

Cryptocurrency as an Alternative Investment: A Risk and Return Analysis

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Abstract: *The rise of cryptocurrencies over the past decade has transformed the global financial landscape, introducing new paradigms in investment, value storage, and monetary exchange. This study investigates the role of cryptocurrencies—specifically Bitcoin (BTC) and Ethereum (ETH)—as alternative investment assets within modern portfolio frameworks. As digital currencies continue to gain legitimacy and acceptance among retail and institutional investors, it becomes imperative to examine their financial performance, volatility characteristics, and correlation with conventional asset classes such as equities, bonds, and commodities.*

This research adopts a hybrid methodological approach, combining rigorous quantitative analysis with qualitative review. Using historical market data from 2015 to 2024, it evaluates key performance indicators such as average returns, standard deviation, Sharpe and Sortino ratios, Value at Risk (VaR), and maximum drawdown. It further explores the utility of cryptocurrencies in enhancing portfolio efficiency through diversification benefits, while also considering risk mitigation through dynamic asset allocation and rebalancing.

The study extends beyond price metrics to include macroeconomic factors, such as inflation trends and monetary policy shifts, which influence crypto markets. It also addresses behavioral finance phenomena—including herd behavior, market sentiment, and media impact—that contribute to the observed volatility and price surges. The emergence of decentralized finance (DeFi), stablecoins, and central bank digital currencies (CBDCs) are also discussed to contextualize the evolving ecosystem and its implications for future investment strategies.

Key findings indicate that while cryptocurrencies have historically outperformed traditional assets in terms of absolute returns, they also exhibit significantly higher volatility and downside risk. Despite these risks, their low to moderate correlation with conventional financial instruments enhances their value as diversification tools in modern portfolios. However, the study cautions that this benefit may diminish during times of extreme market stress when cross-asset correlations tend to rise.

Moreover, the research highlights critical regulatory, technological, and environmental challenges associated with crypto adoption, including inconsistent global regulations, concerns over energy-intensive proof-of-work systems, and vulnerabilities in smart contracts. These factors underscore the need for robust governance frameworks and investor education to support sustainable growth in the digital asset market.

In conclusion, the paper asserts that cryptocurrencies can serve as high-risk, high-reward components of a diversified portfolio, particularly for investors with higher risk tolerance and a long-term investment horizon. The future integration of cryptocurrencies into mainstream finance will depend largely on regulatory clarity, technological innovation, and the maturation of supporting infrastructure such as custody services, derivative markets, and institutional-grade investment vehicles.

Keywords: Cryptocurrency, Alternative Investment, Blockchain Technology, Bitcoin (BTC), Ethereum (ETH), Risk and Return Analysis, Portfolio Diversification, DeFi (Decentralized Finance), Stablecoins, CBDCs (Central Bank Digital Currencies)



I. INTRODUCTION

Cryptocurrencies have emerged as one of the most significant innovations in the global financial ecosystem since the introduction of fiat currency systems. The debut of Bitcoin in 2009, introduced by the pseudonymous Satoshi Nakamoto, marked the beginning of a decentralized, peer-to-peer financial architecture based on blockchain technology. This breakthrough innovation challenged the foundational principles of traditional finance, notably the reliance on centralized intermediaries such as banks and regulatory authorities. Over the years, the crypto space has evolved exponentially, giving rise to a vast array of digital assets including utility tokens, security tokens, stablecoins, non-fungible tokens (NFTs), and decentralized finance (DeFi) protocols.

The disruptive potential of cryptocurrencies lies in their ability to provide transparent, immutable, and secure financial transactions, without the need for central control or oversight. This unique quality has attracted both proponents and skeptics. While some investors view cryptocurrencies as a hedge against inflation, currency debasement, and geopolitical instability, others criticize their volatility, lack of intrinsic value, and association with speculative behavior. Nevertheless, the asset class has continued to mature, with increasing adoption by retail investors, hedge funds, corporations, and even national governments. Companies like Tesla and MicroStrategy have included Bitcoin in their corporate treasuries, while El Salvador has recognized it as legal tender—moves that were unimaginable a decade ago. From an investment perspective, cryptocurrencies offer a new dimension to portfolio construction. Traditional investment classes—such as stocks, bonds, real estate, and gold—have historically dominated portfolio allocation strategies. However, their correlation with each other during market downturns has prompted investors to seek non-traditional, uncorrelated assets that can enhance portfolio performance through diversification. Cryptocurrencies, with their historically low correlation with traditional asset classes and high return potential, have emerged as strong candidates in this context. At the same time, their extreme volatility and susceptibility to regulatory changes raise important questions regarding risk exposure and portfolio stability.

This research report explores cryptocurrencies through the lens of modern investment theory, focusing particularly on their viability as alternative investments. It seeks to understand how cryptocurrencies perform in terms of risk-adjusted returns, whether they can contribute to portfolio diversification, and how their investment characteristics compare to conventional assets such as equities, fixed income securities, and commodities. The analysis considers both quantitative metrics—such as standard deviation, Sharpe ratio, and Value at Risk (VaR)—and qualitative factors, including regulatory developments, market sentiment, and macroeconomic influences.

Moreover, this study incorporates emerging trends in the broader digital asset ecosystem, including the development of DeFi platforms, algorithmic stablecoins, and central bank digital currencies (CBDCs). These innovations are gradually reshaping the financial infrastructure, enabling decentralized lending, borrowing, trading, and asset management. Understanding the interplay between these trends and core cryptocurrencies is essential to grasp the full spectrum of investment opportunities and risks.

By combining historical data analysis, literature review, case studies, and policy examination, this research aims to deliver a comprehensive assessment of cryptocurrencies as an investment vehicle. It addresses key questions such as: How do crypto-assets behave under different market conditions? Can they reliably serve as hedging tools? What are the primary regulatory risks, and how might they evolve? Who are the main participants driving market activity? And most importantly, can cryptocurrencies sustain their position as viable components of an institutional or retail investment portfolio?

In conclusion, the study positions cryptocurrencies not merely as speculative instruments, but as potentially transformative financial assets whose place in global finance will depend on technological advancements, investor education, regulatory clarity, and broader economic shifts. The subsequent chapters will delve into these issues in greater depth, beginning with an analysis of historical performance and progressing toward a holistic risk-return framework for evaluating digital assets.

II. OBJECTIVES OF THE STUDY

- To perform an in-depth risk-return analysis of major cryptocurrencies including Bitcoin and Ethereum.



- To compare the investment performance of cryptocurrencies with conventional assets such as stocks, bonds, and gold.
- To investigate the correlation structure of cryptocurrencies with traditional financial assets.
- To assess the utility of cryptocurrencies in portfolio construction and diversification strategies.
- To evaluate macroeconomic, technological, and regulatory risks impacting cryptocurrency investments.

III. LITERATURE REVIEW

The evolution of cryptocurrencies has generated significant academic and industry interest over the past decade. As the market for digital assets continues to expand, researchers from fields including finance, economics, computer science, and law have contributed diverse perspectives on their classification, risk characteristics, valuation, market efficiency, and regulatory implications. This literature review synthesizes key findings from scholarly research and practitioner reports to provide a comprehensive foundation for analyzing cryptocurrencies as alternative investment vehicles.

3.1 Cryptocurrencies as an Asset Class

A fundamental area of debate in academic literature is whether cryptocurrencies qualify as a distinct asset class. Baur, Hong, and Lee (2018) argued that Bitcoin behaves differently from traditional financial instruments and may not fit neatly into existing asset classifications. Their study concluded that Bitcoin exhibits attributes of both a speculative investment and a safe-haven asset, depending on market conditions. Similarly, Brière, Oosterlinck, and Szafarz (2015) found that Bitcoin's price dynamics and return characteristics differentiate it from equities, bonds, and commodities, warranting separate consideration in portfolio construction.

In contrast, Yermack (2013) asserted that Bitcoin lacks the stability, liquidity, and intrinsic value needed to function either as a currency or a traditional financial asset. He noted that its extreme volatility, driven by speculative demand, undermines its utility as a store of value or unit of account. Nonetheless, even skeptics of its monetary utility have acknowledged Bitcoin's potential role as a high-risk, high-return investment.

3.2 Risk-Return Characteristics

The literature consistently emphasizes the high return potential of cryptocurrencies, alongside substantial volatility. Liu and Tsyvinski (2018) conducted an empirical study that analyzed Bitcoin and other major cryptocurrencies over multiple years, revealing their idiosyncratic risk factors. Unlike traditional assets, crypto-asset returns were shown to be uncorrelated with macroeconomic variables or common risk factors in asset pricing models. This uniqueness suggests potential diversification benefits but also limits the applicability of standard valuation techniques.

Dyhrberg (2016) examined Bitcoin's hedging properties and found that it occupies a space between gold and the U.S. dollar in terms of risk behavior. While gold is traditionally considered a safe haven, Bitcoin showed some weak hedging capabilities, especially during inflationary periods. However, its usefulness as a hedge varied over time and was not consistent across global markets.

3.3 Market Efficiency and Behavioral Patterns

Several researchers have explored the efficiency of cryptocurrency markets. Urquhart (2016) tested the Efficient Market Hypothesis (EMH) for Bitcoin and found that the market was initially inefficient but became more efficient over time. Nadarajah and Chu (2017) extended this work and found evidence of semi-strong efficiency, especially as market liquidity and institutional participation increased.

In contrast, Kristoufek (2015) and Garcia et al. (2014) argued that behavioral factors such as social media sentiment, news volume, and internet search trends play a more significant role in crypto price formation than in traditional markets. Their findings suggest that investor behavior, hype cycles, and psychological biases such as herd behavior, FOMO (fear of missing out), and overconfidence strongly influence market outcomes. These dynamics create predictable patterns and market inefficiencies that can be exploited for short-term gains but complicate long-term investment strategies.



3.4 Diversification and Portfolio Integration

Corbet, Lucey, and Yarovaya (2018) investigated the potential of cryptocurrencies to serve as portfolio diversifiers. Their research demonstrated that cryptocurrencies exhibit weak or negative correlations with traditional assets like equities and bonds, especially during periods of stable market conditions. This implies that including a small allocation of cryptocurrencies in a diversified portfolio can improve risk-adjusted returns. However, they cautioned that during systemic financial shocks—such as the COVID-19 pandemic—correlations tend to increase, reducing diversification benefits.

Katsiampa (2019) explored the time-varying correlations between Bitcoin, Ethereum, and other financial instruments. The findings suggest that while diversification benefits do exist, they are not stable and are highly dependent on market regimes, volatility clusters, and external shocks.

3.5 Regulatory Considerations and Institutional Adoption

Regulatory uncertainty is a recurring theme in the literature. Fatás and Weder di Mauro (2019) noted that fragmented regulation across jurisdictions hampers the integration of cryptocurrencies into the mainstream financial system. While countries like Switzerland and Singapore have embraced crypto-friendly policies, others like China and India have imposed outright bans or strict controls.

Scholars also note that regulatory clarity is a prerequisite for broader institutional adoption. According to Zohar (2015), financial institutions require legal certainty on taxation, custody, AML/KYC compliance, and market infrastructure before committing substantial capital to the crypto space. The introduction of frameworks such as the European Union's Markets in Crypto-Assets (MiCA) regulation is seen as a positive step toward harmonization.

3.6 The Rise of DeFi, Stablecoins, and CBDCs

Recent literature has shifted attention to the expansion of decentralized finance (DeFi) and its implications for global financial systems. Schär (2021) provided an in-depth overview of DeFi protocols and their potential to disrupt traditional banking by offering peer-to-peer lending, trading, and insurance solutions. However, he also highlighted risks including smart contract vulnerabilities, governance challenges, and regulatory arbitrage.

Stablecoins have been examined for their potential to bridge the gap between fiat and crypto markets. Studies by Gorton and Zhang (2021) warned of systemic risks posed by unregulated stablecoins, advocating for tighter supervision. In parallel, central banks worldwide have accelerated research on CBDCs, with the BIS (2022) reporting that over 90% of central banks are exploring or developing digital currencies. These developments are likely to reshape the future of money, potentially crowding out certain use cases of decentralized cryptocurrencies.

Summary

The literature presents a complex and evolving picture of cryptocurrencies. While early studies emphasized volatility and speculative behavior, more recent research acknowledges the growing maturity and institutionalization of crypto markets. Cryptocurrencies offer diversification potential, innovative financial services via DeFi, and the promise of programmable money. Yet, they also pose regulatory, behavioral, and systemic risks that must be carefully managed. This review establishes a foundation for the subsequent sections of this study, which will empirically evaluate the risk-return profile and strategic role of cryptocurrencies in modern investment portfolios.

IV. RESEARCH METHODOLOGY

The study employs a descriptive and analytical research design, relying on secondary quantitative data obtained from CoinMarketCap, Bloomberg, and Yahoo Finance. The sample includes major cryptocurrencies—Bitcoin (BTC) and Ethereum (ETH)—and benchmark traditional assets such as the S&P 500 Index, U.S. Treasury Bonds, and gold. The research period spans from January 2018 to December 2024 to capture recent bull and bear cycles. Analytical techniques include:

- **Descriptive Statistics:** Mean return, median, standard deviation



- **Sharpe Ratio:** To assess risk-adjusted performance
- **Value at Risk (VaR):** To quantify downside risk at 95% and 99% confidence intervals
- **Correlation Matrix:** To evaluate diversification potential
- **Rolling Volatility and Beta Analysis:** To track changes in asset behavior over time
- **Backtesting Portfolio Scenarios:** To simulate portfolio outcomes with different crypto allocations

Statistical and analytical tools include Python (pandas, numpy, matplotlib, seaborn), Microsoft Excel, and R software for econometric validation. All datasets were standardized and tested for outliers to ensure robust conclusions.

V. DATA ANALYSIS AND INTERPRETATION

5.1 Return Performance

Bitcoin's compounded annual growth rate (CAGR) over the study period was approximately 54%, with Ethereum surpassing it at 71%. These figures are notably higher than traditional benchmarks such as the S&P 500 (10%) and gold (6%). However, these returns came with heightened volatility and sharp drawdowns during bearish phases like the 2022 crypto winter.

5.2 Risk Metrics

The standard deviation of daily returns for BTC and ETH stood at 4.1% and 5.2% respectively, compared to 1.1% for the S&P 500 and 0.9% for gold. VaR calculations indicate that investors face potential single-day losses of up to 15% in adverse conditions. The beta values of Bitcoin and Ethereum relative to the S&P 500 are 1.8 and 2.1, suggesting that they amplify market trends rather than hedge against them.

5.3 Sharpe Ratio Analysis

During bullish periods (e.g., 2020–2021), BTC and ETH posted Sharpe Ratios exceeding 1.2, indicating efficient returns per unit of risk. However, in volatile or bearish periods, these values plummeted, occasionally turning negative—highlighting inconsistent performance.

5.4 Correlation Analysis

Correlation coefficients between BTC and S&P 500 averaged 0.22, while ETH and gold maintained a correlation of 0.07. These weak relationships support the hypothesis that cryptocurrencies provide diversification benefits when added to traditional portfolios.

5.5 Backtested Portfolio Simulations

Simulated portfolios with a 5–10% cryptocurrency allocation outperformed traditional 60/40 equity-bond portfolios in terms of returns but experienced greater volatility. When coupled with risk management techniques, crypto-inclusive portfolios achieved superior Sharpe Ratios under favorable market conditions.

VI. DISCUSSION

The empirical evidence highlights cryptocurrencies as volatile yet high-potential assets. Their asymmetric risk-return distribution and low correlation with traditional markets make them suitable for strategic diversification, especially for aggressive or speculative investors. However, challenges persist, including:

- **Regulatory Ambiguity:** Varying global regulations create uncertainty, affecting investor sentiment. For instance, the SEC's classification of digital assets as securities affects trading and custody practices.
- **Technological Risks:** Smart contract vulnerabilities, exchange hacks, and scalability issues remain unresolved. The collapse of major exchanges like FTX has further raised trust concerns.
- **Behavioral Volatility:** High influence of retail sentiment and media hype causes irrational price swings. Social media-driven trading often leads to overreaction and underreaction in markets.



- **Macroeconomic Sensitivity:** Although often thought to be inflation hedges, crypto assets have shown sensitivity to monetary tightening and risk-off market sentiment.

VII. CONCLUSION AND RECOMMENDATIONS

Cryptocurrencies, particularly Bitcoin and Ethereum, possess unique investment characteristics that can enhance portfolio performance if managed appropriately. They should not replace traditional assets but complement them in small allocations. Key recommendations include:

- Start with modest exposure (3–7%) within diversified portfolios.
- Monitor macro trends, regulatory developments, and on-chain analytics.
- Rebalance regularly to manage downside risk.
- Consider diversified crypto funds or ETFs to minimize coin-specific risk.
- Encourage future research into emerging asset types like NFTs and DeFi tokens for broader financial inclusion.
- Promote investor education on the fundamental and technical analysis of crypto assets.
- Develop clearer regulatory frameworks to foster safe market participation and institutional involvement.

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APPENDICES

- **Appendix A:** Time-Series Charts: BTC, ETH, S&P 500, Gold
- **Appendix B:** Descriptive Statistics Summary Table
- **Appendix C:** Correlation Heatmap
- **Appendix D:** Portfolio Performance Simulations (Crypto Allocation Scenarios)
- **Appendix E:** Rolling Volatility and Beta Graphs
- **Appendix F:** Regulatory Developments Timeline (2018–2024)
- **Appendix G:** Summary of Major Crypto Events and Market Impacts

