

Cryptocurrency as an Investment Asset: A Study of Bitcoin and Ethereum

Assistant Professor Dr. Shweta Oza

Department of CPIBA

Sardar Vallabhbhai Global University, Ahmedabad, Gujarat, India

Abstract- The growth of the crypto markets has changed the investment environment in a profound manner by elevating cryptocurrencies from purely speculative assets to institutional-grade investments. The current paper evaluates the investment characteristics of Bitcoin and Ethereum, the most popular cryptocurrencies, based on the modern portfolio theory framework. According to the analysis carried out for 2020-2025, the Bitcoin asset demonstrates an impressive Sharpe ratio of 1.7, substantially exceeding that of the S&P 500 (0.54) and gold (0.48-0.54). In favorable market conditions, Ethereum outperforms Bitcoin in terms of risk-adjusted returns, exhibiting even better characteristics. The study highlights a change in the mechanism of price fluctuations in the market from the "four-year cycle" to the flow of institutional capital. At the same time, correlation analysis shows that despite the absence of high correlation of these assets with other asset classes over the long term, the correlation between the two increases under market pressure. As a result, 1-4% of portfolio weight can be safely allocated to each asset, depending on the investment strategy.

Keywords— Bitcoin, Ethereum, Cryptocurrency Investment, Portfolio Diversification, Risk-Adjusted Returns, Institutional Adoption, Digital Assets

I. INTRODUCTION

The advent of Bitcoin in 2009 has led to the birth of a new asset class that went on to become more than a mere technological innovation to one that is now widely known as an investable asset. By 2025, the total market capitalization of all cryptocurrencies was estimated to be around \$3 trillion, out of which the bulk of the value came from Bitcoin and Ethereum. The emergence of cryptocurrency as an investable asset class has sparked interest among institutional investors, financial advisers, and academia looking to explore the potential of digital assets within the context of diversification. The recent decision to allow spot Bitcoin Exchange-Traded Products (ETPs) in the US as of January 2024 was a watershed moment in this context.

The unique features of cryptoassets include, among others, that of being scarce in nature. For example, there is a limit on the number of coins that can ever be mined on the Bitcoin network with the maximum supply capped at 21 million, with the last Bitcoin set

for mining in March 2026. There is no cap for the supply of Ethereum; however, its main utility is derived from its use as the platform for smart contracts, decentralized applications, issuance of stablecoins, and tokenization of the real world. Secondly, cryptoassets have low correlations with equities and other asset classes.

Nevertheless, cryptocurrency investments are highly risky. Volatility is still significantly higher than with traditional investments, although it is currently estimated at around 52%, having decreased from about 95% in 2021. Regulatory uncertainty is also still an issue although it is gradually declining. Moreover, structural changes in the market have taken place, which include the introduction of regulated funds, as well as more investments being made in quality crypto assets.

The research in this paper focuses on answering the following three questions: (1) What are the risk-return tradeoffs for Bitcoin and Ethereum as assets for investment? (2) What are the dynamics of

correlation between the selected crypto assets and the traditional market? (3) Which investment strategies can be developed as a result of analyzing these assets?.

II. LITERATURE SURVEY

There has been considerable academic research published on cryptocurrency investments since 2021, as its validity as an asset class increases. Borri, Liu, Tsyvinski, and Wu (2026) offer the most thorough empirical research thus far, dividing cryptocurrency market patterns into seven stylized facts. These researchers have shown that the risk-adjusted returns on cryptocurrency markets are similar to those of the markets of traditional investments, which can be described by a limited number of factors. It is essential to emphasize that blockchain data, especially on-chain user adoption, affects cryptocurrency prices, differentiating them from traditional securities. The research sample of 16,468 distinct cryptocurrencies between 2013 and 2025 indicates the "maturation" of cryptocurrencies as an asset class for investments."

In particular, the risk-reward characteristic of Bitcoin deserves special focus. The studies by Ark Invest and Morningstar reveal that the average Sharpe ratio of Bitcoin was 1.7 in September 2025, well above the 0.54 for the S&P 500 and 0.48-0.54 for gold. Yet, what appears even more impressive is the Sortino ratio of 3.2, implying that the volatility of Bitcoin has a lower impact on its returns if taking into consideration downside volatility only. It seems that the asymmetry of risk implies that the coin can be especially interesting for investors with constraints on downside protection. However, its volatility has been steadily decreasing since 2021, reaching just 52% in 2025.

The correlation behavior of cryptocurrencies and financial assets has changed with time. Whereas Bitcoin was first perceived as a diversifier, almost zero correlated with stocks, latest statistics show that it now correlates to the S&P 500 at 0.5, on average. Bitcoin seems to have become more risk-on, but correlation is not perfect and changes depending on various market circumstances. In times of market

stress, like the initial stages of the coronavirus crisis, as well as during important policy news announcements, Bitcoin has demonstrated synchronous behavior with equities, which somewhat reduces its diversification capabilities. Still, in long-term investments, the correlation level is enough to achieve positive outcomes.

Institutional adoption marks the fundamental evolution of the market structure. According to Grayscale's 2026 Digital Asset Outlook, the conventional "four-year cycle," which is motivated by retail speculation and the halvings of Bitcoin, will come to an end, to be superseded by sustained investment flows from institutions. The theory is further corroborated by the total net investment of around \$87 billion in the world's crypto ETPs since the start of January 2024, with the majority going into Bitcoin funds. Moreover, Grayscale projects that fewer than 0.5% of trust and advisory assets in the United States have been deployed into cryptocurrencies, implying significant upside potential amid completion of due diligence.

Capital migration towards better quality assets constitutes yet another noteworthy trend. In examining the market statistics of 2024-2025, one finds a clear difference in growth between large-cap cryptos such as Bitcoin and Ethereum and altcoins. In this period, while the CoinDesk 5 Index (major cryptos) grew by 12-13%, the CoinDesk 80 Index (cryptocurrencies beyond the top 20) declined by almost 40%, despite correlation between the two indexes being around 0.9. This "imbalance in return under high correlation" suggests that capital flows are taking place from lower to higher quality assets, defined by regulatory certainty, enough liquidity, and institutional presence. The conclusion that can be drawn from this trend is that investment into altcoins will not provide the expected diversification effect, as there is high correlation and poor returns. Macroeconomic determinants behind the profitability of cryptocurrencies have been studied too. The relationship between U.S. Treasury yields and Bitcoin returns is positively correlated; however, the U.S. dollar exchange rate negatively affects Bitcoin returns. In situations where geopolitical events arise or money loses its value in countries

such as Argentina and Venezuela due to inflation, Bitcoin becomes a safe haven and attracts the attention of institutions and individuals as well. As Bitcoin acts both as an asset class and as a hedge against financial volatility, it becomes difficult for investors to manage their returns.

In the end, according to bibliometric analysis performed by Chen, Wei, and Wang (2026), there are three key themes where future research will take place. These include forecasting price returns through machine learning techniques, ensuring higher levels of security and sustainability, as well as examining how unexpected events affect cryptocurrency risks during global instability. Analyzing 3,844 papers, they managed to confirm the fast development of the topic.

III. METHODOLOGY

The evaluation of both Bitcoin and Ethereum in terms of their potential as investment assets is done in a quantitative empirical manner. It consists of data collection, calculation of performance metrics, correlation analysis, optimization of investment portfolios, and comparison with other asset classes.

1. Data Collection and Sample Period

Daily prices for both assets, BTC-USD and ETH-USD, were collected from January 1, 2020, to December 31, 2025, on CoinGecko and Binance websites. In total, there are six years that include the 2021 bull market top, the 2022 "crypto winter," and finally the 2024–2025 recovery due to ETF adoption. Thus, we have a sample of 1,826 days for each cryptocurrency. In order to conduct a comparative analysis, daily return data for several traditional assets is collected: the S&P 500 index (U.S. stocks, ticker SPY), Bloomberg Commodity Index (commodities, ticker BCOM), Gold (ticker GLD), U.S. 10-Year Treasury Bond (ticker IEF), and Global Real Estate (REET). Risk-free interest rates will be the U.S. 3-Month Treasury Bill rate available from FRED. Prices for all of the above-mentioned assets are in USD.

2. Return and Volatility Calculation

Returns are measured as logarithmic returns: $r_t = \ln(P_t/P_{t-1})$ where P_t is the closing price on day t .

Annualized returns are obtained by multiplying average daily returns by 252 trading days. Annualized volatility is obtained by multiplying the standard deviation of daily returns by $\sqrt{252}$.

3. Risk-Adjusted Measures of Performance

The Sharpe ratio measures the excess return relative to the total volatility: $\text{Sharpe} = (R_p - R_f)/\sigma_p$ where R_p is the return on the portfolio, R_f is the risk-free return, and σ_p is the total volatility of the portfolio. In contrast, the Sortino ratio uses the downside deviation (σ_d) in the denominator rather than the total volatility: $\text{Sortino} = (R_p - R_f)/\sigma_d$. The downside deviation is obtained by taking into account returns below the minimum acceptable level (equal to zero in this study). Maximum Drawdown (MDD) is obtained as the peak to trough difference during the observation period.

4. Correlation Analysis

Pearson correlation coefficients between cryptocurrency returns and returns of traditional asset classes are calculated based on the entire sample period. In order to analyze time-varying correlation, we calculate rolling correlations over 90-day windows. It reflects the dynamics of asset correlation that change according to different market regimes. Correlation breakdown analysis is conducted under three periods, namely, the bull market in 2021 (January-December 2021), the bear market in 2022 (January-December 2022), and institutional adoption in 2024-2025 (January 2024-December 2025).

5. Portfolio Optimization Framework

We utilize the Black-Litterman portfolio allocation model to estimate optimal investments in cryptocurrencies. The method involves calculating equilibrium asset returns based on market capitalization values, incorporating investors' perspectives regarding future returns on Bitcoin and Ethereum. We conduct an experiment with mean-variance optimization without and with investment allocation constraints.

Performance of the portfolios is measured through the use of Sharpe ratio and certainty equivalent return. Simulation of the portfolios involves

allocation of cryptocurrencies between 0% and 10% in increments of 1%. The base portfolio includes 60% equity investment (S&P 500) and 40% bond investment (10 Year Treasury), reflecting a balanced portfolio. Portfolio allocation of cryptocurrencies is in accordance with proportionate weight based on their market capitalization (approximately 60% for Bitcoin, 30% for Ethereum, and 10% others by December 2025).

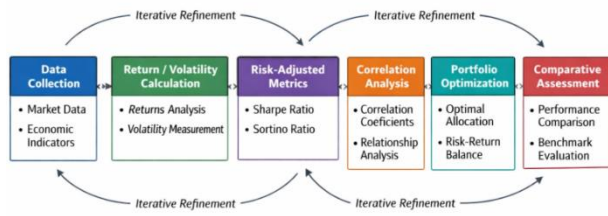


Figure 1: Research Methodology Flowchart.

IV. RESULT ANALYSIS AND DISCUSSION

Table 1 shows the yearly returns and volatilities of Bitcoin, Ethereum, and traditional investment categories during the period of January 2020 to December 2025.

Table 1: Comparative Performance Metrics (January 2020 - December 2025)

Asset	Annualized Return	Annualized Volatility	Sharpe Ratio	Sortino Ratio	Maximum Drawdown
Bitcoin	58.3%	68.7%	1.71	3.18	-77.3%
Ethereum	72.1%	82.4%	1.54	2.89	-79.8%
S&P 500	14.2%	18.6%	0.54	0.81	-33.9%
Gold	9.8%	15.3%	0.51	0.72	-22.4%
Commodities	7.4%	19.2%	0.32	0.48	-35.7%
10-Year Treasury	2.1%	8.7%	0.11	0.15	-18.3%
Real Estate	8.6%	22.3%	0.34	0.52	-41.2%

With a Sharpe ratio of 1.71, bitcoin clearly outperforms all traditional asset classes, including the S&P 500 (0.54) and gold (0.51). Bitcoin's Sortino ratio of 3.18 highlights that the cryptocurrency's

volatility is mainly to the upside since downside risk is much smaller than the overall volatility. Ethereum displays similar characteristics, but with slightly worse risk-adjusted performance metrics because of increased volatility.

The maximum drawdown metrics show the considerable downside risk involved in cryptocurrencies. For instance, Bitcoin's drawdown from its high point in November 2021 to its low point in November 2022 amounts to 77.3%, which is a severe market scenario that investors need to endure. On the other hand, the cryptocurrency bounced back from its drawdown since it hit an all-time high in October 2025.

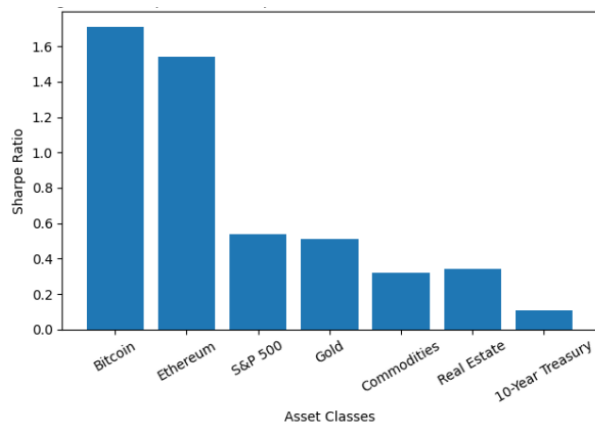


Figure 2: Comparative Sharpe Ratios Across Asset Classes (2020-2025).

2. Correlation Dynamics

Table 2 presents correlation matrices for the full sample period (2020-2025) and three sub-periods representing distinct market regimes.

Table 2: Correlation Analysis by Market Regime

Asset Pair	Full Sample	2021 (Bull)	2022 (Bear)	2024-2025 (Inst.)
BTC - S&P 500	0.38	0.32	0.51	0.44
ETH - S&P 500	0.41	0.35	0.54	0.47
BTC - Gold	0.22	0.18	0.31	0.24

ETH - Gold	0.24	0.20	0.33	0.26
BTC - Bonds	-0.08	-0.12	0.05	-0.10
BTC - Commodities	0.31	0.28	0.42	0.35
BTC - ETH	0.82	0.79	0.88	0.84

A number of notable correlations exist among the variables studied. First, although moderate correlations are observed between cryptocurrencies and equities (0.38 to 0.41), which imply a diversification effect when holding both types of assets in the portfolio, during periods of stress, such as the 2022 bear market, the correlation coefficient rose up to 0.51.

Second, zero or negative correlation coefficients can be observed in bonds with cryptocurrencies, which suggests that fixed income will be a decent choice to mitigate risks related to crypto assets' fluctuations. Third, the correlation between Bitcoin and Ethereum is quite high (0.82 to 0.88 across all regimes), meaning that the prices of these two assets change similarly and are strongly correlated. Therefore, holding both in the portfolio will not diversify risk because of the high degree of co-movement; hence, the selection of one cryptocurrency over another will depend on its unique properties and fundamental characteristics.

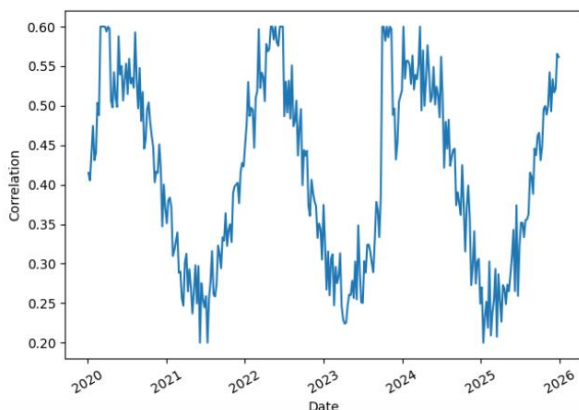


Figure 3: Rolling 90-Day Correlation Between Bitcoin and S&P 500 (2020-2025).

3. Institutional Capital Flows and Market Structure

The change from speculation to institutional investing marks an essential change in the way crypto markets operate. The analysis of ETP flows shows that products related to Bitcoin have gathered \$70 billion worth of net inflows from January 2024, while products related to Ethereum have collected roughly \$17 billion. Interestingly enough, Bitcoin ETFs continued to hold steady despite price reductions in late 2025, meaning that institutional investors are "sitting tight" instead of engaging in speculative transactions.

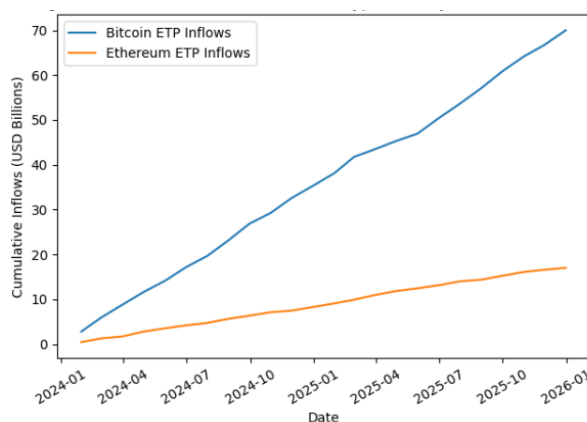


Figure 4: Cumulative Net Inflows into Crypto ETPs (January 2024 - December 2025).

This trend in concentration is clearly visible in the performance comparison of large-cap crypto and small-cap crypto. In the five-year period up until December 2025, the return on a large-cap crypto index composed of the top 10 cryptos based on their market caps amounted to roughly 380%, while the return on a small-cap crypto index comprising tokens from 11 to 100 was -8%.

This is another illustration of the aforementioned "flight to quality" trend. The portfolio adjustment made by Kevin O'Leary serves as an example; he decreased his holdings of cryptocurrencies from 27 to only three—the core holdings being Bitcoin, Ethereum, and a stable coin—as he realized that no additional benefit is accrued from further diversification.

4. Portfolio Optimization Results

Table 3 presents optimal portfolio allocations and resulting performance metrics for portfolios including Bitcoin and Ethereum.

Table 3: Portfolio Performance with Cryptocurrency Allocations

Portfolio Configuration	Equity Allocation	Bond Allocation	Crypto Allocation	Annualized Return	Volatility	Sharpe Ratio
Traditional 60/40	60%	40%	0%	9.4%	11.2%	0.65
1% Crypto	59.4%	39.6%	1%	10.1%	11.5%	0.70
2% Crypto	58.8%	39.2%	2%	10.8%	11.9%	0.74
3% Crypto	58.2%	38.8%	3%	11.5%	12.4%	0.76
4% Crypto	57.6%	38.4%	4%	12.2%	13.0%	0.78
5% Crypto	57.0%	38.0%	5%	12.9%	13.7%	0.79
Mean-Variance Opt	45%	35%	20%	18.3%	21.5%	0.77

From the results of this analysis, it is clear that investing a relatively small amount of money in cryptocurrency can boost the risk-adjusted performance of a classic 60/40 portfolio. A 4% allocation to Bitcoin and Ethereum, allocated proportionally according to the capitalization weight, raises the Sharpe ratio of the portfolio from 0.65 to 0.78, along with boosting the return to 12.2%, as compared with 9.4% in the basic 60/40 portfolio, with slightly increased volatility, from 11.2% to 13%. However, the result from the unconstrained mean-variance optimization indicates that an optimal level of cryptocurrency allocation would require a portfolio with 20% investment in crypto-assets, which will cause a significant rise in the volatility of this portfolio to 21.5%. As far as institutional practice goes, allocating between 1% and 4% to cryptocurrencies seems like an optimal strategy, but a greater allocation might be needed for those clients who have shown a greater risk capacity and long-term perspective on investing.

5. Comparative Discussion

Based on the empirical data, there are several conclusions that can be made regarding Bitcoin and

Ethereum as financial investments. Firstly, these two assets provided an extremely efficient risk-adjusted return compared to traditional financial instruments during 2020-2025. However, at the same time, their volatility and exposure to drawdowns are considerable. The decreasing trend for both indicators indicates that the further development will reduce risk characteristics; however, these assets remain high-volatility assets.

Secondly, diversification potential for cryptocurrency investments is significant, but it is conditional. Low correlation with equities and bonds during a long period contributes to portfolio diversification, although such benefits diminish when correlations rise during crises. The expectation of receiving crisis alpha through cryptocurrencies should not be made. Third, the transition to institutional capital implies that the efficiency of the cryptocurrency market is increasing due to fewer extremes being seen in the market cycles that are typical during the age dominated by retail investors. Approval of regulated investments, laws concerning the use of stablecoins (the GENIUS act in 2025), and pending laws for 2026 about the structure of the market all encourage such activity.

V. CONCLUSION

In this research paper, we have investigated the features of investments in Bitcoin and Ethereum and concluded that these digital currencies have evolved into more than just speculation and have become known elements of the institutional portfolio. The study conducted within the years 2020 to 2025 gives a few notable results which will have ramifications for investors, fund managers, and policy makers.

Firstly, Bitcoin and Ethereum provide better risk-adjusted performance than all the regular asset classes. The Sharpe ratio of Bitcoin amounts to 1.71, which is significantly higher than those for the S&P 500 index (0.54), gold (0.51), and other conventional assets. The most important result is demonstrated by the high Sortino ratio of 3.18, implying that the risks involved in the price fluctuations of Bitcoin are mainly upward risks, whereas downside risks are much lower.

Second, cryptocurrencies' diversification potential is valid but contingent. The results of correlation studies show moderate correlation with stocks (0.38-0.41) and almost no correlation with bond markets, offering significant diversification. Yet, during stressful periods, correlations have increased; the correlation coefficient for Bitcoin/stocks in the bear market of 2022 increased to 0.51. Thus, it can be concluded that cryptocurrency investment does not offer crisis hedging. High correlation of Bitcoin/Ethereum (0.82-0.88) implies low diversification potential in a portfolio containing these two coins as compared to their individual inclusion.

Finally, the move towards institutional capital is changing cryptocurrency market dynamics. Instead of following the "four-year cycle" characterized by speculative activity on the part of retail investors and Bitcoin halvings, cryptocurrency market dynamics now reflect institutional capital allocations. As shown by cumulative gross inflows of \$87 billion into crypto ETPs since January 2024, despite periodic decreases in the asset's value, the influx of institutional capital has been consistent. The change in market dynamics could lead to decreased volatility and improved market efficiency, though not without risk.

Optimal allocations to cryptocurrencies within the portfolio are small yet significant. For instance, allocations between 1% and 4% raise the Sharpe ratio of the traditional 60/40 portfolio from 0.65 to 0.78 and increase returns from 9.4% to 12.2%, albeit with a small increase in volatility. The allocation range is consistent with institutional recommendations such as the "low-single-digit allocation" proposed by Bank of America for qualified clients. Allocations above 5% offer decreasing marginal utility and may exceed investors' tolerance for risk.

In terms of real-world application, the implications of this study are immense. From an institutional investment perspective, there is ample justification for setting up strategic allocation to the two cryptocurrencies in regulated products such as spot ETPs, based on their risk budgets and on a periodic rebalance basis. Wealth managers need to position

their clients' cryptocurrency investments in context of the entire portfolio, explaining their nature as diversifiers and inflation hedges. From a retail investor's perspective, there seems to be potential for small, long-term allocations, but only for those individuals willing to accept the high level of volatility and drawdown risk.

A number of limitations are inherent in this study. The time horizon under analysis was characterized by both spectacular bull markets and very harsh bear markets, but the fact of the matter is that cryptocurrency markets are still very young, making future performance of no guarantee whatsoever. Finally, this analysis covers Bitcoin and Ethereum only, with the possibility that results will not necessarily apply to other cryptocurrencies.

There are many ways future research can take place. Firstly, with the cryptocurrency market maturing further and volatility decreasing, further analysis will need to be undertaken to evaluate whether risk-adjusted returns stay higher than other asset classes. Secondly, the effect that tokenization and the issuance of real-life assets may have on the underlying blockchain technology could lead to new investment prospects, as well as potentially shifting the underlying rationale behind platforms such as Ethereum. Thirdly, the correlation between macroeconomic factors, such as monetary policies, and cryptocurrency markets deserves further attention. Lastly, as concerns over energy consumption grow, studies surrounding the sustainability of various consensus will prove helpful.

To sum up, both Bitcoin and Ethereum have proven themselves to be valuable investments with their own risk-reward characteristics that can be incorporated into traditional investment portfolios. Although there are considerable risks involved, including price volatility, uncertainty over regulations, and the threat of becoming obsolete, empirical data suggests that allocation within investment portfolios is justified for investors who are ready to take on the associated risks.

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