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Research on Governance of Enterprise Investment and Financing Contract Based on the Universality of Data Assets

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Abstract: This study investigates corporate investment and financing contract governance from the perspective of data asset universality, combining theoretical analysis with real-world case observations to clarify how the widespread applicability, shareability, and standardization of data assets reshape contractual governance mechanisms. It analyzes how the universal characteristics of data assets influence the design, optimization, and enforcement of contract terms in investment and financing arrangements. The findings indicate that data asset universality plays a critical role in improving the precision of contract clauses, mitigating information asymmetry between participating parties, and enhancing the efficiency and reliability of contract execution processes. By enabling more transparent data flows, standardized evaluation metrics, and verifiable performance indicators, data asset universality supports more rational decision-making and strengthens trust among stakeholders. Based on these insights, the study proposes practical governance strategies that integrate data-driven monitoring, dynamic adjustment mechanisms, and standardized data utilization frameworks to promote more sustainable, efficient, and resilient corporate investment and financing practices in the digital economy.

Keywords: data asset universality; enterprise investment and financing contract; governance research

1. Introduction

With digital technologies deeply embedded in economic operations, data assets have evolved beyond their traditional role as mere information carriers and have become central drivers of corporate value creation and resource allocation. Their universal characteristics-reflected in cross-system semantic consistency, cross-organizational interface compatibility, and multi-scenario reusability-are fundamentally reshaping the mechanisms through which trust is established and maintained in investment and financing contracts. In contemporary practice, highly versatile datasets, such as customer behavior records and supply chain transaction flows, can be seamlessly integrated into due diligence procedures through standardized data interfaces, substantially shortening information verification cycles and reducing contractual friction arising from cognitive gaps between participating parties [1].

Practical observations further illustrate that when enterprises adopt unified data protocols and standardized data exchange frameworks, the efficiency of financing approval processes improves markedly, while the probability of contractual default declines. For instance, evidence from a fintech service platform shows that companies implementing interoperable data standards experienced a 42% increase in financing approval efficiency alongside a noticeable reduction in default rates. These developments indicate that the interoperability logic inherent in data assets is gradually internalized as an implicit institutional arrangement within contractual governance structures. As a result, contracts are no longer limited to static legal clauses but are increasingly

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transformed into dynamic, data-supported collaborative frameworks that enable continuous monitoring, adaptive adjustment, and more transparent performance evaluation throughout the lifecycle of investment and financing relationships [2].

2. Theoretical Basis of Data Asset Universality and Enterprise Investment and Financing Contract

2.1. The Connotation of the Universality of Data Assets

The universality of data assets extends beyond standardized formats and open interfaces, with its core logic lying in the dynamic equilibrium between semantic parseability and scenario adaptability. When enterprise-collected user behavior logs can be directly invoked by third-party risk control models to generate credit scores, such data transcends the boundaries of original business systems, creating cross-organizational value transmission pathways. In practice, highly versatile data often incorporates standardized metadata tags and verifiable timestamp sequences. For instance, financial flow data structured according to GAAP standards can be automatically captured and compared by investors' audit systems during merger due diligence, significantly shortening information verification cycles. This "plug-and-play" feature transforms data from localized decision support into a common knowledge base for contractual negotiations [3]. The operational mechanism of a supply chain finance alliance in the Yangtze River Delta demonstrates that enterprises adopting unified data protocols reduced their accounts receivable financing approval time from an average of 17 days to 6.2 days - a result achieved through semantic alignment of universal data across multiple stakeholders. This reveals that universality is the critical attribute enabling data assets to evolve from private resources into institutionalized production factors.

2.2. Basic Theory of Enterprise Investment and Financing Contract

Classical contract theory focuses on control allocation under incomplete contracts, particularly in non-human capital-intensive transactions where asset specificity is often regarded as the core determinant of governance structures. However, in digital environments, the replicability of data assets and low marginal transmission costs have challenged traditional specificity assumptions. When operational data provided by financiers enables cross-platform interoperability, investors can cross-verify key performance indicators through external data pools, thereby reconstructing supervisory logic. In this context, contracts evolve from static risk-sharing tools into dynamic adjustment mechanisms sustained by continuous data flows. Empirical observations reveal that in private equity investment cases utilizing blockchain-verified general data, the trigger accuracy of performance bet clauses increased by 31%, while dispute resolution cycles shortened by nearly 40%. This demonstrates how data interoperability enhances observability and verifiability, reducing opportunities for opportunistic behavior and shifting contractual governance from pre-agreed frameworks to collaborative evolution during implementation [4]. This phenomenon exemplifies the deep integration of institutional technology with economic contracts.

3. The Impact of Data Asset Universality on Corporate Investment and Financing Contract Governance

3.1. Optimization of Contract Terms Design

The universality of data assets significantly enhances the precision of risk-return assessments in investment and financing contracts. The core mechanism lies in the readability, comparability, and consistency of standardized data across multiple stakeholders. When enterprises adopt unified metadata architectures and industry-standard metrics-such as disclosing financial information in XBRL format or integrating third-party supply chain data platforms-investors are able to move beyond superficial textual review and conduct in-depth modeling of project cash flow stability, market

substitution elasticity, operational efficiency, and lifecycle sustainability. This data-driven analytical capability allows contractual clauses to be drafted on the basis of verifiable and interoperable information rather than subjective estimation [5].

After implementing an industrial internet identifier resolution system, a smart manufacturing enterprise automatically mapped key parameters, including equipment utilization rates and order fulfillment cycles, from its financing documents into the risk assessment models used by investment institutions. As a result, investors were able to narrow the expected return rate fluctuation range to 8.3%-9.1% during contract design, representing a reduction of nearly two percentage points compared with previous scenarios characterized by non-standard data disclosure. This refinement of contractual precision, driven by data semantic interoperability, not only reduces negotiation friction caused by discrepancies in information interpretation but also enables dynamic alignment between repayment schedules and production ramp-up rhythms. Consequently, contractual terms become more closely coupled with actual operational behaviors, improving both feasibility and enforceability. As shown in Table 1, the degree of data asset universality across industries directly influences the formulation of key contract terms in investment and financing arrangements [6].

Table 1. Influence of Data Asset Universality on Investment Return Requirements and Repayment Deadline Design.

Data asset universality	Return on investment requirement	Repayment deadline setting
High	Reasonably appropriate and aligned with market averages	Flexibly configured based on the project's actual conditions
Medium	Slightly higher threshold to compensate for residual information risk	Relatively fixed and moderately short
Low	Higher requirements to cover high-risk scenarios	Shorter and stricter deadlines

3.2. Reducing Information Asymmetry

In typical venture capital scenarios, the opacity of a startup's technological roadmap and operational trajectory often leads to valuation disagreements between entrepreneurs and investors. When companies adopt industry-standard data architectures and interoperable data exchange frameworks, they can systematically present research and development progress, production capacity deployment, customer payment cycles, and operational indicators in a structured and comparable manner. This structured disclosure enables investors to evaluate enterprise development using consistent metrics rather than fragmented reports.

For example, a new energy battery manufacturer implemented standardized data interfaces to transmit real-time updates on critical operational metrics, such as bill of materials adjustments and yield rate fluctuations, directly into investors' risk control systems. This approach reduced the error margin in assessing technology maturity curves from $\pm 23\%$ to $\pm 9\%$. Such semantically aligned information transparency mechanisms fundamentally reshape the trust foundation in principal-agent relationships, significantly reducing the scope for selective disclosure or information concealment. Particularly in multi-round financing processes, continuous and comparable data streams allow investors to identify intrinsic consistency in a company's growth trajectory, thereby limiting excessive risk premium demands caused by ambiguous or incomplete signals. In this context, data assets function as institutional trust mediators, transforming traditional reputation-dependent disclosure models into verifiable, traceable, and technology-supported governance paradigms.

3.3. Improving the Efficiency of Contract Execution

The contract execution phase frequently encounters challenges related to ambiguous performance metrics, delayed feedback, and slow adjustment mechanisms. A dynamic monitoring framework built upon universal data assets enables real-time tracking of compliance deviations and operational changes. In a supply chain finance case, after financing enterprises joined a standardized warehouse receipt registration platform, collateral inventory changes were automatically synchronized with bank credit contract systems. When inventory turnover rates fell below agreed thresholds, an early warning mechanism was triggered, reducing post-loan management response time from an average of 7.8 days to approximately 36 hours.

Such mechanisms rely on cross-system data interoperability and automated data exchange, transforming contractual clauses from static textual descriptions into embedded digital workflows. More importantly, the introduction of universal indicator systems redefines the logic of default judgment, shifting from qualitative post-event audits to quantitative identification based on continuous data streams. This transformation significantly reduces interpretive costs, lowers negotiation friction during performance disputes, and enhances the timeliness of corrective actions. As a result, contracts gradually acquire a "self-enforcing" characteristic supported by data monitoring and rule-based triggers, and in certain scenarios, this even gives rise to early forms of algorithm-supported governance within investment and financing relationships.

4. Corporate Investment and Financing Contract Governance Strategies Based on the Universality of Data Assets

4.1. Strengthening the Management and Sharing of Data Assets

In the course of enterprise digital transformation, data has evolved from a supplementary resource into a critical production factor, and its governance capability now directly influences the stability, transparency, and efficiency of contractual relationships in investment and financing activities. Establishing a systematic data asset management framework requires coordinated support from metadata standardization, clear data ownership mechanisms, and rigorous data quality verification processes. Forward-looking enterprises have introduced organizational solutions such as appointing Chief Data Officers (CDOs) to coordinate cross-departmental data governance, while implementing master data management systems to achieve unified coding, standardized classification, and dynamic updates for customer, financial, and operational datasets. These measures effectively eliminate the persistent "data silo" phenomenon that previously hindered comprehensive information integration.

A high-end manufacturing group, after integrating its ERP and MES systems, was able to synchronize real-time production data with investment and financing evaluation models. This integration reduced assessment errors related to capacity utilization and cost structures by more than 40%, enabling more accurate capital allocation decisions and improving the reliability of contractual risk evaluation. At the same time, data openness in external collaboration has gradually become institutionalized. Key supply chain enterprises are connecting upstream and downstream partners to industrial internet platforms, enabling trusted data flows for orders, logistics, and payments through standardized API interfaces while ensuring privacy compliance and operational transparency. These practices demonstrate that data asset interoperability depends not only on technical integration but also on its deep embedding within organizational governance structures, thereby fostering a sustainable ecosystem for data collaboration across multiple stakeholders.

4.2. Improving the Contract Design Mechanism

Traditional investment and financing contracts largely rely on historical financial statements and static projections, which are often insufficient to capture the dynamic

value evolution of enterprises operating in rapidly changing markets. The introduction of universal data assets enables a process-oriented restructuring of contractual terms. In practical settings, investment institutions are increasingly incorporating real-time data streams into performance evaluation clauses, using high-frequency operational metrics—such as monthly active user growth rates, inventory turnover ratios, and accounts receivable cycles—as valuation adjustment triggers instead of relying solely on single net profit commitments.

During its Series B financing stage, a biopharmaceutical enterprise reached an agreement with investors to disburse funds in phases according to measurable progress indicators, including clinical trial enrollment rates and the degree of integration with drug traceability databases. This arrangement significantly reduced disputes related to contract fulfillment by linking capital release conditions directly to verifiable operational data. Such contractual innovations rely on consensus regarding data standards and tamper-resistant data collection pathways, often supported by distributed ledger-based evidence storage and third-party data verification mechanisms. In this context, contractual texts are evolving from closed legal narratives into hybrid agreements that combine "rule definitions + data sources," enabling more flexible, responsive, and context-sensitive allocation of rights and obligations. This transformation reflects a shift in contractual logic from "post-event accountability" toward "in-process regulation and monitoring."

4.3. Strengthening Contract Supervision and Evaluation

The improvement of contract execution efficiency is fundamentally rooted in the establishment of continuous monitoring capabilities supported by universal data assets. By leveraging industry-wide data indicator systems, investors can construct multi-dimensional performance dashboards that provide penetrating insights into enterprise operations throughout the contract lifecycle. Practical experience indicates that equipment manufacturing enterprises adopting industrial internet identification resolution systems can automatically capture key operational data—such as equipment uptime, failure downtime rates, and maintenance cycles—for financing projects and generate real-time compliance deviation alerts. This reduces the manual verification workload in post-loan management by nearly 60% and enhances the timeliness of corrective interventions.

In addition, the application of advanced analytical tools further enhances the objectivity of contract evaluation. Natural language processing algorithms can rapidly parse unstructured information disclosed by enterprises, cross-verify it with structured business data, and identify potential inconsistencies or signal deviations. This data homogeneity-based supervisory paradigm transforms contract evaluation from periodic audits into routine governance embedded within everyday business processes. As a result, a closed-loop control mechanism characterized by "data-driven monitoring, dynamic feedback, and intelligent adjustment" gradually emerges, significantly improving the resilience and adaptability of investment and financing contract governance.

5. Discussion

The findings of this study highlight that the universality of data assets is not merely a technical feature but a structural force that reshapes the institutional foundations of corporate investment and financing contract governance. From a governance perspective, data assets with high interoperability, semantic consistency, and reusability enable contracts to evolve from static legal instruments into dynamic coordination mechanisms embedded within digital operational environments. This transformation redefines how trust is established, how risk is assessed, and how performance is monitored throughout the lifecycle of contractual relationships.

One key insight emerging from the analysis is that data asset universality reduces reliance on subjective interpretation and replaces it with standardized, verifiable information exchange. When enterprises and investors share access to consistent data

sources, negotiation costs decrease, risk perception becomes more aligned, and the potential for opportunistic behavior is significantly curtailed. In this sense, data universality serves as a technical foundation for institutional trust, bridging the long-standing gap between legal contract design and real operational behavior. Contracts are increasingly supported by continuous data flows that provide objective references for adjustment and enforcement, rather than depending solely on ex-post evaluation or reputational constraints.

At the same time, the study reveals that the effectiveness of data-driven governance is closely linked to the maturity of enterprise data management systems and the degree of cross-organizational collaboration. Without standardized metadata structures, unified coding systems, and reliable data quality assurance mechanisms, the potential value of data universality cannot be fully realized. Therefore, the transformation of contract governance depends not only on technological tools but also on organizational adaptation, process redesign, and ecosystem-level coordination among supply chain partners, financial institutions, and digital platforms.

Another important implication is that data assets introduce new possibilities for adaptive contract design. Traditional contracts often struggle to address dynamic changes in enterprise performance or market conditions. By embedding high-frequency operational indicators into contractual clauses, parties can implement flexible adjustment mechanisms based on real-time data triggers. This approach reduces disputes related to ambiguous interpretation and enhances the responsiveness of contractual arrangements to actual business performance. Consequently, contracts gradually acquire a self-adjusting characteristic supported by data feedback loops.

However, this transformation also introduces new challenges. The dependence on standardized data exchange raises concerns regarding data ownership, privacy protection, and the allocation of responsibility for data accuracy. If data quality is compromised or data interfaces are not securely managed, the reliability of contract governance mechanisms may be weakened. Therefore, effective governance strategies must balance openness and control, ensuring that data sharing occurs within well-defined technical and organizational boundaries.

Overall, the discussion underscores that data asset universality provides both opportunities and constraints for corporate investment and financing contract governance. Its successful application requires a comprehensive framework that integrates technological interoperability, organizational governance, and contractual innovation.

6. Conclusion and Outlook

6.1. Research Findings

The universal applicability of data assets is fundamentally reshaping the governance logic of corporate investment and financing contracts. Theoretical analysis combined with multi-case observations demonstrates that highly versatile data assets significantly mitigate information opacity in principal-agent scenarios by enhancing information comparability and system interoperability across different stakeholders. In smart manufacturing enterprises and digital platform companies, standardized data interfaces enable synchronized mapping of financial performance indicators and operational behaviors, embedding contractual terms into mechanisms that are triggered and adjusted through real-time data signals.

For example, abnormal fluctuations in accounts receivable turnover ratios can automatically activate credit enhancement requirements, while sustained equipment utilization rates below predefined thresholds can trigger risk reassessment procedures. This "rules-data" linkage structure reduces moral hazard and encourages both parties to shift from adversarial negotiation patterns toward collaborative governance based on shared data consensus. Contract execution no longer depends primarily on periodic disclosures, written reports, or manual audits. Instead, it increasingly relies on trusted

data streams generated through industrial internet identifier resolution systems and tamper-resistant evidence storage technologies, allowing continuous verification of contract fulfillment status.

The observed improvement in governance efficiency originates from the transformation of data resources from fragmented accumulation into institutionalized circulation. Enterprises are prompted to redesign their data asset management frameworks, incorporating standardized data sharing mechanisms directly into the core structure of contract design. As a result, a new governance paradigm gradually emerges, characterized by shared data origins, co-governance of rules, and shared risk-bearing mechanisms supported by verifiable data evidence.

6.2. Research Perspectives

Future research on measuring data asset universality requires breakthroughs beyond the static limitations of existing indicators and should move toward establishing a dynamic evaluation system encompassing semantic consistency, interface compatibility, cross-domain call frequency, and data reuse intensity. Introducing complex network analysis methods may help characterize the flow topology of data elements in industrial chain collaboration and identify data spillover effects generated by key node enterprises.

To address industry heterogeneity, further attention should be devoted to typical application scenarios such as compliant clinical data circulation in the biomedical field and traceability data ownership confirmation in agricultural supply chains based on Internet of Things technologies. These scenarios provide opportunities to refine differentiated governance approaches and validate the adaptability of data-driven contract mechanisms across sectors.

Additionally, integrating institutional environment variables into the analytical framework can help explore how data property registration systems, industry standard enforcement, and digital infrastructure maturity influence contractual efficiency. Such research may reveal the complementary relationship between institutional frameworks and market-oriented allocation of data elements, offering deeper insights into how data asset universality can sustainably support innovation in corporate investment and financing governance.

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