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Cryptocurrency ownership and corporate risk: Empirical evidence from U.S. firms on liquidity, financial conditions, and volatility

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Abstract: This study examines the impact of cryptocurrency ownership on corporate volatility, focusing on external financial conditions, internal financial conditions, and liquidity crises. The research utilizes secondary data from publicly traded companies in the United States listed in the Refinitiv database for the period 2018-2023. To enhance the validity of the results, a matching procedure was implemented, in which each cryptocurrency-owning company was paired with a similar non-cryptocurrency-owning company to create a balanced control group. The analysis employed panel data regression on 384 publicly traded companies in the U.S. The findings indicate that the ratio of cryptocurrency ownership has a significant positive effect on corporate volatility. Additionally, liquidity levels also have a significant positive impact on the volatility of companies holding cryptocurrencies, suggesting that liquidity crises amplify the effect of cryptocurrency ownership fluctuations on corporate volatility. Internal financial conditions, measured by Return on Assets (ROA), exhibit a significant negative effect on the volatility of companies holding cryptocurrencies, implying that strong internal financial health mitigates the impact of cryptocurrency ownership fluctuations on volatility. Conversely, external factors such as company Beta do not influence increased volatility, which contrasts with the expectation that external factors would amplify the effect of cryptocurrency ownership fluctuations on corporate volatility. This study offers important implications for financial managers and regulators in designing risk mitigation strategies against digital asset price fluctuations.

Keywords: *Cryptocurrency ownership, Cryptocurrency ratio, External and internal financial condition, Firm volatility performance, Liquidity.*

1. Introduction

Cryptocurrencies have evolved into significant financial assets since their inception by Nakamoto [1] fundamentally transforming the global financial landscape through blockchain technology, which provides decentralized transaction systems, thereby omitting the need for central authority oversight [2, 3]. As of 2023, the market boasts over 22,000 cryptocurrencies, collectively valued at approximately $798 billion, with Bitcoin and Ethereum leading the pack [4].

Early research emphasized the revolutionary potential of cryptocurrencies in modern finance, highlighting their ability to enhance transaction security and transparency, which fosters innovative financial mechanisms [5]. This shift towards a decentralized financial paradigm also heralds opportunities for cryptocurrencies to replace traditional financial institutions, leveraging reduced costs and enhanced accessibility for a broader user base. However, ongoing challenges regarding the regulatory landscape influence the adoption and secure utilization of these digital assets within traditional financial frameworks [6].

Cryptocurrencies are recognized for their financial technology and potential returns, but they also pose substantial risks due to significant price volatility. The dramatic price fluctuations of cryptocurrencies, exemplified by Bitcoin's surge from approximately $7,000 in 2020 to over $60,000 in

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2021, highlight the high-risk environment these assets create for both individual and corporate investors [7-9]. This inherent volatility necessitates a deeper examination of its consequences for corporate financial performance, particularly in terms of firm-level volatility, liquidity management, and overall financial stability [7-9].

Research suggests that cryptocurrency ownership, assessed as the ratio of digital assets to total assets, correlates with corporate performance metrics, such as the standard deviation of returns [7]. The effects of external financial conditions, indicated by corporate beta, along with internal conditions like return on assets (ROA) and liquidity (current ratio), contribute to a nuanced understanding of how cryptocurrencies may influence public companies in the U.S. market. Investigating these parameters is crucial for understanding their potential role as either hedging instruments or sources of financial instability in corporate balance sheets [7, 10].

Despite the well-established financial properties of cryptocurrencies, such as their low correlation with traditional assets and their potential as hedging instruments, the effect of corporate cryptocurrency ownership on firm volatility remains a relatively underexplored area in the literature. Studies indicate that higher cryptocurrency volatility can lead to increased transaction costs and market inefficiency, as analyzed in Tanos and Badr's work on liquidity and volatility during the pandemic, which underscores how volatility affects decision-making in trading environments [11]. Additionally, the dynamics between cryptocurrencies and conventional financial metrics like return on assets (ROA), liquidity (Current Ratio), and corporate beta suggest that internal and external financial conditions may influence how cryptocurrency ownership impacts corporate performance [7, 12]. These findings imply that while cryptocurrency could stabilize returns through diversification effects, the underlying volatility risk necessitates a nuanced approach informed by corporate financial health [13, 14]. Thus, the proposed framework offers a foundation for studying how cryptocurrency ownership interacts with various financial contexts to shape corporate volatility.

The evolution of cryptocurrencies in the United States, characterized by significant corporate engagement and governmental policy shifts, has notably influenced the broader financial landscape. However, there is no concrete evidence supporting the assertion that President Trump initiated a U.S. Crypto Reserve. As such, this narrative needs to be adjusted to acknowledge a lack of substantial government-backed initiatives specifically named "U.S. Crypto Reserve." Instead, it may refer to general governmental interest in cryptocurrency regulation and monitoring.

Public companies like MicroStrategy and Tesla have certainly redefined their financial strategies by integrating cryptocurrencies into their reserves. MicroStrategy's acquisition of Bitcoin as a primary treasury asset has been substantial, contributing to its market capitalization increases [15]. Tesla's investments reflect a broader trend of asset diversification amid evolving financial environments, although specifics regarding the precise impact on Tesla's financials may vary. Additionally, BTCS Inc.'s approach to offering cryptocurrency dividends signifies innovative corporate practices aligning with the digital economy [16]. Collectively, these developments reflect a transformative period where corporations integrate digital assets into their financial management strategies, showcasing a broader acceptance and strategic adaptation in the U.S. financial sector.

The growing interest in cryptocurrencies presents significant implications for corporate volatility performance, especially for public companies. Recent research indicates that cryptocurrency ownership can greatly influence corporate risk dynamics, shaped by both internal factors (e.g., Return on Assets (ROA), current ratios) and external financial conditions (e.g., corporate beta) [7, 12]. This interplay informs how firms manage cryptocurrency investments to leverage potential benefits while addressing associated risks, highlighting the strategic necessity for comprehensive financial assessments prior to entering cryptocurrency markets.

While cryptocurrencies offer enticing prospects for high returns and diversification, they also carry substantial volatility that necessitates a careful evaluation of a firm's financial health. The empirical findings suggest that the strategic integration of cryptocurrencies into investment portfolios requires a balanced approach, weighing potential returns against the inherent risks associated with market

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conditions and a firm's financial characteristics. Consequently, companies must refine their investment strategies to align with evolving financial landscapes, ensuring robustness in the digital asset arena [12, 17].

The results of this study have several important implications. For corporate management, the results underscore the need for stricter risk management when allocating assets to cryptocurrencies. Companies are advised to ensure sound internal financial conditions (e.g., improving profitability and operational efficiency) and maintain sufficient liquidity to mitigate the negative impact of volatility from crypto holdings. Proactive measures such as establishing risk management protocols for digital assets, stress testing liquidity crisis scenarios, and limiting the proportion of investments in cryptocurrencies to the firm's risk capacity can be considered. For regulators and policy makers, this research provides insights to formulate stricter regulations or disclosure guidelines regarding cryptocurrency holdings by public companies. Transparency of financial reporting on crypto assets and the application of appropriate accounting standards are crucial to maintain investor confidence. In addition, regulators need to develop risk mitigation strategies against price fluctuations of digital assets at the macro level, such as systemic monitoring of corporate exposure to cryptocurrencies. The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and theoretical foundations. Section 3 describes the research methodology and sample selection criteria. Section 4 presents the empirical results, including descriptive statistics, correlation analysis, and regression findings. Finally, Section 5 concludes the paper by summarizing the key findings and providing recommendations.

2. Literature Review and Hypothesis

2.1. Theoretical Foundation

This study is theoretically framed by the principles of agency theory and the Efficient Market Hypothesis (EMH). The latter, proposed by Fama [18] asserts that asset prices incorporate all known information, thereby making it impossible to consistently outperform the market through predictive strategies. Nonetheless, the advent of digital assets and cryptocurrencies challenges this paradigm due to their marked volatility and market inefficiencies.

Complementing EMH, agency theory provides critical insights into the conflicts of interest between corporate managers and shareholders [19]. This perspective is particularly relevant in the modern financial landscape, where managerial decisions regarding cryptocurrency investments can materially influence firm performance.

In this research, the study examine the impact of cryptocurrency ownership—measured as the ratio of digital assets to total balance sheet assets—on corporate volatility performance, operationalized as the standard deviation of returns. The analysis is further enriched by considering external financial conditions, represented by corporate beta, alongside internal financial conditions, namely return on assets (ROA) and liquidity (current ratio). Through this integrated framework, the study aims to elucidate how digital asset allocation strategies interact with both market dynamics and internal corporate factors to affect firm-level risk and performance.

2.2. Crypto Ownerships and Risk: How Market Conditions and Company Performance Shape Volatility

In recent years, digital assets have emerged as a transformative component of corporate finance. With an increasing number of firms incorporating cryptocurrencies into their balance sheets, the digital assets to balance sheet ratio has become a critical metric for evaluating corporate exposure to this emerging asset class. As firms allocate resources to these volatile digital assets, the consequent effects on corporate volatility—typically measured by the standard deviation of returns—merit rigorous examination. Importantly, the interplay of external financial conditions, as captured by corporate beta, and internal financial conditions, as reflected by return on assets (ROA), may moderate this relationship. Understanding these dynamics is essential for investors, corporate managers, and regulators aiming to balance risk and reward in an evolving financial landscape.

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The integration of cryptocurrencies into corporate balance sheets introduces a novel dimension of risk management. The digital assets to balance sheet ratio quantifies the relative weight of digital asset holdings within a firm's financial structure. Early research on digital assets—most notably Bitcoin—has primarily focused on their behaviour as alternative financial instruments. Dyhrberg [20] provided one of the seminal analyses by comparing Bitcoin's volatility properties with those of gold and the U.S. dollar, using a GARCH framework to demonstrate Bitcoin's potential as both a risky and a hedging asset [20]. Although Dyhrberg's focus was on market-level asset behaviour, his methodology has paved the way for analyzing corporate-level exposures.

Subsequent studies have explored the diversification potential of digital assets. Corbet, et al. [21] systematically reviewed the role of cryptocurrencies as financial assets and highlighted that increased exposure—when measured as a proportion of a firm's total assets—can lead to elevated risk levels due to inherent market volatility [21]. Collectively, these studies suggest that while digital asset ownership may offer diversification benefits, it simultaneously introduces nontraditional risks that manifest in higher return variability.

Corporate beta is widely used to capture a firm's systematic risk or its sensitivity to broader market movements. A higher beta indicates that a firm's stock price is more volatile relative to the market, which could amplify the effects of additional risk factors such as digital asset exposure. Dudley, et al. [22] showed that firms engaging in hedging strategies—and by extension, those exposed to volatile instruments—often exhibit altered beta profiles that affect their overall risk of financial distress [22]. When applied to digital assets, the implication is that firms with a high digital assets to balance sheet ratio might experience an increased beta if these assets are highly volatile.

Field and Inci [7] examined the pricing of cryptocurrencies and noted that the market's reaction to digital asset disclosures is often pronounced, suggesting that firms with substantial digital asset positions may face a magnified sensitivity to market shocks [7]. This heightened sensitivity is particularly significant in turbulent market conditions where external factors—such as macroeconomic news or regulatory announcements—can induce rapid shifts in investor sentiment. As a result, the corporate beta may not only reflect traditional market risk but also encapsulate the additional risk introduced by digital asset volatility.

While external factors play a significant role in influencing a firm's volatility, internal financial conditions are equally important. Return on assets (ROA) is a key measure of operational efficiency and profitability, indicating how well a firm utilizes its assets to generate earnings. A robust ROA generally signals effective management and can serve as a stabilizing factor amid external shocks. For example, Faulkender, et al. [23] demonstrated that firms with efficient asset utilization often exhibit superior performance under leverage, suggesting that sound internal management can mitigate volatility [23].

In the context of digital assets, a strong ROA may indicate that a firm has the internal resources and operational discipline to effectively integrate and manage the risks associated with cryptocurrency holdings. Campbell, et al. [24] further emphasized that internal efficiency plays a crucial role in dampening distress risk, implying that firms with higher profitability may be better positioned to absorb the shocks associated with digital asset volatility [24]. Hence, the moderating effect of ROA is likely to be significant in understanding the net impact of digital asset exposure on corporate volatility.

The interaction between external and internal conditions is not simply additive but rather conditional. Field and Inci [7] have proposed conceptual models in which digital asset exposure's effect on volatility is jointly determined by market sensitivity and internal operational efficiency. In such models, firms with high digital asset ratios, high corporate beta, and low ROA are predicted to experience the highest levels of volatility, whereas those with robust internal performance (high ROA) may see a dampened volatility response even if they maintain high digital asset exposure.

Integrating the insights from the reviewed literature, it becomes clear that the impact of cryptocurrency ownership on corporate volatility is a multifaceted issue that hinges on both external and internal financial conditions. The digital assets to balance sheet ratio not only reflects a firm's exposure to a volatile asset class but also interacts with market-wide risk factors (corporate beta) and

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firm-specific performance indicators (ROA). The evidence suggests that while digital asset integration can enhance potential returns, it also increases overall risk—particularly when external conditions are adverse and internal performance is suboptimal. Based on this synthesis, the study posit the following hypothesis:

Hypothesis 1. *Cryptocurrency ownership has an impact on corporate performance volatility.*

Hypothesis 1.1. *Cryptocurrency ownership has a distinct effect on corporate performance volatility depending on its external and internal financial condition.*

2.3. Cryptocurrency Ownership on Corporate Volatility Performance and Liquidity Crisis

The rapid adoption of digital assets over the past decade has prompted a transformation in corporate finance, with many firms now including cryptocurrencies as part of their asset portfolios. As digital assets become a more prominent component of corporate balance sheets, researchers and practitioners alike have begun to examine how the digital assets to balance sheet ratio influences overall firm risk. In particular, questions have arisen regarding the effect on corporate volatility—typically measured by the standard deviation of returns—and the potential for liquidity crises, as indicated by deteriorations in liquidity metrics such as the current ratio.

Cryptocurrency, by their very nature, exhibit high price volatility and are often influenced by speculative trading. While their inclusion in corporate portfolios may offer diversification benefits and innovative financing opportunities, the associated volatility can lead to increased uncertainty in financial performance and heightened liquidity risk. This review synthesizes empirical findings and methodological approaches from the literature to understand these dynamics and ultimately develops a hypothesis linking the extent of digital asset ownership to corporate volatility and liquidity crises.

Liquidity is a cornerstone of corporate financial stability. The current ratio, which compares current assets to current liabilities, is one of the most commonly used indicators of a firm's short-term liquidity position. When firms hold a high proportion of digital assets, the volatility of these assets can rapidly erode liquidity buffers, especially during periods of market stress.

Fu and Smith [25] provides early insights into how liquidity constraints affect corporate financial decisions, noting that firms with lower liquidity ratios are more susceptible to financial distress [25]. In the context of digital asset ownership, the rapid depreciation in asset value during market downturns can lead to a deterioration in the current ratio, thereby signalling a liquidity crisis. Acharya and Pedersen [26] further highlight that liquidity risk is a critical component of asset pricing, and sudden shifts in asset valuations—such as those observed with cryptocurrencies—can trigger significant liquidity shortages [26].

Empirical evidence supports the contention that digital asset volatility has adverse effects on corporate liquidity. For example, when market sentiment turns negative, firms may be forced to liquidate digital assets at depressed prices, thereby reducing their current asset base and worsening liquidity conditions. This phenomenon is particularly acute for companies that lack robust risk management frameworks to cushion against such shocks.

The relationship between asset volatility and liquidity is further complicated by the speculative nature of digital assets. As noted by Urquhart [27] inefficiencies in the Bitcoin market contribute to its extreme price movements, which in turn can lead to rapid changes in liquidity ratios [27]. When digital assets comprise a large fraction of corporate assets, these inefficiencies can result in sudden liquidity crises, as the firm's ability to meet short-term obligations is compromised.

Additionally, cryptocurrency ownership has emerged as a significant factor influencing financial market dynamics. As digital asset adoption increases, investors are allocating a portion of their portfolios to cryptocurrency, which is known for its high price volatility. Sudden fluctuations in cryptocurrency prices can trigger shifts in market expectations and disrupt a company's liquidity conditions, potentially exacerbating corporate performance volatility. Based on the Efficient Market Hypothesis, information related to cryptocurrency price movements and their impact on market

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liquidity will be immediately reflected in asset prices. As a result, the integration of traditional markets with digital assets adds complexity to financial risk management [20, 28].

Empirical research supports the notion that liquidity crises are a major factor contributing to increased corporate performance volatility. Companies experiencing liquidity pressures tend to exhibit more significant stock price fluctuations due to uncertainty arising from a lack of funds to meet financial obligations. These findings highlight the importance of effective liquidity management as a key indicator in assessing corporate market stability and performance. Drawing upon the extensive literature, the study propose the following hypothesis:

Hypothesis 2. *Cryptocurrency ownership despite liquidity crisis has a distinct effect on corporate performance volatility.*

3. Research Design

3.1. Sample Selection

This study investigates the influence of cryptocurrency ownership on corporate volatility among publicly traded firms in the United States. For the purposes of this analysis, cryptocurrency ownership is quantified by the ratio of digital assets to the balance sheet, and corporate volatility is represented by the standard deviation of stock returns. In addition, the study investigates how external financial conditions (as indicated by corporate beta) and internal financial conditions (reflected by return on assets and liquidity measured through the current ratio) moderate this relationship. Since 2018, there has been a noticeable trend among U.S. public companies to incorporate digital assets into their balance sheets, a strategy that reflects both diversification efforts and an adaptation to shifting market dynamics. The United States, with its stringent disclosure standards and sophisticated financial infrastructure, offers an ideal context for such an inquiry [29]. The period from 2018 to 2023 was selected to capture significant transformations in digital asset adoption alongside marked fluctuations in market volatility and corporate financial performance. Data for this study are extracted from publicly available financial statements and regulatory filings, ensuring robust and reliable metrics for corporate beta, return on assets, and liquidity. To mitigate the influence of extreme values, the top and bottom 1% of all continuous variables are trimmed. This study employs a purposive sampling method due to the limited number of public companies that explicitly acknowledge cryptocurrency or digital asset holdings in their financial disclosures. The rationale behind selecting this particular sampling approach is twofold. First, the number of publicly traded firms transparently declaring cryptocurrency ownership on their balance sheets remains relatively limited, thus making a random or population-based sampling approach impractical. Second, adopting purposive sampling allows for a focused examination of companies explicitly disclosing cryptocurrency ownership, enhancing the validity and relevance of findings concerning corporate volatility related to digital asset investments. This method ensures balance and comparability between firms holding cryptocurrencies and their matched non-crypto counterparts, thereby minimizing potential biases arising from heterogeneous firm characteristics unrelated to cryptocurrency ownership. The final sample consists exclusively of firm-year observations from publicly traded companies listed on major U.S. exchanges, thereby providing a solid empirical foundation for analyzing the interplay between digital asset investments and corporate performance [30]. The study utilizes a sample of 384 firm-year observations. The classification of these observations by industry is provided in Table 1 below.

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Table 1.
Industry Distribution of the Sample.

Industry	Number of Firms	%
Information Technology	216	56%
Financials	36	9%
Energy	36	9%
Consumer Discretionary	30	8%
Communication Services	18	5%
Health Care	42	11%
Industrials	6	2%
Total	384	100%

3.2. Regression Model and Measurement of Variables

The dependent variable for this analysis is corporate volatility performance, which is operationalized as the volatility of stock returns. The regression model formulated to test Hypotheses 1 and 1.1 is specified below.

$$\text{Volatility}_{i,t} = \alpha + \beta_1 \text{CryptoR}_{i,t} + \beta_2 \text{CryptoRFC1}_{i,t} + \beta_3 \text{CryptoRFC2}_{i,t} + \sum \alpha_j X_j + \varepsilon_{i,t} \quad (1)$$

The variable $\text{CryptoR}_{i,t}$ denotes the crypto ratio, which measures the level of cryptocurrency ownership for firm i in time period t. Crypto ratio measured as the digital assets to balance sheet ratio, this variable reflects the proportion of a firm's digital asset holdings relative to its total assets. Digital asset data are sourced from financial statement disclosures. The conceptual framework underlying this study is built on the premise that cryptocurrency ownership may not only serve as an alternative asset class but also influence a firm's risk exposure. As companies allocate a portion of their balance sheets to digital assets, the inherent volatility of cryptocurrencies may transfer to the firm's overall risk profile, potentially elevating the standard deviation of its stock returns. The digital assets to balance sheet ratio is thus a critical measure in this context, capturing the extent of a firm's exposure to the digital asset market. Empirical studies, such as those by Catalini and Gans [31] and Baur, et al. [32] have highlighted the transformative role of blockchain technology and digital assets in reshaping financial strategies. However, this study extends the conversation by exploring how these effects are intertwined with broader financial conditions. The variable $\text{CryptoRFC1}_{i,t}$ represents the interaction term between the crypto ratio and the first measure of financial condition (external financial condition) for firm i in year t. External financial condition is measured as corporate beta. Corporate beta is computed by regressing the firm's daily stock returns on a benchmark index (e.g., the S&P 500). This metric assesses the firm's sensitivity to market fluctuations, thereby reflecting external financial conditions. The variable $\text{CryptoRFC2}_{i,t}$ denotes the interaction term between the crypto ratio and the second measure of financial condition (internal financial condition) for firm i in year t. Internal financial condition is measured as Return on Asset (ROA). ROA is a profitability ratio defined as net income divided by total assets. This metric indicates a company's efficiency in utilizing its asset base to generate earnings. Control variables including size, leverage, market volatility (VIX), and Inflation are all included in the model. Hypotheses 2 is examined through the fixed effect model. Unlike simple Ordinary Least Squares (OLS) models, the fixed effects approach accounts for unobserved heterogeneity by controlling for time-invariant characteristics that vary across firms. This methodology effectively removes bias from omitted variables that are constant over time but might differ across entities, such as management style, industry-specific factors, or corporate culture. By using fixed effects, the analysis focuses on within-firm variations over time, thereby providing more reliable estimates of how changes in cryptocurrency ownership impact corporate volatility performance. The regression model is specified as follows:

$$\text{Volatility}_{i,t} = \alpha + \beta_1 \text{CryptoR}_{i,t} + \beta_2 \text{CryptoRLliquid}_{i,t} + \sum \alpha_j X_j + \varepsilon_{i,t} \quad (2)$$

The primary dependent variable, corporate volatility ($\text{Volatility}_{i,t}$), is measured as the annualized standard deviation of stock returns for firm i in year t. The calculation is based on weekly logarithmic

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stock returns sourced from Refinitiv. Specifically, the standard deviation of these weekly returns is first computed for each month to establish monthly volatility. Subsequently, these monthly figures are averaged to derive the final annual volatility measure for each firm. The variable $CryptoRLliquid_{i,t}$ represents the interaction term between the crypto ratio and a state of low liquidity (liquidity crisis) for firm i in year t. Liquidity is a cornerstone of financial stability, and its role in this analysis is critical. This study assesses short-term liquidity using the current ratio, calculated as current assets divided by current liabilities. To capture periods of financial constraint, this continuous measure is transformed into a dummy variable. Firms are classified as having low liquidity (coded as 1) if their current ratio is below the sample average, and as having high liquidity (coded as 0) if their ratio is at or above the average. This binary transformation facilitates the investigation of how liquidity, as a distinct financial condition, influences the relationship between cryptocurrency ownership and corporate volatility performance. The transformation into a dummy variable also simplifies the interpretation of interaction effects in the regression framework, particularly when examining moderating influences. In addition to the primary variables of interest, several control variables are incorporated to account for other factors that might influence corporate volatility. Firm size, measured by the natural logarithm of total assets, is included to capture the scale of operations and its potential moderating effect on volatility. Larger firms may benefit from diversified operations and more robust risk management practices, which can dampen volatility even in the face of fluctuating digital asset values. Leverage, defined as the ratio of total liabilities to total assets, is also controlled for because highly leveraged firms tend to experience amplified risk due to the fixed cost of debt servicing. Market volatility, proxied by the Chicago Board Options Exchange's Volatility Index (VIX), is integrated into the model to account for the broader economic uncertainty that can impact individual firm performance. Finally, the annual inflation rate is used as a control variable to capture macroeconomic influences that may affect both the cost of capital and investment decisions, thereby indirectly influencing corporate volatility. This study employs historical data on the VIX and inflation rate for the period spanning January 2018 to December 2023. VIX data are directly obtained from the Chicago Board Options Exchange, while inflation figures are sourced from the Bureau of Labor Statistics.

4. Empirical Results

4.1. Descriptive Statistics and Correlations

Descriptive statistics for the primary variables are provided in Table 2. The dependent variable, Volatility, exhibits a mean (median) of 0.0647 (0.0627). The crypto ratio, CryptoR, and its related interaction terms, CryptoRFC1, CryptoRFC2, and CryptoRLliquid, have mean (median) values of 0.0397 (0), 0.0931 (0), -2.3115 (0), and 0.0297 (0), respectively. For the control variables, the mean (median) values for firm size (SIZE), leverage (LEV), VIF, and Inflation are 21.4958 (21.9141), 20.8994 (17.3953), 20.5881 (18.2767), and 2.8792 (2.6625), respectively.

Table 2.
Descriptive Statistics.

Variables	Mean	Std. Dev.	Median	Q1	Q3
Volatility	0.0647	0.0223	0.0627	0.0496	0.0788
CryptoR	0.0397	0.1429	0.0000	0	0
CryptoRFC1	0.0931	0.3433	0.0000	0	0.0001
CryptoRFC2	-2.3115	17.2003	0.0000	0	0
CryptoRLliquid	0.0297	0.1289	0.0000	0	0
SIZE	21.4958	2.1031	21.9141	20.6115	22.8203
LEV	20.8994	19.8173	17.3953	5.3675	28.3437
VIX	20.5881	5.1447	18.2767	16.6425	25.6405
Inflation	2.8792	1.4884	2.6625	1.5	3.375

Note: *Volatility*: standard deviation of the logarithmic returns of weekly stock prices.

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CryptoR: digital assets to balance sheet ratio. *CryptoRFC1*: Interaction term between crypto and external financial condition. External financial condition is determined using the Beta; Beta calculated as the covariance of the firm's returns with market returns divided by the variance of market returns. *CryptoRFC2*: Interaction term between crypto and internal financial condition. Internal financial condition is determined using the ROA; ROA defined as net income divided by total assets. *CryptoRLliquid*: Interaction term between crypto and liquidity crisis. Liquidity crisis is coded as 1 if cash (calculated as current assets divided by current liabilities) is less than the median; if not, it is coded as 0. *SIZE*: natural logarithm of total assets. *LEV*: total liabilities divided by total assets. *VIX*: Chicago Board Options Exchange (CBOE)'s Volatility Index. *Inflation*: consumer price index (CPI) growth rate.

Table 3 presents the pairwise correlation matrix, which indicates a robust positive relationship between corporate volatility and the variables CryptoR, CryptoRFC1, and CryptoRLliquid. Conversely, the analysis reveals a robust negative relationship between volatility and CryptoRFC2. This indicates the potential testability of the hypothesis based on the identified link between the dependent variable and the primary explanatory variables. The Variance Inflation Factors (VIFs) for all explanatory variables are well below the common benchmark of 10, indicating that multicollinearity does not pose a problem for this analysis.

Table 3.
Correlations.

Variables	Volatility	CryptoR	CryptoRFC 1	CryptoRFC 2	CryptoR Lliquid	SIZE	LEV	VIX	Inflation
Volatility	1.0000								
CryptoR	0.1636***	1.0000							
CryptoRFC1	0.2359***	0.9187***	1.0000						
CryptoRFC2	-0.0096	-0.5362***	-0.4873***	1.0000					
CryptoR Lliquid	0.1473***	0.8856***	0.7810***	-0.5437***	1.0000				
SIZE	0.0348	-0.2358***	-0.2186***	0.3346***	-0.1461***	1.0000			
LEV	0.0910*	0.1480***	0.1026**	-0.1528***	0.1544***	0.0558	1.0000		
VIX	0.3121***	-0.0040	0.0122	-0.0221	-0.0104	0.0801	-0.0231	1.0000	
Inflation	-0.0815	0.0190	0.0235	-0.0038	0.0203	0.0628	-0.0083	-0.5027***	1.0000

Note: See Table 2 for other variable definitions. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

4.2. Regression Results and Discussion

Table 4 presents the results from the fixed-effect regression analysis, with standardized beta coefficients reported to allow for direct comparison. The findings from Model 1 support Hypothesis 1, revealing a statistically significant positive relationship between the cryptocurrency ownership ratio (CryptoR) and corporate volatility. Regarding the moderating effects, the interaction between crypto holdings and external financial distress (proxied by company beta) is negative but not statistically significant. In contrast, the interaction with internal financial condition (proxied by ROA) is significant, indicating that for firms with stronger internal financial health, cryptocurrency holdings have a more pronounced negative, or mitigating, effect on corporate volatility. This suggests that robust internal finances can serve as a buffer against volatility stemming from external pressures. Finally, all control variables—SIZE, LEV, VIF, and Inflation—are found to have a significant positive association with corporate volatility.

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Table 4.
Regression Results.

Fixed Effect Regression Result	
Variables	**Dependant Variable: Volatility**
Constant	-0.0929*** (0.0273)
CryptoR	0.0984* (0.0544)
CryptoRFC1	-0.0082 (0.0145)
CryptoRFC2	-0.0003*** (0)
SIZE	0.0058*** (0.0013)
LEV	0.0002*** (0.0001)
VIX	0.0012*** (0.0002)
Inflation	0.0003 (0.0006)
N	384
F value	27.6372
Adjusted R^2	0.3589

Note: See Table 2 for other variable definitions. t-values are shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

This study aligns with previous research findings by Fama [18]; Dyhrberg [20] and Bouri, et al. [28] which state that increased exposure to cryptocurrency can enhance stock market dynamics. These findings are consistent with the efficient market hypothesis, which argues that stock prices efficiently reflect all available information, so any new information—including cryptocurrency ownership—can trigger a rapid market response and increase volatility. Moreover, the findings of Fama [18]; Campbell, et al. [33] and Bekaert and Harvey [34] state that strong external financial conditions can enhance company performance through a rapid price adjustment mechanism. According to the Efficient Market Hypothesis, stock prices efficiently reflect all available information, making external financial conditions crucial in informing market assessments of company risks and opportunities. Furthermore, this study aligns with agency theory [19, 35] which states that a strong internal financial condition can reduce conflicts between managers and shareholders and optimize resource allocation. In this context, companies with cryptocurrency assets face additional challenges because the high volatility of cryptocurrency values can increase volatility risk. However, if a company can maintain internal financial stability through effective risk management, the extreme volatility impact of cryptocurrency assets can be minimized. Thus, companies with a healthy internal financial condition and well-managed cryptocurrency holdings exhibit lower volatility performance.

The analysis testing Hypothesis 2, with results shown in Table 5, investigates whether a liquidity crisis alters the effect of cryptocurrency ownership on corporate volatility. The findings suggest a differential impact: during periods of sufficient liquidity, greater cryptocurrency holdings are associated with a significant increase in volatility. This lends support to the argument that digital asset investment heightens a firm's risk profile, an effect that is particularly consequential for companies in financially constrained states. This study aligns with findings that a liquidity crisis has a significant impact on volatility, particularly in companies holding digital assets such as cryptocurrency. According to Brunnermeier and Pedersen [36] a decline in liquidity can increase risk and uncertainty in financial markets, ultimately triggering higher stock price fluctuations. Furthermore, based on the efficient market hypothesis proposed by Fama [18] information related to liquidity conditions is quickly and efficiently reflected in stock prices, meaning that any liquidity instability will lead to increased market volatility. Moreover, cryptocurrency ownership adds complexity to liquidity management and market performance. The inherent volatility of digital assets like cryptocurrency can amplify the impact of a liquidity crisis on stock prices, as sharp cryptocurrency price fluctuations exert additional pressure on a company's financial statements [20]. In this context, the efficient market hypothesis explains that the market will promptly integrate information related to liquidity fluctuations and cryptocurrency value into stock prices, creating a higher volatility dynamic. The conclusion of this study is that the potential benefits of corporate cryptocurrency holdings, particularly as a hedge during a liquidity crisis, are fundamentally contingent upon the firm's internal financial stability. These findings suggest that for

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corporate investors, the focus should not be on the speculative merits of digital assets alone, but on fostering a robust internal environment. A strong internal financial position appears to be a prerequisite for making cryptocurrency investments advantageous, or at least not detrimental. This implies that the decision to invest in cryptocurrency must be a strategic one, carefully aligned with the firm's existing financial and operational health. The analysis also confirms that fundamental firm characteristics, including SIZE, LEV, VIF, and macroeconomic factors like Inflation, are significant positive drivers of corporate volatility.

Table 5.
Regression Results.

Fixed Effect Regression Result	
Variables	**Dependant Variable: Volatility**
Constant	-0.0883*** (0.0269)
CryptoR	0.0512*** (0.0179)
CryptoRLliquid	0.0248*** (0.0071)
SIZE	0.0056*** (0.0013)
LEV	0.0002*** (0.0001)
VIX	0.0012*** (0.0002)
Inflation	0.0003 (0.0006)
N	384
F value	28.8183
Adjusted R²	0.3465

Note: See Table 2 for other variable definitions. t-values are shown in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01.

5. Conclusions

Cryptocurrencies have emerged as a transformative asset class with the potential to disrupt traditional financial structures. In recent years, an increasing number of public companies in the United States have incorporated digital assets into their balance sheets. This study examines the relationship between cryptocurrency ownership—operationalized as the digital assets to balance sheet ratio—and corporate volatility performance, measured by the standard deviation of stock returns. In doing so, the analysis further explores how external financial conditions, represented by corporate beta, internal financial conditions, indicated by return on assets (ROA), and liquidity, measured by the current ratio, moderate this relationship.

The rapid proliferation of digital assets over the past decade has led to significant debate among scholars, investors, and policymakers. Early research on cryptocurrencies largely focused on their role as speculative instruments [32] but more recent studies have shifted attention to their potential as a component of corporate balance sheets. The integration of cryptocurrencies can be seen as an attempt to enhance portfolio diversification, hedge against traditional market risks, and leverage potential high returns in emerging markets [20].

Given the increasing trend of digital asset adoption, this study was motivated by the need to understand how cryptocurrency ownership impacts corporate risk. Specifically, we operationalized cryptocurrency exposure through the digital assets to balance sheet ratio and evaluated its influence on volatility performance. The research hypothesis posits that higher cryptocurrency ownership is associated with increased volatility; however, this effect is not uniform across firms. Instead, the impact is conditional upon external market exposure and internal financial robustness.

This study empirical analysis of public companies in the United States reveals a nuanced relationship between cryptocurrency ownership and corporate volatility performance. The findings indicate that an elevated digital assets to balance sheet ratio generally corresponds with increased volatility, as captured by the standard deviation of stock returns. Although not significant, firms with high corporate beta—an indicator of heightened sensitivity to market movements—tend to diminish volatility effects when they hold significant digital assets. This contradicts existing research that firms

with high corporate beta—an indicator of heightened sensitivity to market movements—tend to experience amplified volatility effects when they hold significant digital assets [32].

Moreover, the study finds that robust internal financial conditions, measured by ROA, can mitigate the adverse effects of cryptocurrency-induced volatility. Firms that demonstrate strong profitability metrics are better positioned to absorb the shocks associated with digital asset price fluctuations. This suggests that sound internal management practices and financial health play a critical role in moderating the risks posed by volatile digital assets [20].

Liquidity crisis, as assessed by the current ratio, also emerges as a crucial moderating factor. When a company experiences liquidity pressure such as cash shortages to meet short-term obligations—it creates market uncertainty. This leads to greater fluctuations, as investors demand higher risk premiums to compensate for liquidity shortages. Findings by Amihud [37] indicate that high illiquidity levels are associated with increased volatility, as liquidity shortages heighten transaction risks and price instability. Furthermore, research by Brunnermeier and Pedersen [36] suggested that liquidity pressure not only worsens market conditions but also amplifies risk and instability, thereby positively impacting corporate performance volatility. Thus, companies facing significant liquidity crises tend to exhibit higher performance volatility, reflecting market responses to financial instability and disrupted cash flow.

A key contribution of this study is its detailed examination of the moderating roles of external and internal financial conditions on the relationship between cryptocurrency ownership and corporate volatility. The findings suggest that external market conditions, as captured by corporate beta, serve as a declining factor. This is different from what it should be where the companies with higher beta coefficients are generally more exposed to market risk, and when coupled with high cryptocurrency exposure, their volatility performance deteriorates markedly. Recent research emphasizes that the interplay between market exposure and asset-specific risks in determining overall firm risk [38].

In contrast, internal financial strength, reflected in a firm's ROA, appears to provide a buffering effect. Firms with superior internal profitability are more resilient to external shocks and better able to capitalize on potential upsides from digital asset investments. This resilience is critical, as it underscores the importance of maintaining robust internal financial conditions to counterbalance the inherent risks of volatile digital assets [31]. Furthermore, companies facing significant liquidity crises tend to exhibit higher performance volatility, reflecting market responses to financial instability and disrupted cash flow. These findings highlight the importance of effective liquidity management strategies and risk mitigation for companies with significant exposure to cryptocurrency [36].

The integration of cryptocurrencies into corporate balance sheets has significant strategic implications. On one hand, the potential for high returns makes digital assets an attractive option for enhancing corporate portfolios. On the other hand, the increased volatility associated with digital asset exposure necessitates a careful balancing act. Corporate managers must ensure that they not only pursue growth opportunities via digital asset investments but also implement robust risk management frameworks that address both external and internal financial conditions.

This study's findings advocate for a dual strategy. First, firms should invest in improving internal financial health—through measures that boost ROA and ensure adequate liquidity—to create a buffer against market volatility. Second, a thorough assessment of external market risks, particularly through the lens of corporate beta, should inform decisions about the extent of digital asset exposure. Such an approach will help firms maximize the potential benefits of cryptocurrency ownership while minimizing its risks [38].

Despite the significant contributions of this study, limitation must be acknowledged. Cryptocurrency price fluctuations are often influenced by market sentiment and investor psychology, which were not accounted for in this research model. Future researchers can add other independent variables, such as market sentiment factors, by analyzing social media, news, or investor sentiment indices related to cryptocurrency.

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Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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