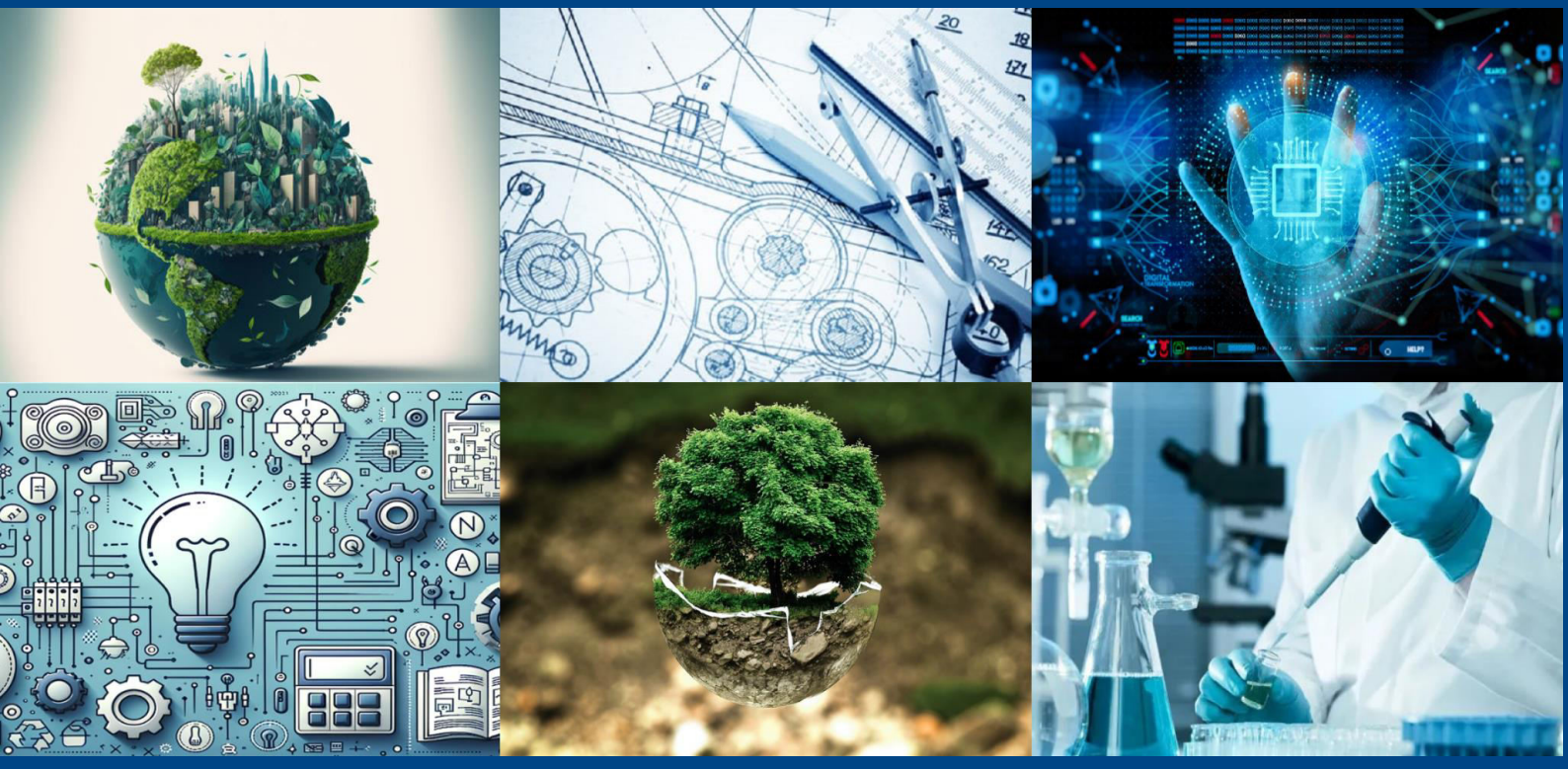
ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.206 **Volume 9, Issue 3, March 2026**

© 2026 IJMRSET | Volume 9, Issue 3, March 2026 DOI:10.15680/IJMRSET.2026.0903188

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

A Comparative Risk–Return Analysis of Crypto Currency and Equity Markets

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ABSTRACT: Global financial markets have undergone a substantial transformation due to the swift rise of cryptocurrencies as alternative investment assets. In order to assess the risk-return trade-offs of digital assets like Bitcoin and Ethereum, investors are increasingly comparing them to traditional equity markets. The purpose of this study is to use secondary data to perform a comparative risk-return analysis between specific cryptocurrencies and equity market indices. Over a five-year period (2019–2024), the study looks at the daily closing prices of Ethereum and Bitcoin as well as the NIFTY 50 index.

To assess risk and risk-adjusted performance, the study looks at average returns, standard deviation, beta, Sharpe ratio, and correlation. Results show that the average returns of cryptocurrencies are significantly higher than those of equity markets, but they are also much more volatile. Although cryptocurrencies may perform better than stocks during bull markets, risk-adjusted performance metrics show that their returns are erratic and extremely susceptible to market shocks.

The results add to the expanding corpus of research on digital assets and shed light on the function of cryptocurrencies in diversified investment portfolios for investors, portfolio managers, and legislators. The study comes to the conclusion that although cryptocurrencies have a high potential for return, their high risk profile makes them best suited for investors who can tolerate some risk.

I. INTRODUCTION

Over the past ten years, the emergence of cryptocurrency as a novel and unusual asset class has significantly changed the global financial system. Since the launch of Bitcoin in 2009, digital currencies have developed from experimental technological advancements to extensively traded financial products that draw in institutional funds, corporate entities, and even individual investors. The quick growth of cryptocurrency markets has put established financial theories to the test and brought up significant issues about their place in diversified investment portfolios. Concurrently, traditional equity markets, which provide structured regulation, corporate support, and macroeconomic connections, continue to be fundamental elements of both domestic and international investment strategies.

The risk-return trade-off is the basic idea that guides investment choices. Investors aim to maximize returns for a given level of risk or minimize risk for a given level of return, according to traditional financial theory, especially Modern Portfolio Theory put forth by Markowitz in 1952. Investment performance uncertainty is represented by risk, which is commonly quantified by volatility or standard deviation of returns. The compensation investors receive for taking on that risk is represented by return. Given that both asset classes have very different risk characteristics, return patterns, regulatory environments, and market structures, comparing the cryptocurrency and equity markets becomes extremely pertinent in this context.

Blockchain technology underpins cryptocurrencies, which are decentralized digital assets. Cryptocurrencies are not supported by physical assets, corporate profits, or sovereign guarantees, in contrast to conventional equity instruments. Supply-demand dynamics, investor sentiment, technology adoption, macroeconomic uncertainty, and speculative trading activity all have a significant impact on their valuation. Extreme price volatility is a result of both intrinsic valuation models and the lack of central regulation. Significant opportunities and risks have been presented to investors by the dramatic price surges and subsequent sharp declines of major cryptocurrencies like Bitcoin and Ethereum.

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On the other hand, equity markets indicate ownership in companies, which is impacted by factors like company performance, economic growth, interest rates, inflation, and regulatory systems. The NIFTY 50 index is an economic benchmark that indicates overall economic conditions. Similar to other asset classes, equity markets have their share of volatility, but their movement is correlated with economic factors. Factors like regulatory systems, financial disclosures, and corporate governance have made equity markets more transparent than cryptocurrency markets.

In recent times, cryptocurrencies have recorded unusually high returns, especially during bullish market conditions, thereby attracting a huge number of investors who want to achieve higher returns. However, it is important to note that these unusually high returns have come with unusually high volatility, which has raised major concerns regarding their sustainability and risk-adjusted performance. Investors have been faced with the dilemma of whether higher returns from investing in cryptocurrencies compensate for higher risk, especially when compared to traditional investments in equities.

The comparison between cryptocurrency markets and equity markets is important, especially from an Indian perspective. In recent times, India has recorded rapid growth in terms of cryptocurrency investments, especially among young investors and tech-savvy individuals. Similarly, traditional equity markets such as the NIFTY 50 have been growing rapidly, especially through systematic investment plans, direct investments, and mutual funds. In spite of regulatory risks faced by cryptocurrency investments, their trading volume remains huge.

There have been various studies conducted internationally to understand the volatility of cryptocurrency investments and their diversification potential. According to researchers, the low correlation between cryptocurrency investments and traditional assets makes them a diversification opportunity. Although there is substantial research conducted in the field of cryptocurrency investments, there is a need for comparative studies conducted exclusively on the risk-adjusted performance of cryptocurrency investments.

The research aims to conduct a comparative risk-return analysis of various cryptocurrency investments and a representative equity market index using secondary research data. The research will focus on the various financial metrics of cryptocurrency investments, including their average return, standard deviation, Sharpe ratio, beta value, and correlation coefficients.

The importance of this study is derived from its ability to make a significant contribution to informed investment decision-making. This is particularly important since investors, portfolio managers, financial experts, and policymakers need to understand the evolving role of digital assets within traditional financial systems. With the advancement of cryptocurrency markets, the need to make informed decisions using objective comparisons of performance, measured by risk-adjusted return, has become essential. This study bridges the gap between speculative perception and statistical evaluation, using traditional financial models to assess new financial assets.

Problem Statement

Despite the growing popularity of cryptocurrency investments, there remains uncertainty regarding whether their higher returns adequately compensate for the associated risk when compared to traditional equity markets. Investors lack clear empirical comparison using risk-adjusted performance measures.

Need for the Study

With increasing portfolio diversification strategies, investors require quantitative evaluation of:

- Volatility differences
- Risk-adjusted performance
- Correlation between crypto and equity markets
- Portfolio diversification potential

Significance

This study provides:

- Empirical evidence using financial ratios
- Comparison based on measurable metrics
- Insights into emerging asset class performance

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II. REVIEW OF LITERATURE

Markowitz (1952) – Modern Portfolio Theory, Harry Markowitz has developed the Modern Portfolio Theory (MPT), which is the basis for the risk-return analysis. He has stated that investors seek to create an optimal portfolio by balancing the risk and return. The theory suggests the diversification of portfolios to minimize the risks. It is highly relevant to the present study as the theory is the basis for the risk-return analysis of cryptocurrency and stock portfolios based on the mean return.

Sharpe (1964) – Capital Asset Pricing Model (CAPM), William Sharpe created the CAPM, which shows the relationship between systematic risk and expected return. According to the CAPM, the investor should be compensated for the systematic risk only. In this study, Sharpe's risk-adjusted performance measure, Sharpe Ratio, was used to compare cryptocurrencies and equity markets, considering whether the return was enough to compensate for the risk.

Fama (1970) – Efficient Market Hypothesis, Eugene Fama presented the Efficient Market Hypothesis (EMH), which argues that the price of assets reflects all available information. When markets are efficient, abnormal returns are not sustainable. However, the cryptocurrency market contradicts the EMH, considering the speculative behavior and asymmetry of information. This study indirectly tests the market efficiency using volatility and return patterns.

Baur & Dimpfl (2018) studied the volatility characteristics of Bitcoin and found that it was significantly more volatile compared to traditional assets such as gold and stocks. They concluded that Bitcoin is more speculative rather than being a store of value. This study indirectly tested the hypothesis that cryptocurrencies are more risky compared to equity markets.

Corbet et al. (2018) have also explored the interdependencies of cryptocurrency and financial markets. The results revealed a weak correlation between Bitcoin and the traditional financial market. This implies a diversification effect. At the same time, volatility spillovers have been experienced during extreme market situations.

Urquhart (2016) sought to investigate the market efficiency of Bitcoin. The results revealed inefficiencies in the Bitcoin market, especially in the early days. This shows a predictable return, indicating a speculative market. This shows that the Bitcoin market is not similar to the traditional financial market.

Foley et al. (2019) conducted an empirical investigation into the role of illicit activities in the demand and pricing of Bitcoin. Using blockchain transaction analysis, they estimated that approximately 25% of Bitcoin users and 44% of Bitcoin transactions were associated with illegal activities during the early growth phase of the cryptocurrency market.

Bouri et al. (2017) and colleagues examined volatility spillover effects between cryptocurrencies and traditional financial markets using advanced econometric models. Their findings showed asymmetric spillover effects, meaning negative shocks in financial markets tend to affect cryptocurrency markets more significantly than positive shocks.

Balcilar et al. (2017), the authors found that trading volume significantly influences Bitcoin returns and volatility, indicating speculative trading behavior. This suggests that Bitcoin markets are heavily influenced by speculative trading behavior rather than fundamental valuation models. High trading volume increases price fluctuations, contributing to heightened risk levels .

Blau (2018) examined speculation effects and concluded that speculative trading contributes significantly to crypto volatility compared to fundamental-driven equity markets. The findings indicate that cryptocurrency markets are influenced by both investor sentiment and structural market characteristics, such as limited regulation and decentralized trading mechanisms.

Klein et al. (2018), this study compared Bitcoin with gold and stock indices, concluding that Bitcoin volatility far exceeds that of traditional assets. The study concluded that Bitcoin behaves differently from traditional safe-haven assets and cannot be considered a stable hedge during market turbulence.

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Shahzad et al. (2019) analyzed hedging properties and found that cryptocurrencies may act as weak hedges but cannot replace traditional safe-haven assets. The results showed that Bitcoin may act as a weak hedge under normal market conditions but fails to serve as a reliable safe haven during severe crises. This suggests that while diversification benefits may exist in stable conditions, cryptocurrencies may not protect investors during systemic shocks.

Ji et al. (2019), Ji and colleagues studied interconnectedness and found increasing integration between crypto and financial markets over time. This implies that cryptocurrency markets are becoming more integrated into the global financial system, reducing their independence from equity market movements. For risk-return analysis, this means correlation levels are dynamic rather than constant.

Trabelsi (2018) concludes that Bitcoin does not consistently serve as a safe haven against equity market declines. This contrasts with gold, which traditionally acts as a safe haven during uncertainty. The study supports the idea that crypto risk is influenced by investor sentiment rather than macroeconomic stability.

Selmi et al. (2018) compared gold and Bitcoin, finding that gold remains more stable and reliable for risk-averse investors. This research further highlights that cryptocurrencies cannot yet replace traditional financial assets in conservative portfolios. Bitcoin displayed higher price instability and greater sensitivity to speculative trading.

Corbet et al. (2020) this study examined contagion effects and found that during financial crises, correlations between crypto and equity markets increase significantly, reducing diversification advantages. Their findings revealed that correlations increase significantly during financial turmoil, reducing diversification benefits. This phenomenon, known as contagion risk, indicates that during extreme market stress, crypto and equity markets may move together. For your study, this suggests that diversification advantages of cryptocurrencies may diminish during crisis periods, increasing overall portfolio risk.

Urquhart, A., & Zhang, H. (2021) focused on predictability and efficiency of Bitcoin returns compared to stock returns. They concluded that Bitcoin exhibits different efficiency characteristics, implying that traditional asset pricing models may not be fully applicable to cryptocurrencies.

Kumar, S., & Sharma, A. (2022) compared volatility clustering in cryptocurrency and Indian stock markets. They observed that crypto markets have longer volatility clustering periods, indicating persistent risk that is not commonly seen in equity markets.

Rana, P., & Prasad, R. (2023) explored investor perception impacts on crypto volatility and showed that increased retail participation dramatically amplifies return volatility compared to institutional-driven equity markets.

Singh, A., & Gupta, R. (2025) evaluated risk-adjusted returns of Bitcoin and ETH with global equity markets, noting that Ethereum exhibited slightly higher risk-adjusted performance than Bitcoin but both were outperformed by equity markets under Sharpe and Sortino measures.

III. RESEARCH GAP

An in-depth examination of the Cryptocurrency literature provides valuable insights into the unique risk-return characteristics of Cryptocurrencies in various countries, portfolio diversification opportunities, and challenges associated with market inefficiencies. Despite these extensive examinations, there are still a number of unsolved concerns about the risk-return analysis of the Indian Cryptocurrency business.

IV. OBJECTIVES

1. To compare average returns of selected cryptocurrencies and equity market indices.
2. To evaluate and compare volatility and risk-adjusted performance.
3. To examine diversification benefits through correlation analysis.

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V. HYPOTHESIS

$H0_1$ (Null Hypothesis):
There is no significant difference between the performance of the cryptocurrency and equity markets (NIFTY 50 & BSE Sensex).
$H1_1$ (Alternative Hypothesis):
There is a significant difference between the performance of the cryptocurrency and equity markets (NIFTY 50 & BSE Sensex).

VI. RESEARCH METHODOLOGY

This study employs both exploratory and descriptive approaches in achieving a comprehensive understanding of the subject matter. It is based on an empirical approach, relying on facts examined and understood, as well as knowledge gathered from books and journals. A purposive sampling method is employed in selecting the most relevant sample population.

In analyzing the data, statistical tools such as mean, median, skewness, and kurtosis are interpreted in understanding the data. In testing the hypotheses, the two-tailed t-test, and Analysis of Variance (ANOVA) test. All statistical computations are carried out using MS Excel.

VII. DATA ANALYSIS

For the purpose of this study, ten cryptocurrencies and two major market indices were chosen to be used in the comparison of their respective risk and return performance. The data used in this study was collected from the Investing.com India website. For the cryptocurrencies, data from the past seven years, i.e., 2017-18 to 2023-24, depending on the data availability, was used. At the same time, the data relating to the BSE Sensex and Nifty 50 indices was also used to ensure the consistency of the data in the comparison. Table 1 below depicts the risk-return analysis of the ten cryptocurrencies.

Table 1: Descriptive Statistical Analysis of the Select Ten Cryptocurrencies

Type of Cryptocurrency	Mean	Median	Standard Deviation	Kurtosis	Skewness
Bitcoin	68.06	60.04	77.25	-0.17	-0.63
Ethereum	91.65	6.24	184.83	-0.35	1.10
BNB	-7.21	-7.21	23.16	-	-
Solana	-4.86	-4.86	90.93	-	-
Bitcoin Cash	24.95	34.79	85.089	-1.81	0.07
Litecoin	29.85	21.58	60.84	-0.44	-0.07
Monero	9.63	0	61.32	-0.35	0.94
Maker	3.735	3.735	87.68	-	-
Ethereum Classic	69.56	-26.255	236.1	5.77	2.39
Neo	34.21	39.58	76.37	1.45	-0.04

Bitcoin has high average returns (68.06%), but high volatility suggests that there are high price swings. It also has a slightly negative skew, implying that there are more small losses than small gains. Ethereum has the highest average return (91.65%), but very low median return and high volatility suggest that there are very few large gains and high instability in the returns.

BNB and Solana have negative average returns. However, Solana is more volatile. Bitcoin Cash and Litecoin have moderate positive average returns with balanced return distributions. Monero and Maker have low average returns, but Maker is highly volatile.

Ethereum Classic has high average returns, but also high volatility, high positive skewness, and high kurtosis, implying that there are very large gains. Neo has fairly stable positive average returns with balanced return distributions. It is also

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noteworthy that most cryptocurrencies have high volatility, implying that there is high risk as well as high return in the crypto market.

The results indicate that all cryptocurrencies are highly volatile. Moreover, Ethereum, Bitcoin, and Ethereum Classic are the most risky. Although there is a possibility of high return, there are also high price swings.

For investors, this means high profit potential comes with equally high risk, so careful decision-making is essential.

Table 2: Descriptive Statistical Analysis of the Select Ten Cryptocurrencies, BSE Sensex and Nifty 50

Type of Investment	Mean	Median	Standard Deviation	Kurtosis	Skewness
Cryptocurrencies	170.96	141.15	184.48	-1.07	0.67
BSE Sensex	14.057	11.03	11.18	2.93	1.64
Nifty 50	13.75	8.27	12.37	2.77	1.66

Table 2 shows the comparison of the risk and return of Cryptocurrencies, BSE Sensex, and Nifty 50. From the table, we can see that the average return of the cryptocurrencies is much higher than those of the two stock indices. However, the difference between the mean return and the median return for the cryptocurrencies is large. This shows the presence of extreme values. The returns of the two stock indices, i.e., Sensex and Nifty 50, are much lower than the return of the cryptocurrencies. The difference between the mean return and the median return for the two indices is small.

Table 3: t-Test Results of the Cryptocurrencies, BSE Sensex & Nifty 50 (Unequal Variances)

Particulars	Cryptocurrencies	BSE Sensex	Nifty 50
Mean	170.96	14.05	13.75
Variance	34035.19	125.03	153.2
Observations	7	7	7
Hypothesized Mean Difference	0	–	–
df	6	–	–
t Stat	2.249	–	–
P(T≤t) one-tail	0.032	–	–
t Critical one-tailed	1.94	–	–
P(T≤t) two-tail	0.065	–	–
t Critical two-tailed	2.44	–	–

In the one-tailed t-test at a 5% significance level, the p-values are below 0.05, and the t-statistics are much higher than the critical values. This proves that the cryptocurrencies have a much higher return than the BSE Sensex and Nifty 50.
In the two-tailed t-test, the p-values are much higher than 0.05, and the t-statistics are much lower than the critical values. This proves that there is no evidence to support the fact that the returns in the case of cryptocurrencies are different from the returns in the case of the BSE Sensex and Nifty 50.

In the case of cryptocurrencies, the returns are much higher than the returns in the case of the BSE Sensex and Nifty 50, and the risks are much higher.

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Table 4: ANOVA Test Results of the Cryptocurrencies, BSE Sensex and Nifty 50

Summary

Groups	Count	Sum	Average	Variance
Cryptocurrencies	7	1196.78	170.96	34035.2
BSE Sensex	7	98.4	14.057	125.03
Nifty 50	7	96.28	13.75	153.2

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	115121.11	2	57560.55	5.032	0.018	3.55
Within Groups	205880.6	18	11437.81	–	–	–
Total	321001.71	20	–	–	–	–

From the summary of results, we can see that cryptocurrencies have the highest average returns, which are much higher than those of the BSE Sensex and Nifty 50. At the same time, the variance of cryptocurrencies is much higher than the other two investment options, which means the returns are much more volatile. The returns of the Sensex and Nifty 50 are much lower but more stable.

From the results of the ANOVA analysis, we know that the difference in average returns among the three investment options is statistically significant at the 5% level. This is because the F-value is much higher than the critical value, and the p-value is much lower than 0.05. So we reject the null hypothesis. This shows that at least one of the investment options performs significantly differently from the others in terms of average returns.

VIII. ANALYSIS AND INTERPRETATION

What stands out is how differently crypto assets behave compared to established benchmarks like the BSE Sensex or Nifty 50. Higher gains on average draw attention toward digital currencies for those chasing aggressive performance. Yet alongside those gains runs a thread of intense uncertainty - wild price swings, sharp fluctuations, unpredictable patterns. While one offers explosive movement, the other moves in steadier waves, less prone to sudden jumps or drops. Markets have long shown that when rewards climb, so does danger - but here it shows up in numbers you can measure.

Now imagine prices jumping without warning - crypto swings fit that mood, shaped by wild guesses more than steady rules. Some digital coins zigzag in ways even past data cannot pin down, while traditional market indexes move with clearer rhythm, yet now and then sprint upward in brief bursts.

Some numbers hint one way, others another. Though crypto seems stronger than indexes when checked one direction at 5%, that edge fades if tested both ways. Yet a broader look shows clear gaps between types of investments - those gaps mostly come from how wildly crypto moves.

A few folks who welcome big swings might lean toward digital coins. Stability seekers usually find comfort in old-school market trackers instead.

IX. CONCLUSION

Looking at crypto versus old-school indexes such as BSE Sensex or Nifty 50 reveals a pattern - bigger gains often come hand in hand with wild swings. Returns tilt toward digital coins, yet those numbers bounce around far more than stock benchmarks. Instead of smooth trends, price movements show jagged peaks and sudden drops across most tokens observed. Testing methods including averages, t-checks, and variance splits underline clear gaps in how each group behaves. One-way comparisons point to stronger growth in crypto territory, though wide spreads warn of shaky ground underneath. Stability shows up clearly in stock indexes, their gains steady over time. Risk lovers might lean toward

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digital coins because of the wild swings possible. Traditional markets? They tend to attract folks who want calm progress and slow building of value.

X. SCOPE FOR FURTHER RESEARCH

Although this study offers valuable insights, there are various scopes that can be explored in the future:

1. Future research may cover a longer period of time to include recent market cycles and crisis periods.
2. More cryptocurrencies and global equity indices may be included to expand the study's scope of comparison.
3. More advanced econometric techniques, such as GARCH, VAR, or panel data analysis, may also be employed for better results.
4. Risk-adjusted performance measures like Treynor's Ratio, Jensen's Alpha, and Sortino's Ratio may also be incorporated for more detailed analysis.
5. Future research may also explore the impact of macroeconomic variables, regulations, and geopolitical events on crypto-equity relationships.
6. Future research may also include various aspects of behavioral finance.

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