Stevens Institute of Technology

Crypto Market Analysis & Real-Estate Business Protocol Proposal

Application of Ethereum Blockchain

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1 Introduction

In the dynamic realm of financial technology, blockchain and cryptocurrencies represent two of the most significant innovations that have reshaped how transactions are conducted and assets are managed globally (Nunez). This paper delves into a dual-focused analysis and proposal. Firstly, we conduct a thorough market analysis of a select group of cryptocurrencies, each chosen for its unique role and impact within the broader digital currency landscape. The cryptocurrencies under review include Bitcoin, often regarded as the progenitor of all digital currencies; Ethereum, notable for its robust smart contract capabilities; XRP, designed primarily for rapid financial transactions; Dogecoin, which began as a meme but has since gained substantial practical application; and Tether, a stablecoin tied to the US dollar, offering a less volatile refuge within the highly fluctuant crypto market (Alessandretti).

This study not only examines the price trends, volatilities, and inter-cryptocurrency correlations but also assesses the impact of significant market events, such as the FTX bankruptcy, on these digital assets (Yousaf). The insights garnered from this analysis aim to provide a granular understanding of how various cryptocurrencies react to internal and external pressures, influencing investor sentiment and market dynamics.

Following the market analysis, the second focus of this paper introduces an innovative business proposal leveraging blockchain technology. This proposal outlines a new protocol for real estate transactions, allowing property deeds to be securely managed and transferred without the need for traditional intermediaries such as lawyers and brokers. By employing blockchain technology, this protocol seeks to revolutionize the real estate market by enhancing transparency, reducing transaction costs, and simplifying the transaction process for buyers and sellers across the globe (Jreisat).

Through comprehensive analysis and forward-thinking proposals, this paper contributes to the ongoing discussions surrounding the application of blockchain technology in traditional sectors, proposing not only a new way to understand cryptocurrencies in relation to the traditional financial markets but also offering a practical application that addresses real-world challenges in real estate transactions.

2 Part I: Selection of Cryptocurrencies

2.1 Overview

This analysis encompasses a selection of five distinct cryptocurrencies, each representing a unique facet of the current digital currency ecosystem. Our selected cryptocurrencies include: **Bitcoin (BTC)**, recognized as the original and most well-known cryptocurrency; **Ethereum (ETH)**, noted for its advanced smart contract capabilities; **XRP**, developed by Ripple Labs with a focus on rapid digital payments; **Dogecoin (DOGE)**, which has evolved from a meme into a cryptocurrency with practical uses in tipping and donations; and **Tether (USDT)**, a stablecoin that introduces a measure of stability in the otherwise volatile cryptocurrency market. This diverse selection aims to cover a broad spectrum of functionalities, market positions, and technological innovations within the crypto space, providing a comprehensive overview of its varied applications and implications.

2.2 Detailed Overview and Crypto Protocol

2.2.1 Bitcoin (BTC)

Overview: Introduced in 2009 by an entity under the pseudonym Satoshi Nakamoto, Bitcoin stands as the inaugural cryptocurrency, designed to operate as a decentralized digital currency without the oversight of a central authority. Transactions are conducted directly between users through the peer-to-peer Bitcoin network.

Protocol: Bitcoin's network is underpinned by a proof-of-work (PoW) protocol, wherein miners employ significant computational resources to solve intricate mathematical problems, thus validating transactions and securing the network, with new bitcoins awarded as a mining reward.

For more details see Nakamoto.

2.2.2 Ethereum (ETH)

Overview: Launched in 2015, Ethereum transcends the conventional definition of a cryptocurrency. It serves as a platform for the development of decentralized applications (DApps) through smart contracts, aiming to democratize access to a decentralized financial system.

Protocol: Initially based on a proof-of-work mechanism similar to that of Bitcoin, Ethereum is transitioning to a proof-of-stake (PoS) model with its Ethereum 2.0 update, which promises enhanced scalability and reduced energy consumption.

Refer to Buterin for additional insights.

2.2.3 XRP (Ripple)

Overview: Created by Ripple Labs in 2012, XRP is central to a digital payment protocol that surpasses its identity as a mere cryptocurrency. It facilitates rapid payment settlements across the network.

Protocol: The XRP Ledger utilizes a consensus protocol that does not rely on the traditional blockchain mining process; instead, it achieves consensus through a network of independent validating servers that constantly compare transaction records.

See Inc. for further information.

2.2.4 Dogecoin (DOGE)

Overview: Originating as a humorous take on the cryptocurrency phenomenon in 2013, Dogecoin was inspired by the "Doge" meme featuring a Shiba Inu. It has since cultivated a community focused on using the cryptocurrency for charitable contributions and tipping online content creators.

Protocol: Dogecoin operates on a less energy-intensive proof-of-work algorithm derived from Litecoin, known as Scrypt, facilitating faster transaction processing.

Detailed information available at Community.

2.2.5 Tether (USDT)

Overview: Introduced in 2014, Tether represents a stablecoin that is tethered to the US dollar, aiming to meld the flexibility of cryptocurrencies with the stability of fiat currency.

Protocol: Tether supports a hybrid use of protocols, operating on the Omni Layer of the Bitcoin blockchain and as an ERC-20 token on the Ethereum blockchain, among other blockchain platforms.

Further details can be found in Technologies.

These cryptocurrencies were chosen to provide a diverse perspective on the various applications, market usage, and technological advancements within the broader cryptocurrency environment. From January 1, 2022, to December 31, 2022, our study observed no missing data, ensuring the completeness and reliability of the analysis conducted during this period.

2.3 Crypto Selection Rationale

The selection of cryptocurrencies for this study was informed by a multifaceted rationale emphasizing diversity, technological innovation, community engagement, and market stability. Each cryptocurrency was chosen not only for its unique position within the market but also for its contribution to advancing the blockchain technology landscape.

Diversity and Relevance: Bitcoin and Ethereum are selected as foundational pillars within the cryptocurrency domain, illustrating the broad spectrum of blockchain applications. Bitcoin, often hailed as the original cryptocurrency, has pioneered the concept of a decentralized digital currency and enjoys widespread adoption and recognition. Ethereum, on the other hand, extends the utility of blockchain beyond mere financial transactions through its support for smart contracts, thereby catalyzing a plethora of decentralized applications (DApps). This diversity underscores the significant role these currencies play in the ongoing development and maturation of the cryptocurrency market.

Technological Diversity: XRP and Tether were chosen to highlight the technological diversity within blockchain implementations. XRP, developed by Ripple, is notable for its rapid transaction capabilities and minimal energy consumption, diverging from the traditional mining-based consensus used by currencies like Bitcoin. Similarly, Tether introduces a model of stability in the highly volatile cryptocurrency market by being pegged to the US dollar, showcasing a unique application of blockchain technology in creating stablecoins that mitigate the price volatility typically associated with cryptocurrencies.

Community and Innovation: Dogecoin exemplifies the impact of community on the value and adoption of a cryptocurrency. Originating as a meme, Dogecoin has transcended its initial novelty to foster a robust community

that actively engages in tipping and charitable activities through the currency. This aspect highlights the role of societal and cultural dynamics in shaping the cryptocurrency landscape, emphasizing the importance of community-driven development and innovation.

Market Stability and Innovations: Finally, the inclusion of Tether also addresses the critical challenge of market stability. By anchoring its value to a stable fiat currency, Tether offers a pragmatic solution to the issue of volatility, which is a pervasive concern for investors in cryptocurrencies like Bitcoin and Ethereum. This approach not only facilitates greater market stability but also enhances the practicality of cryptocurrencies for everyday transactions and financial applications.

Collectively, these selections provide a comprehensive overview of the current state and potential future directions of blockchain technology, illustrating a spectrum of use cases from foundational cryptocurrencies to innovative adaptations addressing specific market needs.
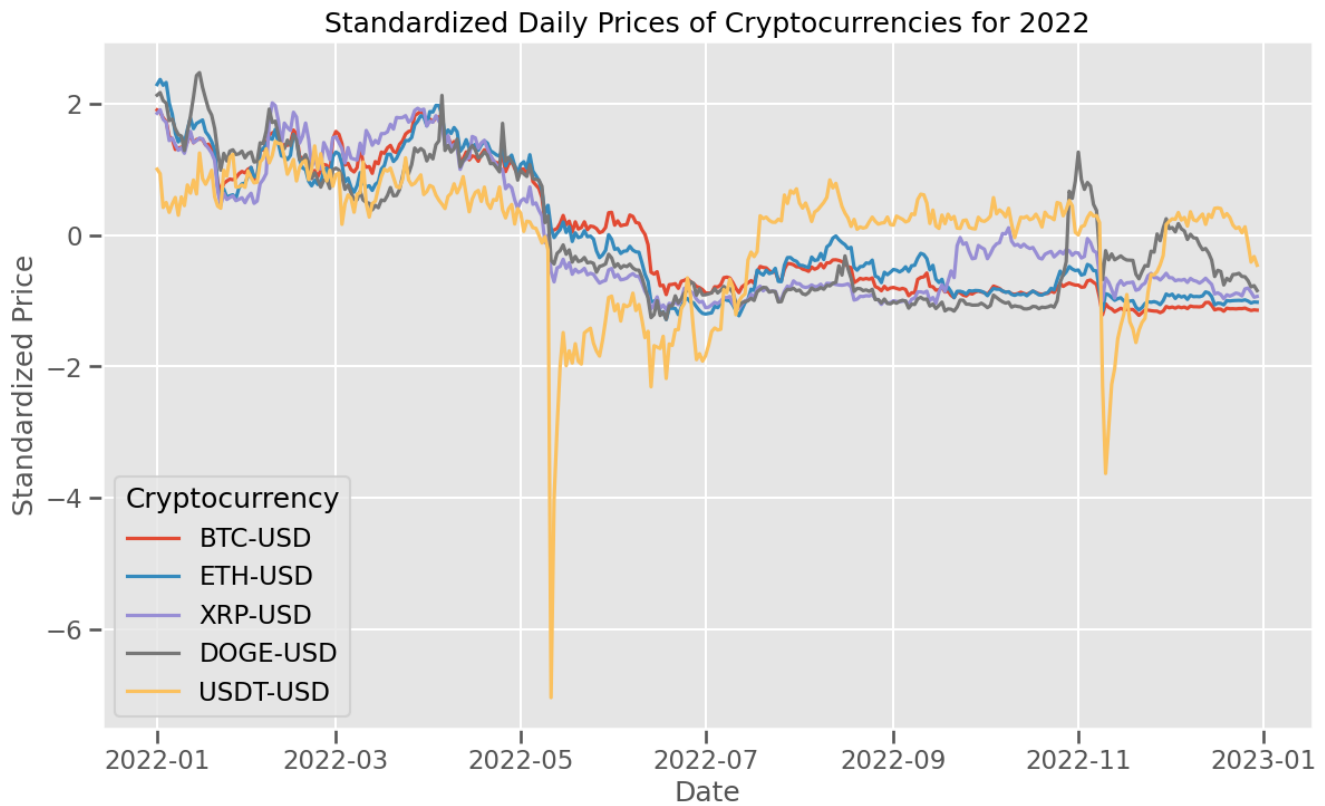
2.4 Market Analysis

Figure 1: Standardized Daily Prices of Cryptocurrencies for 2022

2.4.1 Price Trend Analysis

The analysis of standardized price trends of Bitcoin (BTC), Ethereum (ETH), XRP, Dogecoin (DOGE), and Tether (USDT) throughout 2022 reveals several key insights into the dynamics of the cryptocurrency market:

Correlated Movements: The data illustrates that most cryptocurrencies exhibited closely correlated movements over the course of the year. Such correlation is indicative of the substantial influence exerted by broader market forces and global economic events on the cryptocurrency market as a whole, driving collective swings in investor sentiment—whether bullish or bearish.

Volatility Across Assets: The degree of volatility varied significantly among the analyzed cryptocurrencies. Bitcoin and Ethereum experienced relatively moderate fluctuations, maintaining tighter price bands, while Dogecoin displayed higher volatility, characterized by more pronounced peaks and troughs. This disparity in volatility underscores the differential market perceptions and investor bases of these assets.

Stablecoin Anomaly: An unexpected anomaly was observed in the price trend of Tether (USDT), particularly in May 2022, where it deviated markedly from its expected stable trajectory. Such a divergence, given the design of stablecoins to maintain parity with a peg (e.g., USD), suggests potential extraordinary events, data reporting inaccuracies, or underlying issues with the stability mechanisms during that period.

Market Recovery Ability: Following significant market dips, the cryptocurrencies demonstrated varying degrees of recovery. Bitcoin and Ethereum showed robust resilience and recovery capabilities compared to Dogecoin. This variation could reflect differing levels of market confidence and inherent stability within these digital assets.

Stablecoin's Peculiar Trend: Assuming the accuracy of the observed sharp decline in USDT's value, this could represent a period of intense market stress or a temporary disruption in the stablecoin's dollar peg. However, such incidents are generally ephemeral, as corrective mechanisms typically restore stability swiftly, aligning with the observed rapid return to normalcy.

From the analysis of these price trends, it is evident that while cryptocurrencies are interconnected and respond collectively to market shifts, individual assets exhibit distinct behaviors influenced by their specific market dynamics, investor sentiment, and technological foundations. The peculiar movement observed in Tether's price trend during the analyzed period merits further investigation to ascertain the causes and implications of such an anomaly.

2.4.2   Volatility Analysis

The study of volatility in cryptocurrency markets provides crucial insights into the risks and stability of digital assets. By calculating daily returns and examining their standard deviations, we can gauge the unpredictability associated with each cryptocurrency and identify the factors contributing to these dynamics.

Dogecoin (DOGE-USD): Dogecoin exhibits the highest volatility among the cryptocurrencies analyzed, with a standard deviation of approximately **5.64%**. This elevated volatility can primarily be attributed to its relatively low price per unit, which renders it more susceptible to significant percentage changes on a per-unit basis. Moreover, Dogecoin's price is notably influenced by social media trends and possesses comparatively less market liquidity than more established cryptocurrencies. These elements combine to increase its price volatility, reflecting the substantial impact of retail investor sentiment and speculative trading on its market behavior.

Tether (USDT-USD): In stark contrast, Tether shows the lowest volatility, with a standard deviation near **0.03%**. As a stablecoin, Tether is explicitly designed to be pegged to a fiat currency, specifically the US dollar, and maintains a stable value through various regulatory and technological mechanisms. This stability is critical for its role in providing a safe haven during market turbulence and for facilitating transactions where volatility can be a deterrent.

Bitcoin (BTC-USD) and Ethereum (ETH-USD): Both Bitcoin and Ethereum exhibit moderate levels of volatility, reflecting their established presence in the market and larger capitalizations. These factors typically confer higher liquidity and result in less drastic percentage changes in daily prices.

Benchmark Volatility Analysis: Comparing the volatility of cryptocurrencies with traditional financial markets, such as the S&P 500, highlights the unique risk profiles inherent to digital assets. The S&P 500, with a volatility of **1.00%**, offers a contrast to the higher volatility levels seen in cryptocurrencies, underscoring the potential for greater price stability in traditional equity markets.

Market Implications: This variability in volatility, especially when benchmarked against traditional indices like the S&P 500, illustrates the diverse nature of cryptocurrency markets. While stablecoins like Tether aim to minimize price fluctuations, other cryptocurrencies such as Dogecoin and Bitcoin exhibit a range of volatilities, heavily influenced by investor sentiment, liquidity, and their roles within the digital economy.

The higher volatility of cryptocurrencies compared to traditional markets like the S&P 500 underscores their speculative nature and the heightened risks they pose, which investors must navigate carefully. This analysis emphasizes the importance of strategic risk assessment and portfolio diversification to mitigate the inherent volatility of cryptocurrencies.

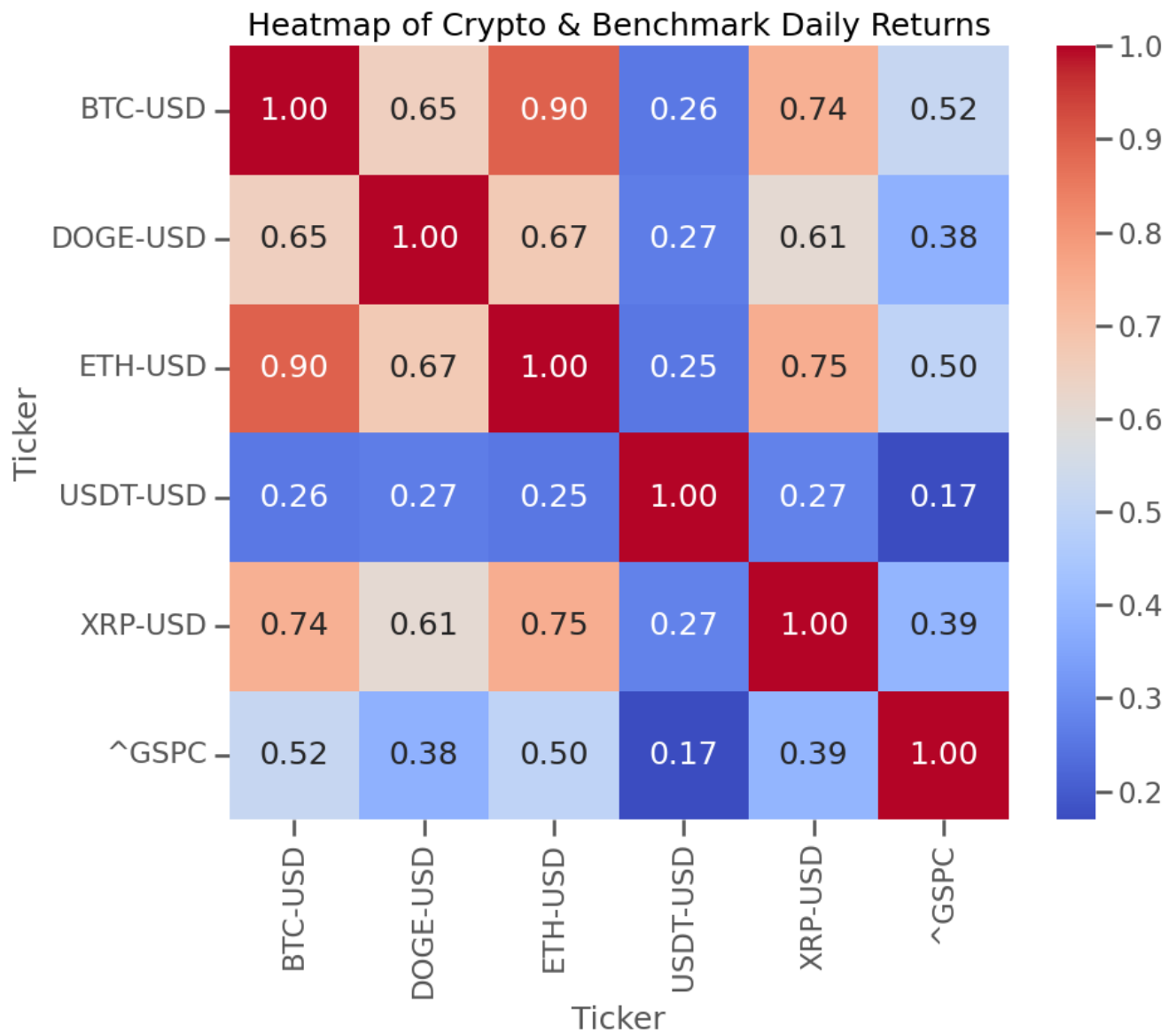### 2.4.3 Correlation Analysis

Figure 2: Correlation Matrix Heatmap of Cryptocurrencies for 2022

A comprehensive examination of the correlation matrix for daily returns of Bitcoin (**BTC**), Ethereum (**ETH**), XRP, Dogecoin (**DOGE**), and Tether (**USDT**) in tandem with the S&P benchmark (**GSPC**) elucidates the interrelationships among these prominent cryptocurrencies:

High Correlations:

- **Bitcoin and Ethereum:** Exhibiting a correlation coefficient of **0.90**, BTC and ETH demonstrate a very strong positive correlation, indicating that these cryptocurrencies often move in tandem. This strong linkage is primarily due to their predominant positions in the market, where both are frequently influenced by similar economic factors, investor sentiments, and regulatory developments.

- **Ethereum and XRP:** With a correlation of **0.75**, movements in Ethereum frequently correlate closely with those in XRP, suggesting overlapping functionalities and investor bases that react similarly to market stimuli in these two platforms.

Moderate Correlations:

- **XRP with Bitcoin and Dogecoin:** XRP displays moderate correlations of **0.74** with BTC and **0.61** with DOGE. These correlations suggest a level of synchronicity, albeit influenced by distinct market dynamics and external factors specific to each cryptocurrency.

- **Dogecoin with Ethereum and Bitcoin:** Correlation coefficients of **0.67** with ETH and **0.65** with BTC for Dogecoin indicate a moderate degree of correlation, influenced by broader market trends that impact all cryptocurrencies, though each responds according to its unique market niche and investor behavior.

Lower Correlations with Tether:

- **All Cryptocurrencies with Tether:** Tether, being a stablecoin tied closely to the US dollar, shows significantly lower correlation coefficients with BTC (**0.26**), ETH (**0.25**), XRP (**0.28**), and DOGE (**0.27**). This fundamental difference in design and purpose—aimed at providing stability—results in less synchronized movements with the more speculative cryptocurrency assets.

Benchmark Correlation Comparison: Comparison with traditional financial markets, specifically through a correlation study with the S&P 500, reveals additional insights. While cryptocurrencies such as BTC and ETH show the highest correlation with each other, they exhibit only moderate correlation levels with the S&P 500, with BTC showing the highest correlation at **0.52**. This suggests that while cryptocurrencies do move somewhat in sync with traditional financial markets, they retain distinct market dynamics that set them apart.

Market Implications: These findings highlight the diverse correlation landscapes within the cryptocurrency markets, where strong intra-crypto correlations contrast with more moderate interactions with traditional financial indices. This divergence underscores the necessity for investors to consider the unique correlation patterns when diversifying portfolios or implementing hedging strategies. The mixed correlation profiles suggest both opportunities and risks, as cryptocurrencies can offer portfolio diversification benefits due to their partial independence from traditional market movements.

2.5 FTX Delta Analysis

2.5.1 Event Overview

In mid-November 2022, the cryptocurrency exchange FTX filed for bankruptcy, triggering significant disturbances across the cryptocurrency markets. This event was exacerbated by the resignation of its CEO, Sam Bankman-Fried, further destabilizing the market's confidence.

2.5.2 FTX Impact on 11/11/22

2.5.3 Immediate Impact

The immediate repercussions of the bankruptcy announcement on November 11, 2022, were starkly evident across various cryptocurrencies:

- **Bitcoin (BTC)** and **Ripple (XRP)** each faced notable declines, with Bitcoin falling by **-3.14%** and XRP by **-2.92%**.

- **Ethereum (ETH)** exhibited relative resilience, with a modest decline of **-0.94%**, reflecting its robust market presence and investor confidence.

Ticker	Impact on Nov 11
BTC-USD	-3.14%
DOGE-USD	-5.46%
ETH-USD	-0.94%
USDT-USD	0.04%
XRP-USD	-2.92%
GSPC	1.00%

Table 1: FTX Impact on Cryptocurrency Prices on November 11, 2022

- **Dogecoin (DOGE)** experienced the most significant drop of **-5.46%**, illustrating its susceptibility to market shocks.

- **Tether (USDT)**, maintaining its stability, changed insignificantly by **+0.04%**, underscoring its role as a stabilizing force within the volatile cryptocurrency environment.

2.5.4 FTX Impact in November 2022

Ticker	Change in Nov 2022
BTC-USD	-16.19%
DOGE-USD	-25.05%
ETH-USD	-17.98%
USDT-USD	0.01%
XRP-USD	-12.02%
ĜSPC	5.81%

Table 2: Monthly Impact of FTX Bankruptcy on Cryptocurrency Prices in November 2022

2.5.5 Long-Term Impact

The extended impact throughout November painted a grim picture of recovery challenges:

- Major cryptocurrencies like **BTC**, **ETH**, and **XRP** recorded substantial declines of **-16.19%**, **-17.98%**, and **-12.02%** respectively.

- **DOGE** was particularly hard hit, plummeting by **-25.05%**, marking the highest vulnerability among the group.

- Conversely, **USDT** showed remarkable stability with only a **0.01%** change, reinforcing its value proposition as a hedge against volatility.

2.5.6 Benchmark and Market Performance Comparison

The correlation and impact studies reveal that while the cryptocurrency market suffered significant losses in response to the FTX crisis, the traditional financial markets, as represented by the S&P 500, exhibited contrasting behavior:

- On November 11, 2022, while cryptocurrencies faced sharp declines, the **S&P 500 (GSPC)** experienced a rise of **1.00%**, demonstrating a decoupling from cryptocurrency market dynamics.

- Over the entire month of November, the S&P 500 gained **5.81%**, further highlighting the resilience and differing risk profiles of traditional equity markets compared to the high-risk cryptocurrency sector.

2.5.7 FTX Conclusion

The FTX bankruptcy served as a critical stress test, revealing the inherent volatility and risk exposure of speculative cryptocurrencies compared to the stability offered by stablecoins like Tether and traditional financial indices like the S&P 500. This event underscores the need for robust risk management strategies and diversified investment approaches to navigate the complexities of cryptocurrency investments effectively.

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