



REVIEW ARTICLE

Correlative Analysis of Cryptocurrencies and Stocks from Asset and Investment Perspective

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Abstract

Cryptocurrencies are relatively young phenomenon in the history of money being used as a basis for exchange of value. This phenomenon was in concept for many years, however, got mainstream traction when Bitcoin was introduced by pseudonymous developer Satoshi Nakamoto in 2008. Cryptocurrency is now perceived by mainstream investment community as a financial asset and thus forming an investment opportunity. This paper explores to validate this perspective of cryptocurrencies being young assets by correlating them against another matured type of security known as stocks. With this exploration, it offers a simplistic-yet-reliable view on the investment opportunity arising from cryptocurrencies against that of a well-established benchmark.

Keywords: Cryptocurrency, Bitcoin, Money, Stock, Equity, Exchange.

关键词：加密货币·比特币·货币·股票·股权·交易。

Introduction

In 1875, William Stanley Jevons summarized the four functions of money as: Medium (of exchange), Measure (unit of account or market value), Standard and Store (of value). The standard of deferred payment is not considered as a distinguished function now, as it is already intrinsically exhibited by other three functions. Historically, few currencies are used also as investment vehicles due to the strength of such currencies, prevailing arbitrage opportunity (simultaneously buying in one market and selling in another at a higher price) and etc. (Bouteska *et al.*, 2024). There are many mainstream cryptocurrencies in market in circulation now, with Bitcoin (BTC) and Ethereum (ETH) being the top two and way ahead of others in terms of market asset

capitalization. With more than 1000 known cryptocurrencies in marketplace now, their total market asset capitalization is quoted as exceeding 1 trillion (Jeris *et al.*, 2022).

Fundamentally, a cryptocurrency is a digital only currency that gets exchanged through a computer network whose transactional value is endorsed by a consensus-based confirmation mechanism (López-Cabarcos *et al.*, 2021). It completely relies on a decentralized system to help verifying the transacting parties have the money they claim to own and without double spending, thereby eliminating the need for centralized intermediaries like banks to confirm the validity and value of the transaction as in typical fiat currency-based exchange (Zahid *et al.*, 2022).

A cryptocurrency records the individual coin ownerships in a digital ledger as blocks of transactions (through distributed ledger technology, such as blockchain), secures the record using cryptography (for e.g. SHA-256 hashing), controls the creation of additional coins (through a rewarding process known as mining) and verifies the transfer of ownership (verifying through decryption using public keys). These transactions are irreversible also once settled, like cash (Bindu *et al.*, 2023). There are many factors influencing the investment opportunity of any asset class like bonds, stocks, etc.: liquidity, valuation (value appreciation), volatility, storage risk, etc.,

There are few factors mentioned below that influence specifically cryptocurrencies:

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Increasing regulation

No central authority issues a cryptocurrency. Cryptocurrencies employ distributed control as opposed to a central bank digital currency (CBDC). Considering such currencies originating from non-regulated sources, many governments are concerned about using for illicit purposes. Hence, in the recent years, many governments and financial authorities like FATF are cracking down on or bringing regulations around the usage of cryptocurrencies. Such bids generally result in devaluing cryptocurrencies (Song, 2023).

Mining Reward and Supply Limit

The total cap of bit coin is 21 million, there is always a limited supply of bitcoin. As per the details available on Dec-2023, around 19.57 million bitcoins have been mined and are in circulation, leaving approximately 1.43 million bitcoins left for mining. The process of mining involves solving complex mathematical equations to verify transactions on the blockchain network is called mining. The reward for each block of transaction is 625 bitcoins, which was 50 bitcoins at the time of launch, this amount is halved after every 210,000 blocks or about one in every four years, this process is called halving event. With a new block being produced approximately every 10 minutes, about 0625 bitcoins are mined per minute, thus estimating to reach the total cap by the year 2140. It is possible that Bitcoin investors could experience adverse effects (Ghorbel & Jeribi, 2021).

Technology Risk

Cryptocurrency is a digital bearer asset; the owner of the private key is considered to be the owner of the currency. This makes it extremely difficult to validate the proof of ownership. If a private key is stolen or misplaced or lost, it is one of the reasons the recovery of crypto assets could be almost impossible. The payment transactions are confirmed through a consensus process that generates a confirmation score (higher the better). Double-spending risk may occur when relying on transactions with 0 confirmations. There were few other risks from the underlying technology: wallet vulnerable to theft, privacy risk due to the theoretical possibility to trace a coin history, attacker node isolating other nodes from honest network. Such potential occurrences reduce the trust and diminish the value (Mallick *et al.*, 2023).

Technology Improvements

the processing of ever-growing block lengths is increasing at geometric scale causing performance concerns. The latest drastic improvements on GPU technology are leveraged by miners in speeding up the processing and confirming of transaction blocks (Aivaz *et al.*, 2023).

Methodology

Bitcoin is employed as a sample cryptocurrency for the study. Typically, the potential investment opportunity on any

Table 1: Correlation over continuous quarterly intervals

From	To	Quarterly
22-09-2014	31-12-2014	-0.33272708
02-01-2015	31-03-2015	0.18355697
01-04-2015	30-06-2015	-0.29261755
01-07-2015	30-09-2015	0.81326623
01-10-2015	31-12-2015	0.38932572
04-01-2016	31-03-2016	0.46013476
01-04-2016	30-06-2016	0.14689510
01-07-2016	30-09-2016	-0.49046253
03-10-2016	30-12-2016	0.74422643
03-01-2017	31-03-2017	0.79212080
03-04-2017	30-06-2017	0.90759210
03-07-2017	29-09-2017	0.20452476
02-10-2017	29-12-2017	0.94728201
02-01-2018	29-03-2018	0.35678006
02-04-2018	29-06-2018	-0.37927738
02-07-2018	28-09-2018	-0.18424352
01-10-2018	31-12-2018	0.68746269
02-01-2019	29-03-2019	0.36334102
01-04-2019	28-06-2019	-0.08791165
01-07-2019	30-09-2019	-0.17249617
01-10-2019	31-12-2019	-0.54281520
02-01-2020	31-03-2020	0.85292253
01-04-2020	30-06-2020	0.79920786
01-07-2020	30-09-2020	0.73748772
01-10-2020	31-12-2020	0.84130020
04-01-2021	31-03-2021	0.77912496
01-04-2021	30-06-2021	-0.63297443
01-07-2021	30-09-2021	0.81349895
01-10-2021	31-12-2021	-0.10364697
03-01-2022	31-03-2022	0.58561556
01-04-2022	30-06-2022	0.94650044
01-07-2022	30-09-2022	0.75104402
03-10-2022	30-12-2022	-0.58019747
03-01-2023	31-03-2023	0.31166874
03-04-2023	30-06-2023	-0.03801495
03-07-2023	29-09-2023	0.45669285
02-10-2023	22-12-2023	0.77562952

asset class is determined by studying historical indicators (for example, price movement, volatility, liquidity), projecting them onto future course and mixing with appropriate event-based indicators (for example, macroeconomic conditions, geopolitical events). Such predictive analysis is much difficult or chaotic with a young asset class such as Bitcoin due to non-existence of enough historical data (Dyhrberg, 2016). The study proposes to explore the investment opportunities

on Bitcoin, in correlation with another asset class, such as Stocks (or Securities), more specifically, S&P 500 index. This approach offers reliability due to the maturity and regulatory nature of stock markets. This approach also offers simplicity because there is enough literature available to predict price movements in stock markets (Song, 2023).

The study will attempt to answer the question of whether historical price movements in S&P 500 stock index are correlated in any way to those of Bitcoin. With that, it would be possible to project the predictive analysis on the same index onto predict the Bitcoin's future price movements. For the current investigation, the historical market data for both Bitcoin and S&P 500 were collected from publicly available source, "Yahoo Finance". Since the historical data for Bitcoin is available only from the recent past, the data for matching time period is collected for S&P 500 as well – 17-Sep-2014 to 22-Dec-2023 (Khan *et al.*, 2020).

Pearson Correlation coefficients are used in financial analysis to assess the degree of association between two variables, or data sets (Aivaz *et al.*, 2023). The gathered market data for Bitcoin and S&P 500 are further analyzed using Correlation Coefficient.

Results

In the below analysis results (Tables 1-4), Green highlighted cells indicate that there is a relatively strong positive

Table 2: Correlation over continuous half-yearly intervals

<i>From</i>	<i>To</i>	<i>Half-yearly</i>
22-09-2014	31-03-2015	-0.50162565
01-04-2015	30-09-2015	0.30738777
01-10-2015	31-03-2016	-0.16729336
01-04-2016	30-09-2016	0.48504851
03-10-2016	31-03-2017	0.91805665
03-04-2017	29-09-2017	0.79298450
02-10-2017	29-03-2018	0.51508087
02-04-2018	28-09-2018	-0.54262267
01-10-2018	29-03-2019	0.38793948
01-04-2019	30-09-2019	0.36651395
01-10-2019	31-03-2020	0.64844687
01-04-2020	30-09-2020	0.88495711
01-10-2020	31-03-2021	0.90629240
01-04-2021	30-09-2021	-0.26763821
01-10-2021	31-03-2022	0.42992690
01-04-2022	30-09-2022	0.77362582
03-10-2022	31-03-2023	0.35483772
03-04-2023	29-09-2023	0.10985824
02-10-2023	22-12-2023	0.77562952

Table 3: Correlation over continuous yearly intervals

<i>From</i>	<i>To</i>	<i>Yearly</i>
22-09-2014	30-09-2015	-0.33017273
01-10-2015	30-09-2016	0.58872819
03-10-2016	29-09-2017	0.80856520
02-10-2017	28-09-2018	-0.04591507
01-10-2018	30-09-2019	0.71411169
01-10-2019	30-09-2020	0.71744385
01-10-2020	30-09-2021	0.64257581
01-10-2021	30-09-2022	0.85420685
03-10-2022	29-09-2023	0.74257352
02-10-2023	22-12-2023	0.77562952

Table 4: Correlation over continuous longer time horizon yearly intervals

<i>From</i>	<i>To</i>	<i>Longer</i>
22-09-2014	30-09-2016	0.29456323
03-10-2016	30-09-2020	0.73241727
01-10-2020	22-12-2023	0.60121342

correlation between Bitcoin and S&P 500 market data – above 70%. Non-highlighted cells indicate that there is negative or no influential correlation between them – below 70%.

The below studies detail the correlation between the cryptocurrencies and the traditional financial assets. The study by Corbet *et al.*, (2018) investigated the relationship between Bitcoin and traditional financial assets from 2012 to 2017. They reported that while Bitcoin's correlation with gold was relatively stable, its relationship with equities increased during market downturns, suggesting it may behave like a safe haven asset. The study by Liu & Tsyvinski, (2018) conducted an analysis on cryptocurrencies' performance relative to stocks, bonds, and commodities. Their findings suggested that cryptocurrencies tended to move independently of traditional assets, although the correlation increased during periods of market volatility. The study by Katsiampa, (2017) analyzed the relationship between Bitcoin and various financial markets. Results indicated that Bitcoin had a significant, albeit varying, correlation with equity markets, particularly during periods of market stress.

Conclusion

The correlation coefficient analysis on the interdependence between Bitcoin and S&P 500 market data clearly reveals a favorable (strongly positive) correlation over longer periods and moderate to inconsistent correlation over shorter periods. As observations from many other researchers recorded across many research papers, the S&P 500 index historically proves that the longer the investors remain invested, the price appreciation remains much higher

while the volatility remains much lower. Hence, similar expectations can be categorically concluded for Bitcoin as well due to the fact that both indexes exhibit favorable correlation for such longer periods. Also, as many other researchers observed, the S&P 500 index historically proves that the shorter the investors remain invested, the price appreciation remains much lower while the volatility remains much higher. However, since, there is only moderate to inconsistent correlation between the two indices, it is not possible to categorically conclude similar expectations for Bitcoin for such shorter periods. The author would like to conclude that the observations from this paper reveal a prospect for better returns on investment over long term horizon. This paper endeavors to compare and analyze the correlation coefficients derived from the available historical data. The primary objective is to draw conclusions regarding the potential of cryptocurrencies to offer superior returns on investment over a longer-term horizon. By scrutinizing the correlation coefficients between cryptocurrencies, represented by Bitcoin, and established indices like NIFTY and S&P 500, the research aims to uncover patterns and relationships. The insights gained from this analysis are anticipated to shed light on whether cryptocurrencies exhibit characteristics that could make them a compelling option for investors seeking favorable returns over an extended time frame.

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