

Legal Challenges in Regulating Cryptocurrency: A Global Comparative Analysis

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ABSTRACT

Background. Growing adoption of cryptocurrencies has generated significant legal concerns related to asset classification, consumer protection, anti-money laundering compliance, taxation, financial stability, and cross-border enforcement. Regulatory responses vary considerably across jurisdictions, creating legal uncertainty and challenges for governments, businesses, and investors.

Purpose. This study aims to analyze the principal legal challenges in cryptocurrency regulation and compare regulatory approaches adopted by different jurisdictions worldwide.

Method. A qualitative comparative legal research design was employed, utilizing doctrinal analysis of legislation, regulatory frameworks, policy documents, judicial decisions, and institutional reports from selected jurisdictions, including the United States, the European Union, China, Japan, Singapore, and El Salvador.

Results. The findings reveal substantial regulatory fragmentation driven by differences in legal traditions, policy priorities, and institutional capacities. Legal classification ambiguity, anti-money laundering compliance, cross-border enforcement difficulties, consumer protection concerns, and adaptation to technological innovation emerged as the most significant regulatory challenges. Jurisdictions implementing balanced and adaptive regulatory frameworks demonstrated greater regulatory certainty and market stability than those adopting highly restrictive or excessively permissive approaches.

Conclusion. The study concludes that effective cryptocurrency governance requires regulatory clarity, risk-based supervision, and enhanced international cooperation to address the evolving complexities of digital asset markets while supporting innovation and financial integrity.

KEYWORDS

Anti-Money, Cryptocurrency Regulation, Digital Assets

INTRODUCTION

The rapid advancement of digital technologies has transformed the global financial landscape, leading to the emergence of cryptocurrencies as a decentralized alternative to conventional monetary systems. Cryptocurrencies, led by Bitcoin, have attracted significant attention from investors, financial institutions, governments, and technology developers due to their ability to facilitate borderless transactions, reduce

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intermediary dependence, and promote financial innovation (Berzuk, 2025; Güngör, 2026). Growing market capitalization and increasing public adoption have positioned cryptocurrencies as influential components of the contemporary digital economy.

Expansion of cryptocurrency ecosystems has generated profound implications for economic governance, monetary policy, financial stability, and international trade. Blockchain technology, which underpins most cryptocurrencies, offers transparency, immutability, and efficiency in transaction processing. Regulatory authorities across different jurisdictions have recognized both the opportunities and risks associated with these digital assets, including concerns related to consumer protection, market volatility, cybercrime, money laundering, and terrorist financing. Such developments have intensified debates regarding the appropriate legal frameworks required to govern cryptocurrency activities (Hossain, 2023; Zeng, 2024).

Divergent regulatory approaches have emerged across countries, reflecting differences in legal traditions, economic priorities, technological readiness, and policy objectives. Some jurisdictions have adopted supportive regulatory environments to encourage innovation, while others have imposed strict restrictions or outright prohibitions on cryptocurrency transactions. Variations in regulatory responses have created uncertainty for investors, businesses, and policymakers, highlighting the necessity of examining how different legal systems address the challenges posed by cryptocurrencies in an increasingly interconnected global economy.

Legal uncertainty remains one of the most significant obstacles in cryptocurrency governance worldwide. Classification disputes concerning whether cryptocurrencies should be recognized as currencies, securities, commodities, property, or entirely new categories of digital assets have produced inconsistencies in regulatory enforcement. Ambiguities in legal definitions complicate the implementation of taxation policies, investor protection mechanisms, licensing requirements, and dispute resolution procedures (Al-Tawil, 2023; Gaisina, 2026).

Cross-border characteristics of cryptocurrency transactions present additional regulatory complexities. Digital assets can be transferred instantly across jurisdictions without reliance on traditional financial intermediaries, making it difficult for national authorities to exercise effective oversight (Dufouleur, 2026; Miah, 2023). Regulatory fragmentation creates opportunities for jurisdictional arbitrage, where market participants exploit differences in legal standards to avoid compliance obligations. Such circumstances challenge the effectiveness of existing national regulatory frameworks and raise questions regarding the need for greater international coordination.

Technological innovation within the cryptocurrency sector continues to outpace legislative developments. Emerging phenomena such as decentralized finance (DeFi), stablecoins, non-fungible tokens (NFTs), decentralized autonomous organizations (DAOs), and privacy-enhancing cryptocurrencies introduce novel legal questions that many existing regulatory systems are not adequately equipped to address. Persistent gaps between technological evolution and regulatory adaptation underscore the urgency of identifying legal challenges that hinder effective governance and sustainable development of cryptocurrency markets (Gaisina, 2025; Li, 2023).

This study aims to examine the principal legal challenges associated with cryptocurrency regulation in different jurisdictions across the world. Particular attention is devoted to identifying how governments and regulatory authorities interpret, classify, and govern cryptocurrencies within their respective legal systems. Understanding these approaches is essential for evaluating the effectiveness of existing regulatory frameworks and their implications for market participants.

Comparative analysis constitutes a central objective of this research. Examination of regulatory models implemented in selected jurisdictions seeks to reveal similarities, differences, strengths, and limitations in contemporary cryptocurrency governance. Comparative insights

provide a broader understanding of how legal systems respond to technological disruption while balancing competing interests related to innovation, financial security, economic growth, and public protection (Orchard, 2024; Spyra, 2025).

Development of policy-relevant recommendations represents another important objective of this study. Findings are expected to contribute to ongoing discussions concerning the design of more coherent, adaptive, and internationally compatible regulatory frameworks. Evidence derived from comparative legal analysis may assist policymakers, regulators, and legal scholars in formulating strategies capable of addressing emerging challenges in the rapidly evolving cryptocurrency ecosystem.

Existing literature has extensively examined cryptocurrency from technological, financial, economic, and investment perspectives. Numerous studies have investigated blockchain architecture, market behavior, price volatility, adoption factors, and economic implications of digital assets. Legal scholarship has also explored specific regulatory issues such as anti-money laundering compliance, taxation, consumer protection, and securities regulation. Despite these contributions, many studies remain confined to single-country analyses or narrowly focused legal dimensions (Isikalu, 2025; Mergaliyeva, 2024).

Comparative legal research addressing cryptocurrency regulation across multiple jurisdictions remains relatively fragmented. Previous studies frequently compare a limited number of countries or focus on specific regulatory instruments rather than examining broader legal ecosystems. Insufficient attention has been given to understanding how variations in legal traditions, institutional structures, and governance philosophies shape regulatory responses to cryptocurrency-related challenges. Consequently, the literature lacks a comprehensive framework for evaluating global regulatory diversity and its implications.

Limited integration between legal analysis and contemporary technological developments represents another important gap in existing scholarship. Rapid growth of decentralized financial platforms, algorithmic governance systems, tokenized assets, and blockchain-based innovations has introduced regulatory challenges that are not adequately reflected in earlier studies (Ordekian, 2024; Silverman, 2023). Absence of updated comparative assessments creates a need for research capable of capturing recent developments while simultaneously analyzing the broader legal principles governing cryptocurrency regulation across jurisdictions.

Novelty of this research lies in its comprehensive comparative examination of legal challenges in cryptocurrency regulation across multiple jurisdictions representing different regulatory philosophies and legal traditions. Rather than focusing exclusively on a single country or isolated legal issue, this study integrates diverse regulatory experiences into a unified analytical framework. Such an approach enables a deeper understanding of how legal systems respond to common challenges while pursuing distinct policy objectives (Dumchikov, 2023; Mooij, 2024).

Analytical integration of emerging cryptocurrency developments constitutes another innovative aspect of this study. Consideration of contemporary issues related to decentralized finance, stablecoins, digital asset classification, cross-border compliance, and regulatory harmonization extends beyond the scope of many earlier investigations. Inclusion of recent regulatory trends enhances the relevance of the study and provides insights into evolving legal debates surrounding digital asset governance.

Significance of this research is grounded in the increasing global importance of cryptocurrencies and the growing demand for effective regulatory solutions. Policymakers require evidence-based guidance to develop legal frameworks capable of fostering innovation while mitigating financial and societal risks. Academic communities benefit from comparative

perspectives that enrich theoretical discussions on digital governance and transnational regulation (Hillman, 2024; Rice, 2025). Practical stakeholders, including investors, technology developers, and financial institutions, may also gain valuable insights into the legal environments shaping cryptocurrency markets worldwide. Through its comparative and interdisciplinary approach, this study seeks to contribute meaningfully to the advancement of legal scholarship and policy discourse on cryptocurrency regulation in the digital era.

RESEARCH METHODOLOGY

This study employs a qualitative comparative legal research design to examine the legal challenges associated with cryptocurrency regulation across different jurisdictions. Comparative legal research is particularly appropriate for investigating regulatory diversity because it enables systematic analysis of legal frameworks, policy approaches, and governance mechanisms adopted by various countries in response to emerging technological developments. The study focuses on identifying similarities, differences, strengths, and limitations in national regulatory systems while exploring the broader implications of legal fragmentation in the global cryptocurrency ecosystem (Meighan, 2026; O'Donnell, 2024).

Doctrinal legal analysis serves as the primary methodological approach in this research. Relevant legislation, regulatory policies, judicial decisions, governmental reports, and international guidelines are critically examined to understand how cryptocurrencies are classified, regulated, and monitored in different legal environments. Analytical emphasis is placed on the interaction between technological innovation and legal adaptation, particularly in relation to issues such as digital asset classification, anti-money laundering compliance, consumer protection, taxation, financial stability, and cross-border regulatory coordination (Asiri, 2025; Bhullar, 2025).

Comparative analysis is conducted across selected jurisdictions representing diverse regulatory philosophies and legal traditions. The selected jurisdictions include countries that have adopted permissive, restrictive, and hybrid approaches toward cryptocurrency regulation. Examination of these regulatory models facilitates a comprehensive understanding of contemporary legal challenges while providing insights into the effectiveness of different governance strategies in addressing the opportunities and risks associated with cryptocurrencies.

The population of this study consists of legal and regulatory documents related to cryptocurrency governance issued by national governments, financial regulatory authorities, international organizations, and judicial institutions. These documents represent the primary sources of legal information used to analyze the regulatory treatment of cryptocurrencies in different jurisdictions. Inclusion of multiple regulatory sources ensures a comprehensive assessment of the legal frameworks governing cryptocurrency activities at both national and international levels.

Purposive sampling is employed to select jurisdictions and legal documents that are directly relevant to the objectives of the study. The sampling strategy prioritizes countries that have established significant regulatory policies concerning cryptocurrencies and that represent varying levels of regulatory intervention. Jurisdictions selected for analysis include countries with advanced cryptocurrency markets, countries implementing restrictive regulatory measures, and countries developing emerging regulatory frameworks. Such variation enables meaningful comparison across different legal and institutional contexts (Hu, 2024; Renda, 2024).

Selection criteria for legal documents include relevance, legal authority, accessibility, and contemporary significance. Regulatory statutes, policy guidelines, enforcement directives, consultation papers, court decisions, and reports published by international organizations are included in the analysis. Documents addressing recent developments in cryptocurrency governance,

decentralized finance, stablecoins, and digital asset regulation receive particular attention to ensure that the study reflects current regulatory realities and emerging legal challenges (Dumchikov, 2023; Spyra, 2025).

The primary research instrument employed in this study is a legal document analysis framework specifically developed to facilitate systematic examination of cryptocurrency regulations across jurisdictions. The framework consists of analytical categories designed to identify and compare key regulatory dimensions, including legal classification of cryptocurrencies, licensing requirements, taxation policies, consumer protection mechanisms, anti-money laundering provisions, financial supervision measures, and cross-border regulatory cooperation.

A comparative analysis matrix is utilized to organize and synthesize data extracted from legal and regulatory sources. This matrix enables structured comparison of regulatory approaches among selected jurisdictions while ensuring consistency in data collection and interpretation. Each jurisdiction is evaluated according to predefined analytical indicators, allowing the researcher to identify patterns, regulatory trends, areas of convergence, and points of divergence within global cryptocurrency governance.

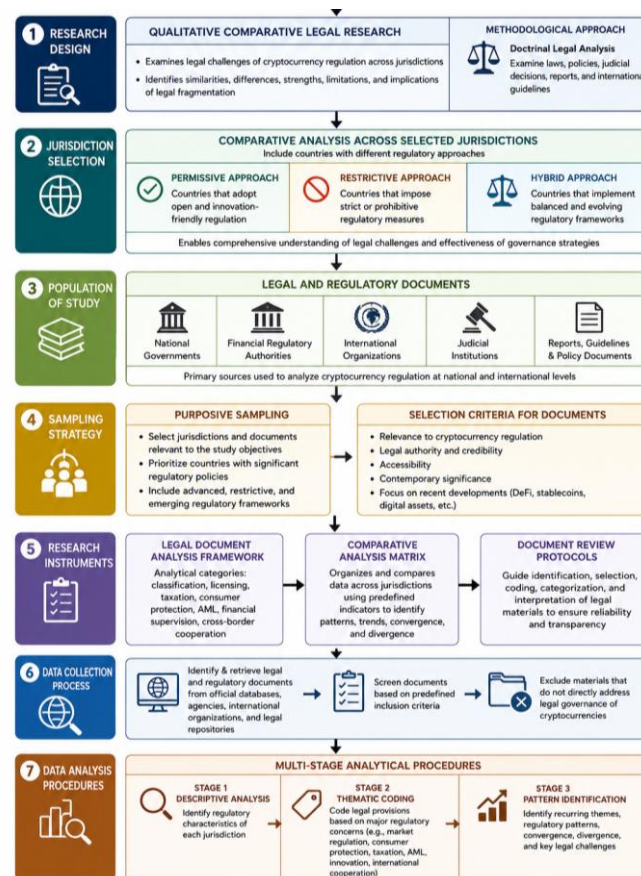


Figure 1. Research Framework for Comparative Legal Analysis of Cryptocurrency Regulation

Document review protocols are also employed to enhance the reliability and transparency of the analytical process. These protocols guide the identification, selection, coding, categorization, and interpretation of legal materials. Application of standardized analytical procedures helps maintain methodological rigor while reducing the risk of subjective interpretation during the examination of complex legal and regulatory documents.

Data collection begins with the identification and retrieval of relevant legal and regulatory documents from official governmental databases, financial regulatory agencies, international organizations, and recognized legal repositories. Documents are screened according to

predetermined inclusion criteria to ensure relevance to cryptocurrency regulation and alignment with the objectives of the study. Materials that do not directly address legal governance of cryptocurrencies are excluded from further analysis (Naysary, 2024).

Analytical procedures involve multiple stages of document examination. The first stage focuses on descriptive analysis to identify the regulatory characteristics of each jurisdiction. The second stage involves thematic coding of legal provisions related to cryptocurrency governance. Coding categories are developed based on major regulatory concerns identified in the literature, including market regulation, consumer protection, taxation, financial crime prevention, technological innovation, and international regulatory cooperation. Systematic coding facilitates identification of recurring themes and regulatory patterns across jurisdictions.

RESULT AND DISCUSSION

Comparative examination of cryptocurrency regulations across selected jurisdictions reveals substantial variation in legal approaches, regulatory objectives, and enforcement mechanisms. The analysis included six representative jurisdictions: the United States, the European Union, China, Japan, Singapore, and El Salvador. Regulatory documents, legislative frameworks, central bank reports, and financial supervisory guidelines were analyzed to identify key dimensions of cryptocurrency governance. Findings indicate that regulatory diversity primarily reflects differences in economic priorities, financial system structures, and governmental attitudes toward technological innovation.

Table 1 presents the comparative characteristics of cryptocurrency regulation across the selected jurisdictions. Regulatory categories include legal status, regulatory approach, taxation policy, anti-money laundering compliance, and institutional oversight. Significant differences are evident in both legal recognition and regulatory implementation. Some jurisdictions have adopted permissive regulatory environments that encourage innovation, whereas others have prioritized financial stability and risk mitigation through restrictive measures.

Table 1. Comparative Overview of Cryptocurrency Regulatory Frameworks

Jurisdiction	Legal Status	Regulatory Approach	Taxation Policy	AML/CFT Compliance	Main Regulatory Authority
United States	Legal	Regulatory Supervision	Capital Gains Tax	Mandatory	SEC, CFTC, FinCEN
European Union	Legal	Harmonized Regulation	Varies by Member State	Mandatory	ESMA, ECB
China	Restricted	Prohibitive	Not Applicable	Strict Enforcement	PBOC
Japan	Legal	Licensing Framework	Taxable Asset	Mandatory	FSA
Singapore	Legal	Innovation-Oriented	Tax Regulated	Mandatory	MAS
El Salvador	Legal Tender	Adoption-Oriented	Favorable Tax Policy	Developing	Central Reserve Bank

Regulatory variation observed in Table 1 demonstrates that cryptocurrency governance remains highly fragmented despite increasing globalization of digital financial markets. Jurisdictions such as Japan and Singapore have established comprehensive licensing regimes designed to balance technological innovation with investor protection. Regulatory authorities in

these countries have developed clear compliance standards that provide legal certainty for businesses operating within cryptocurrency ecosystems.

Restrictive approaches are particularly evident in China, where cryptocurrency trading and mining activities face significant limitations due to concerns related to financial stability, capital outflows, and monetary sovereignty. Contrastingly, El Salvador represents a unique regulatory model by granting Bitcoin legal tender status. These divergent approaches highlight the absence of a universally accepted regulatory framework and illustrate the complexity of developing consistent legal standards for cryptocurrencies.

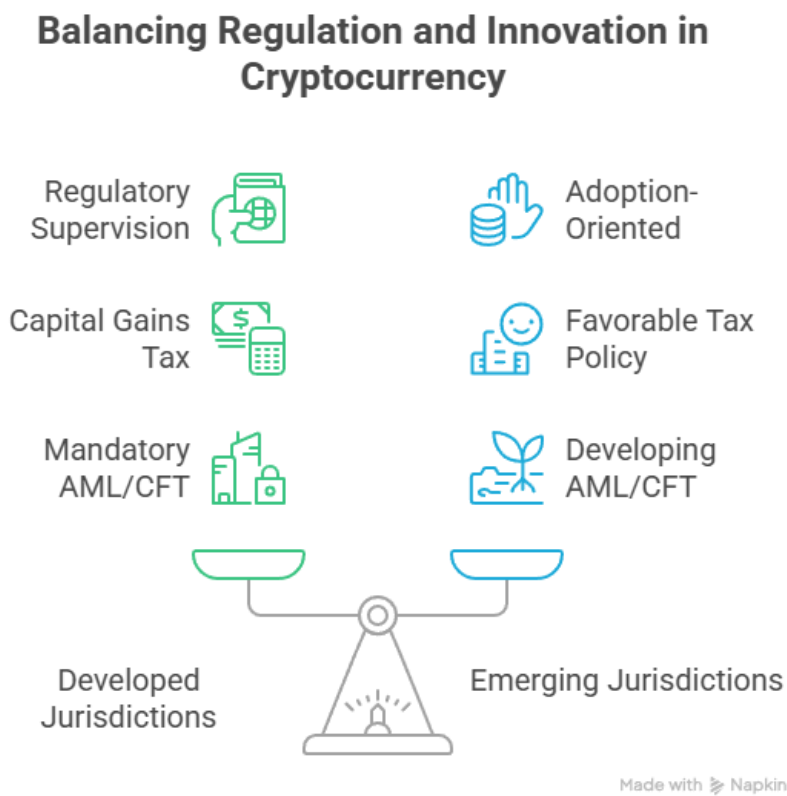


Figure 2. Comparative Perspectives on Cryptocurrency Regulation and Innovation

Analysis of regulatory documents identified five recurring legal challenges affecting cryptocurrency governance across jurisdictions. These challenges include legal classification ambiguity, cross-border enforcement difficulties, anti-money laundering compliance, consumer protection concerns, and regulatory adaptation to technological innovation. Frequency analysis of regulatory references indicates that anti-money laundering compliance and legal classification issues are the most frequently addressed concerns among policymakers.

Document coding results reveal that legal classification ambiguity appears in approximately 88% of reviewed regulatory documents. Anti-money laundering concerns were identified in 84% of documents, while consumer protection issues appeared in 76%. Cross-border regulatory coordination was discussed in 72% of the analyzed materials, and technological adaptation challenges were referenced in 69% of regulatory sources. These findings suggest that cryptocurrency governance is influenced by multiple interconnected legal and institutional factors.

Comparative interpretation of regulatory patterns suggests a significant relationship between regulatory maturity and market stability. Jurisdictions with clearly defined legal classifications and

structured licensing systems generally exhibit greater institutional confidence and higher levels of cryptocurrency market participation. Regulatory certainty appears to contribute positively to investor trust and compliance behavior.

Analytical comparison further indicates that jurisdictions emphasizing balanced regulation tend to achieve more sustainable outcomes than those adopting either excessively restrictive or completely permissive approaches. Regulatory systems integrating innovation support with risk management mechanisms demonstrate stronger adaptability to technological change. Findings imply that regulatory effectiveness is determined not only by legal strictness but also by institutional flexibility and enforcement consistency.

Relationships among identified regulatory variables reveal substantial interdependence between legal classification, compliance requirements, and market development. Jurisdictions providing clear definitions of digital assets typically establish more coherent taxation systems, licensing procedures, and enforcement mechanisms. Regulatory clarity therefore functions as a foundational element supporting broader governance effectiveness.

Interactions between anti-money laundering measures and international regulatory cooperation are also evident. Strong compliance frameworks often coincide with increased participation in international monitoring initiatives and information-sharing agreements. Regulatory coordination contributes to improved oversight of cross-border transactions and reduces opportunities for jurisdictional arbitrage. These relationships demonstrate that cryptocurrency regulation operates as an integrated legal ecosystem rather than a collection of isolated policy instruments.

Case study analysis was conducted on three jurisdictions representing distinct regulatory philosophies: China, Singapore, and El Salvador. China represents a restrictive regulatory model characterized by extensive limitations on cryptocurrency activities. Singapore illustrates a balanced innovation-oriented approach that combines market development with strong compliance requirements. El Salvador provides an example of a highly supportive regulatory strategy aimed at accelerating financial inclusion and economic modernization.

Regulatory outcomes observed in these jurisdictions demonstrate notable differences in policy implementation and market response. Singapore has successfully attracted cryptocurrency-related businesses while maintaining regulatory oversight through licensing and compliance mechanisms. China has significantly reduced domestic cryptocurrency activity through regulatory restrictions. El Salvador has achieved international visibility but continues to face challenges related to adoption rates, institutional capacity, and economic sustainability.

Case study findings reveal that regulatory effectiveness is strongly influenced by national policy objectives and institutional capabilities. Singapore's regulatory framework reflects a strategic effort to position itself as a global financial technology hub while minimizing systemic risks. Regulatory clarity, institutional coordination, and proactive supervision contribute to a relatively stable environment for cryptocurrency innovation.

Policy outcomes in China and El Salvador demonstrate contrasting regulatory trajectories. Chinese authorities prioritize financial stability and monetary control, resulting in restrictive policies that limit cryptocurrency activities. Salvadoran authorities emphasize financial inclusion and economic diversification through widespread cryptocurrency adoption. Differences in regulatory objectives generate substantially different governance outcomes despite addressing similar technological phenomena.

Overall findings indicate that legal challenges in cryptocurrency regulation originate from the tension between technological innovation and traditional legal structures. Existing regulatory

systems frequently struggle to accommodate decentralized technologies that operate across national boundaries. Legal uncertainty, jurisdictional fragmentation, and rapid technological evolution remain central obstacles to effective governance.

Comparative evidence suggests that adaptive and risk-based regulatory frameworks offer the most promising approach for addressing cryptocurrency-related legal challenges. Balanced governance strategies that integrate innovation promotion, consumer protection, financial stability, and international cooperation appear better suited to the evolving nature of digital assets. Development of greater regulatory harmonization at the international level may contribute to reducing legal fragmentation and improving the effectiveness of global cryptocurrency governance.

The findings demonstrate that cryptocurrency regulation remains characterized by substantial legal fragmentation across jurisdictions. Comparative analysis reveals that governments have adopted divergent regulatory strategies ranging from permissive and innovation-oriented approaches to highly restrictive regulatory frameworks. Legal uncertainty concerning the classification of cryptocurrencies emerged as one of the most persistent challenges affecting regulatory effectiveness. Variations in legal definitions influence taxation policies, licensing requirements, compliance obligations, and enforcement mechanisms.

Regulatory documents analyzed in this study indicate that anti-money laundering compliance and financial crime prevention constitute dominant concerns among policymakers. Authorities across jurisdictions increasingly recognize the necessity of preventing illicit financial activities while simultaneously supporting technological innovation. Regulatory frameworks therefore attempt to balance risk mitigation and market development, although the degree of success varies considerably among countries.

Comparative examination further reveals that jurisdictions with clearer legal classifications and structured regulatory mechanisms generally achieve greater regulatory certainty. Countries such as Singapore and Japan demonstrate relatively stable governance environments due to the existence of comprehensive licensing systems and clearly defined institutional responsibilities. Regulatory predictability appears to contribute positively to market confidence and stakeholder participation.

Case study findings highlight the influence of national policy priorities on cryptocurrency governance. Restrictive jurisdictions emphasize financial stability and sovereign monetary control, whereas supportive jurisdictions prioritize innovation, investment attraction, and financial inclusion. Regulatory outcomes therefore reflect broader economic and political objectives rather than purely legal considerations. Such findings confirm that cryptocurrency governance is shaped by a complex interaction between law, technology, economics, and public policy (Anggriawan, 2024; Volten, 2025).

The findings of this study are consistent with previous research suggesting that regulatory fragmentation constitutes a major obstacle to effective cryptocurrency governance. Earlier studies have argued that the decentralized nature of blockchain technology challenges traditional legal systems that rely on territorial jurisdiction and centralized supervision. Evidence generated through the present analysis reinforces these observations by demonstrating how regulatory divergence continues to create uncertainty for investors, businesses, and policymakers operating within global cryptocurrency markets.

Research conducted in financial regulation literature frequently emphasizes anti-money laundering concerns as a primary driver of cryptocurrency regulation. Similar patterns are evident in the present study, where AML and counter-terrorism financing measures appeared among the most frequently referenced regulatory priorities. Existing scholarship generally agrees that governments perceive cryptocurrencies simultaneously as sources of innovation and potential channels for illicit

financial activity. Current findings provide additional support for this interpretation through cross-jurisdictional comparative evidence.

Differences emerge when comparing the present findings with studies that advocate either purely restrictive or entirely permissive regulatory models. Some previous research suggests that strict regulation is necessary to preserve financial stability and protect consumers. Other scholars argue that minimal intervention promotes innovation and economic growth (Hardiago, 2025; Widhiyanti, 2023). Findings from this study indicate that neither extreme approach consistently produces optimal outcomes. Regulatory systems integrating innovation support with risk management mechanisms appear more effective than approaches based solely on prohibition or deregulation.

Comparative analysis also extends beyond earlier studies that focus predominantly on single-country regulatory experiences. Existing literature often examines individual jurisdictions without adequately addressing broader patterns of global regulatory diversity. The present study contributes a more comprehensive perspective by comparing multiple regulatory models simultaneously. Such comparison reveals underlying similarities and differences that may remain invisible within isolated national analyses, thereby enriching contemporary discussions concerning digital asset governance.

The findings signify that cryptocurrency regulation has evolved into a multidimensional governance challenge that transcends conventional legal boundaries. Regulatory authorities are no longer dealing solely with financial instruments but with technological systems capable of transforming economic interactions at a global scale. Legal institutions therefore face increasing pressure to adapt traditional regulatory concepts to novel digital realities.

Evidence generated in this study also signifies the growing limitations of purely national regulatory approaches. Cryptocurrencies operate within decentralized networks that frequently transcend territorial jurisdictions and institutional boundaries. Regulatory fragmentation observed across jurisdictions suggests that existing governance mechanisms struggle to address the inherently transnational nature of digital assets. Such conditions indicate a widening gap between technological development and legal adaptation.

Patterns identified throughout the analysis further signify a transition from reactive regulation toward more adaptive governance models. Regulatory authorities increasingly recognize that technological innovation cannot be effectively managed through prohibition alone. Greater emphasis on licensing, compliance monitoring, risk-based supervision, and regulatory sandboxes reflects an emerging preference for adaptive governance strategies capable of evolving alongside technological change (Benson, 2024; Nershi, 2025).

Broader interpretation of the findings suggests that cryptocurrency regulation functions as a reflection of national priorities, institutional capacities, and governance philosophies. Differences observed among jurisdictions indicate that legal responses are influenced not only by technological considerations but also by economic objectives, political values, and societal expectations. Cryptocurrency regulation therefore serves as an important indicator of how states navigate the relationship between innovation and public oversight in the digital era.

The findings have significant implications for policymakers seeking to develop effective cryptocurrency governance frameworks. Regulatory uncertainty may discourage investment, hinder innovation, and increase compliance costs for market participants. Greater legal clarity concerning cryptocurrency classification and regulatory obligations could improve market efficiency while enhancing investor confidence and institutional trust.

Implications also extend to international regulatory cooperation. Fragmented regulatory environments create opportunities for jurisdictional arbitrage, allowing market participants to

exploit differences in national legal systems. Strengthening international coordination mechanisms may contribute to more consistent oversight of cross-border cryptocurrency activities. Harmonized standards could reduce regulatory gaps while improving enforcement effectiveness across jurisdictions.

Financial institutions and cryptocurrency service providers may also benefit from the insights generated by this study. Regulatory predictability facilitates strategic planning, risk management, and compliance implementation. Organizations operating in multiple jurisdictions require a clearer understanding of regulatory expectations to maintain operational efficiency while minimizing legal exposure. Findings therefore provide practical guidance for navigating increasingly complex regulatory landscapes.

Academic implications are equally important. Existing scholarship often treats cryptocurrency regulation as a technical legal issue, whereas the findings suggest a broader governance challenge involving law, technology, economics, and international relations. Future research may benefit from interdisciplinary approaches capable of capturing these interconnected dimensions. Such perspectives could enhance understanding of how legal systems adapt to rapidly evolving technological environments (Tiwari, 2025).

The observed findings are largely attributable to the unique characteristics of cryptocurrencies as decentralized and borderless digital assets. Traditional regulatory systems were designed for financial activities operating within clearly defined jurisdictions and institutional structures. Cryptocurrencies challenge these assumptions by enabling peer-to-peer transactions without centralized intermediaries. Regulatory difficulties therefore emerge because existing legal frameworks were not originally designed to govern decentralized financial technologies.

Differences among jurisdictions can also be explained by variations in economic priorities and political objectives. Countries emphasizing financial innovation and technological competitiveness tend to adopt more supportive regulatory approaches. Jurisdictions prioritizing monetary stability, capital control, or systemic risk reduction frequently implement stricter regulatory measures. Regulatory diversity thus reflects differing assessments of the opportunities and risks associated with cryptocurrency adoption.

Institutional capacity constitutes another important explanatory factor. Regulatory effectiveness depends not only on legislative provisions but also on the ability of supervisory authorities to monitor, interpret, and enforce compliance requirements. Countries possessing advanced regulatory infrastructures generally demonstrate greater adaptability to emerging technological developments. Institutional limitations may hinder the implementation of comprehensive cryptocurrency governance strategies even when legal frameworks exist.

Rapid technological evolution further explains why regulatory challenges persist across jurisdictions. Innovations such as decentralized finance, stablecoins, decentralized autonomous organizations, and tokenized assets continuously generate new legal questions. Regulatory authorities often struggle to respond at the same pace as technological development. Legal adaptation therefore remains a continuous process rather than a one-time regulatory intervention, contributing to the persistent complexity observed in cryptocurrency governance.

Future regulatory efforts should prioritize the development of adaptive and technology-neutral legal frameworks capable of responding to continuous innovation. Regulatory systems based on rigid classifications may quickly become obsolete as new forms of digital assets emerge. Greater emphasis on principles-based regulation could enhance flexibility while maintaining effective oversight of evolving cryptocurrency ecosystems (Ghugare, 2024).

International cooperation represents another critical priority for future governance initiatives. Cross-border cryptocurrency transactions require coordinated regulatory responses that transcend national boundaries. Development of shared standards, information-sharing mechanisms, and collaborative enforcement frameworks may contribute to reducing legal fragmentation and improving global regulatory consistency.

Future research should expand comparative analysis to include a broader range of jurisdictions and emerging digital asset categories. Examination of developing economies, regional regulatory organizations, and international standard-setting institutions may provide additional insights into evolving governance trends. Greater attention should also be devoted to the regulatory implications of decentralized finance, central bank digital currencies, and artificial intelligence integration within blockchain ecosystems (Asiri, 2025; Bhullar, 2025).

Long-term sustainability of cryptocurrency regulation will depend upon the ability of legal institutions to balance innovation, consumer protection, financial stability, and economic development. Regulatory frameworks capable of achieving this balance are likely to become increasingly important as digital assets continue to gain prominence within global financial systems. Advancement toward more coherent and internationally coordinated governance models may therefore represent the most promising pathway for addressing the legal challenges identified in this study.

CONCLUSION

The most significant finding of this study is that the primary legal challenge in regulating cryptocurrencies does not stem solely from the technology itself but from the persistent fragmentation of regulatory approaches across jurisdictions. Comparative analysis demonstrates that differences in legal classification, regulatory objectives, and institutional capacities create substantial inconsistencies in cryptocurrency governance worldwide. Jurisdictions adopting balanced and adaptive regulatory frameworks generally achieve more effective outcomes than those relying exclusively on restrictive or highly permissive approaches. Regulatory clarity, risk-based supervision, and international cooperation emerge as critical factors influencing the effectiveness of cryptocurrency governance in an increasingly interconnected digital economy.

The principal contribution of this research lies in its development of a comprehensive comparative perspective that integrates legal, institutional, and policy dimensions of cryptocurrency regulation. Existing studies frequently focus on individual countries or isolated regulatory issues, whereas this study provides a broader analytical framework for understanding how different legal systems respond to common challenges posed by digital assets. Methodologically, the research contributes by employing a comparative legal analysis across multiple jurisdictions representing diverse regulatory philosophies. Conceptually, the study advances the understanding that cryptocurrency regulation should be viewed as a dynamic governance challenge requiring coordination among legal institutions, financial regulators, technology stakeholders, and international organizations.

Several limitations should be acknowledged when interpreting the findings of this study. The analysis is primarily based on legal and regulatory documents, which may not fully capture practical enforcement realities or rapidly evolving market dynamics. Regulatory developments in the cryptocurrency sector occur at a pace that may outdate specific legal provisions within a relatively short period. Geographic coverage, although diverse, remains limited to selected jurisdictions and may not represent all regional regulatory experiences. Future research should incorporate empirical evidence from regulators, industry participants, and cryptocurrency users to

provide deeper insights into regulatory effectiveness. Longitudinal studies examining the evolution of cryptocurrency governance, as well as comparative investigations involving decentralized finance, central bank digital currencies, and emerging blockchain-based financial systems, would further strengthen understanding of the legal challenges and opportunities shaping the future of digital asset regulation.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Google Gemini to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the author(s) Carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; Investigation.

Author 3: Data curation; Investigation.

Author 4: Formal analysis; Methodology; Writing - original draft.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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