INSTITUTIONAL MECHANISM OF LEGAL UNCERTAINTY REPRODUCTION IN CRYPTO-ASSET REGULATION

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Abstract. The paper examines the institutional nature of legal uncertainty in crypto-asset regulation. The relevance of the study is determined by the fact that crypto-assets operate in a decentralized technological environment, while regulatory systems are generally based on centralized legal and supervisory mechanisms. This contradiction creates institutional gaps between formal rules, their interpretation, enforcement practices, and the actual behavior of market participants. The purpose of the paper is to identify the mechanism through which legal uncertainty in crypto-asset regulation is reproduced. The study is based on an institutional approach, using structural-functional and mechanism-based analysis. The findings show that legal uncertainty is not merely a temporary regulatory deficiency, but a self-reproducing institutional process. It develops through a sequence of regulatory ambiguity, interpretative variability, heterogeneous enforcement, and adaptive behavior by market participants. The paper concludes that reducing legal uncertainty requires not only the refinement of legal norms, but also the formation of a coherent institutional governance system that takes into account regulatory, infrastructural, technological, and behavioral factors.

Keywords: *crypto-assets; legal uncertainty; institutional gaps; crypto-asset regulation; digital governance; DeFi; enforcement practice; digital economy.*

Introduction

The rapid development of crypto-assets has become one of the most significant manifestations of financial system digitalization. Crypto-assets operate on the basis of decentralized technological infrastructure, enable cross-border transactions, and may function without a centralized issuer or traditional financial intermediary. These features distinguish them from conventional financial instruments and create serious challenges for legal qualification, financial supervision, and institutional regulation.

The theoretical basis for analyzing these challenges is connected with the economic and categorical nature of crypto-assets. Previous research has shown that crypto-assets should be understood as hybrid economic objects combining the features of financial instruments, digital technologies, and elements of commodity circulation. This hybrid nature explains why crypto-assets cannot be fully interpreted within traditional categories of money, securities, investment assets, or digital platforms alone (Iminokhunov & Khakimov, 2026a).

At the same time, the problem of regulation cannot be reduced only to the clarification of the economic nature of crypto-assets. A subsequent study demonstrated that the circulation of crypto-assets is accompanied by institutional uncertainty in law enforcement, which arises from the absence of unified criteria for interpreting key legal categories and results in heterogeneous enforcement decisions and asymmetry of legal risks (Iminokhunov & Khakimov, 2026b).

The present paper develops this research logic further by focusing on the mechanism through which legal uncertainty is reproduced within the institutional system of crypto-asset regulation. In this respect, it relies on the broader institutional governance framework proposed in the authors' current study, which examines the interaction between regulatory architecture,

infrastructural intermediaries, market participants, and decentralized technological environments (Iminokhunov & Khakimov, 2026c, in press).

The problem of legal uncertainty in crypto-asset regulation is often explained either by the novelty of the phenomenon or by the technological complexity of decentralized financial systems. However, such explanations are insufficient. Legal uncertainty persists even in jurisdictions where formal regulatory frameworks have already been developed. This indicates that the problem is not limited to the absence of legal norms. It is rooted in the institutional structure of regulation itself, where formal rules, their interpretation, enforcement practices, infrastructural implementation, and behavioral responses of market participants do not always correspond to one another.

The purpose of this paper is to identify the institutional mechanism through which legal uncertainty in crypto-asset regulation is reproduced. The paper argues that legal uncertainty should be understood not as a one-time regulatory failure, but as a self-reinforcing institutional process. This approach makes it possible to move from a descriptive understanding of the problem to an explanation of its internal logic.

Methods

The methodological basis of the study is the institutional approach. This approach makes it possible to analyze crypto-asset regulation not only as a system of formal legal norms, but also as a set of institutional interactions between public authorities, infrastructure intermediaries, market participants, and the technological environment. In this context, regulation is understood as a process in which legal norms are interpreted, transformed into operational procedures, applied in practice, and then influence the behavior of participants.

The study uses structural-functional analysis to identify the main elements of the institutional environment of crypto-asset regulation. These elements include state authorities, regulatory and supervisory bodies, licensed intermediaries, crypto-asset service providers, banks, payment organizations, investors, traders, individual users, and decentralized technological channels such as blockchain networks, DeFi protocols, and P2P mechanisms.

The methodological logic of the paper follows the sequence of the authors' previous and current studies. First, the theoretical and categorical analysis of crypto-assets provides the basis for understanding their hybrid economic nature (Iminokhunov & Khakimov, 2026a). Second, the analysis of institutional challenges and law enforcement explains how ambiguity in legal categories leads to interpretative variability and asymmetry of legal risks (Iminokhunov & Khakimov, 2026b). Third, the institutional governance framework makes it possible to consider legal uncertainty as a systemic result of interaction between regulatory, infrastructural, technological, and behavioral elements (Iminokhunov & Khakimov, 2026c, in press).

A mechanism-based analysis is used to explain how legal uncertainty is reproduced. This method focuses on the sequence of institutional interactions through which regulatory ambiguity is transformed into heterogeneous enforcement practices and then into adaptive behavior by market participants. The study also relies on comparative reasoning by contrasting centralized regulatory logic with the decentralized nature of crypto-asset circulation.

Results and Discussion

The analysis shows that legal uncertainty in crypto-asset regulation arises at the intersection of three interconnected levels: the regulatory framework, infrastructural implementation, and behavioral responses of market participants. At the regulatory level, uncertainty is associated with the ambiguity of legal categories and the absence of unified criteria for interpreting certain actions related to crypto-assets. At the infrastructural level, uncertainty emerges when regulatory requirements are transformed into practical procedures by exchanges, service providers, banks, and other intermediaries. At the behavioral level,

uncertainty is reinforced by the reactions of market participants, who may choose alternative channels when formal regulation is perceived as unclear, costly, restrictive, or unpredictable.

The first stage of the mechanism is regulatory ambiguity. Crypto-assets combine features of digital technology, financial instruments, investment objects, and network-based assets. This hybrid nature complicates their classification within traditional legal and financial categories. As shown in the authors' earlier research, crypto-assets should be analyzed as a complex economic category rather than as a single-function financial or technological object (Iminokhunov & Khakimov, 2026a). As a result, the same transaction or market behavior may be interpreted differently depending on the regulatory context, the institutional position of the participant, or the specific enforcement practice applied.

The second stage is interpretative variability. Even when legal norms exist, their practical meaning depends on how they are interpreted by regulators, enforcement bodies, infrastructure intermediaries, and market participants. If unified interpretation criteria are absent, similar actions may receive different legal assessments. This reduces predictability and creates asymmetry of legal risks. This problem was substantiated in the authors' study of institutional challenges and law enforcement in crypto-asset regulation, where the absence of unified criteria for interpreting categories such as acquisition, sale, exchange, recurrence, and large-scale transactions was identified as a source of institutional uncertainty (Iminokhunov & Khakimov, 2026b).

The third stage is heterogeneous enforcement. Differences in interpretation lead to differences in legal practice. In the field of crypto-assets, this may be reflected in uneven qualification of transactions, different treatment of similar market operations, inconsistent application of control measures, and uncertainty regarding the boundaries between legal and illegal forms of participation in the crypto market. Heterogeneous enforcement weakens trust in the regulatory system and increases the perception of legal unpredictability.

The fourth stage is adaptive behavior by market participants. When regulation is perceived as uncertain or inconsistent, participants begin to adapt their strategies. They may use decentralized platforms, foreign crypto-asset service providers, peer-to-peer channels, non-custodial wallets, or other mechanisms that reduce their direct dependence on regulated infrastructure. Such behavior is not external to the regulatory system; rather, it becomes part of the mechanism through which legal uncertainty is reproduced.

As a result, a self-reinforcing cycle emerges. Regulatory ambiguity leads to interpretative variability; interpretative variability produces heterogeneous enforcement; heterogeneous enforcement stimulates adaptive behavior; adaptive behavior expands the gap between formal regulation and actual market practice. This gap, in turn, generates new uncertainty and creates additional challenges for regulators. In the institutional governance framework proposed by the authors, this process is interpreted as a cyclical mechanism of legal uncertainty reproduction within the broader architecture of crypto-asset regulation (Iminokhunov & Khakimov, 2026c, in press).

This mechanism demonstrates that legal uncertainty in crypto-asset regulation is not merely a consequence of insufficient legal development. It is an institutional process produced by the interaction of legal, infrastructural, technological, and behavioral factors. Therefore, attempts to reduce uncertainty only through the adoption of new legal norms may be insufficient. If the mechanisms of interpretation, implementation, enforcement, and feedback remain fragmented, new rules may reproduce the same uncertainty in a modified form.

The role of decentralized technologies is also important. DeFi, P2P transactions, and cross-border platforms do not automatically create legal uncertainty by themselves. However, they intensify existing institutional gaps by providing market participants with practical

alternatives to regulated infrastructure. This means that technological decentralization acts as an accelerator of institutional uncertainty when the regulatory system lacks coherence.

From the perspective of digital governance, crypto-asset regulation should therefore be understood as a multi-level institutional system. Its effectiveness depends not only on the content of legal norms, but also on the coherence of interactions between regulatory authorities, infrastructure intermediaries, enforcement mechanisms, technological channels, and market participants. A regulatory system that ignores behavioral adaptation and technological alternatives cannot fully reduce uncertainty.

Conclusion

The study shows that legal uncertainty in crypto-asset regulation has an institutional and self-reproducing nature. It arises not only from gaps in legislation, but from the misalignment between formal rules, their interpretation, enforcement practices, infrastructural implementation, and the behavior of market participants.

The proposed interpretation makes it possible to identify a cyclical mechanism of uncertainty reproduction: regulatory ambiguity generates interpretative variability; interpretative variability leads to heterogeneous enforcement; heterogeneous enforcement stimulates adaptive behavior; adaptive behavior reinforces institutional gaps and reproduces legal uncertainty.

The main conclusion is that reducing legal uncertainty requires a transition from fragmented regulatory measures to a coherent institutional governance model. Such a model should ensure the coordination of legal norms, interpretation procedures, enforcement practices, infrastructure mechanisms, and feedback channels. In the context of decentralized digital financial systems, effective regulation must take into account not only formal legal requirements, but also the technological and behavioral conditions under which crypto-assets actually circulate.

The thesis also demonstrates continuity between the authors' three studies. The first study clarifies the theoretical and categorical foundations of crypto-assets as hybrid objects of the digital economy (Iminokhunov & Khakimov, 2026a). The second study identifies institutional uncertainty and law enforcement contradictions in crypto-asset regulation (Iminokhunov & Khakimov, 2026b). The third study develops an institutional governance framework explaining how legal uncertainty is reproduced and how it may be reduced through a coordinated regulatory mechanism (Iminokhunov & Khakimov, 2026c, in press).

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