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Next-Generation Financial Transaction Informatization: From "Tool Empowerment" to "Intelligent Decision-Making"

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Abstract

The global financial transaction informatization is currently at a critical transition period towards "intelligent decision-making," with "data silos," "capability disconnections," and "path ambiguity" forming the core bottlenecks of the industry. A 2023 survey of global asset management institutions revealed that only 23% of the institutions have completed the transformation to intelligent decision-making, while the rest remain at the basic tool automation stage. This study employs a mixed research design of analytic hierarchy process (AHP), entropy weight method, event study method, and panel data regression to construct a three-dimensional dynamic evolution model of "technology maturity-business integration-decision-making contribution." It delineates a four-stage evolution path and quantifies the characteristics, revealing the catalytic effect of dual-domain capability integration and defining the critical threshold for intelligent decision-making dominance. The findings indicate that dual-domain integration can shorten the informatization upgrade cycle by 38%; "data sharing rate ≥80%, AI model out-of-sample accuracy ≥85%, and cross-departmental collaboration efficiency ≥75%" are the necessary conditions for transitioning from "intelligent assistance" to "decision-making dominance." This study fills the academic gap in "dual-domain collaborative evolution," providing a quantifiable practical guide for the digital transformation of financial institutions, with both theoretical and practical significance.

Keywords: financial transaction informatization, dynamic evolution model, dual-domain integration, intelligent decision-making, critical threshold, digital transformation, quantitative indicator system, insurance asset management, mutual funds, transformation path, AI financial applications, trading performance

1. Introduction

1.1 Research Background and Industry Pain Points

Global financial transaction informatization has gone through three stages of development: "basic electronicization-technology penetration-intelligent decision-making exploration." Influenced by regional development imbalance, institutional size differences, and cognitive level differentiation, a tiered pattern of "23% top-tier leapfrogging, 45% collaborative optimization, and 32% tool

empowerment" has emerged, with the misalignment between technology investment and actual returns becoming increasingly prominent (Davenport, T. H., & Short, J. E., 1990). The industry pain points are concentrated in the following areas: the data sharing rate is only 35%, and data silos cause medium-sized mutual funds to manually migrate data across six systems, with instruction response times reaching up to 4 hours; capability disconnections result in an AI risk control misjudgment rate as high as 30%, making it difficult to balance efficiency improvement and compliance control; the lack of a unified evolution framework leads to a 65% failure rate for small and medium-sized institutions that blindly follow the transformation paths of top-tier institutions, with high trial-and-error costs. The characteristics of insurance asset management ("large funds, long cycles, low volatility") and mutual funds ("multi-strategy, cross-market, high turnover") form a natural complementarity, providing an excellent testing ground for solving industry dilemmas.

Table 1.

Index	Value	Explanation
Data sharing rate	35%	Global industry average
Cross-system manual migration	6 sets/day	Due to the lack of integration of the middleware
Instruction response time	4 hours	Including verification, reconciliation, and manual review

1.2 Literature Review and Academic Gaps

Existing literature on the technological evolution of financial transaction informatization mostly follows a three-stage description of 'tool automation-deep penetration-intelligent decision-making,' but it is often limited to single-case studies and qualitative analysis, lacking a systematic collation of the complete evolution chain and failing to form a quantifiable performance attribution system. General frameworks such as Gartner's maturity curve and Nolan's model neglect the unique attributes of financial transactions ("high frequency, high compliance, high real-time"), resulting in insufficient adaptability; while bank-oriented models from BCG and McKinsey focus on macro customer service narratives and fail to delve into the dynamic coupling mechanism of the entire transaction process. More critically, the academic community has long studied insurance asset management and mutual funds separately, with the former focusing on "large funds, long cycles" risk control digitalization and the latter on "multi-strategy, high turnover" efficiency improvement. The synergistic effect of "risk control + efficiency" lacks empirical support, and single-market samples from Europe and America cannot explain the dual-track system and strong compliance characteristics of the Chinese market, leaving the dual-domain integrated evolution model in an academic void.

1.3 Research Positioning and Core Questions

This study aims to construct a "quantifiable, diagnosable, and navigable" dynamic evolution model for financial transaction informatization, providing institutions with a one-stop solution of "stage diagnosis-path planning-threshold control." The core research focuses on three key questions: First, how to accurately divide the evolution stages and clarify the quantifiable characteristics through the three-dimensional coordinates of "technology maturity-business integration-decision-making contribution"; second, the coupling mechanism of insurance asset management's "large-scale risk control capability" and mutual funds' "high-frequency trading efficiency," and its quantifiable impact on the informatization leapfrogging speed and effect boundary; third, how to define the critical threshold for the transition from "intelligent assistance" to "decision-making dominance," and how to design institutional mechanisms to smoothly cross this inflection point, increasing the transformation success rate from the industry average of 35% to over 65%, thereby filling the academic gap and outputting a practical paradigm.

2. Theoretical Model Construction

2.1 Model Construction Logic and Core Assumptions

Based on the underlying logic that "technology serves business, and business drives decision-making," the practical trajectory is abstracted into a four-level evolution ladder of "tool-collaboration-assistance-decision-making," and the construction process strictly follows three principles: the principle of practical orientation, where all stage thresholds and

quantitative indicators are derived from real business pain points and implementation experience to ensure the model's direct applicability; the principle of integration, which includes the three-dimensional coordinates simultaneously to avoid structural blind spots caused by a single-dimensional perspective; and the principle of dynamic evolution, which depicts the positive flywheel effect of technological iteration, process optimization, decision-making upgrade, and dual-domain integration, clearly presenting the leapfrogging path. Based on the above logic, this study proposes three assumptions: The evolution of financial transaction informatization exhibits a stepwise upward characteristic, with statistically significant differences in the mean values of the three-dimensional indicators across stages; dual-domain capability integration can generate a complementary lever effect, increasing the annual average growth rate of the three-dimensional indicators by more than 50%, compressing the evolution cycle; only when the three-dimensional indicators simultaneously cross the critical thresholds (technology maturity ≥0.75, business integration ≥0.68, decision-making contribution ≥0.62), can the leapfrogging from "intelligent assistance" to "decision-making dominance" be achieved, and any single-dimensional shortcoming will lead to leapfrogging failure.

2.2 Three-Dimensional Indicator System Design and Calculation Methods

Technology maturity focuses on the underlying support capability of technology for transactions, using the entropy weight method for weighting, with the number of annual upgrades measuring the iteration speed, the coverage of AI/algorithms in 12 core scenarios measuring the application depth, and the annual fault-free operation rate measuring stability, with data sourced from upgrade records, maintenance logs, and IT special reports. Business integration measures the adaptability of technology to transaction processes, organizational structure, and market environment, using a hybrid weighting method of analytic hierarchy process and entropy weight method, with cross-departmental data sharing rate breaking down data silos, transaction instruction end-to-end automation rate reducing manual dependence, and cross-market instruction average response time improving collaboration efficiency, with data derived from process logs and system statistical reports. Decision-making contribution assesses the value transition of technology from "assistance" to "dominance," using a hybrid weighting method, with the excess return ratio of intelligent systems measuring profit contribution, risk control correct warning rate measuring decision-making accuracy, and the relative time reduction ratio of intelligent decision-making compared to manual operations measuring efficiency, with data sourced from performance reports, risk logs, and decision-making trace records. The three-dimensional indicators are organically unified, not only depicting the evolution process but also providing the core scale for threshold determination and leapfrogging simulation.

2.3 Four-Stage Evolution Model and Quantitative Characteristics

Cluster analysis shows that financial transaction informatization presents a clear four-level evolution ladder: the Tool Empowerment 1.0 stage, dominated by "single-point electronicization" applications, with system annual upgrades ≤2 times, AI scenario coverage ≤30%, data sharing rate ≤30%, collaboration timeliness ≥4 hours, and only basic technical positions set at the organizational level, with performance improvement relying on manual cost savings. The RPA clearing project I led during my tenure at Fuguo Fund, which reduced manual workload by 60% through automation, is a typical practice of this stage; the Collaborative Optimization 2.0 stage, which breaks down system barriers through interface platforms and standardized SOPs, with annual upgrades of 2-4 times, scenario coverage of 30%-60%, data sharing rate and automation rate both reaching 30%-60%, collaboration timeliness shortened to 2-4 hours, and cross-departmental special groups gradually established. The cross-market SOP standardization I promoted at Guotai Fund, which increased the transaction success rate from 72% to 95%, fits the characteristics of this stage; the Intelligent Assistance 3.0 stage, with AI warnings and algorithmic trading deeply embedded in business operations, with annual upgrades of 4-6 times, scenario coverage of 60%-80%, data sharing rate and automation rate both reaching 60%-80%, collaboration timeliness of 0.5-2 hours, and the formation of digital special teams (Author Anonymous, 2022). The AI market warning system I implemented at Century

Insurance Asset Management, which controlled the risk misjudgment rate within 0.5%, is the core practice of this stage; the Decision-Making Dominance 4.0 stage, with the full formation of intelligent configuration centers and dynamic risk control systems, with annual upgrades ≥6 times, scenario coverage ≥80%, fault-free rate ≥99.9%, data sharing rate and automation rate both ≥80%, full market collaboration time ≤0.5 hours, and intelligent decision-making profit contribution ≥70%. The pilot of the hundred-billion-level asset intelligent configuration system I led at Century Insurance Asset Management, which increased excess returns by 26.7%, marks the ultimate leap from "tool support" to "decision-making hub."

2.4 Dual-Domain Integration's Leapfrogging Catalytic Mechanism

The core of dual-domain integration is to align the capability granularity of insurance asset management's "large funds, stable risk control" with mutual funds' "high turnover, fast collaboration," forming an acceleration flywheel of "risk control threshold reduction, efficiency iteration increase, and data sample expansion." On the one hand, the "asset admission firewall" system I built at Century Insurance Asset Management exports limit templates to mutual funds, achieving compliance risk pre-positioning and enabling intelligent decision-making to operate efficiently within precise risk thresholds. On the other hand, the "cross-border trading integration system" I led in developing at Guotai Fund, which empowers insurance asset management with high-frequency clearing and cross-market matching technologies, compresses the liquidation cycle of third-party entrusted assets from T+3 to T+1, providing high-density practice scenarios. Three transmission paths are thus formed: risk control capability first defines the safety boundary for intelligent decision-making, solving the "dare not use" concern; high-frequency trading scenarios provide a continuous optimization environment for AI models, increasing the system's annual upgrade frequency by 1.6 times; dual-domain data deep integration expands the AI model training set size by four times, increasing risk identification accuracy by 12 percentage points. Quantitative analysis confirms that dual-domain institutions take an average of 15 months to move from stage 1.0 to 4.0, compared to 24.2 months for single-domain institutions, shortening the cycle by 38%; the annual average growth rate of the three-dimensional indicators reaches 13%-15%, compared to 9.0% for single-domain institutions, increasing by 50%; the leapfrogging success rate from stage 3.0 to 4.0 increases from 65% to 92%, with dual-domain integration becoming the key support to break the "transformation death valley."

Table 2.

Index	Single-domain Average	Dual-domain Average
Time taken for 1.0→4.0 phase	24.2 months	15.0 months
Annual average growth rate of three-dimensional indicators	9.0%	13.5%
Success rate of 3.0→4.0 leap	65%	92%

3. Empirical Analysis

3.1 Data Sources and Sample Selection

The core samples include data from Guotai Fund in the mutual fund sector (95 funds, 326 observations) from 2012 to 2017, and data from Century Insurance Asset Management in the insurance asset management sector (360 billion in assets, 123 product accounts, 450 observations) from 2017 to 2024 (Luftman, J. N., 2003). Supplementary samples include early data from Fuguo Fund and Tian'an Insurance Asset Management (210 observations). The core samples cover 128 core transaction nodes, three types of markets, and seven major asset classes, with a time span of 18 years, ensuring representativeness and completeness. To verify the model's universality, data from 20 leading asset management institutions' transformation cases (180 observations) were collected, and public data from industry white papers and regulatory compliance reports were used as external validation references.

3.2 Research Methodology Design

To verify the model's reliability and

leapfrogging logic, a four-layer econometric testing system was designed: descriptive statistics and one-way ANOVA were used to verify the rationality of stage division; the three key upgrades I led were used as natural experiments, with event windows set (6 months before to 12 months after the event) to quantify leapfrogging effects; a panel data of institutions-years from 2008 to 2024 was constructed, with a dual-domain integration dummy variable as the core explanatory variable, using a fixed-effects model to test the catalytic coefficient; and the critical threshold for the leapfrogging from stage 3.0 to 4.0 was estimated using regression discontinuity, verifying the "three-dimensional simultaneous achievement" hypothesis and providing a 95% confidence interval.

3.3 Empirical Results and Analysis

The empirical results verify the model's rationality and leapfrogging logic. Descriptive statistics show a clear ladder feature, with the mean values of the three-dimensional indicators increasing progressively in each stage and standard deviations all below 0.06. One-way ANOVA is significant at the 1% level. The three event window analyses show that the launch of the data platform shortened the instruction response time by 62.5% and increased excess returns by 26.2%; the implementation of the AI warning system further shortened the response time by 46.7% and increased excess returns by another 27.4%; the intelligent decision-making pilot compressed the response time to 0.3 hours and increased excess returns by another 26.7%, with cumulative cross-departmental communication costs reduced by 75%. Panel regression results show that the coefficients of the dual-domain integration dummy variable for the three-dimensional indicators are 0.15, 0.12, and 0.18, respectively (all significant at the 1% level), which can increase the annual average growth rate of the three-dimensional indicators by an additional 5 percentage points and shorten the upgrade cycle by 38%. Regression discontinuity estimates the critical thresholds: data sharing rate ≥80%, AI model out-of-sample accuracy ≥85%, cross-departmental collaboration efficiency ≥75%. When all three dimensions meet the standards, the leapfrogging success rate reaches 92%, and if any one indicator is missing, the success rate plummets to below 45%.

Table 3.

Event Milestone	**Change in Instruction Response Time**	**Change in Excess Return**	**Change in Cross-department Communication Cost**
Data middleware goes live	Reduced by 62.5%	Increased by 26.2%	Initial decrease
AI early warning system implemented	Further reduced by 46.7%	Further increased by 27.4%	Continuous decrease
Intelligent decision-making pilot	Compressed to 0.3 hours	Further increased by 26.7%	Cumulative decrease of 75%

4. Conclusions and Future Work

4.1 Core Research Conclusions

The evolution of financial transaction informatization exhibits a stepwise upward trend, with clear quantifiable characteristics for the three-dimensional indicators in each of the four stages, and significant differences between stages. Dual-domain capability integration is a key catalyst for leapfrogging, with the "risk control + efficiency" complementary effect increasing the annual average growth rate of the three-dimensional indicators by 5 percentage points, shortening the upgrade cycle by 38%, and increasing the transformation success rate by 27%. The critical threshold for transitioning from "intelligent assistance" to "decision-making dominance" is data sharing rate ≥80%, AI model out-of-sample accuracy ≥85%, cross-departmental collaboration efficiency ≥75% (Zhou, Z. L., 2002), and the simultaneous achievement of all three dimensions is a necessary condition for successful leapfrogging. Digital transformation performance is significantly positively correlated with the three-dimensional indicators, with decision-making contribution having the most significant impact on excess returns, while technology maturity and business

integration serve as important prerequisites.

Table 4.

Three-dimensional Indicator	Critical Value	All Three Dimensions Meet the Standard	Any One Missing
Data sharing rate	≥80%	Leap success rate 92%	<45%
AI out-of-sample accuracy	≥85%	As above	As above
Cross-department collaboration efficiency	≥75%	As above	As above

4.2 Theoretical Contributions

This study constructs a three-dimensional dynamic quantification model of "technology maturity-business integration-decision-making contribution" for financial transaction informatization, clarifying the operable indicators for the four-stage evolution for the first time. It fills the gap in the evolution theory of the financial transaction sub-field, overcoming the shortcomings of existing models that "focus on technology but neglect decision-making" and "have more static descriptions and fewer dynamic quantifications." Moreover, it reveals the leapfrogging catalytic mechanism of dual-domain capability integration, quantifies its impact on the upgrade cycle and transformation success rate, provides a new theoretical perspective for cross-domain digital transformation research, enriches the research system of financial digital transformation, defines the critical threshold for intelligent decision-making dominance, constructs a complete logic chain of "stage diagnosis-threshold breakthrough-leapfrogging realization," perfects the quantification evaluation system of digital transformation, and offers a replicable quantification analysis framework for follow-up research.

4.3 Practical Implications

4.3.1 Implications for Asset Management Institutions

Asset management institutions should adopt a "stage diagnosis-path matching" strategy, using the three-dimensional indicators to quickly determine their transformation stage and avoid blindly following trends and leapfrogging transformations. For example, institutions at the Tool Empowerment 1.0 stage should prioritize building a basic data platform instead of directly launching intelligent decision-making systems. They should actively promote dual-domain capability integration, with insurance asset management institutions borrowing high-frequency trading technologies from mutual funds to improve trading efficiency, and mutual funds introducing large-scale risk control systems from insurance asset management to reduce compliance risks. They need to focus on breaking through critical thresholds, prioritizing the construction of data sharing platforms and AI model optimization, while establishing cross-departmental collaboration mechanisms to lay the foundation for leapfrogging to the decision-making dominance stage. They should also establish a dynamic evaluation mechanism, conducting three-dimensional indicator assessments quarterly and adjusting transformation strategies in response to changes in market environment and regulatory policies to ensure the flexibility and adaptability of the evolution path.

4.3.2 Implications for Fintech Companies

Fintech companies should develop modular and iterative transformation solutions based on the characteristics of the four stages of evolution: providing basic automation tools for institutions at the Tool Empowerment stage; offering data interface platforms and standardized SOP management systems for those at the Collaborative Optimization stage; providing AI market warning and algorithmic trading engines for those at the Intelligent Assistance stage; and offering intelligent decision-making hubs and cross-institution collaboration platforms for those at the Decision-Making Dominance stage, to meet the differentiated needs of institutions at different stages.

4.3.3 Implications for Regulatory Authorities

Regulatory authorities should refer to the critical threshold standards defined in this study to formulate differentiated digital transformation regulatory policies: for institutions at the Tool

Empowerment and Collaborative Optimization stages, focus on regulating basic compliance risks; for those at the Intelligent Assistance and Decision-Making Dominance stages, establish an "intelligent decision-making filing system," requiring institutions to disclose the decision-making logic and risk control measures of AI models, encouraging innovation while preventing systemic risks.

4.4 Research Limitations and Future Work

4.4.1 Research Limitations

The study focuses on dual-domain leading institutions in the Chinese market, and the applicability of the model to small and medium-sized institutions, which have differences in business scale, asset types, and technology investment compared to leading institutions, still needs further verification. The study does not fully consider the impact of extreme market environments on the evolution model, and the indicator changes and leapfrogging paths under extreme conditions need further exploration. Additionally, the model does not incorporate the impact of frontier technologies such as blockchain and quantum computing, which require more in-depth research on their empowerment of the decision-making dominance stage.

4.4.2 Future Work

Future research will expand the sample scope to include small and medium-sized institutions and international market cases to test the universality of the model and construct differentiated evolution path guidelines. Introduce moderating variables, considering extreme market environments and frontier technology applications as moderating variables, to analyze the impact mechanisms of external shocks on evolution paths and improve the dynamic adaptability of the model. Deepen application research by developing a transformation ROI calculation tool based on this model and creating an integrated digital platform for "stage diagnosis-path planning-threshold monitoring" to enhance practical implementation. Expand research boundaries by exploring the synergistic effects of dual-domain integration and financial regulatory technology, and analyzing the application of the evolution model in emerging scenarios such as cross-border trading and green finance.

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