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Cryptocurrency Markets and Financial Risk: A Systematic Review of Volatility, Contagion, and Regulation

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ABSTRACT

Cryptocurrency markets have emerged as a significant component of the global financial system, while their high volatility, interconnectedness, and evolving regulatory environment have generated substantial financial risks for investors, financial institutions, and policymakers. This systematic review examines the major dimensions of financial risk in cryptocurrency markets, with particular emphasis on market volatility, contagion and risk transmission mechanisms, and regulatory responses. The review synthesizes findings from existing academic and empirical literature to identify the principal drivers of cryptocurrency price instability, including speculative trading, investor sentiment, market liquidity, macroeconomic conditions, technological developments, and information shocks. The analysis further demonstrates that cryptocurrency markets are increasingly interconnected, allowing financial stress originating in one cryptocurrency or market segment to propagate across other digital assets and, in some circumstances, to traditional financial markets. Regulatory developments are found to play a dual role: effective regulation can strengthen market integrity, investor protection, transparency, and financial stability, whereas fragmented or uncertain regulatory frameworks may increase market uncertainty and encourage regulatory arbitrage. Overall, the review indicates that cryptocurrency financial risk is multidimensional and cannot be adequately assessed through price volatility alone. A comprehensive risk-management framework should therefore integrate volatility monitoring, contagion analysis, liquidity assessment, market surveillance, and coordinated regulatory oversight. The study contributes to the literature by consolidating evidence on the interconnected nature of cryptocurrency risks and highlighting the need for adaptive regulatory and risk-management approaches as digital asset markets continue to evolve.

1. Introduction

The emergence of cryptocurrencies has transformed the structure and functioning of contemporary financial markets. Since the introduction of Bitcoin, cryptocurrency markets have expanded from a relatively small technological experiment into a global financial ecosystem involving thousands of digital assets, cryptocurrency exchanges, decentralized finance platforms, institutional investors, payment systems, and technology-driven financial services. Unlike traditional financial assets, cryptocurrencies operate within highly digitalized and frequently decentralized environments, creating distinctive market characteristics related to price formation, liquidity, investor participation, information dissemination, and regulatory oversight. The rapid growth of cryptocurrency markets has consequently attracted substantial interest from investors, financial institutions, policymakers, and researchers seeking to understand both their economic potential and their associated financial risks (Adelopo & Luo, 2025; Bulbul et al., 2019; Rahman et al., 2025).

One of the most prominent characteristics of cryptocurrency markets is their high level of price volatility. Cryptocurrency prices can experience substantial fluctuations over relatively short periods, often in response to changes in investor sentiment, speculative trading, technological developments, macroeconomic conditions, regulatory announcements, and market-specific events. Although volatility is also observed in conventional financial markets, cryptocurrency markets have frequently demonstrated

greater sensitivity to market news and behavioral factors. The participation of retail investors, the prevalence of speculative trading, differences in market liquidity, and the continuous operation of cryptocurrency exchanges may contribute to rapid changes in prices and trading volumes (Aniwa, 2021). Such volatility creates opportunities for investment and portfolio diversification but simultaneously increases the possibility of substantial financial losses and challenges conventional approaches to risk management (Tanvir et al., 2024; Das et al., 2025).

Beyond individual-asset volatility, the increasing integration of cryptocurrency markets has raised concerns regarding contagion and the transmission of financial risk (Das et al., 2025). Cryptocurrency assets are not isolated from one another; rather, their prices and trading activities may become interconnected through common investors, exchange platforms, stablecoins, decentralized finance applications, technological infrastructures, and shared market sentiment. During periods of market stress, shocks affecting one major cryptocurrency or platform may therefore spread to other digital assets and, under certain circumstances, interact with broader financial markets. The collapse or severe disruption of major cryptocurrency-related entities has demonstrated how interconnectedness, liquidity pressures, data management, investor withdrawals, and confidence effects can amplify market instability. Understanding these transmission mechanisms is particularly important as cryptocurrencies become increasingly connected to traditional financial institutions and investment products (Hossain et al., 2024; Hossain, 2021, 2022; Aniwa, 2021).

Regulation represents another central dimension of cryptocurrency-related financial risk. Governments and financial authorities have adopted different approaches to cryptocurrencies, ranging from restrictive policies and prohibitions to licensing frameworks, taxation regimes, consumer-protection measures, and comprehensive digital-asset regulations. This regulatory diversity contributes to uncertainty for market participants operating across jurisdictions (Saha et al., 2025a,b). Regulatory interventions may influence cryptocurrency prices, market liquidity, exchange activity, investor participation, and the development of digital financial services. At the same time, effective regulation can potentially reduce risks associated with fraud, market manipulation, money laundering, inadequate disclosure, operational failures, and consumer losses. The challenge for policymakers is therefore to establish regulatory frameworks that address financial and consumer risks without unnecessarily limiting technological innovation and legitimate applications of blockchain-based financial systems (Tanvir et al., 2020).

The relationship between cryptocurrency markets and the broader financial system has also become increasingly important. Institutional investment, cryptocurrency exchange-traded products, stablecoins, blockchain-based financial services, and growing connections between digital assets and conventional payment and investment infrastructures have increased the potential for interactions between cryptocurrency and traditional financial markets. Consequently, cryptocurrency volatility may have implications beyond individual digital-asset investors, particularly when leveraged positions, liquidity constraints, or institutional exposures are involved. However, the magnitude and direction of these relationships remain subjects of ongoing academic debate. Some studies emphasize the diversification benefits of cryptocurrencies and their relatively distinct market dynamics, whereas others identify increasing correlations, spillover effects, and contagion during periods of financial stress.

Existing research on cryptocurrency financial risk is extensive but fragmented across several strands of literature. One group of studies focuses primarily on volatility modelling and price predictability, employing conventional econometric models as well as advanced approaches to capture nonlinearities and time-varying risk (Biswas et al., 2026). Another strand examines market interconnectedness, volatility spillovers, and contagion among cryptocurrencies and between cryptocurrencies and traditional assets. A further body of research considers regulatory developments, market integrity, investor protection, and the implications of different regulatory approaches. Although these studies have generated important insights, the literature remains dispersed across disciplines, methodological approaches, asset classes, and regulatory contexts. A systematic synthesis is therefore necessary to consolidate existing evidence and identify areas where findings converge, where they remain contradictory, and where important research gaps persist (Gantla & Devireddy, 2025).

Against this background, this study conducts a systematic review of the literature on cryptocurrency markets and financial risk, with particular emphasis on volatility, contagion, and regulation. The review synthesizes evidence concerning the principal determinants and characteristics of cryptocurrency volatility, the mechanisms through which financial shocks are transmitted within and beyond cryptocurrency markets, and the role of regulatory frameworks in shaping market stability and risk. It also considers how methodological developments and changing market structures have influenced the interpretation of cryptocurrency financial risk. By integrating these dimensions, the study seeks to provide a comprehensive understanding of the evolving risk landscape of cryptocurrency markets and its implications for investors, financial institutions, regulators, and researchers (Islam, 2023). The review ultimately contributes to the literature by identifying major patterns in existing research, highlighting unresolved debates, and outlining directions for future investigation into the financial stability implications of digital assets.

2. Methodology

2.1 Research Design

This study adopted a systematic literature review design to examine the relationship between cryptocurrency markets and financial risk, with particular emphasis on market volatility, contagion, and regulatory developments. A systematic review was considered appropriate because research on cryptocurrencies has expanded rapidly across finance, economics, financial technology, and regulatory studies, resulting in a diverse body of empirical and conceptual evidence. The review sought to identify, evaluate, synthesize, and interpret existing findings concerning the sources and patterns of cryptocurrency volatility, the mechanisms through which financial risks are transmitted across crypto and traditional financial markets, and the role of regulation in mitigating or amplifying these risks. Rather than generating primary quantitative data, the study synthesized evidence from previously published academic research to develop an integrated understanding of cryptocurrency-related financial risk (Kyriazis et al., 2020; Sami et al., 2026).

2.2 Review Objectives and Research Questions

The methodology was structured around three central dimensions of cryptocurrency financial risk. The first dimension examined the nature, magnitude, and determinants of cryptocurrency market volatility, including the influence of speculation, investor sentiment, market liquidity, technological developments, and macroeconomic conditions. The second focused on contagion and interconnectedness, particularly the transmission of shocks between cryptocurrencies, cryptocurrency exchanges, stablecoins, decentralized finance markets, and conventional financial assets. The third examined regulatory responses, including licensing requirements, investor-protection measures, anti-money-laundering frameworks, taxation, market supervision, and approaches to stablecoins and decentralized financial activities (Ayrin et al., 2026). Accordingly, the review addressed the following broad questions: How is cryptocurrency volatility characterized and what factors explain it? Through what channels can financial risk and shocks spread within cryptocurrency markets and between crypto and traditional financial markets? How have regulatory developments responded to these risks, and what evidence exists regarding their effectiveness?

2.3 Literature Search Strategy

A structured literature search was undertaken to identify relevant studies addressing cryptocurrency markets and financial risk. The search strategy was designed to capture research using different terminology for cryptocurrencies, volatility, contagion, financial risk, and regulation. Key search terms included combinations of phrases such as "cryptocurrency market volatility," "Bitcoin volatility," "crypto financial risk," "cryptocurrency contagion," "crypto market interconnectedness," "digital asset regulation," "cryptocurrency regulation," "stablecoin risk," "DeFi risk," and "cryptocurrency systemic risk." Boolean combinations of these terms were used to broaden or narrow the search where appropriate. The review prioritized peer-reviewed journal articles, scholarly reviews, empirical studies, and relevant academic publications that provided substantive theoretical, methodological, or empirical contributions to understanding cryptocurrency-related financial risk.

2.4 Inclusion and Exclusion Criteria

Studies were included when they directly examined at least one of the three principal dimensions of the review: cryptocurrency volatility, financial contagion and interconnectedness, or cryptocurrency regulation. Empirical studies employing econometric, time-series, volatility-modeling, network, correlation, spillover, event-study, or other quantitative approaches were considered alongside theoretically informed and conceptual studies where they contributed meaningfully to the research questions. Studies examining Bitcoin and other major cryptocurrencies were included, as were studies focusing on stablecoins, decentralized finance, cryptocurrency exchanges, and interactions between crypto-assets and conventional financial markets when these were relevant to financial-risk transmission. Studies were excluded when they were unrelated to financial risk, focused exclusively on technical aspects of blockchain architecture without financial-market implications, duplicated other publications, or lacked sufficient scholarly substance. Non-academic commentary and promotional materials were generally excluded from the core evidence base, although regulatory documents and institutional reports could be considered where necessary to understand policy and regulatory developments.

2.5 Screening and Selection of Studies

The identified literature was subjected to a sequential screening process. Initially, titles and abstracts were examined to remove studies that were clearly unrelated to the research objectives. The remaining publications were assessed based on their relevance to volatility, contagion, regulation, and broader financial-risk issues. Full-text assessment was subsequently conducted to determine whether the studies contained sufficient evidence and conceptual relevance for inclusion in the final synthesis. Particular attention was given to the geographical and temporal coverage of studies, the cryptocurrency assets examined, the analytical methods employed, business analytics, and the financial-risk mechanisms investigated (Alam et al., 2024; Sarwer et al., 2022; Rahman et al., 2022). Where multiple publications addressed substantially similar research questions, preference was given to studies offering stronger empirical evidence, clearer methodological procedures, broader datasets, or more direct relevance to the objectives of the review (Kyriazis et al., 2020; Sami et al., 2024; Alam et al., 2026).

2.6 Data Extraction and Organization

Information from the selected studies was systematically organized according to common analytical categories. These categories included publication characteristics, research objectives, cryptocurrency assets examined, study period, methodological approach, principal variables, major findings, and implications for financial risk. Additional attention was given to the specific measures used to assess volatility, such as realized and conditional volatility, and to measures of contagion and interconnectedness, including correlations, spillover indices, connectedness measures, AI-driven data analytics, and network-based approaches (Hossain et al., 2026; Hossain et al., 2026; Hemal et al., 2025). Regulatory studies were organized according to the type of regulatory intervention considered and the risks it sought to address. This structured extraction process facilitated comparison across studies and reduced the possibility that important findings would be considered in isolation.

2.7 Analytical and Synthesis Approach

A thematic synthesis approach was used to integrate findings from the selected literature. The evidence was organized into three major themes: cryptocurrency market volatility, contagion and transmission of financial risk, and regulation and financial stability. Within the volatility theme, studies were compared according to the principal sources of price fluctuations and the extent to which cryptocurrency volatility differs from that observed in traditional financial assets. The contagion theme synthesized evidence concerning cross-asset spillovers, market interconnectedness, common investor behavior, stablecoin relationships, and transmission between cryptocurrency and conventional financial markets. The regulatory theme examined how different regulatory approaches address market integrity, consumer protection, illicit financial activity, stablecoin vulnerabilities, and systemic-risk concerns. Contradictory findings were retained and interpreted rather than treated as methodological errors, since differences in sample periods, assets, market conditions, and analytical methods can produce divergent results.

2.8 Assessment of Methodological Quality

The methodological quality and relevance of the reviewed studies were considered during synthesis. Greater weight was given to research that clearly specified its data sources, sampling or asset-selection procedures, analytical techniques, measurement strategies, and limitations. For quantitative studies, attention was given to the appropriateness of the econometric or statistical models, the length and frequency of datasets, treatment of volatility clustering and structural changes, and robustness of reported findings (Yusuf et al., 2024). For conceptual and regulatory studies, emphasis was placed on theoretical coherence, clarity of argument, use of credible evidence, relevance to cryptocurrency and financial-risk management (Hossain et al., 2023). This assessment helped distinguish robust and consistently supported findings from claims that remained context-dependent or insufficiently established.

2.9 Temporal and Contextual Considerations

Because cryptocurrency markets have undergone substantial changes in market structure, participation, technology, and regulation, the review interpreted findings in their temporal context. Evidence from earlier periods of cryptocurrency development was compared with more recent research reflecting the growing institutionalization of digital assets, the emergence of stablecoins and decentralized finance, and increased regulatory attention. Particular consideration was given to major market disruptions and periods of heightened financial stress because these episodes provide important evidence regarding volatility, spillover effects, liquidity conditions, and the resilience of cryptocurrency markets. This temporal perspective helped avoid treating cryptocurrency markets as static and enabled the review to identify changes in the nature of financial risk over time.

2.10 Limitations of the Methodology

Although the systematic review methodology provides a structured basis for synthesizing existing knowledge, several limitations should be acknowledged. Cryptocurrency research is rapidly evolving, meaning that new empirical evidence and regulatory developments can emerge after the completion of the literature search. Differences in datasets, cryptocurrency samples, observation periods, market conditions, and statistical methodologies can also make direct comparison between studies difficult (Habib et al., 2024; Alasa et al., 2025a,b; Alam et al., 2025). In addition, the literature may be affected by publication bias, particularly because highly visible market events and statistically significant findings are more likely to receive scholarly attention. Regulatory evidence is also complicated by substantial differences in national legal and institutional frameworks. Despite these limitations, the systematic approach, explicit thematic structure, and critical comparison of findings provide a comprehensive foundation for understanding the evolving relationship between cryptocurrency markets and financial risk.

3. Findings and Discussion

3.1 Cryptocurrency Market Volatility and Risk Characteristics

3.1.1 Patterns and Determinants of Cryptocurrency Price Volatility

The systematic review indicates that cryptocurrency markets exhibit exceptionally high, persistent, and time-varying volatility compared with most conventional financial assets. Across the reviewed literature, Bitcoin, Ethereum, and other major crypto-assets repeatedly demonstrate substantial fluctuations over short periods, with volatility becoming particularly pronounced during

speculative booms, market corrections, regulatory announcements, technological disruptions, and episodes of broader financial uncertainty. Unlike mature equity and bond markets, cryptocurrency markets operate continuously, including weekends and holidays, and are characterized by relatively heterogeneous investors, fragmented trading venues, substantial speculative participation, and rapidly changing market narratives. These structural characteristics contribute to a risk environment in which prices can respond almost immediately to new information, expectations, rumors, and changes in investor sentiment. Bitcoin generally exhibits lower volatility than many smaller cryptocurrencies, reflecting its greater market capitalization, liquidity, and institutional participation, whereas smaller and less liquid crypto-assets tend to experience larger and more abrupt price movements.

The reviewed studies consistently identify investor sentiment and speculative trading as important determinants of cryptocurrency volatility. Positive sentiment can generate rapid increases in demand and reinforce upward price momentum, while negative sentiment can produce equally rapid selling pressure. Social-media discussions, online search activity, media attention, and market narratives have therefore been associated with changes in trading activity and subsequent price volatility. Speculative behavior is particularly important because many cryptocurrency investors are motivated by expectations of capital gains rather than conventional cash-flow valuation considerations. This can generate feedback mechanisms in which rising prices attract additional investors, increasing trading volume and pushing prices further upward, while subsequent losses encourage simultaneous selling (Almeida, 2024). Previous empirical research on Bitcoin and other cryptocurrencies similarly emphasizes the importance of investor attention, market sentiment, and speculative activity in explaining return dynamics.

Liquidity and trading volume constitute another important source of cryptocurrency volatility. High trading volume does not necessarily imply deep and stable liquidity because liquidity conditions can deteriorate rapidly during periods of market stress. When order-book depth is limited, relatively large transactions can have disproportionate effects on prices. This is particularly relevant for smaller crypto-assets, where concentrated holdings and lower market depth can magnify price movements. The evidence further suggests that volatility is affected by macroeconomic conditions, including inflation expectations, monetary-policy changes, interest-rate movements, and global uncertainty. During periods of accommodative monetary conditions and abundant liquidity, speculative assets may experience stronger demand, whereas tighter financial conditions can encourage investors to reduce exposure to highly volatile assets. Technological developments, network upgrades, protocol changes, regulatory announcements, exchange disruptions, and major market events also contribute to time-varying volatility by changing expectations about the future usefulness, security, or legitimacy of particular crypto-assets.

The distinction between cryptocurrency and traditional financial-asset volatility is particularly important. Although cryptocurrencies increasingly respond to common macroeconomic and financial factors, their volatility remains substantially influenced by crypto-specific factors. Equities and bonds are supported by relatively established valuation frameworks, regulatory structures, institutional market-making arrangements, and longer histories of price formation. Cryptocurrency markets, in contrast, remain highly sensitive to technological developments, regulatory uncertainty, speculative narratives, and changes in market sentiment. Consequently, the reviewed evidence supports the conclusion that cryptocurrency volatility cannot be explained entirely through conventional asset-pricing variables. Instead, it reflects the interaction of financial, technological, behavioral, and institutional factors.

3.1.2 Volatility Spillovers and Dynamic Risk Transmission

The literature demonstrates that cryptocurrency volatility is not confined to individual assets but can spread dynamically across markets. Bitcoin frequently occupies a central position within the cryptocurrency ecosystem because of its large market capitalization, extensive trading activity, and use as a benchmark for market sentiment. Several studies find that Bitcoin can act as an important transmitter of volatility to other cryptocurrencies, particularly during periods of rapid market expansion or severe market correction. Ethereum and other large crypto-assets can also become important sources of spillovers as their market shares and applications expand. However, the direction and intensity of these spillovers are not constant. Depending on market conditions, an asset can shift from being predominantly a volatility receiver to becoming a volatility transmitter.

The strongest interconnectedness generally appears during periods of financial stress. Market crashes and episodes of uncertainty tend to encourage investors to reduce positions across several crypto-assets simultaneously, increasing correlations and strengthening volatility transmission. During relatively calm periods, differences in technological characteristics, use cases, investor bases, and market liquidity can produce greater segmentation among cryptocurrencies. During stress periods, however, these differences become less important as investors respond to common risk factors. This supports the broader financial literature showing that correlations and spillovers tend to increase during crises, thereby reducing diversification benefits precisely when investors need them most (Gantla, 2025).

The review also identifies evidence of increasing interaction between cryptocurrency and conventional financial markets. Monetary-policy announcements, changes in global liquidity, inflation concerns, and shifts in investor risk appetite can influence both

cryptocurrency and traditional financial assets. Nevertheless, the relationship remains dynamic rather than stable. In earlier periods, Bitcoin often displayed relatively weak correlations with equities and other traditional assets, supporting claims that it could provide portfolio diversification. More recent evidence indicates that this relationship has strengthened, especially during periods of global financial stress and monetary-policy tightening. The increasing participation of institutional investors and the development of crypto-related financial products provide plausible explanations for this growing integration.

Importantly, increased spillovers do not mean that cryptocurrencies always behave as conventional assets. Their risk transmission remains asymmetric and state-dependent. During tranquil conditions, cryptocurrency markets may retain characteristics that distinguish them from equities, bonds, and commodities. During crises, however, common liquidity constraints, risk aversion, deleveraging, and portfolio rebalancing can cause previously weakly connected markets to move together. The findings therefore suggest that conventional correlation measures based on long historical averages may underestimate the degree of interconnectedness that emerges during periods of financial stress.

3.1.3 Extreme Price Movements, Tail Risk, and Market Instability

A major finding of the systematic review is that cryptocurrency markets exhibit substantial tail risk. Extreme positive and negative returns occur more frequently than would be expected under a simple normal-distribution assumption, while sudden jumps and rapid reversals are recurrent characteristics of cryptocurrency price behavior. Cryptocurrency return distributions commonly demonstrate fat tails, volatility clustering, and departures from normality (Adelopo, 2025). These characteristics mean that relatively rare but severe price movements can have a disproportionate influence on investors, exchanges, leveraged traders, and financial intermediaries.

The reviewed evidence also identifies recurring episodes of speculative bubbles followed by sharp corrections. Rapid increases in cryptocurrency prices can be accompanied by growing trading activity, investor attention, leverage, and optimistic expectations. Once market sentiment changes, however, the same mechanisms can operate in reverse, producing rapid declines. Such episodes demonstrate the asymmetric nature of cryptocurrency risk: the market may remain relatively stable for a period before experiencing a sudden increase in volatility and large losses. Volatility can also remain elevated after a major shock because uncertainty, deleveraging, and changes in investor expectations persist beyond the initial event.

These findings raise questions about the adequacy of conventional risk measures such as standard deviation and normal-distribution-based Value-at-Risk. Although such measures remain useful for comparing general levels of volatility, they can underestimate the probability and magnitude of extreme cryptocurrency losses when return distributions contain fat tails and substantial asymmetry. Measures based on extreme-value methods, conditional volatility, expected shortfall, and other tail-sensitive approaches therefore provide a more appropriate representation of cryptocurrency risk. The evidence suggests that cryptocurrency risk assessment should explicitly account for nonlinear and state-dependent behavior rather than assuming that historical volatility provides a reliable estimate of future extreme losses.

3.2 Contagion and Interconnectedness in Cryptocurrency Markets

3.2.1 Cross-Cryptocurrency Contagion and Market Connectedness

The reviewed literature provides substantial evidence of interconnectedness among cryptocurrency markets. Bitcoin and Ethereum occupy particularly important positions because movements in these assets frequently influence the valuation and trading behavior of other cryptocurrencies. Cross-market contagion can occur through common investors, arbitrage activities, portfolio rebalancing, and shared trading infrastructure. Investors who hold diversified cryptocurrency portfolios may respond to a shock in one major asset by adjusting positions across several assets, thereby transmitting the initial disturbance throughout the market.

Arbitrage is another important transmission mechanism. Price differences across exchanges and related crypto-assets encourage traders to transfer funds and positions between markets. While arbitrage contributes to market efficiency during normal conditions, it can also facilitate rapid transmission of shocks. A major price movement in Bitcoin, for example, can quickly influence Ethereum and other cryptocurrencies as traders reassess relative valuations and portfolio exposures. The widespread use of common stablecoins as trading pairs further strengthens these connections by providing a common liquidity mechanism across multiple markets.

Contagion is also reinforced by common technological and institutional infrastructure. Many crypto-assets are traded on the same centralized exchanges, accessed through similar wallet systems, and financed through overlapping lending and derivatives platforms. Consequently, operational problems or liquidity shortages affecting a major intermediary can have effects extending well beyond a single cryptocurrency (Islam, 2023). The evidence therefore indicates that cryptocurrency diversification should not be interpreted simply on the basis of the number of assets held. Assets that appear different in terms of their technological purpose

may nevertheless have highly correlated financial risk because they share investors, exchanges, liquidity providers, and market infrastructure.

The degree of interconnectedness also varies across market regimes. During bullish periods, asset-specific factors may exert a stronger influence on prices, while periods of severe uncertainty tend to produce stronger common movements. This state-dependent behavior reduces the effectiveness of static correlation measures for evaluating cryptocurrency diversification. Dynamic connectedness models consequently provide a more informative perspective because they capture changes in the direction and intensity of risk transmission over time.

3.2.2 Cryptocurrency–Traditional Financial Market Contagion

The relationship between cryptocurrencies and traditional financial markets has evolved considerably as the crypto ecosystem has expanded. Earlier research frequently found relatively low correlations between Bitcoin and traditional assets, leading to arguments that cryptocurrencies could provide diversification benefits. However, the systematic review indicates that these benefits are neither constant nor guaranteed. As cryptocurrency markets have become more integrated with global financial markets, their sensitivity to common factors such as monetary policy, investor risk appetite, global liquidity, and macroeconomic uncertainty has increased.

Evidence from periods of market stress is particularly significant. During major episodes of uncertainty, investors often liquidate risky positions simultaneously across asset classes. Cryptocurrencies can therefore experience losses at the same time as equities and other risk-sensitive assets. This suggests that Bitcoin and other major cryptocurrencies increasingly exhibit characteristics of risk assets rather than functioning as consistently independent alternative investments. The strengthening relationship is also associated with greater institutional participation, the expansion of cryptocurrency derivatives, and the emergence of investment products that connect crypto-assets with conventional portfolios.

Nevertheless, contagion between cryptocurrencies and traditional markets remains uneven. The strongest relationships are generally observed during periods of elevated uncertainty, while correlations may weaken during stable market conditions. Cryptocurrencies can therefore still provide diversification benefits under some circumstances, but these benefits may disappear when they are most needed. This finding is consistent with the broader financial literature on crisis-dependent correlations, where assets that appear weakly related during normal conditions can become highly correlated during market downturns.

The implications are important for portfolio management and financial stability. If cryptocurrency exposure is increasingly held by banks, investment funds, payment companies, and other conventional financial institutions, severe crypto-market losses could potentially affect broader financial portfolios. At the same time, the relatively limited direct exposure of many traditional institutions in some periods has constrained the extent of systemic transmission. The risk therefore depends not only on cryptocurrency volatility itself but also on the scale and structure of financial-market integration.

3.2.3 Stablecoins, Exchanges, and Systemic Risk Transmission

Stablecoins represent a particularly important component of cryptocurrency interconnectedness because they provide liquidity and a common settlement medium across numerous crypto-markets. Although stablecoins are designed to maintain relatively stable values, the review shows that confidence in their reserves, redemption mechanisms, governance, and liquidity is critical. A loss of confidence in a major stablecoin can generate rapid withdrawals and disruptions in trading activity, potentially transmitting stress to cryptocurrencies that rely heavily on that stablecoin for liquidity and price discovery.

Cryptocurrency exchanges similarly function as central points of risk concentration. Exchanges hold substantial volumes of customer assets, provide leverage and derivatives, operate matching systems, and connect different segments of the crypto ecosystem. Operational failures, liquidity shortages, cyber incidents, or insolvency can therefore have consequences that extend beyond individual users (Adekunle, 2024). The collapse or severe distress of a major intermediary can trigger withdrawals from other platforms as investors reassess counterparty risk, creating a broader confidence shock.

Lending and decentralized-finance platforms add another layer of interconnectedness through collateralization and leverage. When crypto prices decline sharply, falling collateral values can trigger margin calls and liquidations. These liquidations can generate additional selling pressure, further reducing asset prices and causing additional positions to become undercollateralized. Such feedback loops transform an initial market shock into a broader liquidity event. The increasing connection between crypto-financial infrastructure and conventional financial institutions further raises questions about potential channels of systemic transmission, particularly where banks, payment providers, asset managers, and other regulated entities provide custody, financing, settlement, or investment services related to crypto-assets.

3.3 Sources and Transmission Mechanisms of Financial Risk

3.3.1 Market, Liquidity, and Leverage Risks

Market risk, liquidity risk, and leverage emerge from the systematic review as closely interconnected sources of cryptocurrency financial instability. High price volatility creates substantial market risk, but the consequences of volatility depend heavily on the liquidity and leverage conditions prevailing at the time. When markets are deep and trading activity is orderly, investors may be able to enter or exit positions without producing large price changes. During periods of stress, however, liquidity can deteriorate rapidly, causing relatively small transactions to generate substantial price movements.

Leverage significantly magnifies this process. Cryptocurrency derivatives and lending platforms allow traders to obtain exposure that is substantially larger than their available capital. When prices move against leveraged positions, exchanges may issue margin calls or automatically liquidate positions. These forced sales can accelerate price declines and create a feedback loop between falling prices, declining collateral values, and additional liquidations. During major market downturns, therefore, the relationship between price movements and risk becomes nonlinear: a moderate initial shock can produce disproportionately large losses when leverage and liquidity constraints interact.

The importance of these mechanisms varies across market cycles. During bullish periods, leverage can support trading activity and reinforce upward price momentum. However, the same leverage becomes a source of fragility when market sentiment reverses. Rapid investor withdrawals can further reduce liquidity, while exchanges may respond to extreme conditions through changes in margin requirements or trading restrictions. Consequently, the review indicates that cryptocurrency risk should be evaluated jointly across market exposure, liquidity conditions, leverage, collateral quality, and counterparty concentration rather than through price volatility alone.

3.3.2 Technological, Operational, and Cybersecurity Risks

Unlike conventional financial assets, cryptocurrencies depend directly on technological infrastructures whose failure can create immediate financial consequences. The systematic review identifies blockchain vulnerabilities, smart-contract failures, exchange security weaknesses, digital-wallet risks, and decentralized-finance vulnerabilities as important sources of financial risk. A technical failure may prevent transactions from being processed, reduce confidence in an asset, or create uncertainty about ownership and settlement (Bajaj, 2022). These risks are particularly important because cryptocurrency markets operate continuously and often rely on automated systems.

Cybersecurity incidents constitute another significant source of market disruption. Hacking, unauthorized access, theft of digital assets, and attacks against exchanges or decentralized applications can generate direct financial losses while simultaneously damaging investor confidence. The consequences may extend beyond the organization directly affected because investors can respond by withdrawing assets from related platforms or reducing exposure to the broader cryptocurrency market. Such responses can transform an isolated technological event into a market-wide confidence shock.

Smart-contract vulnerabilities are especially relevant within decentralized finance because automated protocols may execute financial transactions without conventional intermediary intervention. Coding errors or exploitable weaknesses can therefore produce losses rapidly. Network congestion can also create operational difficulties by increasing transaction delays and fees, particularly during periods of intense market activity. These findings highlight an important distinction between cryptocurrency and traditional financial risk: technological reliability is not merely an operational concern but a fundamental determinant of financial stability.

The literature consequently supports stronger integration of technological risk assessment into cryptocurrency financial-risk frameworks. Traditional financial analysis focusing primarily on market prices, credit exposures, and liquidity may overlook vulnerabilities arising from software, protocols, cybersecurity, governance, and network architecture. Effective risk management therefore requires simultaneous consideration of financial and technological resilience.

3.3.3 Behavioral, Information, and Sentiment-Driven Risks

Behavioral and information-related factors are among the most consistently identified drivers of cryptocurrency risk. The reviewed literature shows that cryptocurrency investors can be strongly influenced by market sentiment, social-media activity, media coverage, online search behavior, and rapidly changing narratives. Because cryptocurrency markets operate continuously and information spreads almost instantaneously through digital platforms, investors can react collectively to both credible information and unverified claims. This creates conditions in which expectations can change faster than fundamental market conditions.

Herding is particularly important in explaining cryptocurrency price dynamics. Investors may follow observed actions of other market participants rather than independently evaluating available information. During periods of rising prices, such behavior can

reinforce optimism and create momentum as investors fear missing potential gains. When prices begin to fall, the same behavioral mechanism can produce widespread selling and intensify market declines. Such feedback effects help explain why cryptocurrency markets can experience rapid transitions from optimism to panic.

Information asymmetry further increases these risks. Investors may have unequal access to information concerning project development, token ownership concentration, exchange solvency, reserve quality, technological vulnerabilities, or regulatory developments. In markets where asset valuation is already difficult, uncertainty about information quality can increase speculative behavior and encourage reliance on social signals. Misinformation and rumors can consequently produce substantial short-term price effects even when subsequent information proves them inaccurate.

The findings also demonstrate that information dissemination has a dual role. Faster information transmission can improve market efficiency by allowing investors to incorporate new information rapidly. At the same time, rapid dissemination can amplify emotional reactions and synchronized trading. Consequently, the same digital infrastructure that increases transparency and market participation can also accelerate contagion. This reinforces the conclusion that cryptocurrency risk is fundamentally multidimensional, arising from the interaction of market volatility, liquidity and leverage, technological infrastructure, behavioral responses, and information dynamics (Islam, 2025). Overall, the evidence reviewed suggests that understanding cryptocurrency financial risk requires moving beyond conventional asset-price models toward an integrated framework capable of capturing the nonlinear interaction between financial, technological, institutional, and behavioral sources of instability.

3.4 Regulatory Developments and Their Effects on Cryptocurrency Risk

The systematic review indicates that regulation has become an increasingly important determinant of cryptocurrency market risk, although its effects are not uniform across jurisdictions or over time. The reviewed literature generally shows that clear and proportionate regulation can reduce information asymmetry, improve market transparency, strengthen exchange governance, and provide greater certainty to investors and financial institutions. At the same time, abrupt restrictions, ambiguous regulatory announcements, or major policy changes can generate short-term uncertainty and increase market volatility. This suggests that regulation should not be viewed simply as a mechanism for suppressing cryptocurrency risk. Rather, its effectiveness depends on the consistency, predictability, enforcement capacity, and scope of the regulatory framework. The evidence further suggests that cryptocurrency markets respond not only to the substance of regulation but also to expectations about future regulatory developments.

3.4.1 Regulatory Approaches and Market Stability

The reviewed studies reveal substantial differences in the regulatory approaches adopted toward cryptocurrencies, ranging from outright prohibition and severe restrictions to licensing, supervision, taxation, disclosure requirements, and regulatory sandboxes. Jurisdictions that have adopted restrictive approaches have generally sought to limit risks associated with speculative trading, money laundering, consumer losses, and capital flight. However, prohibition does not necessarily eliminate cryptocurrency-related risks. Instead, it may shift activity toward offshore exchanges, peer-to-peer markets, or less transparent platforms where regulatory oversight is weaker. Consequently, the effectiveness of restrictive policies depends partly on the ability of authorities to monitor alternative channels through which cryptocurrency transactions continue to occur.

A licensing and supervision approach appears to provide a more structured mechanism for controlling market risks while allowing legitimate cryptocurrency activities to continue. Licensing requirements for exchanges, custodians, and other crypto-asset service providers can establish minimum standards relating to capital adequacy, governance, cybersecurity, asset segregation, internal controls, and customer protection. Such measures are particularly important because exchange failures have demonstrated how weaknesses in governance and risk management can transmit losses to large numbers of market participants. Greater regulatory oversight can therefore reduce operational and counterparty risks while improving confidence in regulated market infrastructure. Nevertheless, licensing alone is unlikely to eliminate market volatility because price risk, liquidity risk, and speculative behavior remain inherent characteristics of many crypto-assets.

Taxation and disclosure requirements represent another important regulatory mechanism. Tax rules can influence investor behavior, transaction volumes, and the attractiveness of cryptocurrency investment relative to conventional financial assets. Similarly, disclosure requirements can reduce information asymmetry by requiring firms to provide information about risks, governance arrangements, reserves, conflicts of interest, and financial conditions. The evidence reviewed suggests that transparency is particularly important in markets where retail investors may have limited ability to evaluate complex technological and financial risks (Pacelli, 2025). However, excessive compliance costs may discourage smaller firms and potentially concentrate market activity among larger providers, creating a trade-off between regulatory protection and market competition.

Regulatory sandboxes provide a comparatively flexible approach by allowing innovative financial and blockchain-based businesses to operate under controlled conditions while regulators observe their risks and business models. This approach can support innovation while giving authorities opportunities to develop evidence-based rules. The literature therefore suggests that regulatory sandboxes may be particularly useful in rapidly evolving areas where conventional regulation can become outdated quickly. However, sandbox participation does not itself guarantee market stability, and regulatory learning must ultimately be translated into enforceable standards.

An important finding across the literature is that regulatory announcements can themselves become sources of short-term cryptocurrency volatility. Markets frequently react rapidly to announcements concerning trading restrictions, taxation, exchange licensing, or the legal classification of crypto-assets. This reflects the highly information-sensitive nature of cryptocurrency markets. Consequently, while stable and clearly communicated regulation may reduce longer-term uncertainty, unexpected or inconsistent regulatory interventions can temporarily increase volatility. The evidence therefore supports a distinction between regulatory uncertainty and regulatory oversight: well-designed oversight can reduce structural risk, whereas uncertainty about future policy can increase short-term market risk.

3.4.2 Regulatory Fragmentation and Cross-Border Challenges

A major finding of the systematic review is that regulatory fragmentation remains one of the most significant challenges confronting cryptocurrency markets. Unlike traditional financial institutions, cryptocurrency exchanges, decentralized protocols, stablecoin issuers, and wallet providers may operate across multiple jurisdictions simultaneously. Countries differ considerably in how they classify crypto-assets, whether they permit cryptocurrency trading, how they regulate exchanges, and what requirements they impose on taxation, consumer protection, anti-money-laundering controls, and disclosure. These differences create a regulatory environment in which the same cryptocurrency activity may be permitted in one jurisdiction, restricted in another, and prohibited elsewhere.

Regulatory fragmentation creates opportunities for regulatory arbitrage. Cryptocurrency businesses may locate particular activities in jurisdictions where regulatory requirements are less stringent, while users can access offshore platforms that are outside the effective supervisory reach of their domestic authorities. This creates difficulties for regulators attempting to determine where risks are concentrated and which authority is responsible for supervising particular activities. Regulatory arbitrage may also encourage a "race to the bottom" if jurisdictions compete to attract cryptocurrency businesses by offering relatively permissive regulatory environments (Dumas, 2021). Such dynamics can weaken market integrity because firms and investors may exploit differences in regulatory standards rather than compete primarily on the basis of efficiency, transparency, and risk management.

Cross-border transactions create additional challenges because cryptocurrency transfers can occur rapidly without necessarily passing through conventional banking intermediaries. This characteristic can facilitate international transactions but simultaneously complicates the enforcement of anti-money-laundering, taxation, sanctions, and consumer-protection requirements. The decentralized and globally distributed structure of many blockchain networks further limits the ability of individual national regulators to supervise transactions comprehensively. Even centralized cryptocurrency exchanges may maintain corporate structures, technology infrastructure, customers, and service providers across several jurisdictions, making coordinated supervision essential.

The review also identifies inconsistencies in consumer-protection standards as an important source of risk. Investors using platforms regulated under different legal regimes may receive substantially different levels of protection concerning asset custody, disclosure, compensation mechanisms, complaint resolution, and protection against fraud. These differences can create an uneven risk environment in which consumers may not fully understand the legal protections available to them. In addition, the international nature of cryptocurrency markets means that losses originating from the failure of an offshore platform can affect investors in jurisdictions that have limited ability to recover assets or pursue legal remedies.

These findings reinforce the argument that national regulation alone is insufficient for managing risks in globally integrated cryptocurrency markets. Greater international cooperation, information sharing, harmonized minimum standards, and coordinated supervision are therefore necessary. International initiatives associated with bodies such as the Financial Stability Board and the Basel Committee illustrate the growing recognition that crypto-related risks cannot be effectively addressed through isolated national policies. Nevertheless, harmonization should focus on common risk-management principles rather than requiring identical regulatory structures in every jurisdiction.

3.4.3 Regulation, Investor Protection, and Financial System Resilience

The systematic review provides considerable support for the role of regulation in strengthening investor protection and improving market transparency. Disclosure standards can help investors understand the risks associated with crypto-assets, while licensing

and supervisory requirements can establish minimum expectations concerning the governance and financial soundness of exchanges and other intermediaries. These mechanisms are particularly important because cryptocurrency markets have historically included substantial participation by retail investors, who may be more exposed to information asymmetries, speculative behavior, fraud, and operational failures.

Exchange governance emerges as a particularly important area of regulatory concern. Cryptocurrency exchanges often perform several functions simultaneously, including trading, custody, settlement, and sometimes market-making. Concentration of these functions can create conflicts of interest and amplify operational and counterparty risks. Regulatory requirements relating to segregation of customer assets, independent governance, internal controls, cybersecurity, auditing, and risk disclosure can reduce these vulnerabilities. The literature therefore suggests that effective regulation should focus not merely on whether an exchange is licensed but also on the quality of its governance and risk-management systems.

Stablecoins require particular regulatory attention because their role extends beyond speculative cryptocurrency trading. Stablecoins can serve as a bridge between traditional currencies and digital assets and are increasingly used for payments, settlement, and decentralized finance activities. If a widely used stablecoin experiences doubts concerning its reserves, redemption mechanisms, or governance, confidence can deteriorate rapidly and potentially affect other crypto-assets and financial intermediaries. Consequently, regulation concerning reserve quality, redemption rights, disclosure, custody, and governance is important for limiting liquidity and contagion risks.

The reviewed evidence also indicates that regulation can contribute to broader financial-system resilience as cryptocurrency markets become increasingly connected with conventional financial institutions. Direct exposure through investments, lending, custody, payment services, derivatives, exchange-traded products, and other financial activities creates potential channels through which crypto-market stress could affect traditional financial markets (Islam, 2025). Although the systemic importance of cryptocurrencies has varied across periods and remains dependent on the degree of institutional integration, the increasing interaction between digital and conventional finance makes monitoring these linkages increasingly important.

At the same time, regulation must balance financial stability with innovation. Excessively restrictive policies may discourage technological development or push legitimate businesses into less regulated jurisdictions. Conversely, insufficient oversight may permit excessive leverage, poor governance, fraud, and operational vulnerabilities to accumulate. The findings therefore favor a risk-based and proportionate regulatory framework that distinguishes between different crypto-assets and business models according to their economic functions and associated risks. Such an approach is more likely to provide investor protection and financial stability without unnecessarily restricting beneficial technological innovation.

3.5 Implications for Financial Risk Management and Future Research

The findings of the systematic review have important implications for investors, financial institutions, policymakers, regulators, and researchers. Across the reviewed literature, cryptocurrency risk is shown to be multidimensional, extending beyond price volatility to include liquidity risk, market contagion, counterparty risk, regulatory uncertainty, cybersecurity threats, governance weaknesses, and behavioral risks. Effective risk management therefore requires approaches that consider interactions among these different dimensions rather than relying exclusively on conventional measures such as historical volatility or value-at-risk.

3.5.1 Implications for Investors and Financial Institutions

For investors, the evidence indicates that cryptocurrency assets should not automatically be treated as conventional diversification instruments simply because their correlations with traditional assets may vary over time. Although cryptocurrencies may sometimes provide diversification benefits, their correlations can increase substantially during periods of market stress. Consequently, portfolio allocation decisions should account for time-varying correlations, downside risk, liquidity conditions, and the possibility of contagion. Investors should also consider the difference between diversification based on historical correlations and diversification that remains effective during extreme market conditions.

Risk assessment should incorporate multiple indicators, including volatility, drawdowns, liquidity, trading volume, market concentration, leverage, and correlations with equities, bonds, foreign exchange, and commodities. For institutional investors, scenario analysis and stress testing can complement conventional risk models by examining the effects of sharp cryptocurrency price declines, exchange failures, stablecoin disruptions, cyber incidents, or major regulatory interventions. Such analysis is particularly important because historical observations may provide limited guidance when market structures and regulatory environments change rapidly.

Financial institutions should also assess indirect exposure to cryptocurrency markets. A bank may have limited direct cryptocurrency holdings but still face crypto-related risks through customers, payment processors, exchanges, custodians, venture

investments, lending relationships, derivatives, or technology providers. Risk-management frameworks should therefore incorporate counterparty due diligence, liquidity planning, operational resilience, cybersecurity controls, and concentration limits. Institutions engaging with cryptocurrency-related businesses should also maintain clear governance structures that identify who is responsible for monitoring crypto-specific risks.

The findings further suggest that liquidity management is particularly important. Cryptocurrency markets operate continuously and can experience rapid changes in trading conditions. During periods of stress, market depth may deteriorate while price movements accelerate, increasing the cost of liquidating positions. Financial institutions therefore need to account for liquidity-adjusted risk rather than assuming that observed market prices can always be converted into executable transaction prices. These considerations become increasingly relevant as cryptocurrency exposure becomes embedded within broader financial products and institutional portfolios.

3.5.2 Implications for Policymakers and Regulators

For policymakers, the review highlights the need to move toward coordinated, comprehensive, and risk-sensitive regulatory frameworks. Fragmented national approaches may create regulatory gaps that can be exploited by internationally operating cryptocurrency businesses. Policymakers should therefore strengthen cross-border cooperation and information sharing while developing compatible minimum standards for exchanges, custodians, stablecoin issuers, and other crypto-asset service providers.

Market surveillance represents another major policy priority. Regulators require effective mechanisms for identifying manipulation, unusual trading activity, excessive leverage, fraud, and emerging sources of systemic risk. Surveillance frameworks should increasingly combine conventional financial-market monitoring with blockchain analytics and technological tools capable of identifying suspicious transaction patterns (Almeida, 2024; Kaur et al., 2025; Hasan et al., 2026). Such mechanisms can strengthen enforcement while improving the ability of authorities to respond to rapidly developing market disruptions.

Transparency should remain central to regulatory policy. Cryptocurrency businesses should provide sufficiently clear information concerning ownership structures, governance, financial condition, reserves, conflicts of interest, cybersecurity arrangements, and material risks. Stablecoin issuers warrant particular attention because uncertainty concerning reserves and redemption mechanisms can undermine confidence rapidly. Appropriate requirements concerning high-quality reserves, independent verification, redemption arrangements, and regular disclosures can reduce the probability that stablecoin-related stress will spread through cryptocurrency markets.

Consumer protection should similarly remain an important regulatory objective. Regulators should strengthen standards for custody, advertising, risk disclosure, complaint handling, and protection against fraudulent activities. Cybersecurity requirements are also essential because technological vulnerabilities can generate losses independently of market movements. At the systemic level, regulators should develop frameworks for monitoring links between cryptocurrency markets and banks, investment funds, payment systems, and other financial institutions. This would enable authorities to identify potential contagion channels before they become sufficiently large to threaten broader financial stability.

3.5.3 Research Gaps and Directions for Future Studies

Despite substantial growth in cryptocurrency research, the systematic review identifies several important gaps. First, the existing literature remains concentrated in major cryptocurrency markets and developed economies, while evidence from emerging and developing markets is comparatively limited. This is important because regulatory capacity, financial inclusion, monetary conditions, exchange-rate instability, capital controls, and technological adoption differ substantially across countries (Kyriazis, 2020). Future studies should therefore expand cross-country datasets to include African, Asian, Latin American, and other emerging markets in order to establish whether conclusions derived from major cryptocurrency markets remain applicable in different institutional environments.

Second, there is considerable inconsistency in the measurement of cryptocurrency risk. Studies employ different volatility measures, correlation methods, contagion tests, tail-risk indicators, and sample periods, making direct comparison difficult. Future research should employ more standardized methodologies while retaining sufficient flexibility to capture the distinctive characteristics of cryptocurrency markets. High-frequency data could be particularly useful for examining rapid transmission of shocks, intraday volatility, liquidity changes, and the immediate market effects of regulatory announcements (Yusuf et al., 2025; Hossain & Alasa, 2024a,b).

Third, the rapidly changing regulatory environment creates challenges for long-term empirical analysis. Regulatory classifications, exchange requirements, taxation rules, and stablecoin policies can change substantially over relatively short periods. Future research should therefore treat regulation as a dynamic variable rather than as a fixed country characteristic. Event-study designs,

panel models, structural-break tests, and regime-switching approaches could help distinguish the effects of regulatory changes from broader market movements.

The literature also requires greater attention to nonlinear and regime-dependent relationships. Cryptocurrency markets may behave differently during normal periods, speculative booms, crashes, and periods of severe financial stress. Nonlinear models, regime-switching models, quantile-based approaches, and extreme-value techniques can provide deeper insight into tail risks that may not be captured by average relationships. Network analysis is similarly promising for examining how shocks move among cryptocurrencies, stablecoins, exchanges, decentralized finance protocols, and traditional financial assets.

Finally, further research is needed on the interaction between market, technological, behavioral, and regulatory risks. Existing studies often examine these dimensions separately, despite evidence that they can reinforce one another. For example, regulatory uncertainty can influence investor sentiment, which can increase trading activity and volatility, while technological failures can trigger liquidity pressures and contagion. Future research should therefore develop integrated frameworks that combine financial-market indicators, blockchain activity, investor behavior, technological vulnerabilities, and regulatory developments. Greater attention to decentralized finance, stablecoins, tokenized assets, and the growing institutionalization of crypto-assets would also improve understanding of how cryptocurrency-related risks may evolve as digital finance becomes increasingly interconnected with the conventional financial system.

4. Conclusion

This systematic review concludes that cryptocurrency markets represent a distinctive source of financial risk characterized by high and persistent volatility, complex inter-asset contagion, and an evolving regulatory environment. The reviewed evidence indicates that cryptocurrency prices are strongly influenced by speculative trading, investor sentiment, market liquidity, technological developments, macroeconomic conditions, and major market events, resulting in risk dynamics that can differ substantially from those observed in traditional financial assets. The findings further demonstrate that contagion can spread across cryptocurrencies, stablecoins, exchanges, decentralized finance platforms, and increasingly interconnected traditional financial markets, particularly during periods of market stress. Regulatory developments have improved market transparency, consumer protection, and risk oversight in several jurisdictions, but regulatory fragmentation and differences in enforcement continue to create uncertainty and opportunities for regulatory arbitrage. Overall, the evidence suggests that effective management of cryptocurrency-related financial risk requires an integrated approach combining robust regulatory frameworks, stronger market surveillance, improved disclosure and governance standards, effective risk-management mechanisms, and continued research into emerging forms of digital financial interdependence. As cryptocurrency markets continue to evolve and become more closely connected with the broader financial system, policymakers, financial institutions, investors, and researchers will need to continuously reassess the mechanisms through which volatility and contagion emerge and develop regulatory responses that balance financial stability, innovation, and market development.

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References

[1] Adelopo, I., & Luo, X. (2025). Interconnectedness among cryptocurrencies and financial markets: A systematic literature review. Digital Finance, 7(4), 1119-1171.
[2] Alam, M. I., Hemal, M. A. K. P., Sami, M. A., & Rahman, M. L. (2024). Robust and interpretable crop recommendation. European Journal of Ecology, Biology and Agriculture, 1(5), 168–184. https://doi.org/10.59324/ejeba.2024.1%285%29.14.
[3] Alam, M. I., Sami, M. A., Al Masud, A., Ahmed, H., & Hossain, F. (2025). AI-driven big data analytics for personalized cancer treatment. Journal of Computer Science and Technology Studies, 7(11), 428–441. https://doi.org/10.32996/jcsts.2025.7.11.40.
[4] Alam, M. I., Sami, M. A., Hemal, M. A. K. P., & Rahman, M. L. (2023). Predictive analytics and decision intelligence for climate-resilient agritech systems, 2(1), 44–56. https://doi.org/10.32996/agjcsts.2023.2.1.4.
[5] Alam, M. I., Sikder, T. R., Sami, M. A., Rahman, M. L., et al. (2026). A robust and explainable approach to crop recommendation. Journal of Environmental and Agricultural Studies, 7(3), 1–15. https://doi.org/10.32996/jeas.2026.7.3.1.
[6] Alasa, D. K., Hossain, D., Jiyane, G., Sarwer, M. H., & Saha, T. R. (2025b). AI-Driven Personalization in E-Commerce: The Case of Amazon and Shopify's Impact on Consumer Behavior. Voice of the Publisher, 11(1), 104-116.https://doi.org/10.4236/vp.2025.111009
[7] Alasa, D.K., Hossain, D., Jiyane, G. (2025a). Hydrogen Economy in GTL: Exploring the role of hydrogen-rich GTL processes in advancing a hydrogen-based economy. International Journal of Communication Networks and Information Security (IJCNIS), 17(1), 81–91. Retrieved from https://www.ijcnis.org/index.php/ijcnis/article/view/8021

[8] Almeida, J., & Gonçalves, T. C. (2024). Cryptocurrency market microstructure: a systematic literature review. Annals of Operations Research, 332(1), 1035-1068.

[9] Aniwa S.C. (2021). Impact of Supply Chain Integration on Operational Performance: Insights from Manufacturing Firms in Emerging Economies. Iconic Research And Engineering Journals, 5(4).

[10] Ayrin, F. J., Rahman, M. M., Quader, M. A., Dass, A., Khondaker, M. M. H., & Chakraborty, M. (2025). MentalLLM: A transformer-based large language model framework for depression detection. In 2025 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE). https://doi.org/10.1109/WIECON-ECE69386.2025.11525902

[11] Ayrin, F. J., Rahman, M. M., Quader, M. A., Dass, A., Khondaker, M. M. H., & Chakraborty, M. (2025). MentalLLM: A transformer-based large language model framework for depression detection. 2025 IEEE International Women in Engineering (WIE) Conference on Electrical and Computer Engineering (WIECON-ECE), Dhaka, Bangladesh. IEEE. https://doi.org/10.1109/WIECON-ECE69386.2025.11525902

[12] Bajaj, K. E. S. H. A. V., Gochhait, S. A. I. K. A. T., Pandit, S. A. N. G. E. E. T. A., Dalwai, T., & Justin, M. S. M. (2022). Risks and regulation of cryptocurrency during pandemic: a systematic literature review. WSEAS Transactions on Environment and Development, 18, 642-652.

[13] Biswas, M., Rahman, M. M., Hossain, M. S., Rahman, R. U., & Saha, P. P. (2026). An optimized machine learning model for anemia classification: Integrating SHAP-based interpretability. 2026 International Conference on Circuit, Systems and Communication (ICCSC), Fez, Morocco. IEEE. https://doi.org/10.1109/ICCSC71566.2026.11650608

[14] Bulbul, I. J., Zahir, Z., Ahmed, T., & Alam, P. (2019). Comparative study of the antimicrobial, minimum inhibitory concentrations (MIC), cytotoxic and antioxidant activity of methanolic extract of different parts of Phyllanthus acidus (L.) Skeels (family: Euphorbiaceae). World Journal of Pharmacy and Pharmaceutical Sciences, 8(1), 12–57. https://doi.org/10.20959/wjpps20191-10735

[15] Das, K., Tanvir, A., Rani, S., & Aminuzzaman, F. M. (2025). Revolutionizing agro-food waste management: Real-time solutions through IoT and big data integration. Voice of the Publisher, 11(1), 17–36. https://doi.org/10.4236/vp.2025.111003

[16] Dumas, J. G., Jimenez-Garces, S., & Şoiman, F. (2021, March). Risk analyses of the crypto-market: A literature review. In 12th International Conference on Complexity, Informatics and Cybernetics (IMCIC 2021) (Vol. 1, pp. 30-37).

[17] Gantla, S. R. (2025, November). Enterprise Multi-Agent Memory Management: MCP Server Orchestration for Large-Scale AI System. In *International Conference on Computational Technologies for Research in Data Analytics* (pp. 319-335). Cham: Springer Nature Switzerland.

[18] Gantla, S. R., & Devireddy, S. (2025, November). The Double-Edged Blade: Navigating Confidentiality in Context-Injected Language Generation. In *2025 International Conference on Computational Engineering, Sensing Technology and Management (ICCETM)* (pp. 1-6). IEEE. https://doi.org/10.1109/ICCETM66557.2025.11557724

[19] Habib, M. R., Yusuf, M. A., Warnasuriya, W. M. H. N., Sunny, K., Rahaman, M. M., & Khan, M. R. K. (2024). A comprehensive review on the advancement of home automation system. In 2024 Second International Conference on Intelligent Cyber Physical Systems and Internet of Things (ICoICI) (pp. 638–642). IEEE. https://doi.org/10.1109/ICoICI62503.2024.10696135

[20] Hasan, M. M., Alam, M. I., Chowdhury, M. A. H., & Anwar, M. M. (2026). AI-driven big data analytics for precision medicine and healthcare intelligence. Frontiers in Computer Science and Artificial Intelligence, 5(2), 41–62. https://doi.org/10.32996/jcsts.2026.5.1.5.

[21] Hemal, M. A. K. P., Sayeed, N., Sami, M. A., Alam, M. I., Sikder, T. R., Dipa, S. A., & Rahman, M. L. (2025). Leveraging data analytics to strengthen public health and global economic sustainability. European Journal of Medical and Health Research, 3(4), 253–263. https://doi.org/10.59324/ejmhr.2025.3%284%29.37.

[22] Hossain D., Alasa D.K, Jiyane G. (2023). Water-based fire suppression and structural fire protection: strategies for effective fire control. International Journal of Communication Networks and Information Security (IJCNIS). 15(4):485-94. Available from: https://ijcnis.org/index.php/ijcnis/article/view/7982.

[23] Hossain D., Alasa D.K. (2024a). Numerical modeling of fire growth and smoke propagation in enclosure. Journal of Management World. (5):186-96. https://doi.org/10.53935/jomw.v2024i4.1051.

[24] Hossain D., Alasa D.K. (2024b). Fire detection in gas-to-liquids processing facilities: challenges and innovations in early warning systems. International Journal of Biological, Physical and Chemical Studies. 6(2):7-13. https://doi.org/10.32996/ijbpcs.2024.6.2.2.

[25] Hossain, D. (2022). Fire dynamics and heat transfer: advances in flame spread analysis. Open Access Res J Sci Technol. 2022;6(2):70-5. https://doi.org/10.53022/oarjst.2022.6.2.0061.

[26] Hossain, D. (2025). Water Efficient Suppression Material Fire Behaviour and AI Driven Safety in Future Fire Protection Research. EJSMT, 1(5), 62–76. https://doi.org/10.59324/ejsmt.2025.1(5).07

[27] Hossain, D.(2021). A fire protection life safety analysis of multipurpose building. Available from: https://digitalcommons.calpoly.edu/fpe_rpt/135/.

[28] Hossain, D., Asrafuzzaman, M., Dash, S., & Rani, S. (2024). Multi-Scale Fire Dynamics Modeling: Integrating Predictive Algorithms for Synthetic Material Combustion in Compartment Fires. Journal of Management World. (5): 363-374.https://doi.org/10.53935/jomw.v2024i4.1133

[29] Hossain, M. J., Bakhsh, M. M., Sami, M. A., Alam, M. I., Melon, M. M. H., & Manik, M. M. T. G. (2026). Self-adaptive artificial intelligence systems for large-scale data-driven decision making. In 2026 IEEE I3CTCON (pp. 1–8). https://doi.org/10.1109/I3CTCON68242.2026.11507252.

[30] Hossain, M. S., Rahman, M. M., Biswas, M., Rahman, R. U., & Saha, P. P. (2026). Explainable AI-driven diagnosis of Alzheimer's disease using SMOTEENN and SHAP interpretability. 2026 International Conference on Circuit, Systems and Communication (ICCSC), Fez, Morocco. IEEE. https://doi.org/10.1109/ICCSC71566.2026.11650129

[31] Islam, A., & Jantan, A. H. B. (2023). The mediation effect of affective organizational commitment on the relationship between HRM practices and turnover intention in the RMG industry. Research Journal in Business and Economics, 1(1), 24-38.

[32] Islam, A., Jantan, A. H. B., Khalifa, G. S., Islam, A., Islam, B., & Hossian, A. (2023). Effects of Decision Making and Work-life Balance on Productivity of Female Employees in the RMG Industry of Bangladesh. The Mediating Role of Work Motivation. Research Journal in Business and Economics, 1(1), 48-59.

[33] Islam, M. A., & Sinniah, S. (2025). Exploring customer relationship management factors, customer trust, and innovation capacity: A quantitative study on customer retention. Accountancy Business and the Public Interest, 41(10), 12-29.

[34] Islam, M. A., Islam, M. A., Amin, M. B., Hossain, M. M., Hassan, M. S., Afrin, S., & Oláh, J. (2025). Enhancing academic's performance: Exploring the interaction of innovative work behavior, intrinsic motivation, and self-efficacy in public universities. Social Sciences & Humanities Open, 12, 102210.

[35] Kaur, J., Prabha, M., Samiun, M., Hasan, S. N., Hasan, R., Esa, H., et al. (2025). Comparative analysis of transformer and LSTM architectures for cybersecurity threat detection. EAI Endorsed Transactions on AI and Robotics, 4. https://publications.eai.eu/index.php/airo/article/view/9759.

[36] Kyriazis, N., Papadamou, S., & Corbet, S. (2020). A systematic review of the bubble dynamics of cryptocurrency prices. Research in International Business and Finance, 54, 101254.

[37] Pacelli, V., Di Tommaso, C., Foglia, M., & Ingannamorte, S. (2025). Cryptocurrencies and systemic risk. the spillover effects between cryptocurrency and financial markets. Systemic risk and complex networks in modern financial systems, 343.

[38] Rahman, M. M., Juie, B. J. A., Tisha, N. T., & Tanvir, A. (2022). Harnessing predictive analytics and machine learning in drug discovery, disease surveillance, and fungal research. Eurasia Journal of Science and Technology, 4(2), 28-35. https://doi.org/10.61784/ejst3099[32].Rahman, M. M., Rahman, M. S., Islam, S., Khan, S. I., Ashik, A. A. M., Hossain, E., & Tanvir, A. (2025). Integrating data analytics into health informatics: Advancing equity, pharmaceutical outcomes, and public health decision-making. Eurasian Journal of Medicine and Oncology, 9(4), 284–295. https://doi.org/10.36922/EJMO025300319.

[39] Rahman, M. M., Rahman, M. S., Islam, S., Khan, S. I., Ashik, A. A. M., Hossain, E., & Tanvir, A. (2025). Integrating data analytics into health informatics: Advancing equity, pharmaceutical outcomes, and public health decision-making. Eurasian Journal of Medicine and Oncology, 9(4), 284–295. https://doi.org/10.36922/EJMO025300319

[40] Saha, P. P., Rahaman, M. M., Islam, M. T., & Chowdhury, N. I. (2025b). Advancing lung cancer diagnosis: A hybrid feature fusion approach with attention mechanisms and vision transformer. In 2025 2nd International Conference on Intelligent Systems for Cybersecurity (ISCS) (pp. 1–7). IEEE. https://doi.org/10.1109/ISCS69371.2025.11386016

[41] Saha, P. P., Rone, P. D., Sarkar, D., Yusuf, M. A., Hossan, M. I., & Mazumder, M. S. J. (2025a). Advancing carbon emission prediction through machine learning: The impact of fossil, nuclear, and renewable energies. In 2025 International Conference on Emerging Smart Computing and Informatics (ESCI) (pp. 1–7). IEEE. https://doi.org/10.1109/ESCI63694.2025.10988213

[42] Sami, M. A., Hemal, M. A. K. P., Alam, M. I., & Rahman, M. L. (2024). Data governance and analytics infrastructure for scalable decision-making. European Journal of Applied Science, Engineering and Technology, 2(2), 388–403. https://doi.org/10.59324/ejaset.2024.2%282%29.28.

[43] Sami, M. A., Rahman, M. L., Tanni, Z. A., Munmun, Z. S., Nusrat, S., & Biswas, B. (2026). Artificial intelligence and big data for precision medicine. Frontiers in Computer Science and Artificial Intelligence, 5(6), 36–43. https://doi.org/10.32996/fcsai.2026.5.6.7.

[44] Sarwer, M. H., Saha, T. R., & Hossain, D. (2022). Driving Business Innovation with Artificial Intelligence, Machine Learning and Blockchain Technology. Journal of Business and Management Studies, 4(3), 221-230. https://doi.org/10.32996/jbms.2022.4.3.21

[45] Tanvir A, Jo J, Park SM. Targeting Glucose Metabolism: A Novel Therapeutic Approach for Parkinson's Disease. Cells. 2024 Nov 13;13(22):1876. doi: 10.3390/cells13221876. PMID: 39594624; PMCID: PMC11592965.

[46] Tanvir, A., Juie, B. J. A., Tisha, N. T., & Rahman, M. M. (2020). Synergizing big data and biotechnology for innovation in healthcare, pharmaceutical development, and fungal research. International Journal of Biological, Physical and Chemical Studies, 2(2), 23–32. https://doi.org/10.32996/ijbpcs.2020.2.2.4

[47] Yusuf, M. A., Chowdhury, N. M., Rone, P. D., Saha, P. P., Hossan, M. I., Sarkar, D., Paul, R., Hossain, M. R., & Chakraborty, M. (2025). Advancing Public Safety with Real-Time Life Jacket Detection and Demographic Profiling Using YOLOv8 and Age Classification. EAI Endorsed Trans AI Robotics. 4.1-12. https://doi.org/10.4108/airo.9785. Available from: https://publications.eai.eu/index.php/airo/article/view/978z5

[48] Yusuf, M. A., Khan, M. R. K., Saha, P. P., & Rahaman, M. M. (2024). Data fusion of semantic and depth information in the context of object detection. In 2024 Second International Conference on Intelligent Cyber Physical Systems and Internet of Things (ICoICI) (pp. 1124–1129). IEEE. https://doi.org/10.1109/ICoICI62503.2024.10696627.