Journal of
Risk and Financial Management

MDPI

Article

Joint Impact of Market Volatility and Cryptocurrency Holdings on Corporate Liquidity: A Comparative Analysis of Cryptocurrency Exchanges and Other Firms

Namryoung Lee

School of Business, Korea Aerospace University, Goyang 10540, Republic of Korea; nrlee@kau.ac.kr

Abstract: This study examines the impact of market volatility and cryptocurrency holdings on corporate liquidity, with a particular focus on the differences between cryptocurrency exchanges and other businesses. The analysis is based on 181 firm-year observations from 2017 to 2022, using Bitcoin volatility, VIX, and VKOSPI as indicators of market volatility. Ordinary Least Squares (OLS) and robust regression analyses are employed to assess the relationships between these variables. It is first noted that, albeit insignificant, market volatility has a detrimental influence on company liquidity. The positive correlation for cryptocurrency exchanges, however, suggests that cryptocurrency exchanges could potentially leverage market volatility as a strategic advantage. Additionally, the study shows that cryptocurrency holdings enhance corporate liquidity, with a stronger association observed in cryptocurrency exchanges. The analysis also incorporates lagged variables to capture delayed effects, confirming that cryptocurrency holdings exert both immediate and delayed positive impacts on liquidity, likely due to effective strategic management practices within exchanges.

Keywords: volatility; strategical use of volatility; cryptocurrency holdings; corporate liquidity

Citation: Lee, Namryoung. 2024. Joint Impact of Market Volatility and Cryptocurrency Holdings on Corporate Liquidity: A Comparative Analysis of Cryptocurrency Exchanges and Other Firms. *Journal of Risk and Financial Management* 17: 406. https://doi.org/10.3390/jrfm17090406

Academic Editor: Thanasis Stengos

Received: 4 August 2024
Revised: 6 September 2024
Accepted: 6 September 2024
Published: 9 September 2024

1. Introduction

Cryptocurrencies have become increasingly popular since Satoshi Nakamoto first introduced them in 2009. With the use of blockchain technology, cryptocurrencies are digital assets that allow transactions to take place in a decentralized network without the need for a central authority. According to Anderson et al. (2022), there are currently over 21,000 distinct types of cryptocurrencies, with a market value of about $1 trillion. Prominent examples of cryptocurrencies encompass Bitcoin, Ethereum, and Ripple. The potential revolutionary changes to the financial system have been the main focus of early research on the economic impact and application of cryptocurrencies. According to Narayanan et al. (2016), new financial innovations are made possible by the blockchain technology that powers cryptocurrencies, which improves the security and transparency of financial transactions. Böhme et al. (2015) added that there is a chance that cryptocurrencies may either replace or supplement current financial institutions. Beyond their use as an investing tool, these studies indicate that cryptocurrencies have the capacity to fundamentally alter the financial system as a whole.

A diverse array of investors has been drawn to cryptocurrencies due to their unique financial technology and high return potential. Compared to conventional financial assets, cryptocurrencies have distinct qualities that present both new investing opportunities and risks. For instance, investors may benefit greatly from the price volatility of cryptocurrencies, but they may also suffer large losses. One of the main drawbacks of cryptocurrencies is their tremendous volatility, which is a double-edged sword. Coins, particularly well-known ones such as Bitcoin (BTC), are known to have three to four times the price volatility of stocks. As such, they are considered a "high risk, high return" investment that investors should carefully consider before investing. As for the adoption of cryptocurrencies, there were those who supported their use as well as those who believed that their volatility

presented risks (Shehada and Shehada 2020). Because a cryptocurrency's price can be impacted by both internal and external factors, it is not necessarily appropriate to think of bitcoin as a new egg basket (Qin et al. 2021). There could be greater uncertainty due to the bubble risk that comes with significant cryptocurrency volatility (Yermack 2015; Baek and Elbeck 2015; Bradbury 2015; Borri 2019; Charfeddine et al. 2020; Steinmetz et al. 2021). Furthermore, even while blockchain technology makes cryptocurrency trading transparent and efficient on a worldwide scale, regulation of the industry is still necessary to make it a potentially secure asset to invest in (Symss 2023). Taking into account the flaws identified in the aforementioned studies, Bitcoin is not a suitable investment for those who are averse to taking on excessive risk because of its extraordinary volatility.

However, for those willing to take risks and test out various asset classes, it might offer chances. Cryptocurrencies offer the advantage of potentially generating high returns. For instance, Bitcoin's price surged from about $7000 in early 2020 to over $60,000 by the end of 2021. During this period, companies holding Bitcoin saw substantial profits. MicroStrategy, one of the world's top three Bitcoin-holding companies, along with Tesla and Marathon Digital Holdings Inc., adopted Bitcoin as a strategic asset, significantly increasing its asset value. In June 2024, MicroStrategy further solidified its strategy by purchasing additional Bitcoin worth $786 million following the sale of convertible bonds. This move demonstrated a firm commitment to enhancing financial stability through asset portfolio diversification with Bitcoin. Such strategies are bringing new changes to corporate asset portfolios and liquidity management. It is evident that a new trend is emerging from the growing amount of money that corporations and institutional investors are investing in cryptocurrencies. A noteworthy development in the acceptance of cryptocurrencies by enterprises and institutional investors is the change in perception and use of these digital assets. A number of reasons, such as changes in regulations, advances in technology, and an increase in market trust, are driving this movement (Medium 2024, 20 May). Increased acceptance of cryptocurrencies by individual investors, companies, and financial institutions is giving the market more credibility (Ashurbayli and Yusifov 2023). Furthermore, businesses that adopt cryptocurrencies can offer customers more payment options beyond fiat money, improving liquidity. Blockchain technology can also lower transaction costs, boosting profitability. Despite the growing interest in cryptocurrencies, there is still limited understanding of how these digital assets impact corporate liquidity, especially in the context of market volatility. This study aims to address this gap by investigating the joint impact of market volatility and cryptocurrency holdings on corporate liquidity, with a particular focus on cryptocurrency exchanges compared to other firms. Specifically, the research seeks to answer the following questions: How does market volatility influence corporate liquidity, and does this effect differ between cryptocurrency exchanges and other firms? What role do cryptocurrency holdings play in enhancing corporate liquidity, particularly within cryptocurrency exchanges?" To explore these questions, the study builds upon the existing literature on market volatility, cryptocurrency investments, and corporate finance. Previous research has highlighted the unique properties of cryptocurrencies, such as their low correlation with traditional assets and their potential as a hedge against market risks (Bouri et al. 2017b, 2017c). However, the relationship between these properties and corporate liquidity remains underexplored. This study posits that market volatility generally has a negative impact on corporate liquidity. However, it is expected that cryptocurrency exchanges may mitigate this adverse effect through strategic management practices, thereby leveraging market volatility to their advantage. Additionally, the study suggests that cryptocurrency holdings are likely to enhance corporate liquidity, with this effect being more pronounced within cryptocurrency exchanges, where the ability to effectively manage volatility plays a crucial role. The theoretical framework integrates these perspectives, proposing that cryptocurrency exchanges, due to their advanced technological infrastructure and regulatory compliance, are better positioned to leverage the benefits of cryptocurrency holdings while minimizing the risks associated with market volatility. The conceptual framework visually represents the hypothesized relationships between the key variables of the study: market

volatility, cryptocurrency holdings, and corporate liquidity. This framework illustrates how market volatility is expected to impact corporate liquidity negatively, while cryptocurrency holdings are anticipated to enhance liquidity. Additionally, it highlights the potential for cryptocurrency exchanges to mitigate the adverse effects of market volatility through strategic management, thereby optimizing liquidity outcomes. This study contributes to the literature by providing new insights into how market volatility and cryptocurrency holdings jointly impact corporate liquidity. Specifically, it emphasizes the unique role of cryptocurrency exchanges in managing these factors more effectively than other firms. Preliminary findings suggest that while market volatility generally has a negative impact on corporate liquidity, cryptocurrency exchanges appear to turn this volatility into a strategic advantage. Additionally, cryptocurrency holdings are shown to enhance liquidity, with a more pronounced effect within exchanges. These findings have significant implications for both theoretical models of corporate finance and practical strategies for managing digital assets.

In summary, businesses can enhance financial stability, diversify their assets to reduce risk, and protect themselves from inflation by making investments in cryptocurrency. Better liquidity is one area in which it can be quite beneficial. Cryptocurrencies are often held for diversification purposes because they are independent of traditional financial markets and show minimal correlation with assets such as stocks or bonds (Dyhrberg 2016; Bouri et al. 2017b, 2017c). The primary distinction between cryptocurrencies and conventional money lies in their decentralized nature. Baur et al. (2018) highlight that Bitcoin has a low correlation with traditional assets, such as equities, bonds, and commodities. Unlike fiat currencies, which are regulated by central banks to control inflation, Bitcoin operates independently of any central financial authority (Elwell et al. 2013; Charfeddine et al. 2020). As noted by several studies, Bitcoin can serve as a hedge against inflation, stock market volatility, and exchange rate fluctuations (Kubat 2015; Dyhrberg 2016; Bouri et al. 2017a, 2017b, 2017c; Selmi et al. 2018). Furthermore, cryptocurrencies open up new avenues for businesses to attract investment and raise capital. Specifically, entrepreneurs can acquire capital quickly through Initial Coin Offerings (ICOs) (Catalini and Gans 2019).

Through prudent strategies, investors have the ability to adequately counterbalance the inherent risks of cryptocurrencies. The volatility of cryptocurrency can be efficiently alleviated by employing techniques such as diversification, derivatives, dynamic asset allocation, and strong corporate governance. The use of cryptocurrency as a hedge has been demonstrated to improve risk-adjusted returns in diverse portfolios by Briere et al. (2015), Platanakis and Urquhart (2020), Ma et al. (2020), and Long et al. (2022).

Traditional methodologies, such as the GARCH methodology, or more advanced analytical tools, including machine learning and deep learning methodologies, offer promising capabilities for forecasting Bitcoin volatility (Dyhrberg 2016; Kou et al. 2014; Pratas et al. 2023). Organizations that use a dynamic approach, according to Ma et al. (2020), are better able to manage risk and capitalize on favorable market movements. Cryptocurrency risk management may also be impacted by corporate governance and a company's financial standing. Solid corporate governance enhances the positive impact of blockchain technology on investment efficiency (Ezzi et al. 2022). Lee (2023) found that companies with stronger financial positions benefit more from their cryptocurrency investments, improving sustainability and profitability.

Meanwhile, cryptocurrency exchanges provide users with the opportunity to engage in the acquisition, sale, or exchange of digital assets for other forms of assets. To illustrate, in order to acquire bitcoin, an aspiring investor is required to complete the registration process for an account with a cryptocurrency exchange. As noted by Scharfman (2023), these platforms deliver services akin to those offered by traditional financial exchanges, whereby they impose fees and retain a segment of the bid-ask spread as compensation for transactions.

Nearly 600 cryptocurrency exchanges existed globally in 2022, according to Forbes, with a total 24 h trading volume of $52.9 billion. Asian exchanges are popular because

of low cryptocurrency mining costs, a well-established mobile payment economy, and a gaming culture. Particularly, crypto exchanges are also drawn to the Republic of Korea (Alekseenko 2023). Forbes disclosed the rankings of cryptocurrency exchanges for the year 2024. Securing the highest rank was achieved by Coinbase, a cryptocurrency exchange that is officially listed on Nasdaq. In the realm of Korean exchanges, Upbit clinched the 4th spot while Bithumb obtained the 17th position. Trading volume is confirmed to have an influence similar to the worldwide crypto currency market, despite certain constraints in the Korean cryptocurrency market. With its high trading volumes, Kimchi Premium, and passionate investor participation, the South Korean cryptocurrency market has attracted a lot of attention from around the world (Tiger Research Reports 2024, 22 March). Due to transaction and currency exchange fees, the value of coins accumulated on South Korea's major cryptocurrency exchanges increased dramatically in the first quarter of 2024. It is anticipated that exchanges will hold a significantly larger amount of cryptocurrency in the future. Cryptocurrency exchanges can hold cryptocurrencies as long-term investment assets. This approach is particularly advantageous for major cryptocurrencies like Bitcoin and Ethereum, which are likely to increase in value over time. By holding these assets, exchanges can hedge against inflation, helping to protect the value of traditional cash assets (Deloitte 2021).

As of the end of June 2022, 37 listed Korean corporations were found to be in possession of cryptocurrencies; the majority of these companies were either gaming companies or payment processing companies. This appears to be a new trend, similar to many multinational corporations investing in cryptocurrencies. It was also determined that several unlisted corporations, especially those operating cryptocurrency exchanges, retained a substantial amount of cryptocurrency.

Cryptocurrency exchanges exhibit distinctive capabilities that enable them to effectively manage the volatility of digital assets compared to traditional firms. Through robust liquidity provision, cutting-edge technological infrastructure, stringent regulatory compliance, availability of derivatives, and hedging strategies, as well as superior market intelligence, they can potentially reduce risks and utilize their cryptocurrency holdings to bolster operational stability. The acquisition and retention of cryptocurrencies by cryptocurrency exchanges are carried out through diverse methods. Traders engaging in bitcoin transactions are subjected to two types of fees: trading fees and withdrawal expenses, with potential additional costs related to borrowing for more intricate trading methods such as margin trading. By generating continuous revenue from transaction fees, exchanges can mitigate liquidity risks, leveraging their expertise in cryptocurrency trading and management to offer self-provided liquidity that facilitates active trading. Liquidity in the financial market plays a pivotal role in minimizing the impact of market volatility and maintaining seamless trading operations (Mancini et al. 2013). Within exchanges, a significant volume of cryptocurrencies is traded, enabling them to effectively manage liquidity by buying and selling cryptocurrencies as required. Major exchanges such as Binance and Coinbase Pro demonstrate the capacity to process substantial transactions without causing significant price fluctuations (Hansen et al. 2024), thereby enhancing price efficiency and market liquidity, factors that contribute to overall market stability as evidenced by Pagnotta and Buraschi (2018). Consequently, in comparison to other entities holding cryptocurrencies, exchanges can leverage these assets more efficiently for liquidity management purposes.

The maintenance of stability and liquidity in financial markets necessitates the utilization of advanced technologies. Cryptocurrency exchanges employ sophisticated analytical tools and machine learning algorithms to forecast market movements and fluctuations (Hendershott and Riordan 2011; Khan et al. 2023; Hansen et al. 2024). Leading bitcoin exchanges like Binance offer a variety of derivatives instruments (Coinbureau 2024) crucial for mitigating risks associated with price volatility. Exchanges also make use of extensive market data and advanced analytics to provide insights and forecasts on market trends. Regulatory compliance stands out as another crucial factor supporting the stability of bitcoin exchanges.

Given the aforementioned attributes, cryptocurrency exchanges may offer advantages in terms of reducing volatility risks and improving financial positions compared to other cryptocurrency-holding entities. Building upon this, the study investigates the positive impact of holding cryptocurrencies on corporate liquidity. Specifically, it delves into whether cryptocurrency exchanges, with their ability to strategically navigate cryptocurrency volatility, experience greater enhancements in liquidity compared to other entities. This investigation involves a comparative analysis between exchanges and other firms regarding the influence of market volatility on corporate liquidity. The paper's structure encompasses Section 2 discussing theories and a literature review, Section 3 detailing methodologies and research samples, Section 4 presenting descriptive statistics, correlations, and regression analysis results, and finally, Section 5 outlining findings and providing research-based recommendations.

2. Literature Review and Hypothesis

2.1. Theoretical Foundation

This study is grounded in the Efficient Market Hypothesis (EMH), a theory proposed by Eugene Fama in the 1960s. EMH posits that asset prices fully reflect all available information, making it impossible for investors to consistently achieve higher returns than the overall market through timing or selection. In the context of cryptocurrency markets, however, the high volatility and relatively low market efficiency present opportunities for abnormal returns, which contrasts with the traditional assumptions of EMH. This research explores how these market inefficiencies, particularly in cryptocurrency exchanges, impact corporate liquidity and how firms might leverage these conditions to their advantage.

2.2. Cryptocurrency Volatility: Opportunities and Risks

The volatility of cryptocurrencies has been the topic of much controversy among scholars and investors alike. This volatility can yield significant returns while also posing substantial risks. By understanding and effectively managing the associated risks, investors can capitalize on the opportunities presented by cryptocurrency volatility. Some bitcoin investments have done very well in the last few years (Deloitte 2022).

Speculators are attracted to cryptocurrencies due to the substantial fluctuation in prices, as this allows them to achieve substantial financial gains through precise predictions of market fluctuations (Cheah and Fry 2015). According to Yermack (2015), Bitcoin is better suited as a speculative investment than a stable currency due to its extreme volatility. For investors prepared to accept the risks involved, this volatility presents a considerable return potential. Bitcoin's high price volatility and trading volume make it an attractive investment for those seeking short-term gains (Baur et al. 2018). Cryptocurrency market volatility and inefficiency can be leveraged to achieve high returns and provide opportunities for abnormal returns (Urquhart 2016; Liu and Tsyvinski 2018).

Certain aspects of cryptocurrencies that set them apart from conventional financial assets have been the subject of some research. The unique characteristics of cryptocurrencies, such as low correlation with traditional assets and potential as a speculative investment, offer compelling opportunities for investors willing to manage the associated risks. Bitcoin, unlike traditional financial assets, offers portfolio diversification benefits due to its low correlation with other asset classes (Elwell et al. 2013; Baur et al. 2018). By including cryptocurrencies in a diversified portfolio, investors can potentially enhance returns while mitigating overall risk. Research by Bouri et al. (2017a, 2017c) supports the view that Bitcoin can serve as a valuable tool for portfolio diversification. Dyhrberg (2016), Kubat (2015), and Selmi et al. (2018) have demonstrated Bitcoin's potential to hedge against risks associated with inflation, stock market volatility, and currency fluctuations. Similarly, Corbet et al. (2020) also explore how Bitcoin's price volatility can provide investment opportunities. Their findings suggest that Bitcoin's price movements interact with traditional financial market uncertainties, presenting a unique mechanism through which investors can achieve high returns. Their study indicates that, when managed well, the high volatility

of cryptocurrencies can enhance overall financial health. According to Hashemi Joo et al. (2020) and Kostika and Laopodis (2019), cryptocurrencies are ideal for global investment portfolios because they tend to be unaffected by international exchange rates and stock markets. The potential of Bitcoin as a viable substitute for conventional investment methods is demonstrated by the greater risk-adjusted returns that investment portfolios containing Bitcoin obtain in comparison to those that do not (Lee et al. 2017; Aggarwal et al. 2018). Cryptocurrency is one alternative for emergency income investments, which are crucial (Symss 2023). The volatility of cryptocurrencies also offers significant opportunities for enhancing corporate liquidity. Companies with cryptocurrency holdings can secure liquidity by turning assets into cash faster than with traditional assets. Makarov and Schoar (2020) examine the impact of active trading in cryptocurrency markets, concluding that companies participating in frequent trades can capitalize on high volatility to achieve significant gains. Corbet et al. (2020) find that significant cryptocurrency investments improve corporate liquidity and financial stability. According to Liu and Tsyvinski (2018), strategic investment in volatile cryptocurrencies can yield significant profits, thereby providing companies with additional liquid assets. The aforementioned research collectively highlights that while cryptocurrencies like Bitcoin are highly volatile, this volatility can be harnessed to achieve substantial returns.

The volatility of cryptocurrencies, while offering potential benefits such as high returns and portfolio diversification, also presents significant risks and disadvantages. One of the primary concerns addressed in the literature is the extreme price volatility of cryptocurrencies, which can lead to substantial financial losses. Investing in cryptocurrencies carries a greater risk due to their increased volatility in comparison to other traditional investments (Shehada and Shehada 2020; Selmi et al. 2018). It is unlikely that investors will consider Bitcoin to be profitable until the market develops (Smales 2019). The lack of intrinsic value and the heavy reliance on speculative trading contribute to the extreme price swings in cryptocurrency markets (Gandal and Halaburda 2016). To think of bitcoin as a new egg basket is not always relevant, as both external and internal factors can impact a cryptocurrency's price (Qin et al. 2021). According to Steinmetz et al. (2021), the volatility of cryptocurrencies has the potential to significantly affect the stability of the financial system and may necessitate further caution and attention.

Since cryptocurrencies have such huge and dramatic return swings, Borri (2019) claims that they are also riskier than the majority of conventional investments. The bubble risk associated with significant volatility in Bitcoin could be the cause of increased uncertainty. Bitcoin is more prone to speculative bubbles and tends to be more volatile than hard currencies (Grinberg 2011). As stated by Yermack (2015), its volatility reduces its value as money, and Bitcoin is only used for asset diversification, according to Bouri et al. (2017a).

The volatility of cryptocurrency is much higher than that of established asset classes. Investors are exposed to a significant risk due to this volatility since it can cause abrupt and extreme price movements that can destabilize the financial system and may necessitate further caution and attention (Makarov and Schoar 2020; Steinmetz et al. 2021). Additional research indicates that the bubble risk associated with excessive bitcoin volatility may be the source of increased uncertainty (Yermack 2015; Baek and Elbeck 2015; Charfeddine et al. 2020).

Considering both the opportunities and risks associated with cryptocurrency volatility, given the high volatility and relative inefficiency of cryptocurrency markets, it is hypothesized that market volatility will have a significant impact on corporate liquidity, particularly for firms with large cryptocurrency holdings. The following hypothesis is proposed:

Hypothesis 1. *Market volatility impacts corporate liquidity.*

Hypothesis 1.1. *This impact varies between exchanges and other firms.*

2.3. Managing Cryptocurrency Volatility Risks in Corporate Investments and Exchanges

Cryptocurrency volatility presents substantial risks, but with prudent strategies, investors can mitigate these risks effectively. These include diversification, the use of derivatives and hedging strategies, dynamic asset allocation, and strong corporate governance. As a potent and reliable hedge against the investing risks associated with gold and crude oil, the cryptocurrency index can be utilized (Long et al. 2022). Corporations can employ derivatives and hedging strategies to manage the volatility of cryptocurrency investments (Briere et al. 2015). Their findings demonstrate that even a tiny percentage of Bitcoins can significantly enhance the risk-return trade-off of well-diversified portfolios. Using an asymmetric GARCH methodology, Dyhrberg (2016) finds that Bitcoin can be used as a hedge against stocks in the Financial Times Stock Exchange Index. Guesmi et al. (2019) also assert that incorporating Bitcoin into diversified investment portfolios can reduce overall portfolio risk, using various multivariate GARCH models. Ma et al. (2020) demonstrated that better returns for the same amount of risk were obtained by using cryptocurrencies in portfolios of stocks, currencies, and commodities. The inclusion of Bitcoin in a conventional stock and bond portfolio has been shown by Platanakis and Urquhart (2020) to significantly improve risk-adjusted returns. According to Ma et al. (2020), organizations that implement a dynamic approach are better able to manage risk and take advantage of positive market moves.

Additionally, the role of corporate governance, the company's financial status, and the characteristics of different industries can impact managing cryptocurrency risks. Corporate governance acts as a mediator in the relationship between investment efficiency and blockchain technology. Blockchain technology has a favorable impact on investment efficiency that is more pronounced for companies that follow solid corporate governance practices (Ezzi et al. 2022). Based on Lee's (2023) examination of how cryptocurrency holdings affect sustainability and profitability, companies with stronger financial positions stand to gain more from their virtual currency investments.

Advanced analytical tools of technology and financial sectors may be better suited to manage bitcoin volatility. According to Kou et al. (2014), machine learning approaches are a developing technology in financial risk analysis. Deep learning methodologies could offer a potential tool for forecasting Bitcoin volatility, especially for short-term horizons, when comparing the forecasting properties of standard methodologies with deep learning methodologies for Bitcoin volatility prediction (Pratas et al. 2023). Bitcoin's acceptance as an alternative currency is yet another COVID-19 phenomenon. Demand for high-volatility hedges, as opposed to traditional hedges such as low-yield developed country bonds, has been fueled by high equities and credit values (Morgan 2021, April 27).

In the meantime, cryptocurrency exchanges play an integral role in the cryptocurrency ecosystem, significantly contributing to market stability and liquidity. Exchanges fall into two categories: decentralized and centralized. Cryptocurrency exchanges provide services to customers for the purchase, sale, and exchange of cryptocurrencies. Even those these centralized exchanges offer consumers good service during high-volume transactions, the presence of centralized administration also means that exchanges must deal with internal operations, corporate ethics, asset theft, and other risk factors that could compromise user asset security (Chainalysis Report 2021). Some exchanges manipulate the market by inflating trading volumes. The "Pump and Dumps Scheme" (P&D) is a common example of market manipulation fraud (Li et al. 2021). Some of the unexpected transaction amounts observed on the investigated exchanges could be attributed to legislative changes and industry, or to market malfeasance (Gu et al. 2022). In any case, a sizable number of cryptocurrencies are traded on exchanges. Tripathi and Sharma (2024) examine six of the top cryptocurrency exchanges in addition to nine conventional small-cap stock indices in order to determine if cryptocurrency exchanges have more liquidity than conventional financial markets. They discover that Binance is the most liquid cryptocurrency exchange and that Russell 2000 Small Cap is the most liquid traditional market. The findings indicate that compared to cryptocurrency exchanges, small-cap indices are typically more liquid.

However, during the COVID-19 pandemic's second wave, Binance showed greater liquidity than conventional markets.

In order to mitigate the effects of market volatility and maintain seamless trading operations, liquidity is essential. Exchanges play an important role in supplying liquidity through market making, ensuring that there is always a buyer or seller. This ongoing liquidity serves to stabilize prices and mitigates the impact of huge deals on the markets. Exchanges can strategically use the inherent volatility of cryptocurrencies to their advantage, managing liquidity by buying and selling as needed (Deloitte 2021). Leading exchanges such as Binance and Coinbase Pro maintain broad order books with substantial buy and sell orders, allowing them to absorb larger trades without triggering significant price swings (Hansen et al. 2024). The significance of liquidity in financial markets is also emphasized by Mancini et al. (2013), who point out that diversified portfolios and high trading volumes act as a buffer against excessive market volatility. In a similar vein, Pagnotta and Buraschi (2018) show how exchanges improve pricing efficiency and market liquidity, which in turn promotes overall market stability. Because of their strong liquidity provision, they might be able to reduce risks and use their cryptocurrency holdings to boost operational stability.

Cryptocurrency exchanges leverage cutting-edge technologies to manage trading, storage, and administration of digital assets. These advanced systems are crucial for maintaining market stability and liquidity. Exchanges utilize sophisticated analytical tools and machine learning algorithms to forecast market trends and volatility. They utilize data sourced from two centralized exchanges, namely Coinbase Pro and Binance, alongside a decentralized exchange, in order to analyze repetitive patterns in volatility and trading volume pertaining to the principal cryptocurrencies, Ether and Bitcoin. They discover regular trends in volume and volatility by hour, day of the week, and within the hour. These trends, which have gotten stronger over time, are probably connected to futures market funding times and algorithmic trading (Hansen et al. 2024). Hendershott and Riordan (2011) and Khan et al. (2023) explore the role of algorithmic trading in financial markets. The ability of exchanges to utilize sophisticated data analysis tools and real-time trading systems helps in tracking and reacting promptly to market movements, thereby preserving market stability and liquidity.

Regulatory compliance is another critical aspect that contributes to the stability of cryptocurrency exchanges. Robust internal controls and adherence to global financial regulations help exchanges manage risks effectively and maintain operational transparency. Crypto exchanges should adhere to prudential regulations and have strong internal control and risk assessment procedures. Particularly in South Korea, cryptocurrency exchanges are required to adhere to AML/CFT standards and receive a license from the Financial Services Commission. As a result, transactions are only permitted if the client has a legitimate bank account connected to their digital wallet, and anonymous accounts are prohibited (Act on Reporting and Using Specified Financial Transaction Information 2001, 2021 Revision).

To accommodate a broad range of trading styles and inclinations, cryptocurrency exchanges leading bitcoin trading platforms, such as Binance, also provide a variety of derivative instruments, such as futures and options (Coinbureau 2024), which are crucial for managing risks associated with price fluctuations. By providing these hedging tools, exchanges enable market participants to protect their portfolios from adverse price movements, thereby contributing to overall market stability and liquidity. The risk-return profiles of the most popular cryptocurrencies are thoroughly examined by Liu and Tsyvinski (2018), who also offer insights into the asset management practices of exchanges. Furthermore, exchanges leverage extensive market data and advanced analytics to provide insights and forecasts about market trends. This capability is crucial for anticipating market movements and managing risks proactively, a feature that traditional firms may not have developed to the same extent. The ability to acquire real-time market data gives cryptocurrency exchanges the advantage of being able to quickly react to price movements and monitor them. This skill is essential for controlling the dramatic price swings that characterize

Bitcoin. As previously mentioned, their strong liquidity provision, advanced technological infrastructure, stringent regulatory compliance, availability of derivatives and hedging strategies, and superior market intelligence may allow them to mitigate risks and leverage their cryptocurrency holdings for improved operational stability.

In this context, the study first examines the impact of market volatility on corporate liquidity, with a particular focus on whether cryptocurrency exchanges are affected differently compared to other companies. The study also delves into examining the influence of cryptocurrency holdings on the financial liquidity of a firm, along with exploring whether the effect of cryptocurrency holdings on the liquidity of a cryptocurrency exchange differs from that on other types of businesses. If cryptocurrency exchanges are able to utilize market volatility as a potential advantage, a positive relationship may exist between market volatility and the liquidity of these exchanges. The Republic of Korea has witnessed a surge in the number of companies holding cryptocurrencies since 2017, with relevant data becoming publicly available thereafter. While not presently mandatory, companies engaging in cryptocurrency ownership or issuance will be required to disclose related information in their financial statements starting from the year 2024. Consequently, between 2017 and 2022, an investigation will be carried out on both publicly traded and unregistered entities to determine the impact of cryptocurrency investments on a company's financial liquidity.

Given the unique volatility of cryptocurrency markets and the relative inefficiency compared to traditional financial markets, firms holding cryptocurrencies, especially those with advanced risk management strategies, are likely to experience a substantial impact on their liquidity. The ability to effectively manage this volatility can either stabilize or destabilize a firm's liquidity, depending on the strategies employed. Cryptocurrency exchanges, which typically possess advanced technological infrastructure and superior market intelligence, are likely to manage the inherent volatility of cryptocurrency markets more effectively than other firms. This capability may result in different liquidity outcomes for exchanges compared to other types of firms, as they can better leverage market inefficiencies and volatility to their advantage. Drawing upon the aforementioned, the study posits the subsequent hypotheses:

Hypothesis 2. *Cryptocurrency holdings impact corporate liquidity.*

Hypothesis 2.1. *This impact manifests differently on exchanges compared to other firms.*

3. Research Design

3.1. Sample Selection

This research investigates the influence of cryptocurrency ownership on a company's financial liquidity utilizing a deliberately chosen sample covering the period from 2017 to 2022. Since 2017, there has been a gradual increase in Korean firms revealing their cryptocurrency investments. Korea was chosen as the focus of this study due to its uniquely active cryptocurrency market, often characterized by the 'Kimchi Premium,' where cryptocurrency prices are consistently higher compared to global averages. This phenomenon is driven by a combination of high demand from tech-savvy investors and the country's advanced digital infrastructure. Additionally, Korea's financial market is rapidly evolving, with significant integration of new financial technologies, making it an ideal case for exploring the impact of cryptocurrency holdings on corporate liquidity. The Korean government's dynamic regulatory environment, which has alternated between strict regulation and cautious promotion of cryptocurrencies, further adds to the relevance of this study. The year 2022 was selected as the endpoint for this study due to data availability and the need to ensure the accuracy and consistency of the data used. At the time of conducting the research, complete and verified financial data for 2023 and beyond was not yet available, which could have compromised the reliability of the analysis. The market conditions during this period are representative of the overall trends and volatility that characterize cryptocurrency markets, providing a robust foundation for the study's findings. The study encompasses both publicly traded and privately held enterprises. Due to the ambiguous

nature of firms' policies on disclosing their cryptocurrency investments, the selection of companies for this study is based on information publicly disclosed by the Financial Supervisory Service. The top and bottom 1% of all continuous variables are adjusted in order to mitigate the impact of extreme values. The sample comprises a total of 181 firm-year observations, with 114 being publicly traded and 67 privately held. The distribution of the sample by industry is presented in Table 1 below.

Table 1. Industry Distribution of the Sample.

Industry	Number of Firms	%
Cryptocurrency/Blockchain	41	23%
Information and Communication Technology	57	31%
Game	60	33%
Advertising	9	5%
Financial Investment	11	6%
Restaurant	3	2%
Total	181	100%

3.2. Regression Model and Measurement of Variables

The cash ratio, which serves as a measure of business liquidity, is utilized as the dependent variable, and the regression model for Hypothesis 1 and 1.1 is presented below.

$$\text{CashR}_{i,t} = \alpha + \beta_1 \text{Volatility}_{i.t} + \beta_2 \text{VolatilityEX}_{i.t} + \sum \alpha_j X_j + \sum \alpha_k \text{IND}_k + \sum \alpha_l \text{YEAR}_l + \varepsilon_{i,t} \quad (1)$$

As a robust approach, market volatility includes multiple volatility indices such as Bitcoin Volatility, VIX (Chicago Board Options Exchange (CBOE)'s Volatility Index), and VKOSPI (KOSPI 200 Volatility Index). Bitcoin volatility is a measure of the variability in the price of Bitcoin over a specific period. The volatility is calculated as the standard deviation of the logarithmic returns of daily Bitcoin prices, which are sourced from CoinMarketCap. Initially, daily returns are computed, followed by calculating the standard deviation of these returns on a monthly basis to determine monthly volatility. Finally, the monthly volatilities are averaged to derive the annual volatility figures for Bitcoin. As the most widely traded cryptocurrency, Bitcoin's price movements are highly influential in the digital asset market. The VIX, also known as the "fear gauge", measures the market's expectation of 30-day forward-looking volatility implied by S&P 500 index options. It is a widely recognized indicator of market sentiment and investor anxiety. The KOSPI 200 Volatility Index, VKOSPI, measures the market's expectation of volatility in the KOSPI 200 index, which is a benchmark for the South Korean stock market. Similar to the VIX, it reflects investor sentiment and perceived risk in the Korean equity market. The study utilizes historical data for Bitcoin prices, VIX, and VKOSPI from January 2012 to December 2022. Annual volatility figures can be calculated based on the data for Bitcoin obtained from CoinMarketCap, while VIX data are sourced from Yahoo Finance and VKOSPI data from Investing.com (https://www.investing.com/indices/kospi-historical-data, accessed on 24 June 2024) or the Korea Exchange (KRX). Market volatility often has an immediate effect on corporate liquidity as firms respond to current market conditions. Hence the contemporaneous volatility measure is used to capture the direct impact of volatility on liquidity. The $\text{VolatilityEX}_{i.t}$ is an interaction term between Volatility and EX in year t. Control variables including investment, size, operating cash flow, sales growth, and leverage are all included in the model. Furthermore, as control factors, dummy variables related to the industry and year are added.

Hypotheses 1 is examined through the Ordinary Least Squares (OLS) model. The regression model is presented below.

$$\text{CashR}_{i,t} = \alpha + \beta_1 \text{Crypto}_{i.t} + \beta_2 \text{CryptoEX}_{i.t} + \sum \alpha_j X_j + \sum \alpha_k \text{IND}_k + \sum \alpha_l \text{YEAR}_l + \varepsilon_{i,t} \quad (2)$$

where $CashR_{i,t}$ stands for the cash ratio, a metric for a firm's financial liquidity. Liquidity ratio computations can be used by investors and lenders to assess the health of a company. Lenders and investors will occasionally consider two types of liquidity ratios: the quick ratio and the cash ratio. One commonly used statistic to evaluate a company's financial liquidity is the cash ratio. The cash ratio focuses even more closely; hence the cash ratio is used in this study. The cash ratio is calculated by dividing cash and cash equivalents by total assets.

If the business has cryptocurrencies, the dummy variable "crypto" is coded as 1, otherwise it is coded as 0. The study additionally employs a regression model that integrates lagged variables ($Crypto_{i.t\text{-}1}$, $Crypto_{i.t\text{-}2}$) to account for the delayed impacts of cryptocurrency investments on liquidity. Utilizing lagged independent variables (t-1, t-2) in addition to a concurrent one (t) are chosen for establishing causality and chronological sequence (Montgomery et al. 2008) and to mitigate simultaneity bias (Greene 2012). Financial decisions and market reactions often have lagged effects (Box et al. 2015). Lagged variables often provide a better fit for models where the independent variable's effect is not immediate, thereby improving the model's predictive power. The $CryptoEX_{i.t}$ ($CryptoEX_{i.t\text{-}1}$ $CryptoEX_{i.t\text{-}2}$) is an interaction term between cryptocurrency holdings and EX. The variable denoted as "EX" is considered a dummy variable, taking on a value of 1 when the company operates as a cryptocurrency exchange, and 0 otherwise. Guidelines are currently being advocated to enhance the transparency of cryptocurrency accounting and disclosure, aiming to incorporate cryptocurrency entrusted by investors into the financial statements of cryptocurrency exchanges; however, this implementation has not been executed thus far. The cryptocurrency exchange assets examined in this research do not comprise cryptocurrencies entrusted by clients. The model includes control variables that have the potential to impact a company's liquidity. Investment, size, operating cash flow, sales growth, and leverage are some of these variables. Leverage is calculated by dividing total liabilities by total assets. The natural log of all assets is used to calculate size while accounting for the implications of size. It also includes growth, which is the change in revenues ($(Revenue_t - Revenue_{t\text{-}1})/Assets_{t\text{-}1}$) and OCF, or operating cash flow divided by assets. Investment is a control variable since it has the potential to impact a company's performance. In addition, dummy variables pertaining to the year and industry are included as control variables.

4. Empirical Results

4.1. Descriptive Statistics and Correlations

The statistical summary of the primary variables is presented in Table 2. In relation to the dependent variable CashR, the mean (median) stands at 0.2207 (−0.0097). For Crypto, the mean (median) is recorded at 0.4361 (0). The mean (median) for CryptoEX is 0.1165 (0), suggesting that approximately 12% of companies holding cryptocurrency are exchanges. As for Volatility, VIX, and VKOSPI, the mean (median) values are 0.7730 (0.7860), 0.9770 (1.1152), and 2.0916 (0.7900), respectively. Lastly, the mean (median) figures for the control variables LEV, SIZE, OCF, GROW, and INV are 0.4321 (0.4020), 17.5702 (14.0337), 0.0028 (0.0323), 0.4674 (0.0663), and 0.0663 (0.0255), respectively.

Table 2. Descriptive Statistics.

Variables	Mean	StdDev	Median	Q1	Q3
CashR	0.2207	0.1970	0.1548	0.0963	0.2704
Crypto	0.4361	0.4968	0	0	1
CryptoEX	0.1165	0.3215	0	0	0
Volatility	0.7730	0.1894	0.7860	0.6768	0.9572
VIX	0.9770	0.3964	1.1152	0.6246	1.3951
VKOSPI	2.0916	3.4887	0.7900	−0.5300	4.2900
LEV	0.4321	0.2514	0.4020	0.2008	0.6333

Table 2. *Cont.*

Variables	Mean	StdDev	Median	Q1	Q3
SIZE	17.5702	6.5691	14.0337	11.8072	24.1268
OCF	0.0028	0.2953	0.0323	−0.0693	0.1053
GROW	0.4674	1.4833	0.0663	−0.1446	0.3439
INV	0.0663	0.0964	0.0255	0.0091	0.0776

Notes. *CashR*: cash and cash equivalents divided by assets. *Crypto*: Crypto is a dummy variable coded as 1 if the company holds a cryptocurrencies in year t, otherwise, it is coded as 0. *Volatility*: Bitcoin Volatility Index. *VIX*: Chicago Board Options Exchange (CBOE)'s Volatility Index. *VKOSPI*: KOSPI Volatility Index. *LEV*: total liabilities divided by total assets. *SIZE*: natural logarithm of total assets. *OCF*: operating cash flow divided by total assets. *GROW*: revenue growth. *INV*: plant, property, and equipment (except land and construction in progress) divided by total assets.

Table 3 presents the pairwise associations, demonstrating a robust positive relationship between the cash ratio and the variables Crypto, CryptoEX, and VolatilityEX. This indicates the potential testability of the hypothesis based on the identified link between the dependent variable and the primary explanatory variables. Additionally, the Variance Inflation Factors (VIFs) for all variables are below 2, with most values around 1, indicating no multicollinearity concerns.

Table 3. Correlations.

Variables	*Cash*	*Crypto*	*CryptoEX*	*Volatility*	*VolatilityEX*	*LEV*	*SIZE*	*OCF*	*GROW*	*INV*
Cash	1									
Crypto	0.3013 *	1								
CryptoEX	0.5244 *	0.4130 *	1							
Volatility	0.0166	0.2818 *	0.0304	1						
VolatilityEX	0.5608 *	0.3201 *	0.8970 *	0.1210	1					
LEV	0.2326 *	0.2145 *	0.3045 *	0.0325	0.3273 *	1				
SIZE	0.4918 *	0.5084 *	0.4040 *	0.1337	0.4512 *	0.1799 *	1			
OCF	0.0608	−0.128	−0.1653 *	−0.0028	−0.1065	−0.0272	−0.0676	1		
GROW	0.2350 *	0.0913	0.1950 *	−0.0262	0.2494 *	0.0635	0.3043 *	0.2753 *	1	
INV	−0.1096	−0.0249	−0.1685 *	−0.0692	−0.1716 *	0.1339	0.0636	−0.0187	0.1139	1

Note. VolatilityEX: an interaction term between Volatility and EX. See Table 2 for other variable definitions. * $p < 0.05$.

4.2. Regression Results and Discussion

Hypotheses 1 and 1.1 involve a comparative analysis of the impact of market volatility on corporate liquidity between exchanges and other companies. While market volatility generally may negatively affect corporate liquidity, cryptocurrency exchanges, due to their distinctive capabilities such as robust liquidity provision, advanced technological infrastructure, strict regulatory compliance, derivatives availability, hedging strategies, and superior market intelligence, are likely to exhibit a positive correlation. This aligns with the Efficient Market Hypothesis (EMH), which suggests that while markets are generally efficient, specific entities like cryptocurrency exchanges can exploit market inefficiencies to their advantage, as demonstrated by their ability to leverage volatility positively. As a robust approach, market volatility includes indices such as Bitcoin Volatility, VIX (CBOE Volatility Index), and VKOSPI (KOSPI 200 Volatility Index). Panel A in Table 4 shows that Bitcoin Volatility and VIX have a negative but insignificant impact on corporate liquidity, whereas VKOSPI has an insignificant positive correlation. However, for cryptocurrency exchanges, all three volatility measures show a significant positive correlation with corporate liquidity. These findings resonate with previous empirical studies that highlight the adaptive strategies of cryptocurrency exchanges (e.g., Deloitte 2021; Hansen et al. 2024) and their unique position in managing volatility. This positive correlation, particularly given the general expectation of volatility's adverse effects, suggests that cryptocurrency exchanges may possess unique risk management capabilities or benefit from specific market

conditions that other firms do not. This warrants further investigation into the specific strategies employed by these exchanges to leverage volatility, potentially offering new insights into best practices for managing financial instability. Economically, these findings suggest that cryptocurrency exchanges are uniquely positioned to turn market volatility into a strategic asset, contributing to a broader understanding of how firms can navigate volatile market conditions. The findings obtained would serve as the foundation for substantiating Hypothesis 2.1. This is a noteworthy finding, suggesting that, as hypothesized, volatility may actually present strategic opportunities that positively impact the finances of companies on cryptocurrency exchanges. It indicates that a deeper understanding of cryptocurrencies and market movements can enable investors to turn the volatility of cryptocurrencies and the market into opportunities rather than crises. The results might be able to inform companies and investors about enhancing risk management practices and making well-informed financial choices within a market environment characterized by volatility. This underscores the need for investor strategies that capitalize on such insights. These results are consistent with the previous literature that highlights the adaptive strategies of cryptocurrency exchanges (e.g., Deloitte 2021; Hansen et al. 2024) and their ability to turn potential risks into opportunities. This further validates the notion that, unlike traditional firms, cryptocurrency exchanges may have evolved unique capabilities to thrive in volatile market conditions. Economically, these findings suggest that cryptocurrency exchanges are uniquely positioned to turn market volatility into a strategic asset. The ability to maintain liquidity during periods of high volatility not only enhances financial stability but also provides these exchanges with a competitive edge in the rapidly evolving financial landscape. This indicates that for cryptocurrency exchanges, market volatility, typically seen as a risk, can be transformed into an opportunity for financial growth and stability. Control variables, SIZE, and OCF, show a significant positive correlation with corporate liquidity across models with different independent variables. Panel B of Table 4 presents the outcomes from the robust regression analysis, which resemble the OLS outcomes, except when using VKOSPI as the volatility variable. While the robust regression analysis supports the consistency of the OLS results, further robustness checks, such as alternative model specifications and subsample analyses, would be beneficial to ensure the reliability of these findings across different contexts.

Table 4. Regression Results.

Panel A. OLS Regression Results			
Variables	**Dependent Variable: *CashR***		
	Model 1	**Model 2**	**Model 3**
Constant	0.0183 (0.19)	−0.0246 (−0.34)	−0.0395 (−0.61)
Volatility	−0.0447 (−0.48)	-	-
VolEX	0.2691 *** (4.21)	-	-
VIX	-	−0.0135 (−0.33)	-
VIXEX	-	0.1740 *** (4.13)	-
VKOSPI	-	-	0.0048 (0.42)
VKOSPIEX	-	-	0.0254 *** (3.09)
LEV	−0.0251 (−0.45)	−0.0033 (−0.07)	0.0135 (0.26)
SIZE	0.0137 *** (4.90)	0.0147 *** (5.58)	0.0170 *** (6.69)
OCF	0.1129 *** (2.65)	0.1127 *** (2.75)	0.1236 *** (2.92)
GROW	−0.0066 (−0.72)	−0.0007 (−0.08)	0.0007 (0.08)
INV	0.1678 (1.12)	0.1102 (0.80)	0.0957 (0.67)
Industry dummies		Included	
Year dummies		Included	
F value	9.47 ***	10.50 ***	9.68 ***
Adjusted R^2	*0.4630*	*0.4701*	*0.4478*
N	*168*	*183*	*183*

Table 4. *Cont.*

Panel B. Robust Regression Results			
Variables	**Dependent Variable: *CashR***		
	Model 1	**Model 2**	**Model 3**
Constant	0.0183 (0.39)	−0.0246 (−0.48)	−0.0395 (−0.87)
Volatility	−0.0447 (−1.27)	-	-
VolEX	0.2691 *** (5.00)	-	-
VIX	-	−0.0135 (−0.62)	-
VIXEX	-	0.1740 *** (4.83)	-
VKOSPI	-	-	0.0048 (0.73)
VKOSPIEX	-	-	0.0254 (1.68)
LEV	−0.0251 (−0.43)	−0.0033 (−0.06)	0.0135 (0.24)
SIZE	0.0137 *** (6.98)	0.0147 *** (6.73)	0.0170 *** (5.81)
OCF	0.1129 (1.03)	0.1127 (1.16)	0.1236 (1.49)
GROW	−0.0066 (−0.41)	−0.0007 (−0.04)	0.0007 (0.04)
INV	0.1678 * (2.72)	0.1102 (1.79)	0.0957 (1.62)
Industry dummies		Included	
Year dummies		Included	
Adjusted R^2	0.5177	0.5196	0.4993
N	*168*	*183*	*183*

Note. VIXEX: an interaction term between *VIX* and EX. *VKOSPIEX:* an interaction term between *VKOSPI* and EX. See Table 2 for other variable definitions. t-values are shown in parentheses. * $p < 0.10$, *** $p < 0.01$.

Panel A in Table 5 illustrates the results obtained from the Ordinary Least Squares (OLS) analysis concerning the relationship between cryptocurrency holdings and the liquidity of business finances. The analysis investigates the impact of cryptocurrencies held by companies on their liquidity. If cryptocurrency holdings positively contribute to financial stability through asset portfolio diversification, as proven in previous research, a positive correlation between cryptocurrency holdings and corporate liquidity is expected. Particularly for cryptocurrency exchanges, if their distinctive capabilities allow them to manage cryptocurrency volatility more efficiently and strategically, an even stronger positive correlation will be evident.

Table 5. Regression Results.

Panel A. OLS Regression Results			
Variables	**Dependent Variable: *CashR***		
	Model 1	**Model 2**	**Model 3**
Constant	−0.0436 (−0.68)	−0.0213 (−0.33)	−0.0189 (−0.29)
$Crypto_t$	−0.0041 (−0.13)	-	-
$Crypto_tEX$	0.2401 *** (4.82)	-	-
$lagCrypto_{t-1}$	-	0.0528 * (1.71)	-
$lagCrypto_{t-1}EX$	-	0.1967 *** (3.79)	-
$lagCrypto_{t-2}$	-	-	0.0723 ** (2.49)
$lagCrypto_{t-2}EX$	-	-	0.1679 *** (3.11)
LEV	−0.0198 (−0.39)	−0.0280 (−0.54)	−0.0301 (−0.59)
SIZE	0.0144 *** (5.49)	0.0136 *** (5.16)	0.0136 *** (5.22)
OCF	0.1043 *** (2.60)	0.0829 ** (2.04)	0.0930 ** (2.30)
GROW	−0.0032 (−0.38)	−0.0057 (−0.67)	−0.0058 (−0.69)
INV	0.1397 (1.02)	0.1127 (0.81)	0.0912 (0.66)
Industry dummies		Included	
Year dummies		Included	
F value	11.25 ***	11.01 ***	11.15 ***
Adjusted R^2	*0.4920*	*0.4873*	*0.4923*
N	*181*	*180*	*179*

Table 5. *Cont.*

Panel B. Robust Regression Results			
Variables	**Dependent Variable: *CashR***		
	Model 1	**Model 2**	**Model 3**
Constant	−0.0436 (−1.02)	−0.0213 (−0.68)	−0.0189 (−0.38)
$Crypto_t$	−0.0041 (−0.12)	-	-
$Crypto_tEX$	0.2401 *** (3.65)	-	-
$lagCrypto_{t-1}$	-	0.0528 ** (2.74)	-
$lagCrypto_{t-1}EX$	-	0.1968 *** (5.05)	-
$lagCrypto_{t-2}$	-	-	0.0723 ** (3.12)
$lagCrypto_{t-2}EX$	-	-	0.1679 ** (2.44)
LEV	−0.0198 (−0.32)	−0.0280 (−0.55)	−0.0301 (−0.54)
SIZE	0.0144 *** (7.62)	0.0136 *** (7.54)	0.0136 *** (4.73)
OCF	0.1043 (1.24)	0.0829 (0.91)	0.0930 (1.00)
GROW	−0.0032 (−0.21)	−0.0057 (−0.40)	−0.0058 (−0.38)
INV	0.1397 ** (2.24)	0.1127 * (1.86)	0.0912 * (1.85)
Industry dummies		Included	
Year dummies		Included	
Adjusted R^2	*0.5400*	*0.5360*	*0.5407*
N	*181*	*180*	*179*

Note. $lagCrypto_{t-1}$*:* cryptocurrency holdings in *t*-1. $lagCrypto_{t-1}EX$*:* an interaction term between $lagCrypto_{t-1}$ and EX. $lagCrypto_{t-2}$*:* cryptocurrency holdings in *t*-2. $lagCrypto_{t-2}EX$*:* an interaction term between $lagCrypto_{t-2}$ and EX. See Table 2 for other variable definitions. t-values are shown in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The analysis further incorporates lagged variables ($Crypto_{i,t}$, $Crypto_{i,t}$) to examine the delayed impacts of cryptocurrency holdings on liquidity, considering causality, chronological sequence, and mitigating simultaneity bias. The analysis results support Hypotheses 2 and 2.1. The results show that while concurrent year holdings negatively and insignificantly impact liquidity, *t*-1 and *t*-2 holdings significantly and positively influence liquidity, with *t*-2 showing the strongest positive correlation. This aligns with Box et al. (2015) on the lagged effects of financial decisions and market reactions. Intriguing findings for cryptocurrency exchanges are that positive significant impacts are observed in concurrents year, *t*-1, and *t*-2, indicating both immediate and delayed positive effects, likely attributable to the strategic management of held cryptocurrencies. The control variables, SIZE and OCF, significantly positively correlate with the financial liquidity of the company across models with different independent variables. Panel B in Table 5 shows findings from robust regression analysis, which are consistent with the OLS outcomes regarding explanatory factors.

5. Conclusions

Cryptocurrencies have garnered substantial attention following their establishment in 2009 by Satoshi Nakamoto. The current landscape comprises over 21,000 distinct cryptocurrencies, collectively valued at approximately $1 trillion (Anderson et al. 2022). Cryptocurrency is commonly viewed as a high-risk investment instrument owing to its inherent volatility; nevertheless, this volatility has the potential to yield substantial returns for investors. With regards to the integration of cryptocurrencies, some individuals advocated for their implementation while others expressed concerns about the financial instability they may bring (Shehada and Shehada 2020). There might exist enhanced ambiguity associated with substantial volatility in cryptocurrencies (Yermack 2015; Baek and Elbeck 2015; Bradbury 2015; Borri 2019; Selmi et al. 2018; Charfeddine et al. 2020; Steinmetz et al. 2021). The huge price swings in cryptocurrency markets are a result of both a heavy reliance on speculative trading and a lack of intrinsic value (Gandal and Halaburda 2016). Consequently, cryptocurrency may not be appropriate for investors with a low risk tolerance. Nevertheless, individuals open to embracing risk and spreading their investments across different asset categories might find potential prospects available (Kliber et al. 2019). The rationale behind the portfolio diversification benefits of Bitcoin, in contrast to conventional

financial assets, stems from its limited correlation with other classes of assets (Elwell et al. 2013; Baur et al. 2018). The volatility of cryptocurrencies can be effectively managed by strategically employing diversification, utilizing derivatives, and implementing hedging strategies. Liquidity is crucial to reducing the impact of market volatility. Cryptocurrency exchanges are beneficial in that regard. With massive buy and sell orders, major exchanges such as Binance and Coinbase Pro can handle big transactions without producing noticeable price movements (Hansen et al. 2024). To manage liquidity by purchasing and selling as needed, exchanges can strategically take advantage of the innate volatility of cryptocurrencies (Deloitte 2021). Cryptocurrency exchanges also maintain advanced systems that are essential to preserving market liquidity and stability. In addition, a range of derivatives instruments, including futures and options, are offered by cryptocurrency exchanges (Coinbureau 2024). Regulatory compliance is another important factor that supports the stability of cryptocurrency exchanges.

In light of this, the study conducted a comparative analysis of the effects of market volatility on liquidity between cryptocurrency exchanges and other businesses. The study also examined whether holding cryptocurrencies has a positive impact on corporate liquidity and whether cryptocurrency exchanges-which are useful for managing volatility-improve liquidity more than other types of businesses.

First, when using cryptocurrency volatility, VIX, and VKOSPI as indicators of market volatility, it was observed that while market volatility negatively impacts corporate liquidity, this effect is not statistically significant. However, for cryptocurrency exchanges, there was a positive correlation between market volatility and corporate liquidity. This implies that cryptocurrency exchanges might have utilized market volatility as a strategic opportunity. It also highlights the importance for all cryptocurrency investors of using investment strategies that leverage knowledge about cryptocurrencies and market volatility to turn fluctuations into opportunities.

Secondly, the analysis discovered that cryptocurrency holdings improved company liquidity, and there was a stronger link between cryptocurrency holdings and liquidity on cryptocurrency exchanges. Lagged variables were also employed in the analysis to account for the delayed effects of bitcoin investments on liquidity and to mitigate simultaneity bias (Greene 2012). Financial decisions and market reactions frequently have lag effects (Box et al. 2015). The outcomes validated delayed effects of cryptocurrency holdings. The findings pertaining to cryptocurrency exchanges indicated both the immediate and delayed benefits of cryptocurrency holdings, most likely as a result of strategic management. This study contributes to the literature by providing a comparative analysis of the impact of market volatility and cryptocurrency holdings on corporate liquidity, particularly highlighting the unique position of cryptocurrency exchanges. The findings offer new insights into how cryptocurrency exchanges can strategically leverage market volatility to enhance liquidity, which has implications for both investors and policymakers. The implications of these findings extend beyond academia to practical applications. For practitioners, particularly those in financial management and investment strategy, the study underscores the importance of understanding and managing market volatility and cryptocurrency holdings. For theorists, the study provides a foundation for further exploration of the dynamic relationship between market volatility and corporate liquidity, particularly in the context of emerging financial technologies. While meaningful outcomes were achieved, limitations in data disclosure and the relatively small sample size, as well as the short study period, resulted in constraints on the quantity of data available, consequently impeding the ability to perform more advanced analyses. These factors may limit the generalizability of the findings, and caution should be exercised when applying these results to a broader context. In future research, it would be beneficial to utilize a larger dataset and an extended study period, which could provide more comprehensive insights and potentially more robust conclusions. For future research, it would be beneficial to utilize more refined and comprehensive datasets to further explore the potential impact of the COVID-19 pandemic on corporate liquidity in cryptocurrency markets. Such analyses could provide

deeper insights and help confirm whether the observed trends hold true in different market conditions.

Funding: This research received no external funding.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The author declares no conflict of interest.

References

Act on Reporting and Using Specified Financial Transaction Information. 2001. Available online: https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=60111&type=part&key=23 (accessed on 10 May 2024).

Aggarwal, Shivani, Mayank Santosh, and Prateek Bedi. 2018. Bitcoin and portfolio diversification: Evidence from India. In *Digital India*. Cham: Springer, pp. 99–115. [CrossRef]

Alekseenko, Aleksandr P. 2023. Model Framework for Consumer Protection and Crypto-Exchanges Regulation. *Journal of Risk and Financial Management* 16: 305. [CrossRef]

Anderson, Chelsea M., Vivian W. Fang, James Moon, and Jonathan E. Shipman. 2022. Accounting for Cryptocurrencies. *Georgia Tech Scheller College of Business Research Paper No. 4294133*. [CrossRef]

Ashurbayli, Nigar, and Ali Yusifov. 2023. Investing in cryptocurrency as an alternative way of financial investments. *Agora International Journal of Economical Sciences* 17: 10–16. [CrossRef]

Baek, Chung, and Matt Elbeck. 2015. Bitcoins as an investment or speculative vehicle? A first look. *Applied Economics Letters* 22: 30–34. [CrossRef]

Baur, Dirk G., KiHoon Hong, and Adrian D. Lee. 2018. Bitcoin: Medium of Exchange or Speculative Assets? *Journal of International Financial Markets, Institutions and Money* 54: 177–89. [CrossRef]

Böhme, Rainer, Nicolas Christin, Benjamin Edelman, and Tyler Moore. 2015. Bitcoin: Economics, Technology, and Governance. *Journal of Economic Perspectives* 29: 213–38. [CrossRef]

Borri, Nicola. 2019. Conditional tail-risk in cryptocurrency markets. *Journal of Empirical Finance* 50: 1–19. [CrossRef]

Bouri, Elie, Peter Molnár, Georges Azzi, David Roubaud, and Lars Ivar Hagfors. 2017a. On the hedge and safe haven properties of bitcoin: Is it really more than a diversifier? *Finance Research Letters* 20: 192–98. [CrossRef]

Bouri, Elie, Rangan Gupta, Aviral Kumar Tiwari, and David Roubaud. 2017b. Bitcoin for energy commodities before and after the December 2013 crash: Diversifier, hedge or safe haven? *Applied Economics* 49: 5063–73. [CrossRef]

Bouri, Elie, Rangan Gupta, Aviral Kumar Tiwari, and David Roubaud. 2017c. Does Bitcoin hedge global uncertainty? Evidence from wavelet-based quantile-in-quantile regressions. *Finance Research Letters* 23: 87–95. [CrossRef]

Box, George E. P., Gwilym M. Jenkins, Gregory C. Reinsel, and Greta M. Ljung. 2015. *Time Series Analysis: Forecasting and Control*. Hoboken: John Wiley & Sons.

Bradbury, Danny. 2015. In blocks we trust [bitcoin security]. *Engineering Technology* 10: 68–71. [CrossRef]

Briere, Marie, Kim Oosterlinck, and Ariane Szafarz. 2015. Virtual Currency, Tangible Return: Portfolio Diversification with Bitcoin. *Journal of Asset Management* 16: 365–73. [CrossRef]

Catalini, Christian, and Joshua S. Gans. 2019. Some Simple Economics of the Blockchain. Rotman School of Management Working Paper No. 2874598. MIT Sloan Research Paper No. 5191-16. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2874598 (accessed on 10 May 2024).

Chainalysis Report. 2021. Key Players of the Cryptocurrency Ecosystem Who's Who on the Blockchains? Available online: https://go.chainalysis.com/key-players-in-crypto-report.html (accessed on 12 May 2024).

Charfeddine, Lanouar, Noureddine Benlagha, and Youcef Maouchi. 2020. Investigating the dynamic relationship between cryptocurrencies and conventional assets: Implications for financial investors. *Economic Modelling* 85: 198–217. [CrossRef]

Cheah, Eng-Tuck, and John Fry. 2015. Speculative bubbles in Bitcoin markets? An empirical investigation into the fundamental value of Bitcoin. *Economics Letters* 130: 32–36. [CrossRef]

Coinbureau. 2024. Best 5 Crypto Derivatives Exchanges 2024. Available online: https://coinbureau.com/analysis/best-crypto-derivatives-exchanges/ (accessed on 12 May 2024).

Corbet, Shaen, Charles Larkin, Brian M. Lucey, Andrew Meegan, and Larisa Yarovaya. 2020. The impact of macroeconomic news on Bitcoin returns. *The European Journal of Finance* 26: 1396–416. [CrossRef]

Deloitte. 2021. Corporations Investing in Crypto. Guidelines and Considerations for Companies on Digital Asset Allocation. Available online: https://www2.deloitte.com/us/en/pages/audit/articles/corporates-investing-in-crypto.html (accessed on 12 May 2024).

Deloitte. 2022. Perspectives. The Use of Cryptocurrency in Business. Why Companies Should Consider Using Cryptocurrency. Available online: https://www2.deloitte.com/us/en/pages/audit/articles/corporates-using-crypto.html (accessed on 12 May 2024).

Dyhrberg, Anne Haubo. 2016. Bitcoin, gold and the dollar—A GARCH volatility analysis. *Finance Research Letter* 16: 85–92. [CrossRef]

Elwell, Craig Kent, M. Maureen Murphy, Michael V. Seitzinger, and Edward Vincent Murphy. 2013. Bitcoin: Questions, Answers, and Analysis of Legal Issues. *Congressional Research Service Reports*. Available online: https://sgp.fas.org/crs/misc/R43339.pdf (accessed on 12 May 2024).

Ezzi, Ferdaws, Maher Abida, and Anis Jarboui. 2022. The Mediating Effect of Corporate Governance on the Relationship Between Blockchain Technology and Investment Efficiency. *Journal of the Knowledge Economy* 32. [CrossRef]
Gandal, Neil, and Hanna Halaburda. 2016. Can We Predict the Winner in a Market with Network Effects? Competition in Cryptocurrency Market. *Games* 7: 16. [CrossRef]
Greene, William H. 2012. *Econometric Analysis*, 7th ed. Upper Saddle River: Prentice Hall.
Grinberg, Reuben. 2011. Bitcoin: An Innovative Alternative Digital Currency. *Hastings Science & Technology Law Journal* 4: 160–207. Available online: https://repository.uclawsf.edu/hastings_science_technology_law_journal/vol4/iss1/3 (accessed on 12 May 2024).
Gu, Zhuoming, Dan Lin, and Jiajing Wu. 2022. On-Chain Analysis-Based Detection of Abnormal Transaction Amount on Cryptocurrency Exchanges. Available online: https://ssrn.com/abstract=4051536 (accessed on 15 May 2024).
Guesmi, Khaled, Samir Saadi, Ilyes Abid, and Zied Ftiti. 2019. Portfolio Diversification with Virtual Currency: Evidence from Bitcoin. *International Review of Financial Analysis* 63: 431–37. [CrossRef]
Hansen, Peter Reinhard, Chan Kim, and Wade Kimbrough. 2024. Periodicity in Cryptocurrency Volatility and Liquidity. *Journal of Financial Econometrics* 22: 224–51. [CrossRef]
Hashemi Joo, Mohammad, Yuka Nishikawa, and Krishnan Dandapani. 2020. Announcement effects in the cryptocurrency market. *Applied Economics* 52: 4794–808. [CrossRef]
Hendershott, Terrence, and Ryan Riordan. 2011. Algorithmic trading and information. *Journal of Financial and Quantitative Analysis* 46: 1001–24. [CrossRef]
Khan, Farman Ullah, Faridoon Khan, and Parvez Ahmed Shaikh. 2023. Forecasting returns volatility of cryptocurrency by applying various deep learning algorithms. *Future Business Journal* 9: 25. [CrossRef]
Kliber, Agata, Paweł Marszałek, Ida Musiałkowska, and Katarzyna Świerczyńska. 2019. Bitcoin: Safe haven, hedge or diversifier? Perception of bitcoin in the context of a country's economic situation—A stochastic volatility approach. *Physica A: Statistical Mechanics and Its Applications* 524: 246–57. [CrossRef]
Kostika, Eleftheria, and Nikiforos T. Laopodis. 2019. Dynamic linkages among cryptocurrencies, exchange rates and global equity markets. *Studies in Economics and Finance* 37: 243–65. [CrossRef]
Kou, Gang, Yi Peng, and Guoxun Wang. 2014. Evaluation of clustering algorithms for financial risk analysis using MCDM methods. *Information Sciences* 275: 1–12. [CrossRef]
Kubat, Max. 2015. Virtual currency bitcoin in the scope of money definition and store of value. *Procedia Economics and Finance* 30: 409–16. [CrossRef]
Lee, David Kuo Chuen, Li Guo, and Yu Wang. 2017. Cryptocurrency: A new investment opportunity? *The Journal of Alternative Investments* 20: 16–40. [CrossRef]
Lee, Namryoung. 2023. The Relationship between a Company's Cryptocurrency Holdings and Its Sustainable Performance—With a Focus on External and Internal Financial Issues and Cash. *Sustainability* 15: 16188. [CrossRef]
Li, Tao, Donghwa Shin, and Baolian Wang. 2021. Cryptocurrency Pump-And-Dump Schemes. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3267041 (accessed on 15 May 2024).
Liu, Yukun, and Aleh Tsyvinski. 2018. Risks and Returns of Cryptocurrency. *Review of Financial Studies* 32: 1849–74. [CrossRef]
Long, Wen, Maohua Wang, and Man Guo. 2022. The asset allocation utility of digital cryptocurrency. *Procedia Computer Science* 214: 1174–81. [CrossRef]
Ma, Yechi, Ferhana Ahmad, Miao Liu, and Zilong Wang. 2020. Portfolio optimization in the era of digital financialization using cryptocurrencies. *Technological Forecasting and Social Change* 161: 120265. [CrossRef] [PubMed]
Makarov, Igor, and Antoinette Schoar. 2020. Trading and Arbitrage in Cryptocurrency Markets. *Journal of Financial Economics* 135: 293–319. [CrossRef]
Mancini, Loriano, Angelo Ranaldo, and Jan Wrampelmeyer. 2013. Liquidity in the foreign exchange market. *Journal of Financial Markets* 16: 385–417. [CrossRef]
Medium. 2024. Major Companies and Institutions Adopting Bitcoin. Available online: https://medium.com/@bitcofun/major-companies-and-institutions-adopting-bitcoin-521871c2631b (accessed on 30 May 2024).
Montgomery, Paul G., David B. Pyne, Will G. Hopkins, Jason C. Dorman, Katherine Cook, and Clare L. Minahan. 2008. The effect of recovery strategies on physical performance and cumulative fatigue in competitive basketball. *Journal of Sports Sciences* 26: 1135–45. [CrossRef]
Morgan, J. P. 2021. Bitcoin, Blockchain and Digital Finance: Fintech Goes Mainstream in the COVID-19 Era. April 27. Available online: https://www.jpmorgan.com/insights/global-research/technology/bitcoin-blockchain-digital-finance (accessed on 15 May 2024).
Narayanan, Arvind, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. 2016. *Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction*. Princeton: Princeton University Press.
Pagnotta, Emiliano, and Andrea Buraschi. 2018. An Equilibrium Valuation of Bitcoin and Decentralized Network. Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3142022 (accessed on 15 May 2024).
Platanakis, Emmanouil, and Andrew Urquhart. 2020. Should investors include bitcoin in their portfolios? A portfolio theory approach. *The British Accounting Review* 52: 100837. [CrossRef]
Pratas, Tiago E., Filipe R. Ramos, and Lihki Rubio. 2023. Forecasting bitcoin volatility: Exploring the potential of deep learning. *Eurasian Economic Review* 13: 285–305. [CrossRef]

Qin, Meng, Chi-Wei Su, and Ran Tao. 2021. BitCoin: A new basket for eggs? *Economic Modelling* 94: 896–907. [CrossRef]
Scharfman, Jason. 2023. Introduction to cryptocurrency and digital asset fraud and crime. In *The Cryptocurrency and Digital Asset Fraud Casebook*. Cham: Springer International Publishing.
Selmi, Refk, Walid Mensi, Shawkat Hammoudeh, and Jamal Bouoiyour. 2018. Is Bitcoin a hedge, a safe haven or a diversifier for oil price movements? A comparison with gold. *Energy Economics* 74: 787–801. [CrossRef]
Shehada, Feras, and Mohanad Shehada. 2020. The Challenges Facing IFRS for Accounting of Cryptocurrencies. Paper presented at the 1st International Conference on Information Technology & Business ICITB2020, Online(Zoom), July 25.
Smales, Lee A. 2019. Bitcoin as a safe haven: Is it even worth considering? *Finance Research Letter* 30: 385–93. [CrossRef]
Steinmetz, Fred, Marc Von Meduna, Lennart Ante, and Ingo Fiedler. 2021. Ownership, uses and perceptions of cryptocurrency: Results from a population survey. *Technological Forecasting and Social Change* 173: 121073. [CrossRef]
Symss, Jacqueline. 2023. Can cryptocurrency solve the problem of financial constraint in corporates? A literature review and theoretical perspective. *Qualitative Research in Financial Markets*. *ahead-of-print*. [CrossRef]
Tiger Research Reports. 2024. 4 Characteristics of the Korean Crypto Market. March 22. Available online: https://reports.tiger-research.com/p/korean-crypto-market-eng (accessed on 5 June 2024).
Tripathi, Bhaskar, and Rakesh Kumar Sharma. 2024. Cryptocurrency Exchanges and Traditional Markets: A Multi-algorithm Liquidity Comparison Using Multi-criteria Decision Analysis. *Computational Economics*. [CrossRef]
Urquhart, Andrew. 2016. The inefficiency of Bitcoin. *Economics Letters* 148: 80–82. [CrossRef]
Yermack, David. 2015. Is bitcoin a real currency? An economic appraisal. In *Handbook of Digital Currency*. Cambridge, MA: Academic Press, pp. 31–43. [CrossRef]