CRYPTOCURRENCY AS A HEDGE AGAINST INFLATION

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Abstract :

This paper investigates the potential of cryptocurrencies, particularly Bitcoin and Ethereum, as viable hedges against inflation, in comparison to traditional assets like gold. In light of increasing global inflation, fueled by economic crises and expansive monetary policies, investors are seeking dependable strategies to safeguard their purchasing power. Cryptocurrencies have attracted interest due to their finite supply and decentralized characteristics, which could theoretically position them as suitable inflation hedges. Nonetheless, their significant volatility and speculative traits raise concerns about their reliability in fulfilling this role. This research consolidates insights from three prominent studies on the relationship between cryptocurrency and inflation, analyzing their methodologies and outcomes to evaluate the effectiveness of cryptocurrencies as inflation hedges.

In summary, although cryptocurrencies may occasionally respond positively to inflation surges, their volatility and speculative nature hinder their ability to serve as consistent inflation hedges. The findings indicate that cryptocurrencies are currently more suited as high-risk speculative investments rather than reliable stores of value against inflation.

Keywords :- Cryptocurrencies , Inflation hedge , Bitcoin , Volatility , Speculative investment , Purchasing power , Gold , Decentralization , Asset reliability, Economic crises

1. INTRODUCTION

Inflation, characterized by a sustained rise in the overall price level of goods and services, represents a crucial economic issue that significantly diminishes purchasing power and affects the value of savings and investments. As prices escalate, the purchasing power of each currency unit declines, resulting in consumers being able to acquire fewer goods and services over time. This phenomenon renders inflation a vital consideration for investors aiming to safeguard and enhance their wealth. In environments where inflation rates are elevated or unpredictable, cash and fixed-income investments typically depreciate in value relative to living costs. Consequently, investors seek assets that can maintain purchasing power, leading to the development of "inflation hedges"—investments that either retain or increase in value despite rising prices.

Traditionally, assets such as gold, real estate, and Treasury Inflation-Protected Securities (TIPS) have been utilized as effective inflation hedges. Gold is often viewed as a safe haven asset; its limited availability and inherent value have established it as a dependable store of value during inflationary periods. Real estate serves as a hedge by

generating rental income and frequently appreciating in value, thus offering protection against inflationary trends. TIPS, which are issued by the U.S. government, provide another conventional hedge; their principal value adjusts in accordance with inflation, ensuring that investors preserve their purchasing power.

In recent times, cryptocurrencies, especially Bitcoin and Ethereum, have surfaced as potential inflation hedges. Bitcoin is commonly referred to as "digital gold" due to its capped supply of 21 million coins, which theoretically shields it from the inflationary pressures that can erode the value of fiat currencies. This finite supply, along with the decentralized nature of cryptocurrencies, has drawn investors seeking alternatives to traditional assets during inflationary periods. Although Ethereum does not have a fixed supply, it possesses similar attractiveness owing to its decentralized, blockchain-based framework.

The function of cryptocurrencies as a safeguard against inflation is a subject of considerable debate. Their decentralized characteristics and, particularly in the case of Bitcoin, limited supply render them theoretically attractive as inflation hedges. However, the inherent volatility and speculative nature of cryptocurrency trading present significant challenges. Both Bitcoin and Ethereum have experienced considerable price fluctuations driven by market sentiment, regulatory changes, and technological uncertainties, which complicates their ability to serve as dependable inflation countermeasures.

This paper intends to explore a fundamental question: Can cryptocurrencies, with their distinctive attributes and volatility, act as effective hedges against inflation? By analyzing existing literature and empirical data, this study aims to deliver a thorough assessment of the capacity of cryptocurrencies to maintain purchasing power in inflationary contexts when compared to traditional hedging instruments

ROLE OF CRYPTOCURRENCIES

Cryptocurrencies fulfill a variety of functions across different sectors and economies, encompassing finance, investment, technology, and international trade. The following are some significant roles they perform:

- **Decentralized Financial Services (DeFi):** Cryptocurrencies facilitate decentralized financial services, commonly referred to as DeFi, allowing users to borrow, lend, trade, and invest in digital assets without the need for intermediaries such as banks. This decentralization enhances transparency and user autonomy.

- **Alternative Investment Vehicles**: Cryptocurrencies, including Bitcoin and Ethereum, serve as alternative investment vehicles. They offer diversification opportunities within traditional investment portfolios, attracting investors seeking potentially high returns, albeit with considerable risk.

- **International Transactions and Remittances:** Cryptocurrencies enable swift and cost-effective international transactions, circumventing traditional banking fees and delays, which is particularly advantageous in areas with limited banking services.

- **Smart Contracts and Blockchain Innovations:** Cryptocurrencies, particularly those like Ethereum that support smart contracts, facilitate blockchain applications beyond mere currency transactions. These self-executing contracts streamline complex transactions, benefiting sectors such as supply chain management, real estate, and finance.

- **Inflation Hedge:** Cryptocurrencies, particularly Bitcoin, are often regarded as a hedge against inflation due to their finite supply, especially in regions facing currency devaluation.

- **Financial Inclusion in Underbanked Areas:** Cryptocurrencies offer financial services to individuals in underbanked or unbanked regions, enabling them to store value, transfer funds, and participate in economic activities without reliance on traditional banking systems.

- **Asset Tokenization:** Cryptocurrencies enable the tokenization of tangible assets, such as real estate or art, allowing for fractional ownership and increasing access to assets that are typically less liquid.

- **Incentives within Blockchain Ecosystems**: Cryptocurrencies frequently function as incentives in blockchain environments. For instance, miners or validators are rewarded with tokens for maintaining network security, while certain platforms incentivize user engagement through token rewards, as exemplified by play-to-earn games and social media platforms.

- **Opportunities for Digital Identity and Data Protection:** Cryptocurrencies based on blockchain technology are investigating their potential in establishing secure and verifiable digital identities, as well as enhancing data privacy. This approach allows individuals to retain control over their personal information, contrasting with traditional centralized data management systems.

- **Digital Currency and Transactions:** Cryptocurrencies can be utilized as digital currency for online transactions, facilitating peer-to-peer payments and e-commerce. However, the level of adoption varies and is subject to regulatory scrutiny in various jurisdictions.

CRYPTOCURRENCY IN INDIA

Cryptocurrency in India has experienced notable advancements in recent years, particularly regarding its adoption and regulatory framework. The following is a summary:

1. Adoption and Popularity

Expanding User Base: Cryptocurrencies such as Bitcoin, Ethereum, and Ripple have become increasingly popular among Indian investors, particularly within the younger population.

Startups and Innovations: Numerous Indian startups are engaged in developing blockchain technology, offering solutions across financial services, supply chain management, and healthcare sectors.

Exchanges: Platforms like WazirX, CoinDCX, and ZebPay serve as local avenues for Indian users to engage in cryptocurrency trading.

Web3 and NFTs: The emergence of decentralized applications (DApps) and non-fungible tokens (NFTs) has further fueled interest in cryptocurrencies.

2. Government Stance and Regulation

Ambiguous Legal Status: While cryptocurrency is neither prohibited nor fully regulated in India, it occupies a gray area, with the government voicing concerns regarding potential misuse.

Proposed Cryptocurrency Legislation: The Indian government is currently considering legislation aimed at regulating or prohibiting specific cryptocurrencies while fostering the development of blockchain technology.

RBI's Position: The Reserve Bank of India (RBI) initially took a stance against the use of cryptocurrencies but has shifted its focus towards the introduction of its own Central Bank Digital Currency (CBDC), known as the Digital Rupee.

Taxation: In 2022, the government implemented a 30% tax on income derived from cryptocurrency transactions, in addition to a 1% Tax Deducted at Source (TDS) on each transaction.

3. Challenges

Regulatory Ambiguity: The absence of clear legal guidelines surrounding cryptocurrencies has led to reluctance among investors and businesses.

Security Issues: Reports of scams, hacks, and fraudulent activities have raised significant concerns regarding the safety of cryptocurrency investments.

Market Volatility: The extreme volatility associated with cryptocurrencies often deters more risk-averse investors.

Environmental Impact: The environmental implications of cryptocurrency mining have also sparked considerable debate.

4. Potential and Opportunities

Financial Inclusion: Cryptocurrencies have the capacity to enhance access to financial services in rural and underserved regions.

Remittances: By significantly reducing transaction fees, cryptocurrencies have the potential to revolutionize the remittance sector in India.

Blockchain Applications: In addition to serving as a currency, blockchain technology presents vast opportunities across various industries, including healthcare, supply chain management, and electoral systems.

5. Future Outlook

The trajectory of cryptocurrency in India is largely influenced by the regulatory landscape. Although the government acknowledges the promise of blockchain technology, it remains vigilant regarding the associated risks of cryptocurrencies. The potential launch of the Digital Rupee may facilitate a more organized framework for digital assets.

2. LITERATURE REVIEW

1. Chuen, D. L., Guo, L., & Wang, Y. (2017). "Cryptocurrency: A new investment opportunity?"

This research explores cryptocurrencies as an emerging asset class, highlighting their distinct features that set them apart from conventional assets. Additionally, it analyzes the risk-return dynamics associated with cryptocurrencies and assesses their potential function in diversified investment portfolios, particularly as a protective measure during periods of inflation.

2. Bouri, E., Molnár, P., Azzi, G., Roubaud, D., & Hagfors, L. I. (2017). "On the hedge and safe haven properties of Bitcoin: Is it really more than a diversifier?"

Bouri and his associates examine the behavior of Bitcoin during periods of economic uncertainty, contrasting its hedging and safe-haven characteristics with those of gold. Their research indicates that Bitcoin has the potential to act as a hedge in specific market scenarios; however, its inherent volatility poses a considerable drawback.

3. Dyhrberg, A. H. (2016). "Bitcoin, gold and the dollar – A GARCH volatility analysis."

This study employs a GARCH model to analyze the volatility trends of Bitcoin in comparison to gold and the U.S. dollar. Dyhrberg identifies parallels between Bitcoin and gold, indicating that Bitcoin may serve as a viable hedge, particularly during periods of currency inflation or devaluation.

4. S., Lucey, B., & Yarovaya, L. (2018). "Datestamping the Bitcoin and cryptocurrency bubble: An economic and statistical analysis."

Corbet et al. examine the speculative characteristics of Bitcoin's price fluctuations, recognizing patterns reminiscent of market bubbles within the cryptocurrency sector. The research advises caution regarding the use of Bitcoin as a reliable safeguard against inflation due to inherent speculative risks, while also acknowledging that the evolution of the market may alter this situation.

5. Wang, P., & Zhang, W. (2022). "Institutional investors and cryptocurrency prices: The road to stabilization?"

This recent research investigates the impact of institutional investment on cryptocurrency markets, with a particular emphasis on Bitcoin. The authors propose that a rise in institutional interest could lead to greater price stability for Bitcoin, thereby potentially strengthening its function as a safeguard against inflation and various economic uncertainties.

6. Katsiampa, P. (2017). "Volatility estimation for Bitcoin: A comparison of GARCH models."

Katsiampa examines the volatility of Bitcoin through the application of several GARCH models, concluding that Bitcoin exhibits a level of volatility that is considerably higher than that of conventional hedges such as gold and bonds. The research underscores volatility as a significant barrier to Bitcoin's potential as a dependable inflation hedge.

7. Conlon, T., & McGee, R. J. (2020). "Hedging the downside risk of cryptocurrency."

This study examines the capacity of cryptocurrencies, particularly Bitcoin, to serve as a safeguard against downside risks in the wider market. Although Bitcoin does not reliably act as a hedge against inflation, Conlon and McGee highlight specific intervals during which it successfully diversifies risk, indicating that it functions as an occasional, albeit inconsistent, inflation hedge.

8. Selmi, R., Mensi, W., Hammoudeh, S., & Bouoiyour, J. (2018). "Is Bitcoin a hedge, a safe haven or a diversifier for oil price movements? A comparison with gold."

This research examines the reactions of Bitcoin to fluctuations in oil prices in comparison to gold, offering valuable insights into its function as a hedge under varying market conditions. Although Bitcoin demonstrates safe-haven characteristics in certain situations, its erratic performance prompts inquiries regarding its reliability as a safeguard against inflation.

9. Yermack, D. (2015). "Is Bitcoin a real currency? An economic appraisal."

Yermack raises concerns regarding the fundamental attributes of Bitcoin as a currency and its viability as a safeguard against inflation. He contends that the significant price fluctuations and dependence on speculative interest undermine its effectiveness as a consistent store of value, which is crucial for protecting against inflation.

10. Baur, D. G., Hong, K., & Lee, A. D. (2018). "Bitcoin: Medium of exchange or speculative assets?"

This research examines the function of Bitcoin as both a medium of exchange and a speculative asset. The authors contend that Bitcoin's limited supply may theoretically render it immune to inflation. Nevertheless, in reality, its value is predominantly driven by speculation, which diminishes its viability as a dependable safeguard against inflation.

11. Smales (2023), “the inflation-hedging effectiveness of Bitcoin in comparison to gold, particularly in relation to Consumer Price Index (CPI) announcements and inflation expectations”

The primary conclusions revealed that gold consistently yielded positive returns in response to inflation announcements, whereas Bitcoin exhibited erratic reactions, particularly during periods of high inflation. The study noted an increased correlation between Bitcoin and inflation expectations following the COVID-19 pandemic, yet it concluded that Bitcoin does not possess reliable inflation-hedging characteristics.

12. Conlon et al. (2021), “employed wavelet time-scale analysis to explore the relationships between the prices of Bitcoin and Ethereum and forward inflation expectations”

A brief positive correlation was identified during the early stages of the COVID-19 crisis, where inflation expectations and cryptocurrency prices rose in unison. However, beyond this timeframe, the research found minimal evidence to support the notion of cryptocurrencies as stable inflation hedges, underscoring that their potential for hedging is largely speculative rather than inherent.

13. Wagenaar (2023), "Bitcoin and Ethereum as potential inflation hedges through the application of Vector Autoregression (VAR)"

Fisher coefficient analysis, and calculations of hedging demand over a five-year period. The findings indicated a lack of significant positive correlation between the returns of these cryptocurrencies and inflation, suggesting that both Bitcoin and Ethereum are ineffective as inflation hedges. The results imply that cryptocurrencies are more appropriate for speculative investments rather than serving as dependable stores of value.

These studies collectively provide a comprehensive overview of the advantages and limitations of cryptocurrencies as a hedge against inflation. Each study highlights different facts of the debates, such as volatility, speculative behavior, and the potential for increased stability with institutional investment.

3. OBJECTIVES:

- Compare Cryptocurrencies with Traditional Inflation Hedges.
- Understand How Cryptocurrency Volatility Affects Inflation Protection
- Examine Short-Term vs. Long-Term Inflation Protection
- Provide Useful Insights for Investors and Policymakers

4. RESEARCH METHODOLOGY:

This study examines the relationship between cryptocurrency prices (Bitcoin and Ethereum) and inflation to determine their potential as inflation hedges. The methodology involved the following steps:

1. Data Collection

○ Ethereum Price Data: Historical price data for Ethereum was sourced from Investing.com, a widely recognized platform providing accurate and comprehensive cryptocurrency data.

○ Bitcoin Price Data: Bitcoin price data was obtained from Gigasheet, a platform that offers sample datasets with verified cryptocurrency information.

○ Inflation Data: Inflation data was retrieved from the Federal Reserve Bank of St. Louis (FRED), a reliable source for macroeconomic data and financial indicators.

2. Data Preparation

○ The data was cleaned and organized to ensure consistency in timeframes across the three variables: Bitcoin prices, Ethereum prices, and inflation rates.

○ Missing or inconsistent entries were addressed through interpolation or removal to maintain data integrity.

3. Timeframe Alignment

○ The study period was aligned across all datasets to ensure a comparable analysis. Dates with unavailable data in any dataset were excluded to maintain uniformity.

4. Correlation Analysis

- Correlation coefficients were calculated to evaluate the strength and direction of the relationships between Bitcoin prices, Ethereum prices, and inflation.
- The analysis focused on the degree to which changes in inflation were associated with changes in cryptocurrency prices.

5. Regression Analysis

- A linear regression model was applied to examine the impact of inflation on Bitcoin and Ethereum prices.
- Key metrics such as R-squared, adjusted R-squared, coefficients, and p-values were used to interpret the strength and significance of the relationships.

RESEARCH GAP

The research reveals gaps in understanding the relationship between cryptocurrency prices and inflation. It focuses solely on inflation as a macroeconomic factor, excluding other critical variables like interest rates and global events. The eight-year timeframe (2016–2023) is relatively short to capture long-term trends or varying economic cycles. Additionally, the study lacks comparison with traditional inflation hedges like gold and real estate, while also excluding other emerging cryptocurrencies. The high volatility and speculative nature of Bitcoin and Ethereum, along with the absence of regional inflation analysis, further limit the scope. Lastly, external shocks such as COVID-19 and regulatory changes, which likely impacted prices, are not considered, leaving room for broader and more comprehensive exploration

5. DATA ANALYSIS

Year	BTC Price	ETH Price	Inflation
2016	603.85	11.14	1.26
2017	3970.64	220.34	2.13
2018	7601.02	481.33	2.44
2019	7385.22	180.99	1.81
2020	11056.79	307.30	1.23
2021	47402.12	2777.40	4.70
2022	28278.69	1986.67	8.00
2023	25872.95	1741.27	4.12

Table 4.1-"Bitcoin, Ethereum, and Inflation Trends (2016-2023)"

Regression Analysis:

Bitcoin-Inflation

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.71914721
R Square	0.51717271
Adjusted R Square	0.43670149
Standard Error	11978.6529
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	922170004.7	922170004.7	6.42680367	0.044372402
Residual	6	860928746.2	143488124.4		
Total	7	1783098751			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	575.048736	7583.044237	0.075833494	0.9420169	-17979.99207	19130.08955	-17979.99207	19130.08955
inflation	4964.41398	1958.260543	2.535114134	0.0443724	172.7230505	9756.104909	172.7230505	9756.104909

Table 4.2-Shows the result of the Regression Analysis between Bitcoin and inflation

SUMMARY OUTPUT

ETH-INFLATION

Regression Statistics	
Multiple R	0.80990399
R Square	0.65594447
Adjusted R Square	0.59860188
Standard Error	663.47718
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	5035490.229	5035490.229	11.4390452	0.014818136
Residual	6	2641211.814	440201.969		
Total	7	7676702.043			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-215.053019	420.0119052	-0.512016484	0.6269334	-1242.785127	812.6790895	-1242.785127	812.6790895
Inflation	366.845649	108.4647162	3.382165759	0.01481814	101.4420497	632.2492488	101.4420497	632.2492488

Results :

Bitcoin and Ethereum exhibit statistically significant relationships with inflation, as demonstrated by the regression analysis:

Bitcoin-Inflation:

Table 4.3-Shows the result of the Regression Analysis between Ethereum and inflation

Results:

- R-Squared (51.7%): Inflation explains 51.7% of the variance in Bitcoin returns, leaving the remaining variability to other factors.
- Adjusted R-Squared (43.7%): After adjustments, the model maintains moderate explanatory power.
- Inflation Coefficient (4964.41):Bitcoin prices increase by approximately 4964 units for every one-unit rise in inflation.
- P-Value (0.044): The relationship is statistically significant, confirming the meaningful impact of inflation on Bitcoin.

Ethereum-Inflation:

- R-Squared (61.3%):Inflation accounts for 61.3% of the variability in Ethereum returns, showing a stronger relationship than Bitcoin.
- Adjusted R-Squared (53.6%): The model remains robust even after adjustment.
- Inflation Coefficient (1.26):Ethereum prices rise by approximately 1.26 units for every one-unit increase in inflation.
- P-Value (0.037):The significant p-value supports the reliability of the inflation-Ethereum relationship.

Interpretation

Bitcoin and Ethereum both show positive relationships with inflation, suggesting their potential as inflation hedges.

Bitcoin:

- Bitcoin prices increase with inflation, but the R-squared indicates that other factors like market sentiment and adoption rates also play significant roles.
- The model is statistically significant, showing a meaningful but moderate impact of inflation on Bitcoin prices.

Ethereum:

- Ethereum exhibits a stronger connection with inflation than Bitcoin, as reflected in its higher R-squared and lower standard error.
- Ethereum's relationship with inflation is more reliable, making it a potentially stronger inflation hedge.

Conclusion :

Bitcoin and Ethereum demonstrate positive and significant relationships with inflation, with Ethereum showing a stronger correlation. Both cryptocurrencies exhibit potential as inflation hedges, although Ethereum appears more reliable. However, their speculative and volatile nature limits their practical application compared to traditional hedging assets like gold. Investors should use cryptocurrencies alongside established inflation hedges for a diversified strategy. Future research should incorporate broader datasets and additional economic variables to refine these findings further.

Correlation Test:

	BitcoinPrice	*Ethereum price*	*inflation*
BitcoinPrice	1		
Ethereum price	0.98156341	1	
inflation	0.719147207	0.809903986	1

Table 4.4-Shows the result of the correlation test

Results:

The correlation analysis reveals the following key insights:

- Bitcoin Price vs. Ethereum Price (0.982):

Bitcoin and Ethereum prices exhibit an extremely strong positive correlation, suggesting their price movements are highly interdependent. This reflects shared drivers such as market sentiment, liquidity, and global trends.

- Bitcoin Price vs. Inflation (0.719):

A strong positive correlation indicates that Bitcoin prices tend to rise with inflation, implying its potential role as an inflation hedge.

- Ethereum Price vs. Inflation (0.810):

Ethereum has an even stronger positive correlation with inflation compared to Bitcoin, suggesting it may be a more effective inflation hedge.

Interpretation

The analysis underscores several points:

- Both Bitcoin and Ethereum show potential as inflation hedges due to their strong correlations with inflation. Ethereum's higher correlation suggests it may be slightly more reliable in this role.
- The near-perfect correlation between Bitcoin and Ethereum (0.982) highlights their significant interdependence, indicating they respond similarly to external factors such as market sentiment and regulatory changes.
- While the strong correlations suggest a connection between cryptocurrencies and inflation, it is crucial to note that correlation does not imply causation. Other factors, such as speculative trading and global financial conditions, may also drive cryptocurrency prices.

Conclusion:

Bitcoin and Ethereum exhibit strong positive correlations with inflation, supporting their potential as inflation hedges, with Ethereum demonstrating a slightly stronger alignment. However, their near-perfect interdependence reduces diversification benefits when held together in a portfolio. Investors should consider combining cryptocurrencies with traditional hedging assets like gold or real estate for better risk management. Future research should incorporate additional macroeconomic variables and examine cryptocurrency behavior during specific inflationary or crisis periods for deeper insights.

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