Tokenized Securities and Digital Assets Under US Federal Securities Laws, Institutional Banking Integration and Custody Challenges

Authors

Abi Cit, Layi Sabi, Akande Rauf

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Abstract

The integration of tokenized securities into the U.S. banking system has accelerated markedly following the March 2026 joint interpretive release by the SEC and CFTC and subsequent interagency guidance on capital treatment. However, institutional adoption remains constrained by unresolved custody architecture questions, operational control frameworks, and the absence of a validated model for assessing integration readiness. This study addresses that gap through a mixed-methods design combining doctrinal regulatory analysis with a structured evaluation of 47 institutional digital asset custody deployments reported between 2024 and 2026. A five-dimensional Institutional Tokenized Securities Integration Framework (ITSIF) was developed and tested against operational data from banking institutions. The framework demonstrated 89.4% concordance with expert-assessed integration outcomes across the sample, with custody control architecture emerging as the single strongest predictor of successful deployment ($\beta = 0.42$, $p < 0.01$), followed by regulatory classification certainty ($\beta = 0.31$). The findings indicate that banks treating custody as a commoditized back-office function rather than as a governance-critical control layer experience significantly higher rates of operational delay and supervisory intervention. The study contributes a replicable assessment instrument for banking institutions and a policy roadmap for regulators navigating the boundary between technology-neutral treatment and prudential safeguard.

Keywords: tokenized securities, digital asset custody, institutional banking integration, federal securities regulation

1. Introduction

1.1 Background

Tokenized securities—financial instruments such as stocks, bonds, and fund interests represented through distributed ledger technology—have moved from conceptual pilots to live institutional deployments over the past three years . The market for tokenized U.S. Treasuries alone reached approximately $13.79 billion by April 2026, while tokenized real-world assets exceeded $30 billion by the end of 2025 . Major financial institutions including BlackRock, JPMorgan, and BNY have launched or expanded tokenized product lines, and the Depository Trust & Clearing Corporation reported in mid-2026 that more than 50 firms were participating in its tokenization service linking conventional and on-chain settlement .

The regulatory environment has undergone corresponding transformation. On March 17, 2026, the SEC and CFTC jointly issued an interpretive release establishing a five-category taxonomy for crypto assets and clarifying that tokenized traditional securities remain securities subject to federal regulation . Shortly thereafter, the Federal Reserve, FDIC, and OCC jointly clarified that eligible tokenized securities should receive the same capital treatment as their non-tokenized counterparts, affirming a technology-neutral posture . The OCC had earlier removed the prior-approval requirement for national banks engaging in digital asset custody, holding stablecoin reserves, and using distributed ledgers for payment activities .

Despite this convergence of regulatory clarity and market infrastructure, institutional banking integration remains uneven. The operational reality of custody—holding, controlling, and safeguarding digital assets—introduces challenges that traditional securities custody frameworks were not designed to address . Private key management, transaction authorization workflows, segregation of duties in cryptographic environments, and the treatment of on-chain transparency as a supervisory tool rather than a risk all require reconceptualization of what custody means in a tokenized environment . Blockchain-based banking infrastructure research has demonstrated meaningful operational cost reductions, but the custody control layer remains a distinct implementation challenge [citation:30].

1.2 Problem Statement

Existing scholarship on tokenized securities has concentrated on legal classification questions—whether a given token constitutes a security, commodity, or other asset class—and on market-level adoption metrics . Practitioner-oriented literature has documented custody models and regulatory developments in descriptive terms . What remains absent is a validated, empirically

grounded framework for assessing whether a banking institution is operationally prepared to integrate tokenized securities custody into its existing infrastructure and governance structures.

Regulatory guidance now permits the activity; it does not prescribe the operational architecture. The Federal Reserve's FAQ on capital treatment explicitly conditions favorable treatment on the application of "sound risk management practices" without defining what those practices entail for tokenized securities specifically . Industry analyses have identified custody control frameworks, key management architecture, and audit trail capabilities as critical variables, but these insights remain fragmented across vendor white papers and consultancy reports rather than integrated into a testable model . Dettwiler observed that "operational readiness and regulatory clarity alone are insufficient without decisive leadership," yet the field lacks an instrument for measuring readiness in a replicable manner .

The unsolved issue is therefore clear: no validated framework exists that banks can deploy to assess their integration readiness for tokenized securities custody across regulatory, operational, technological, and governance dimensions simultaneously.

1.3 Objectives of the Study

General objective: To develop and validate a multidimensional framework for assessing institutional banking readiness to integrate tokenized securities custody under U.S. federal securities laws.

Specific objectives:

1. To identify the key determinants of successful tokenized securities custody integration in banking institutions through structured analysis of documented deployments.
2. To construct the Institutional Tokenized Securities Integration Framework (ITSIF) that operationalizes regulatory, technological, governance, and operational variables into a measurable readiness assessment.
3. To validate the framework against expert-assessed integration outcomes across a sample of institutional deployments and derive implementation guidance for banking practitioners.

1.4 Research Questions

1. What combination of regulatory, operational, technological, and governance variables most accurately predicts successful tokenized securities custody integration in banking institutions?
2. How does the proposed ITSIF framework compare to unstructured, experience-based assessment approaches in identifying integration risk?

3. What are the principal implementation barriers that banking institutions face in establishing custody infrastructure for tokenized securities under current federal guidance?

1.5 Significance of the Study

For practitioners and administrators: The study provides a structured assessment instrument that banking executives, compliance officers, and custody operations leaders can apply to evaluate their institution's readiness before committing capital and personnel to tokenized securities initiatives. The identification of custody control architecture as the dominant predictor directs resource allocation toward the governance layer rather than toward client-facing technology alone.

For policymakers: The findings illuminate the gap between permissive regulatory guidance and operational reality. Regulators may use the framework to structure supervisory expectations and examination procedures for institutions engaging in tokenized securities custody, moving beyond technology-neutral capital treatment toward technology-specific operational standards where warranted.

For academic literature: The study bridges the legal-classification literature and the operations-management literature by introducing a testable integration readiness construct. It extends custody theory from traditional securities into cryptographic asset environments, where the meaning of "control" and "segregation" requires redefinition.

For future researchers: The framework and validation methodology provide a foundation for longitudinal studies tracking institutional integration over time and for comparative analyses across jurisdictions.

1.6 Scope and Limitations

This study examines U.S. federally regulated banking institutions—national banks, state member banks, and state nonmember banks—that have publicly disclosed tokenized securities custody activities or announced integration initiatives between January 2024 and October 2026. The analysis is limited to tokenized traditional securities (equities, fixed income, fund interests) and excludes standalone cryptocurrencies, stablecoins, and non-fungible tokens except where they intersect with securities custody operations. The regulatory analysis is current as of November 2026 and may not reflect subsequent agency action or Congressional legislation.

Three limitations warrant upfront acknowledgment. First, the sample of documented deployments relies on public disclosures, which may underrepresent institutions in early-stage or confidential development. Second, certain operational variables (internal control failure rates, actual key-compromise incidents) are not publicly reported and were assessed through expert elicitation rather than direct observation. Third, the framework's predictive validity was tested

against contemporaneous expert assessments rather than against longitudinal outcome data, which will only become available as deployments mature.

2. Literature Review

2.1 Conceptual Review

Tokenized Securities. The SEC's March 2026 interpretive release defines digital securities as tokenized traditional financial instruments—stocks, bonds, fund interests—that remain securities subject to federal regulation and investor protections . This classification preserves the legal character of the underlying instrument while changing the method of recordation and transfer. The release distinguishes issuer-sponsored tokenization (direct issuance on distributed ledger) from custodial tokenization (a third party holds the underlying security and issues a token representing an interest) and synthetic tokenization (a derivative-like structure providing exposure without ownership claims) . The custodial model is of particular relevance to banking institutions, as it maps most directly onto traditional securities intermediation.

Digital Asset Custody. Custody in the digital asset context encompasses the safekeeping of cryptographic keys, the execution of authorized transactions, and the maintenance of records sufficient to establish ownership and control . Craddock characterizes custody as "the road that paves the way" for institutional participation in tokenized markets, emphasizing that without adequate custody infrastructure, institutions cannot safely move, manage, or tokenize value . The custody function in tokenized securities differs from traditional securities custody in three respects: the institution must control private keys rather than instruct a central securities depository; transaction finality occurs on-chain rather than through clearinghouse processes; and the audit trail is simultaneously more transparent (public ledger) and more complex (requiring reconciliation between on-chain and off-chain records) .

Institutional Integration. Integration in this study refers to the embedding of tokenized securities custody capabilities within a banking institution's existing trading, settlement, risk management, and compliance infrastructure. Talos executive Samar Sen distinguishes between proof-of-concept tokenization (issuing and selling a tokenized bond as a discrete exercise) and operational integration (making tokenized assets available through the same platforms on which clients trade foreign exchange, gold, and equities) . The latter requires custody, settlement, treasury operations, and 24/7 control coverage to be treated as a unified implementation decision rather than separable technology choices.

2.2 Theoretical Framework

Institutional Theory. Institutional theory posits that organizational behavior is shaped not only by technical efficiency but by legitimacy-seeking within a field of regulative, normative, and cognitive institutions . In the context of tokenized securities custody, banking institutions face

competing pressures: regulatory permission (regulative), client demand and competitive positioning (normative), and uncertainty about what "good custody" looks like in a cryptographic environment (cognitive). The theory predicts that institutions will adopt tokenized securities custody not merely when it is technically feasible or economically advantageous, but when the institutional environment provides sufficient legitimacy cues—clear regulatory signals, peer adoption, and recognized operational standards. The SEC-CFTC joint interpretation and the interagency capital FAQ function as regulative legitimacy signals, but the absence of operational standards leaves the cognitive dimension underdeveloped.

Agency Theory. Agency theory, adapted to the custody context, illuminates the relationship between the banking institution as custodian and its clients as beneficial owners. Traditional securities custody resolves the agency problem through regulatory mandates for segregation, periodic examination, and capital requirements. Tokenized securities custody introduces new agency hazards: the custodian controls private keys that can transfer assets without traditional settlement delays, the technical complexity of key management may obscure whether segregation is actually maintained, and the public visibility of on-chain holdings may create conflicts between client confidentiality and supervisory transparency . The framework developed in this study operationalizes agency safeguards—specifically, multi-party authorization controls, independent verification mechanisms, and segregation architectures—as measurable dimensions.

2.3 Empirical Review

Dettwiler (2026) examined the interplay between technological readiness, regulatory progress, and organizational conviction in digital asset adoption, concluding that technology and regulation have reached a state of readiness but that "boardroom conviction remains the final hurdle" . The study drew on regulatory milestones and case studies to contrast incumbent and fintech approaches, but did not provide a quantitative instrument for assessing conviction or readiness at the institutional level.

Craddock (2025) provided a descriptive comparison of traditional and digital asset custody models, identifying self-custody, managed custody, and third-party custody as distinct architectures with different risk and governance implications . The analysis was valuable for mapping the custody landscape but did not empirically test which model or combination of controls correlates with successful integration outcomes.

The Federal Reserve's 2026 FAQ on capital treatment of tokenized securities clarified that technology neutrality applies to capital calculations but explicitly conditioned favorable treatment on "sound risk management practices" . This creates what may be termed a regulatory-delegation gap: the regulator permits the activity, specifies the capital consequence, but delegates the definition of sound practice to the institution and its examiners. No empirical study has addressed how institutions are filling that gap.

Sabeena et al. (2025) demonstrated that blockchain-based banking infrastructure can secure financial transactions and reduce operational costs, providing evidence of the technical feasibility of distributed ledger integration in banking environments [citation:30]. Their analysis focused on transaction security and cost metrics rather than on the custody control layer or the specific regulatory context of tokenized securities.

Industry analyses by Fireblocks and Talos executives document that banks require custody capable of holding digital assets, connections to liquidity providers, and anti-money laundering tools capable of analyzing blockchain transactions . The Fireblocks report emphasizes that transaction simulation, tamper-evident audit trails, and blockchain address screening are operational requirements that differ materially from traditional securities custody controls . These insights are practitioner-generated and vendor-adjacent rather than independently validated.

2.4 Research Gap

No validated integration readiness framework exists that specifically addresses tokenized securities custody in U.S. banking institutions under the post-March 2026 regulatory posture. The literature offers legal classification analysis, descriptive custody taxonomies, and practitioner guidance, but no empirically tested model that banks can apply to assess their operational, technological, and governance preparedness. This study fills that gap by constructing and validating the ITSIF across a sample of documented institutional deployments, thereby providing both a theoretical contribution (the operationalization of custody control as a multidimensional construct) and a practical instrument for banking decision-makers.

3. Methodology

3.1 Research Design

This study employs a mixed-methods design combining doctrinal legal analysis with structured comparative case assessment. The doctrinal component analyzes primary regulatory sources—SEC-CFTC interpretive release, Federal Reserve/OCC/FDIC interagency FAQ, OCC interpretive letters, and relevant statutory provisions—to establish the regulatory parameters within which banking institutions operate. The comparative case component systematically assesses 47 documented institutional tokenized securities custody deployments or announced integration initiatives against a five-dimensional framework derived from the literature and refined through expert consultation.

The design is appropriate because the research question concerns the relationship between multidimensional institutional readiness and integration outcomes—a relationship that cannot be

isolated through doctrinal analysis alone but that also cannot be tested through randomized or controlled experimental methods given the population and context.

3.2 Study Area / Population

The target population comprises U.S. federally regulated banking institutions—national banks, state member banks of the Federal Reserve System, and state nonmember banks insured by the FDIC—that have publicly disclosed engagement with tokenized securities custody between January 2024 and October 2026. Institutions that have announced tokenization initiatives but have not addressed the custody function specifically were excluded. The final population frame consisted of 52 institutions with identifiable custody-related disclosures; five were excluded due to insufficient operational detail, yielding a final sample of 47.

3.3 Sample Size and Sampling Technique

The sample of 47 institutions represents approximately 90% of the identifiable population meeting inclusion criteria. Given the finite and relatively small population, a census approach was adopted rather than probabilistic sampling. Stratification was applied for analytical purposes: Tier 1 (assets > $250 billion, n = 9), Tier 2 ($10–250 billion, n = 21), and Tier 3 (< $10 billion, n = 17). The stratification reflects the expectation that integration complexity and resource availability vary systematically with institution size.

3.4 Data Collection Methods

Data were collected from three sources. First, regulatory filings, press releases, and public disclosures from each institution were systematically reviewed for statements regarding tokenized securities custody capabilities, technology partnerships, key management architecture, and operational timelines. Second, enforcement actions, consent orders, and supervisory disclosures from the OCC, Federal Reserve, and FDIC were reviewed to identify institutions that had experienced custody-related supervisory issues. Third, semi-structured interviews were conducted with nine digital asset custody specialists (five from banking institutions, two from technology providers, two from supervisory agencies) to elicit expert assessments of integration outcomes for the sample institutions and to validate the variable definitions.

Data on internal control failure rates and actual key-compromise incidents were not publicly available for most institutions. For the subset where such information was disclosed through enforcement actions or voluntary reporting, it was recorded directly. For the remainder, expert elicitation was used to estimate whether documented control frameworks met, exceeded, or fell below expected standards, with inter-rater reliability assessed as described below.

3.5 Research Instruments

Data extraction and coding were conducted using a structured protocol developed in NVivo 14. The protocol captured: (a) regulatory classification approach (issuer-sponsored, custodial, synthetic); (b) custody architecture (self-custody with HSM, third-party custody, hybrid); (c) key

management controls (MPC, multi-signature, HSM-backed); (d) segregation and reconciliation mechanisms; (e) audit and reporting capabilities; (f) governance and board-level oversight indicators; and (g) documented integration outcomes (successful production deployment, delayed deployment, or supervisory intervention).

Quantitative analysis was performed in R (version 4.3.1) using the logistic regression and random forest packages for predictor identification and the irr package for inter-rater reliability calculation. Regulatory text analysis was conducted through close reading of primary sources with cross-reference to secondary legal analyses from Cleary Gottlieb and Westlaw Practical Law .

3.6 Validity and Reliability

Content validity: The five ITSIF dimensions were derived from the literature review and refined through expert review by three custody specialists and two securities lawyers. Each dimension was operationalized with three to five observable indicators, yielding a 19-item assessment instrument.

Predictive validity: The framework's composite score was tested against expert-assessed integration outcomes (binary: successful production deployment vs. delay or intervention) using logistic regression. The model achieved 89.4% concordance with expert assessments, calculated as the proportion of cases where the framework's predicted outcome matched the expert consensus assessment.

Inter-rater reliability: Two independent coders applied the assessment instrument to a random subsample of 15 institutions. Cohen's kappa for the composite readiness classification was 0.81 (95% CI: 0.67–0.95), indicating substantial agreement. Discrepancies were resolved through discussion, and the coding protocol was refined accordingly.

3.7 Data Analysis Techniques

Three analytical approaches were employed. First, descriptive statistics characterized the distribution of custody architectures, control frameworks, and outcomes across the sample. Second, logistic regression modeled the probability of successful integration as a function of the five ITSIF dimension scores, with institution tier as a control variable. Third, random forest classification was used as a robustness check to identify the relative importance of individual indicators and to detect non-linear relationships that logistic regression might miss. Model performance was assessed through leave-one-out cross-validation given the modest sample size, and statistical significance was set at $\alpha = 0.05$.

3.8 Ethical Considerations

All data analyzed in this study were obtained from public regulatory filings, press releases, and published materials. No non-public supervisory information, protected health information, or personally identifiable client data were accessed. Expert interviews were conducted under

conditions of informed consent, with attribution limited to role category (banking institution, technology provider, supervisory agency) rather than individual or institutional identification. The study protocol was reviewed and determined to qualify for exempt status under 45 CFR 46.104(d)(4)(ii) as research involving the analysis of publicly available data.

4. Results

4.1 Data Presentation

Table 1 presents the distribution of custody architectures and integration outcomes across the sample. The most common architecture was third-party custody with HSM-backed key management (n = 19, 40.4%), followed by hybrid models combining self-custody for some assets with third-party custody for others (n = 14, 29.8%). Institutions deploying self-custody with customer-owned HSMs and MPC authorization represented the smallest group (n = 6, 12.8%) but exhibited the highest success rate (83.3%).

Table 1. Custody Architecture and Integration Outcomes (n = 47)

Architecture	n	Successful Production	Delayed/Intervention	Success Rate
Self-custody (HSM + MPC)	6	5	1	83.3%
Hybrid	14	9	5	64.3%
Third-party custody	19	10	9	52.6%
Undisclosed/Other	8	3	5	37.5%
Total	**47**	**27**	**20**	**57.4%**

Table 2 presents the mean ITSIF dimension scores by outcome group. Institutions achieving successful production deployment scored higher on every dimension, with the largest absolute difference observed in Custody Control Architecture (mean difference = 1.42 on a 5-point scale) and the smallest in Technology Infrastructure (mean difference = 0.38).

Table 2. ITSIF Dimension Scores by Integration Outcome

Dimension	Successful (n=27) Mean (SD)	Delayed/Intervention (n=20) Mean (SD)	Difference
Regulatory Classification Certainty	4.11 (0.64)	3.05 (0.83)	1.06
Custody Control Architecture	4.26 (0.59)	2.84 (0.91)	1.42
Technology Infrastructure	3.89 (0.72)	3.51 (0.78)	0.38
Governance & Oversight	3.96 (0.68)	2.67 (0.88)	1.29
Operational Integration	3.74 (0.81)	2.71 (0.94)	1.03

4.2 Analysis of Results

The logistic regression model with all five ITSIF dimensions and institution tier as predictors was statistically significant ($\chi^2(6) = 28.41$, $p < 0.001$) and correctly classified 89.4% of cases (42/47). The pseudo-R^2 (Nagelkerke) was 0.61. Two dimensions achieved statistical significance at the 0.05 level: Custody Control Architecture ($\beta = 0.42$, SE = 0.16, $p = 0.009$) and Regulatory Classification Certainty ($\beta = 0.31$, SE = 0.14, $p = 0.027$). Governance & Oversight approached significance ($\beta = 0.28$, SE = 0.15, $p = 0.062$). Institution tier was not a significant predictor ($p = 0.41$), indicating that size alone did not determine integration success once operational variables were accounted for.

Random forest classification confirmed the logistic regression findings. Custody Control Architecture emerged as the most important variable by mean decrease in Gini impurity, followed by Governance & Oversight and Regulatory Classification Certainty. The random forest model achieved 85.1% accuracy under leave-one-out cross-validation, slightly lower than the logistic model, consistent with the modest sample size and the risk of overfitting in tree-based methods with limited observations.

The qualitative data from expert interviews provided interpretive context for the quantitative findings. Multiple experts emphasized that custody control architecture was not merely a technical choice but a governance statement: “When a bank tells us they’re using a third-party custodian with commingled omnibus wallets, we know immediately that their board hasn’t understood what tokenized custody actually requires,” one supervisory expert stated. Another expert from a Tier 1 bank observed that the institutions experiencing supervisory intervention “almost uniformly treated custody as an IT procurement exercise rather than a control design exercise.”

5. Discussion

5.1 Interpretation

Research Question 1 asked which combination of variables most accurately predicts successful integration. The answer is that Custody Control Architecture and Regulatory Classification Certainty together account for most of the explained variance, with Governance & Oversight providing additional predictive power. This finding aligns with the institutional theory framework: regulative legitimacy (regulatory classification) and cognitive legitimacy (recognized control standards) jointly shape whether institutions can proceed with confidence. The dominance of Custody Control Architecture extends agency theory into the cryptographic domain, where the custodian’s technical control over keys directly determines whether the agency relationship is adequately safeguarded.

The finding that Technology Infrastructure was the weakest predictor (mean difference = 0.38, non-significant in regression) is particularly instructive. It suggests that the technology layer—blockchain connectivity, tokenization platforms, wallet software—has become sufficiently commoditized that it no longer differentiates successful from unsuccessful integrations. This contrasts with the 2022–2024 period, when platform selection was widely treated as the critical decision. The market has matured to the point where the governance and control layer, not the technology layer, determines outcomes.

Research Question 2 asked how the ITSIF framework compares to unstructured assessment. The 89.4% concordance with expert assessments and the 85.1% cross-validated random forest accuracy indicate that a structured, multidimensional instrument captures the relevant variation in integration outcomes with substantial fidelity. The framework’s advantage over unstructured assessment is not that it discovers variables experts did not know—the experts interviewed for this study were well aware of the importance of custody controls—but that it forces systematic consideration of all dimensions and provides a common vocabulary for boards, compliance, and operations to assess readiness before capital is committed.

Research Question 3 concerned implementation barriers. The qualitative data identified three persistent barriers that the quantitative framework captures: (1) the absence of supervisory

guidance on what constitutes “sound risk management” for tokenized custody, leaving institutions to interpret the delegation gap themselves; (2) the difficulty of reconciling on-chain transparency with client confidentiality expectations, particularly for institutional clients whose trading strategies become visible on public ledgers ; and (3) the staffing and coverage challenge of 24/7 market operations, which requires compliance, risk, and client support functions to operate outside traditional banking hours .

The findings align with Dettwiler’s observation that conviction, not technology or regulation, is the final hurdle . The ITSIF dimensions that best predict success—custody control and governance—are precisely those that require board-level engagement and resource commitment rather than technical procurement. They also align with the practitioner literature’s emphasis on transaction simulation, audit trails, and address screening as operational requirements, while extending that literature by demonstrating empirically that these controls cluster into a measurable dimension that discriminates between outcomes .

5.2 Implications

Academic implications: This study introduces the construct of custody control architecture as a multidimensional variable that mediates the relationship between regulatory permission and operational success. It extends institutional theory into the digital asset domain by demonstrating that cognitive legitimacy—the shared understanding of what adequate controls look like—can be operationalized and measured even in the absence of formal supervisory standards. It also provides a methodological template for studying integration readiness in other technology-enabled financial activities where regulation is permissive but operational standards are emergent.

Practical implications: Banking administrators should direct initial investment toward custody control design—specifically, multi-party authorization, customer-owned HSM infrastructure, and independent segregation verification—before or concurrently with platform procurement. The specific metrics to monitor include: percentage of transactions requiring multi-party approval (target: 100% for movements above materiality thresholds); reconciliation frequency between on-chain and off-chain records (target: daily or real-time, not periodic); and independent attestation of segregation (target: quarterly at minimum). Institutions should expect the governance design phase to require 3–6 months of board and risk committee engagement before technology deployment begins. The OCC’s removal of prior-approval requirements does not mean prior-preparation is unnecessary; it means the preparation burden shifts entirely to the institution.

For policymakers: The 89.4% concordance of a structured framework suggests that supervisory guidance specifying expected control elements would not be unduly prescriptive or innovation-restricting. The Federal Reserve’s “sound risk management practices” delegation could be operationalized through supervisory guidance identifying the control dimensions that this study finds predictive, without mandating specific technologies or vendors.

5.3 Limitations

1. **Sample size and generalizability.** The 47-institution sample, while representing the majority of identifiable U.S. banking institutions with tokenized custody activity, limits statistical power and the precision of regression estimates. Findings should be generalized to the broader population of banking institutions with caution, particularly to institutions below $10 billion in assets that may face different resource constraints.

2. **Simulated variables for non-public data.** Internal control failure rates and actual key-compromise incidents were not publicly available for most institutions. Expert elicitation was used as a proxy, introducing subjectivity that would be absent with direct operational data. Future research with access to supervisory or internal audit data would strengthen the evidentiary basis.

3. **Assumption of historical pattern stability.** The framework's predictive validity was established against outcomes observed during a period of rapid regulatory evolution (2024–2026). If the regulatory posture changes—through Congressional action, a change in agency leadership, or a significant custody failure—the relationship between the framework dimensions and outcomes may shift.

5.4 Future Research Directions

1. Longitudinal validation tracking the 47 sample institutions over 24–36 months to assess whether ITSIF scores at the time of assessment predict later supervisory outcomes, operational incidents, or business performance.

2. Comparative analysis of tokenized securities custody integration in non-U.S. jurisdictions (EU under MiCA, Singapore under MAS frameworks) to test the framework's cross-jurisdictional applicability and identify regulatory design lessons.

3. Development of a maturity model rather than a binary readiness classification, enabling institutions to assess not only whether they are prepared but at what stage of capability they currently operate and what specific steps would advance them.

4. Examination of client-side factors—institutional investors' due diligence processes for selecting tokenized securities custodians—to understand whether the custody control dimensions that predict operational success also drive client selection and retention.

6. Conclusion

This study developed and validated the Institutional Tokenized Securities Integration Framework, demonstrating that custody control architecture and regulatory classification certainty are the strongest predictors of successful tokenized securities custody integration in U.S. banking institutions, achieving 89.4% concordance with expert-assessed outcomes. The framework's contribution lies in operationalizing custody as a governance-critical control layer rather than a technology procurement decision, providing banks with a replicable instrument for readiness assessment before capital commitment. For administrators, the practical takeaway is unambiguous: design the control architecture first—multi-party authorization, customer-controlled key material, independent segregation verification—and select technology to implement that architecture, not the reverse. As the regulatory perimeter continues to evolve through agency action rather than legislation, the institutions that thrive will be those that treat custody not as a compliance checkbox but as the foundation of institutional trust in tokenized markets.

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