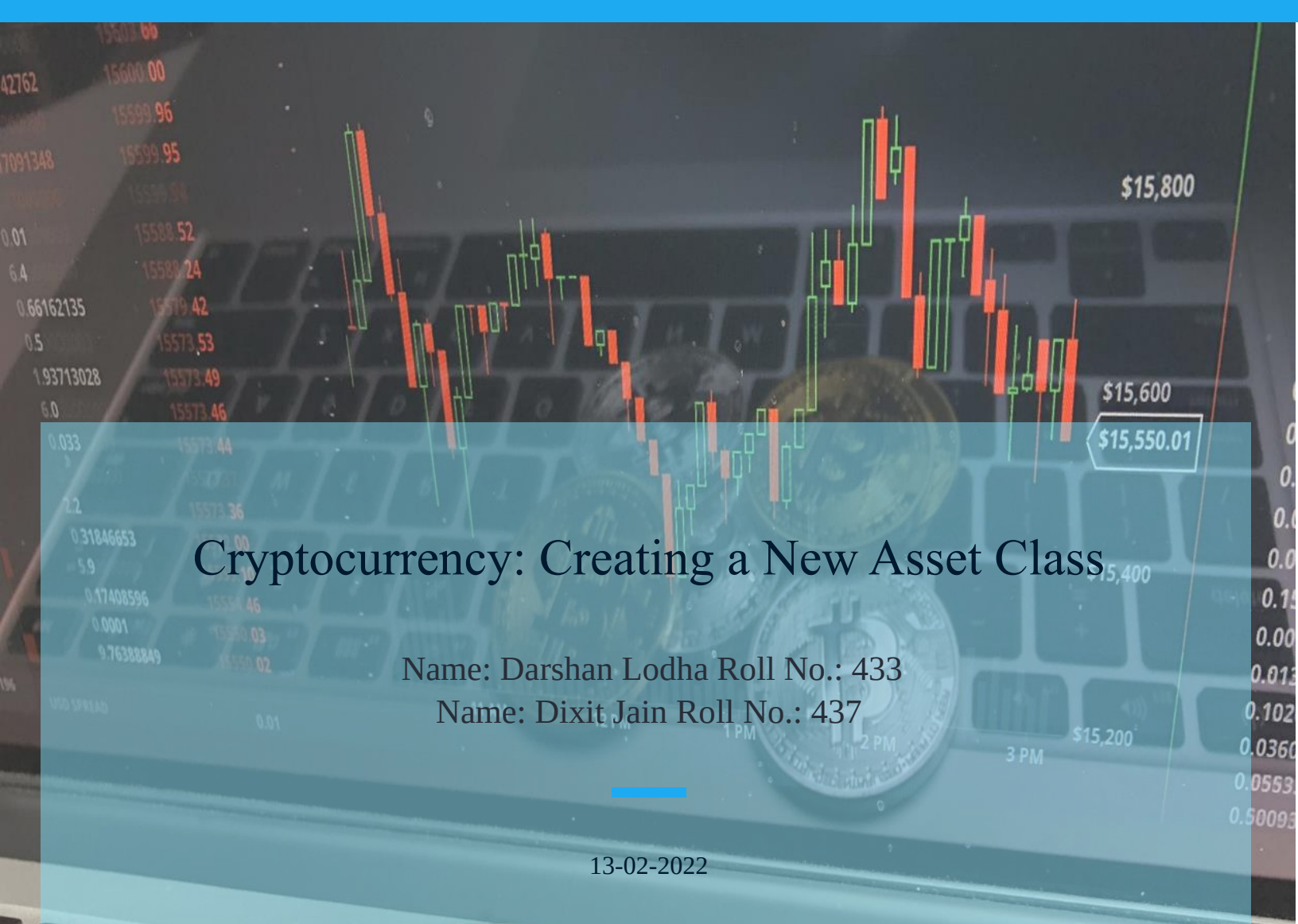




Cryptocurrency: Creating a New Asset Class

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1. Abstract

The cryptocurrency market is changing at a rapid pace with blockchain, Bitcoin, Ethereum and crypto-mining being the current buzzwords among the masses. Modern investment opportunities such as cryptocurrencies, NFTs and metaverse has attracted public attention in the recent times. For such investment opportunities to reach to the level of an investable asset class that can provide portfolio diversification benefits, there are numerous factors to be taken into consideration. This research paper in particular tries to answer the question as to can cryptocurrencies be considered to be a new asset class?

For the purpose of this research, we have analyzed the cryptocurrency market in detail in terms of its historical returns, average volatility, relationship with traditional asset classes, diversification benefits, liquidity, regulatory frameworks, investor's perception, etc.

We find that cryptocurrencies like Bitcoin and Ethereum show characteristics of a new asset class based on strong internal correlation coefficient, an absence of strong correlation coefficient with any traditional asset class like equity, commodities and precious metals as well as sufficient market liquidity, while market stability has scope for improvement. Adding cryptocurrency to traditional portfolios leads to significant risk-adjusted returns. These results validate the introduction of cryptocurrencies to be a distinct asset class.

Based on our analysis, we think that cryptocurrency is tending towards being an investable asset class with scope of improvements in regulatory certainties, liquidity, growing investor interest – especially institutional investors, etc.

2. Introduction

The increased applications of blockchain technology have aggravated the emergence of cryptocurrencies as a significant component of financial markets. But the question that remains unanswered for most of the people that restricts them to invest in the cryptocurrency market is what is actually the blockchain technology? Blockchain, sometimes referred to as Distributed Ledger Technology (DLT), makes the history of any digital asset extremely difficult to alter and increases transparency using decentralization and cryptographic hashing. A blockchain consists of blocks as a database that stores encrypted blocks of

data which in turn are chained together to form a chronological single-source-of-truth for the data. The three components of blockchain are:

- **Blocks:** Blocks are the store of information on the blockchain.
- **Miners:** Miners spend time and resources to verify blocks and in turn earn a commission.
- **Nodes:** Have a copy of the blockchain and enables decentralization.

At the time of writing, there are about 16,000 total cryptocurrencies introduced in the cryptocurrency space. In this paper, we have analyzed a large panel of historical prices, trading volumes and market capitalization on actively quoted cryptocurrencies to identify and understand their relationship with standard asset class. The analysis is based on the cryptocurrencies like Bitcoin and Ethereum with daily prices, trading volume, and market capitalization expressed in US dollars for the past 5 years from 11th February 2017 to 10th February 2022.

Since, the introduction of Bitcoin based on blockchain technology in 2018, global financial markets have experienced increased deals of crypto as a new asset class. Cryptos are based on fundamentally new technologies as mentioned – blockchain, the potential of which highly anticipated but not fully understood. In their current form, however, cryptos are also behaving like high net growth assets. Given the emergence of cryptocurrency markets, understanding the characteristics and the relationship of crypto and global asset classes is relevant to a broad audience, from market participants seeking modern ways to generate returns with high diversification benefits, to regulators and governments wishing to better understand the trading objectives and market structure to formulate their policies and regulatory framework around cryptocurrency, and to academics being keen to better understand and draw insights around the movements and the development of the market. However, with increasing participation by investors in the asset class, the literature and information on the cryptocurrency market is still largely underdeveloped and unclear compared to the traditional asset classes.

3. Literature Review

This research paper has focused on the statistical characteristics and risk assessment of cryptocurrency compared to the traditional asset classes like equities, commodities and precious metals. The introduction of Bitcoin dates back to 2008 when a person using the pseudonym Satoshi Nakamoto

published a paper entitled “Bitcoin: A peer-to-peer Electronic Cash System”. The actual cryptocurrency software was released in the open-source domain in the early 2009. Thus, Bitcoin has established itself as the cryptocurrency with the highest market capitalization.

Using time series models, Pichl and Taisei Kaizogi in 2017 found that cryptocurrency markets are even more volatile than foreign exchange markets. Analysis reported by Bouri et al. in 2017, Katsiampa in 2017, Bariviera in 2107 and Stavroyiannis in 2018 observed the phenomenon of volatility clustering in the cryptocurrency market. Bouri using dynamic conditional correlations reached to a conclusion that Bitcoin is a suitable diversifier, have hedge and safe heaven properties against Asia pacific stocks and concluded that the frequency of data matters to Bitcoin properties. Katsiampa studied the ability of several GARCH models to explain the volatility in the historical prices of Bitcoin. Katsiampa’s study was concentrated by a modelling methodology. Bariviera studied the long-range dependence of cryptocurrency’s expected return and expected volatility. The conclusion of the study was that the daily volatility exhibits long-range memory during all the periods. Stavroyiannis implemented a GJR-GARCH model in which the residuals follow the standardized Pearson type-IV distribution. His findings include that Bitcoin is a highly volatile currency violating the value-at-risk measures more than the other assets. Also, with respect to the Basel Committee on Banking Supervision Accords, a Bitcoin investor is subjected to higher capital requirements and capital allocation ratio.

Recent studies during the Covid-19 pandemic were also referred for the purpose of this research. These include studies by Vukovic, Sarkodie and Naeem. Darko Vukovic developed a unique Covid-19 global composite index that measures the effect of the daily pandemic time-variant movements. Sarkodie investigated the effects of Covid-19 outcomes on the market prices of the top coins in the cryptocurrency space. Several financial institutions including Morgan Stanley and Goldman Sachs have also published their analysis around the cryptocurrency space in 2021. Organizations like The Journal of Alternative Investments and The Journal of Risk and Financial Management have shared their observations and analysis through their reports.

These studies have encouraged us to analyze the cryptocurrency market and our analysis extend to the data available during the recovery period of the economy from the pandemic including the second and third wave. We have extended our study to more cryptocurrencies apart from Bitcoin. With governments and regulators coming up with policies and increased developments in the market, we have gone one

step ahead to incorporate these in our analysis and contribute to the available researches and study reports as mentioned above. Thus, on the basis of the current nature of the cryptocurrency world, we would be trying to answer as to can cryptocurrencies be considered as a new asset class.

4. Methodology

We first analyze cryptocurrency's suitability to create a new asset class. We have used Sharpe's definition of distinguishing asset classes on the basis of three criteria:

- Mutual exclusivity between asset classes
- Exhaustiveness within an asset class
- Differing returns between asset classes

For testing the mutual exclusivity between asset classes, we have analyzed the Pearson's correlation coefficient between the returns of the leading cryptocurrencies – Bitcoin and Ethereum with the traditional asset classes – S&P 500, Dow Jones Industrial Average Index, Sensex, S&P Precious Metal Index and S&P Goldman Sachs Commodity Index (GSCI). The exhaustiveness within an asset class is analyzed in the same correlation study between Bitcoin and Ethereum. In order to analyze the differing returns between asset classes, we have computed average annualized returns and volatility of Bitcoin, Ethereum and the traditional asset classes.

We have also analyzed the liquidity in the market by comparing the liquidity of crypto markets relative to traditional tech equities as an indicator whether investment positions can effectively be entered and exited from. Along with a quantitative approach, we have also implemented a qualitative approach towards analyzing the cryptocurrency market. We have plotted graphs of the historical prices, historical daily returns, etc. of the asset classes.

5. Body

Cryptocurrencies based on blockchain are a new and unclassified emergence at the intersection of technology and finance. It is therefore of particular interest whether cryptocurrencies can be considered as a new asset class for investment purposes. Economic turbulences such as the Covid-19 pandemic

have served to draw our attention to the fragility of our monetary and financial system. As a reaction to what has become one of the most prominent emergences of an investment class, which led to 20 million Indians being jumped on to the crypto bandwagon in 2021. Bitcoin was launched in 2009 setting the stage for numerous further projects which led to the development of a new bridge between technology and finance. However, the question remains unanswered as to whether cryptocurrencies can be considered as a distinct asset class in their own right, enabling diversification and higher risk calculated return compared to portfolios consisting of only traditional asset classes. If cryptocurrencies were to constitute a distinct asset class, this would carry significant implications for fund managers, retail investors, governments, regulators and policy makers alike.

5.1 The Technology Behind Cryptocurrency

Distributed Ledger

A database that is shared and synchronized across multiple sites and geographies by many participants. Each participant can access and own a copy of the ledger, and all changes to the ledger are visible to all participants. Distributed ledgers have no central authority; when a change is made to the ledger, a consensus algorithm is used to verify the change. Information on blockchain-based distributed ledgers is securely stored using cryptography and can be accessed using keys and signatures.

Blockchain

A blockchain is a type of distributed ledger that stores a list of records known as blocks. The Bitcoin blockchain was created by Satoshi Nakamoto in 2008 to solve the double spend problem of decentralized systems—how to verify without a trusted central authority that the same coin was not spent twice—by using a “distributed timestamp server to generate computational proof of the chronological order of transactions.”

Nodes

Node is a computer that runs the blockchain algorithm and transmits information across the network. Nodes are categorized according to their roles: mining nodes add transactions to the blockchain through a mining process; full nodes hold and distribute copies of the ledger; super nodes connect full nodes to each other; light nodes are similar to full nodes but hold only a portion of the ledger.

Mining

The process of verifying and recording transactions on the blockchain via a consensus algorithm. Miners are rewarded for their process of mining. Bitcoin is one of the cryptocurrencies that can be mined, but not all crypto currencies are mineable.

Forks

When blockchain nodes are not in agreement on a network's transaction history or rules around what makes a transaction valid, the blockchain may fork. Forks can happen by accident or intentionally. Soft forks are mostly accidental; there is still one blockchain as old nodes can continue to communicate with new nodes. Hard forks are intentional; the blockchain splits into two as old nodes cannot communicate with new nodes.

Consensus Algorithm

A mechanism by which all the nodes on a blockchain network reach a common agreement about the state of the distributed ledger. Various cryptocurrency networks use different consensus algorithms; the two most preferably used are Proof of Work and Proof of Stake.

Proof of Work (PoW)

Used by crypto networks like Bitcoin and Litecoin, PoW requires participant nodes to show that a required amount of computational effort has been expended. PoW requires a significant amount of analysis on computing resources.

Proof of Stake (PoS)

Currently used by cryptocurrency system like Cardano and Polkadot, and planned for Ethereum in the future, PoS, unlike PoW, does not involve solving a mathematical query to validate transactions. Instead, participant nodes must stake some amount of cryptocurrency if they want to validate. A random node is then selected as a validator based on how much cryptocurrency is staked, among other factors.

As blockchain technology cannot be altered with, it shows complete transparency between the peers and miners which makes it secure to implement. Through the blockchain technology, people transacting remain anonymous for the parties not involved in the transaction. However, it is argued widely that a major disadvantage of the crypto based on blockchain technology is it's use by people for illegal transactions. This is invalidated by the data available indicating that only 0.15% of the total transactions were used to finance illegal activities which is relatively high than the numbers in traditional currency system.

5.2 Coins and Tokens in the Cryptocurrency Market

The total market capitalization of the cryptocurrency market is approximately \$2 trillion which is just 1.6% of the total market capital of the global equity market which stands at \$125 trillion.

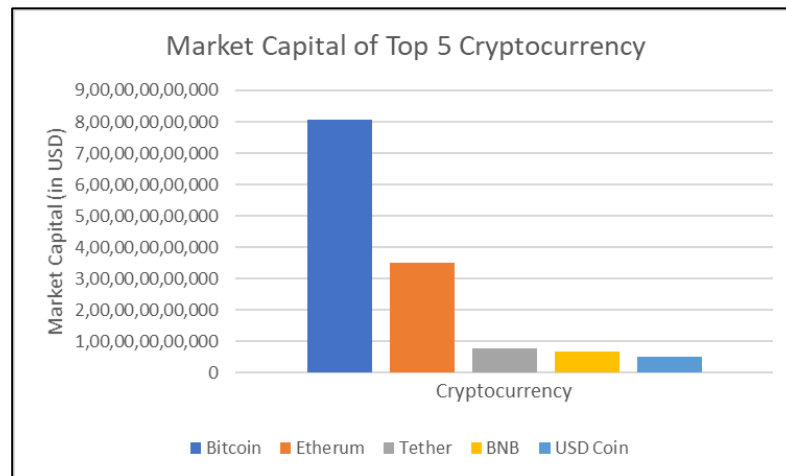


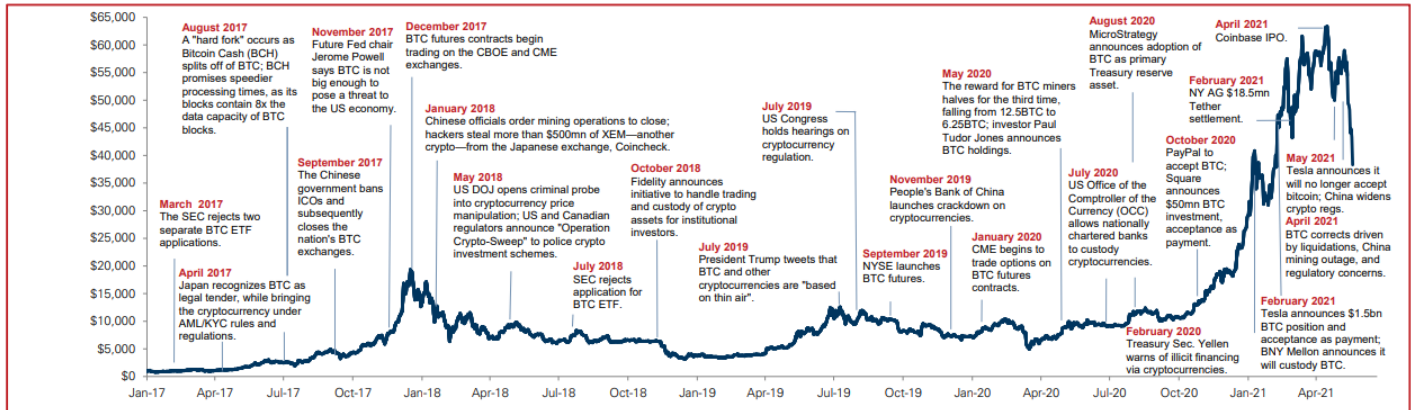
Figure 1: Market Capitalization of Cryptocurrency

As can be inferred from figure 1, Bitcoin has the highest market capitalization out of all the cryptocurrencies followed by Ethereum. Details about the top coins and tokens in cryptocurrency market can be found in appendix A.

One of the important factors to consider while investing in cryptocurrency is the volatility observed in the market. The factors that contribute to the ups and downs in the prices of cryptocurrencies include liquidity, market news, relationship with other financial markets, investor sentiments, etc.

The following graph indicates the different reasons for the movement in prices of Bitcoin.

2017-2021



2013-2016

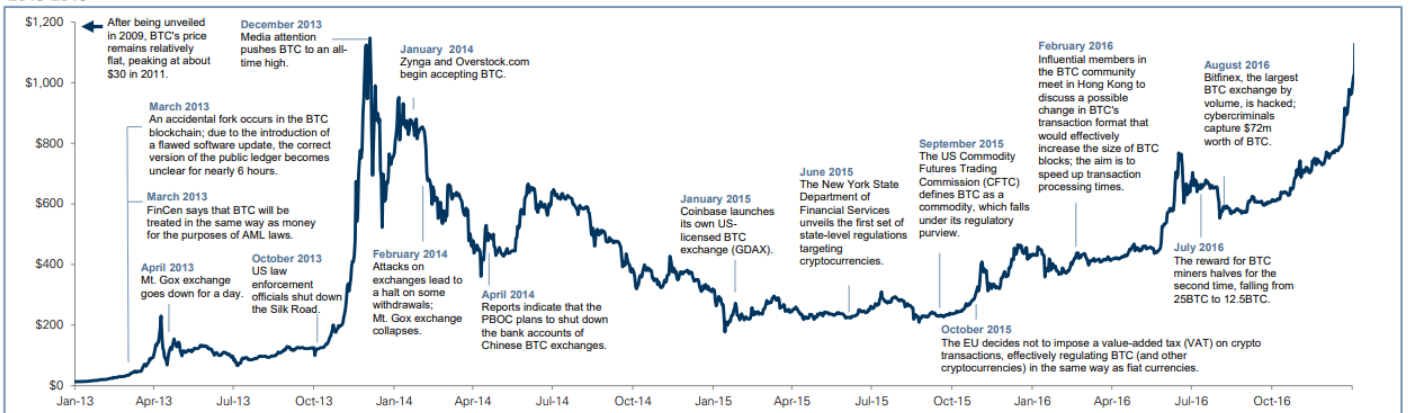


Figure 2: Reasons for the movements in prices of Bitcoin

5.3 Risk-Return profile of Cryptocurrency

In order to analyze the risk-return profile of cryptocurrency, we have computed and analyzed the historical returns and standard deviation of the top cryptocurrencies – Bitcoin and Ethereum along with S&P 500 index in USA and Dow Jones Industrial Average Index.

Volatility	10-02-2017 to 09-02-2018	10-02-2018 to 09-02-2019	10-02-2019 to 09-02-2020	10-02-2020 to 09-02-2021	10-02-2021 to 09-02-2022
Bitcoin	101.08%	72.60%	71.36%	81.69%	73.88%
Ethereum	144.88%	101.26%	79.85%	108.17%	97.87%
S&P 500	7.81%	13.26%	9.82%	28.69%	11.17%
Dow Jones Industrial Average	8.30%	13.72%	9.83%	30.51%	10.14%

Table 1: Standard Deviation of Returns

Expected Return	10-02-2017 to 09-02-2018	10-02-2018 to 09-02-2019	10-02-2019 to 09-02-2020	10-02-2020 to 09-02-2021	10-02-2021 to 09-02-2022
Bitcoin	265.17%	-58.60%	124.54%	190.91%	20.42%
Ethereum	533.60%	-140.34%	90.74%	269.60%	102.78%
S&P 500	8.81%	3.17%	15.22%	14.80%	10.34%
Dow Jones Industrial Average	12.56%	3.50%	11.10%	9.47%	8.51%

Table 2: Expected Returns

As can be inferred from table 1 and table 2, Bitcoin and Ethereum which broadly represent the cryptocurrency market, exhibits high volatility relative to S&P 500 and Dow Jones industrial Average Index. However, along with high volatility, cryptocurrencies offer higher returns to the investors as well on the basis of the average annual returns for the past 5 years. Thus, it can be concluded that cryptocurrencies are high-growth assets when compared to traditional asset classes like equity.

Bitcoin offers high daily returns as well when compared to other asset classes. However, it indicates the inherent volatility of returns which can be detrimental for some. Thus, there is scope for improvement in the stability of cryptocurrencies with price moving alongside the fundamentals of the asset class.

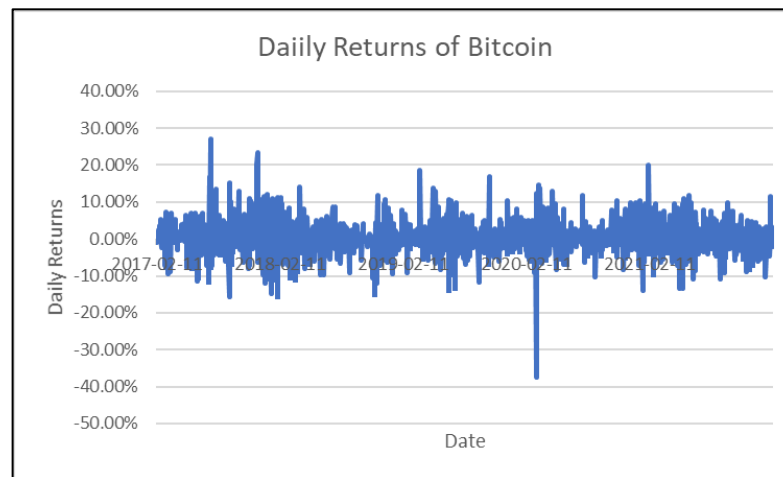


Figure 3: Daily Returns of Bitcoin

The historical price movements of Bitcoin and Ethereum is shown in figure 4.

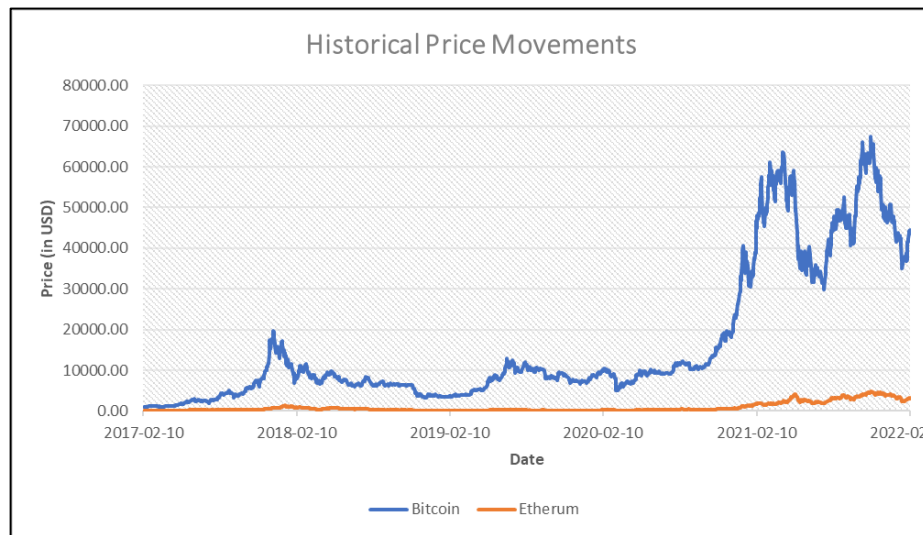


Figure 4: Historical daily prices of Bitcoin

5.4 Correlation analysis between cryptocurrencies and traditional asset classes

We have used Sharpe's definition of distinguishing asset classes on the basis of three criteria:

- Mutual exclusivity between asset classes
- Exhaustiveness within an asset class
- Differing returns between asset classes

In order to test the above metrics, we have calculated the correlation matrix involving the top cryptocurrencies – Bitcoin and Ethereum along with traditional asset classes including S&P 500, Dow Jones Industrial Average Index, Sensex, S&P GSCI (Commodity index) and S&P Precious Metals.

Correlation Matrix	Bitcoin	Ethereum	S&P 500	Dow Jones Industrial Average	Sensex	S&P GSCI	S&P Precious Metal
Bitcoin	100.00%	68.12%	17.44%	16.03%	4.59%	13.31%	11.50%
Ethereum	68.12%	100%	18.92%	17.55%	9.08%	10.77%	9.92%

Table 3: Correlation analysis

From table 3, it can be concluded that the correlation of Bitcoin and Ethereum is low with other traditional asset class with the highest being 17.44% and 18.92% with S&P 500. It can also be inferred that the correlation of Bitcoin with Ethereum is high i.e., 68.12%. From the results of table 2 and table 3, we conclude that cryptocurrency can be considered as a distinct asset class since it satisfies the Sharpe's definition of distinguishing asset classes.

From the correlation analysis, it can also be interpreted that since, cryptocurrencies do not have strong correlation with traditional asset classes, it will provide good diversification benefits to the portfolio holder along with other asset classes.

5.5 Legalities, Public Reaction & Corporate Plans

One of the major hurdles between investor participation and the cryptocurrency market is the regulatory uncertainty. In India, cryptocurrency is not yet been recognized as a legal investment class nor as a legal tender. Thus, investors who are willing to invest in the asset class remain unsure owing to the regulatory frameworks around the space. In India, however, RBI had imposed a restriction in 2018 on banks and other financial institutions restricting them to deal in transactions involving cryptocurrency. This was interpreted as an idea towards a complete ban by the government. However, in early 2020, Supreme Court of India in one of its cases quashed the order of RBI of restricting banks and financial institutions dealing in cryptocurrency. RBI still stays on the side of banning cryptocurrency altogether. In the Union Budget 2022, Government of India announced that it has imposed a tax of 30% of the net profits in cryptocurrency and NFTs.

Public reaction can be summed up in the following points:

- Cryptocurrencies are transferrable with complete anonymity and anytime round the clock.
- Complete transparency and a secure network.
- Decentralization of the transaction pathway.
- Complete divisibility of holdings is allowed which gives a hand on flexibility of holdings relative to the traditional asset classes.

Several companies have been in the forefront of announcing to accept payments in cryptocurrencies. For instance, Tesla in 2021, had announced that it will start accepting payments in cryptocurrency for its products. However, citing the environmental concerns that mining cryptocurrency results in, Tesla announced a few weeks later that it has scrapped its plans of accepting payments in cryptocurrency.

6. Conclusion

Just as the value of foreign currency investment fluctuates based on countless factors – such as national interest rates, trade deficit with other countries, and government policy – cryptocurrency market trade at prices based on the perceived value of the platforms and projects with which they are associated. In this reference, instead of an investment in a particular country's economy, holding a cryptocurrency can be seen as an investment in the network, system and technology behind it. In this paper, we have used a detailed set of prices, traded volumes, and market capitalization for a few cryptocurrencies representing the larger market to empirically investigate their relationship with standard and traditional asset classes and the main driving factors behind market activity.

Our findings include that with high volatility, cryptocurrencies also provide higher returns compared to the traditional asset classes. The correlation analysis results in the conclusion that cryptocurrency exhibits low correlation with other asset classes proving to provide good diversification benefits whereas it exhibits high correlation among the cryptocurrencies. This stands true as per Sharpe's definition and we conclude that cryptocurrency, if not currently, is moving on the path towards becoming a new asset class with scopes of improvement in its stability, regulations and liquidity for increased participation by institutional investors and financial investors.

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8. Appendix

A. Coins And Tokens in Cryptocurrency

Name/ Market cap	Function	Established	Background/Objectives	Current/ Maximum supply	Consensus mechanism
Bitcoin (BTC) \$700bn	Currency	2009	The first cryptocurrency, established to allow peer-to-peer transactions without the need for a trusted third party. Transactions are verified by network nodes and recorded on the blockchain.	18.7mn/ 21mn	Proof of work (one party proves to the other that a certain amount of computational effort has been expended)
Ethereum (ETH) \$285bn	Smart contract application platform	2015	The most actively used blockchain, established to enable the creation and use of smart contracts and decentralized applications. Ether is Ethereum's native cryptocurrency.	115.9mn/ unlimited	Currently proof of work, but moving to proof of stake
Tether (USDT) \$58bn	Stablecoin	2014	Originally designed as a stablecoin—aiming to be fully backed by a fiat currency—it was later found that each tether was not fully backed by US Dollars at all times.	58bn/ unlimited	N/A; USDT tokens run on the Algorand, BCH, EOS, Ethereum, Liquid Network, Omni, Solana, Tron blockchains
Binance Coin (BNB) \$52bn	Currency/ application/ utility	2017	Issued by the Binance cryptocurrency exchange, Binance Coin is used to pay for fees on the exchange. While it originally operated on the Ethereum blockchain, BNB had its own mainnet ¹ launch in 2019.	153.4mn/ 170.5mn	Proof of stake (randomly assigns the node that will mine/validate, partially according to the number of coins a node stakes)
Cardano (ADA) \$47bn	Smart contract application platform	2017	Cardano is a public blockchain established to enable the creation and use of smart contracts while focusing on scalability and interoperability. Ada is Cardano's internal cryptocurrency.	31.9bn/ 45bn	Proof of stake
Dogecoin (DOGE) \$43bn	Currency	2013	Named after the Shiba Inu meme and created as a "fun" alternative to bitcoin, dogecoin is a peer-to-peer, open-source cryptocurrency. Dogecoin is a fork of the luckycoin blockchain.	130bn/ unlimited	Proof of work
XRP \$38bn	Currency	2012	XRP is a real-time settlement system, exchange, and remittance network that facilitates cross-border payments for financial institutions.	46bn/ 100bn	A network of servers validates transactions through a custom consensus algorithm
Polkadot (DOT) \$24bn	Smart contract application platform	2017	Polkadot is designed to provide interoperability between other blockchains. Polkadot features "shared security"—developers can create their own blockchains on the system while still having access to Polkadot's security.	939mn/ unlimited	Proof of stake
Internet Computer (ICP) \$15bn	Smart contract/data platform	2021	Internet Computer is a public blockchain that extends the functionality of the public internet to allow it to host back-end software. This enables developers to create websites, enterprise IT systems and internet services by installing code directly onto the public internet, bypassing server computers and commercial cloud services. ICP is Internet Computer's utility and governance token.	124mn/ unlimited	Independent data centers operate standardized computer nodes, and are rewarded for the time that they correctly operate these nodes (currently 48 data centers run 1,300 nodes)