International Journal of Economics, Finance and Management Sciences
2024, Vol. 12, No. 6, pp. 403-432
https://doi.org/10.11648/j.ijefm.20241206.16

Research Article

In - Depth Research on User Profiles in Securities Companies Under the Digital Background

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Abstract

Based on systematically grasping the development, integration, and application of relevant technologies such as the industrial value - chain model in the securities industry, the securitization of real - industry assets and their flow patterns, and regulatory and risk - prevention - and - control models, this paper conducts in - depth research on user profiles centering on the main path of securities business and product innovation. Aiming at the modeling problems of business - behavior - level homomorphism consistency and business - network - isomorphy consistency in business network systems, the concept of business - network profiles is originally proposed. That is, taking the description image of user profiles as an index, equivalent classification analysis of the description image of business - network profiles is carried out. According to the behavior equivalence class and behavior - homomorphism consistency, the user - network associations and interaction relationships are identified, and the user - association - action - and - influence - network profile is established, thereby obtaining more accurate and scientific data analysis and business applications. Finally, from the perspectives of algorithms and modeling, the structural model frameworks of the correlation relationships, interaction relationships, and influence relationships between user profiles and business - network profiles are discussed one by one, and the extended user profiles, business - network profiles, and their application results are presented.

Keywords

Digital Management, Securities Companies, User Profiles, Business - Network Profiles

1. Introduction

The term "user profile" is a commonly employed expression. Within the industry, greater emphasis is placed on user tags and the tag system. The tag system of user profiling rests upon the indicator system and interfaces with operational strategies. It serves as the bedrock not only for personalized recommendation but also for digital operation.

How can one concretize the comprehension of users? This entails exploring users' footprints, instituting market segmentation and user clustering, and attaining refined user services (including recommendation, search, precision marketing, targeted placement, risk control, quantitative and qualitative analysis, as well as digital operational user analysis, etc.). Moreover, how can risks be averted to bring about a win-win scenario for both the company and its users? All of these objectives are to be accomplished through the integration of the user profile with the business network profile.

Specifically, by taking the descriptive representation of the user profile as an index, an equivalent classification analysis

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Received: 14 October 2024; **Accepted:** 18 November 2024; **Published:** 29 November 2024

of the descriptive representation of the business network profile is carried out. Based on behavior equivalence classes and behavior homomorphism consistency, the associations and interaction relationships within the user network are identified, thereby establishing the user association, interaction, and impact network profile. This, in turn, enables the acquisition of more precise and scientific data analysis and business applications.

The combination of the user profile and the business network profile allows for a comprehensive and profound exploration from an alternative perspective of the correlative relationships and operational principles among the descriptive representation of the user profile, the descriptive representation of the business network profile, and risk control.

2. Conventional Practices for User Profiling in Securities Companies

2.1. Conventional Practices for User Profiling

User profiling can assist securities companies in precise marketing, optimizing customer service, facilitating product research, development and innovation, providing support for strategic decision - making, and strengthening risk management. The conventional practices are as follows:

1) Data collection. Relevant data of customers are collected through multiple channels, such as customer surveys (in the form of questionnaires, interviews, etc.), CRM (CRM: Customer Relationship Management) systems (basic information, trading records, etc. recorded in the customer relationship management system), securities trading platform data (trading behavior, holding positions, etc.), and social media data (customers' statements related to securities on social platforms, securities topics they follow, etc.).
2) Data cleaning and integration. The collected data are cleaned to remove duplicate, incorrect or invalid data, and the data from different channels are integrated according to customer IDs (ID: Identification Number)or other identifiers for subsequent analysis.
3) Data analysis. Analyze various aspects of customer information. This includes basic information (age, gender, region, occupation, etc.) to analyze the distribution of customers in different age groups, genders, and regions; trading behavior (trading frequency, trading amount, types of securities bought and sold, etc.) to understand customers' trading habits and risk preferences; investment preferences (such as preferred industry sectors, investment styles whether long - term value investment or short - term trading, etc.); asset status (customers' total assets, available funds, etc.); customer feedback (evaluations, opinions and suggestions on the services of securities companies, etc.).
4) Profile construction. Based on the results of data analysis, customer information is integrated and classified to form user profiles containing various aspects of information such as customers' basic attributes, trading behavior characteristics, investment preferences, and risk - bearing capacity. User profiles can be presented in the form of text descriptions, charts, visualizations, etc., making them more intuitive and clear.
5) Profile application. Apply the constructed user profiles to various businesses, such as for precise marketing (recommending suitable securities products or services to different types of customers), customer service (providing personalized services and suggestions according to customer profiles), risk management (evaluating customers' risk - bearing capacity and taking corresponding risk control measures), product research and development (developing new securities products according to customer needs and preferences), etc.
6) Update and maintenance. As time passes and the market environment changes, customers' situations will also change. Therefore, it is necessary to regularly update user profiles to maintain their effectiveness and usability. At the same time, adjust and improve user profiles according to customer feedback and market changes [1, 7].

2.2. Limitations of Existing User Profiles

Existing user profiles generally have the following limitations:

1) Difficulty in comprehensively covering business requirements Existing user profiles mainly focus on aspects such as customers' personal attributes, trading behaviors, and investment preferences. The business of securities companies is complex and diverse, and user - oriented profiles alone are difficult to deeply understand the specific requirements in different business scenarios. For example, in investment banking business, the financing needs and listing plans of corporate clients are vastly different from the focus of individual investor profiles, and existing user profiles cannot provide precise support for these businesses. For some emerging businesses, such as fintech - driven intelligent investment advisors and quantitative trading, existing user profiles are unable to adapt and capture changes in relevant user behaviors and needs in a timely manner, resulting in a lack of effective decision - making basis when expanding new businesses.
2) Lack of in - depth business insights User profiles usually focus on the individual customer level and have limited understanding of the key links and pain points in the overall business processes of securities companies. For example, in brokerage business, it may only focus on customers' trading frequency and asset size, while ignoring the impact of business - related factors such as system stability and order - processing effi-

ciency during the trading execution process on customer experience. Different business segments in securities companies often have mutual influence and synergy, but existing user profiles are difficult to reveal these relationships and cannot conduct in - depth analysis of the correlations and synergy effects between businesses, which is not conducive to formulating comprehensive business development strategies.

3) Mismatch between static nature and dynamic business changes As the market environment, regulatory policies, and industry competition are constantly changing, the business of securities companies is also continuously evolving. Existing user profiles are often not updated in a timely manner and are difficult to dynamically reflect the impact of business changes on customer behaviors and needs. For example, when there are major policy adjustments in the market, customers' investment strategies and risk preferences may change significantly, but user profiles may not be able to quickly capture these changes, resulting in a lag in marketing strategies and service provision.

3. Proposal of Business Network Profile

3.1. Reasons for the Introduction of Business Network Profile

The complexity and diversity of securities companies' business can no longer be supported by general user profiles in terms of business requirements. Business network profiles can meet the following requirements:

1) Gain in - depth understanding of business characteristics. Different businesses have different processes, risks, profit characteristics, etc. Through business network profiles, securities companies can clearly grasp the essence of each business, such as the trading mode and characteristics of brokerage business, the operation process and key links of investment banking business, etc., so as to better allocate resources and make management decisions, and formulate targeted operation strategies and optimize business processes to improve business efficiency and quality.
2) Accurately position business directions. It helps securities companies to clarify which businesses are core businesses, which ones have high growth potential, and which ones need to be adjusted or expanded. For example, by analyzing the business network profile, if it is found that a certain type of innovative business has strong market demand and broad development prospects, the company can increase its investment and layout in this business, seize the market opportunity in advance, create new profit growth points for the company, and adapt to the constantly changing market environment and industry competition situation.
3) Meet compliance and risk management requirements. The securities industry is strictly regulated, and different businesses face different risk types and regulatory standards. Business network profiles are dynamic profiles that can help companies clearly identify the risk points and compliance key points of each business, such as the market risk of self - operated business, the credit risk of asset management business, etc., and then establish corresponding risk prevention and control mechanisms and compliance management systems to ensure the company's stable operation under the premise of compliance and avoid significant losses to the company due to violations or risk out - of - control.
4) Business complexity requires more comprehensive profiles. The business of securities companies involves multiple fields and links, and it is necessary to have an in - depth understanding of customers' investment goals, risk - bearing capacity, trading habits, market sensitivity, etc. General user profiles usually only focus on customers' basic information and trading behavior and cannot meet the complexity requirements of securities companies' business.
5) Personalized needs require accurate profiles. Different customers have different investment needs and preferences, and customized services and products need to be provided according to customers's personalized needs. General user profiles are often too general to accurately grasp customers' personalized needs and are difficult to provide accurate service and product recommendations [10].
6) Business innovation requires forward - looking profiles. With the development of the market and the intensification of competition, securities companies need to continuously introduce innovative businesses and products to meet customers' needs and improve market competitiveness. General user profiles are often lack of forward - looking and cannot provide strong support for business innovation.

3.2. Functions Achieved by Business Network Profiles

1) Support Precise Business Decisions

Business network profiles can deeply analyze the characteristics, requirements, and development trends of different business segments, providing strong support for business decisions in securities companies. For example, for investment banking business, through business network profiles, one can understand the financing needs, competition situation, and regulatory requirements of different industries, thereby targeting the expansion of client resources and formulating business strategies.

It helps securities companies identify key success factors and risk points in the business. Through the analysis of business processes, market competition, and client feedback,

constructing business network profiles can clarify the advantages and disadvantages of each business link, providing guidance for risk management and business optimization [3].

2) Promote Business Synergy and Innovation

Business network profiles are helpful in discovering potential synergy opportunities among different businesses. By analyzing the client groups, business processes, and value - creation models of each business segment, one can find business intersections and cooperation spaces to realize resource sharing and complementary advantages. For example, combine the client resources of brokerage business with asset management business to provide clients with one - stop financial service solutions.

Stimulate business innovation. By deeply understanding the business status quo and market demand, business network profiles can provide inspiration and direction for the development of innovative businesses. For example, according to the needs of clients for convenient trading tools and personalized investment advice discovered in the business network profiles, develop an innovative intelligent trading platform or investment advisory service.

3) Improve Business Operational Efficiency

Business network profiles can help securities companies optimize business processes and improve operational efficiency. By analyzing bottlenecks and inefficient links in business processes, make targeted improvements and optimizations, reduce operational costs, and improve service quality. For example, in brokerage business, through business network profiles, if the problem of a cumbersome client account - opening process is discovered, the account - opening process can be simplified to increase the client conversion rate.

Provide a basis for resource allocation. According to the evaluation of the importance and development potential of different business segments by business network profiles, securities companies can rationally allocate human, financial, and technological resources to ensure the effectiveness and return on investment of resource input [4].

4) Integration of User Profiles and Business Network Profiles

Combining user profiles and business network profiles can achieve more comprehensive and precise client insights and business decisions. By integrating clients' personal information, behavioral characteristics, and business requirements, securities companies can provide clients with personalized financial service solutions while optimizing business layout and resource allocation.

For example, for a high - net - worth individual client, not only can his investment preferences and risk - bearing capacity be understood through user profiles, but also the possible business areas he may be involved in, such as wealth management and private banking business, can be analyzed by combining business network profiles, and a comprehensive financial service plan can be tailored for him, including asset allocation suggestions, exclusive investment product recommendations, and personalized client services.

5) Innovative Service and Product Development

Based on the complementary advantages of user profiles and business network profiles, the development of innovative services and products in securities companies can be promoted. By deeply understanding client needs and business characteristics and combining fintech means, more competitive financial products and services can be created.

For example, use the client behavior data in user profiles and the market trend analysis in business network profiles to develop an intelligent investment advisory service, which automatically provides clients with personalized investment portfolio suggestions according to their risk preferences and investment goals, and adjusts in real - time according to market changes. At the same time, combine the brokerage business requirements in business network profiles to provide clients with convenient trading channels and efficient order - execution services.

6) Data - Driven Business Optimization and Innovation

The construction and application of user profiles and business network profiles rely on a large amount of data support. By integrating multi - source data, including client trading data, market data, industry research reports, etc., and using data analysis and machine - learning techniques, the accuracy and practicality of the profiles can be continuously optimized, providing continuous impetus for business optimization and innovation.

For example, through in - depth analysis of user profile and business network profile data, discover the investment behavior patterns of clients and the changing trends of business needs in specific market environments. Based on these findings, securities companies can timely adjust business strategies, launch new products and services that meet market demands, and improve market competitiveness. At the same time, use data analysis techniques to monitor and optimize business processes to improve operational efficiency and service quality.

3.3. Frontier Technologies, Mathematical Models and Data Processing Methods Involved in Business Network Profiling

To carry out business network profiling, the following basic conditions need to be possessed and mastered:

1) Frontier Technologies Artificial Intelligence and Machine Learning: Deep - learning algorithms can be used to automatically extract features and patterns from a large amount of business data. For example, neural networks can be used to analyze complex business process data to identify potential risk patterns or business trends.

Natural Language Processing: For businesses involving a large amount of text data, such as research reports and news information, natural language processing techniques can be used for text classification, sentiment analysis, and topic

extraction to help understand and analyze business - related text information.

Blockchain Technology: Ensure the authenticity, integrity, and non - tamperability of business data, and has application potential in scenarios involving multi - party business cooperation and transaction data recording. For example, it ensures the security and reliability of transaction data in securities clearing and settlement business [2, 8, 11].

2) Mathematical Models

Cluster Analysis: Group or cluster similar businesses to discover the characteristics and rules of different types of businesses. For example, customers' trading behaviors can be clustered into different trading pattern groups according to trading characteristics.

Association Rule Mining: Used to discover the association relationships between different variables in business data, such as finding the potential associations between certain business operations and specific business results, providing references for business decision - making.

Regression Analysis: Can be used to predict business indicators, such as predicting future trading volumes and revenues based on historical business data, helping to formulate reasonable business goals and plans.

3) Data Processing Methods

Data Cleaning and Pre - processing: Clean the original business data, remove noise, outliers, and duplicate data, and perform pre - processing operations such as standardization and normalization to improve data quality and provide a reliable basis for subsequent analysis.

Feature Engineering: Extract and construct meaningful features from the original business data. For example, extract features such as trading frequency and trading amount fluctuation from trading data to better reflect the essential attributes of the business.

Data Fusion: Integrate business data from different data sources (such as internal business systems, external market data, etc.) to obtain more comprehensive and multi - dimensional business information, and comprehensively analyze data from all parties to fully depict the business situation.

4) Data Acquisition Channels

Internal Data: Securities companies themselves possess rich business data, including customer trading data, account information, and business process data. These data are an important basis for business network profiling and can be relatively easily obtained through internal data warehouses and business systems.

External Data: External data such as market quotation data, macro - economic data, and industry research reports can be obtained by cooperating with third - party data providers to supplement the deficiencies of internal data and enrich the dimensions of business network profiling. However, obtaining external data may face problems such as uneven data quality, data privacy, and security, and a strict data screening and security protection mechanism needs to be established.

5) Technical Conditions

Computing Capacity: With the development of cloud - computing technology, securities companies can use the powerful computing resources of cloud service providers to meet the requirements for large - scale data processing and complex model calculation in the process of business network profiling.

Data Storage: High - capacity and highly reliable data storage technologies can store and manage vast amounts of business data, providing data support for business network profiling.

Data Analysis Tools and Platforms: There are many mature data analysis tools and platforms available in the market. These tools and platforms provide rich functions and algorithms, which are helpful for securities companies to implement business network profiling. However, securities companies need to appropriately customize and optimize these tools and platforms according to their own business characteristics and requirements to better meet the requirements of business network profiling. Moreover, in terms of data security and privacy protection, technological means and management measures need to be continuously strengthened to ensure the safe and compliant use of data in the process of business network profiling.

In conclusion, in the context of the complex business of securities companies, the existing user profiles have certain limitations. The introduction of business network profiling can make up for these deficiencies and provide strong support for business decision - making, collaborative innovation, and operational efficiency improvement in securities companies. Through the complementary advantages of user profiles and business network profiles, data - driven business optimization and innovation can be achieved, and higher - quality and personalized financial services can be provided for customers.

4. Business Network Profiles in Securities Companies

What can be used to describe and express the data modeling of the business network systems in securities companies? Here, the expansion of user profiles, namely business network profiles, is proposed and further explored.

4.1. Basic Assumptions on Data Availability

It is assumed that securities companies can obtain users' basic information data and users' behavior data within a certain range, including users' form - filling information data, users' trading information data, users' social attribute information data, users' environmental attribute information data, etc. It is also assumed that there is a business value network within the products and services provided by securities companies to users, and this network can record its operational behavior information data during its operation process, including operation records of business nodes, rule control

records, time of business value network node task processes and stipulated task target records, users' requests for and feedback on accepting business, business network handling records, and information system logs of securities companies supporting business realization.

In addition, there are also supportive data and information obtained by securities companies through compliant third - party commercial databases or other means.

4.2. Basic Terms

4.2.1. User

Specifically refers to business users and potential business users of securities companies, which are divided into group users, individual users, and cluster users.

Business users of securities companies refer to customers who have established actual business relationships with securities companies. They are using various financial services and products provided by securities companies, such as conducting stock trading, purchasing funds, entrusting wealth management, etc.

Potential business users are groups that have not yet carried out business cooperation with securities companies at present but have a certain possibility of becoming business users in the future. This may include individuals who are interested in investment but have not yet taken action, or some enterprises or groups that have not yet chosen this securities company but have relevant needs.

Group users usually refer to large - scale enterprise groups or institutions. These users may have large - scale funds that need to be managed for investment and may involve multiple financial instruments and complex investment strategies. Their business needs are often more comprehensive and complex, which may include corporate financing, merger and acquisition restructuring consulting, employee stock ownership plans, etc.

Individual users are individual investors. Their investment scales and needs are relatively scattered and diverse, ranging from novice investors who are new to the investment field to experienced senior investors. Their investment goals may include asset appreciation, pension planning, children's education reserves, etc.

Cluster users are user groups that are relatively concentrated due to having certain common characteristics or needs. For example, practitioners in a specific industry in a certain area may have certain similarities in investment preferences and needs due to industry characteristics and geographical factors; or they may be followers of certain specific investment concepts, such as value - investment groups, growth - stock investment groups, etc.

4.2.2. User Network System

The users of securities companies are different groups or related individuals. Whether they are corporate users, individual users or clustered users, there are interconnections and interactions among them. Therefore, the market that the business of securities companies faces is a complex network system. Taking the basic deterministic attributes of users as the node identification attributes, a model of the complex network system of user behaviors can be established according to the classification of user behaviors, that is, the portrait of the homomorphism consistency model at the user network behavior level.

Corporate users are usually large enterprises or institutions. Their investment decisions and behaviors may have a significant impact on the market, and the investment strategies among different departments or subsidiaries within them may be interrelated.

Although individual users are relatively small in scale, their investment behaviors may be influenced by factors such as market public opinion and recommendations from relatives and friends, thus having indirect connections with other individual users.

Clustered users can be a group of people with similar investment goals or backgrounds, and their behaviors may show a certain degree of consistency.

Due to the interconnections and interactions among these users, a complex network structure is formed. The portrait of the homomorphism consistency model at the user network behavior level aims to capture the similar behavior patterns and common characteristics of users in the network. Through this model, the behavior trends of users can be better predicted, service strategies can be optimized, more precise marketing plans can be formulated, and risk management and compliance monitoring can be carried out more effectively.

4.2.3. Business

The business of a securities company is the product + service of the securities company and its supporting business process network.

The products of securities companies usually include, but are not limited to, the following:

1) Underwriting and sponsorship services for various types of securities, helping enterprises issue stocks, bonds and other securities for financing.
2) Different types of securities investment fund products to meet the diversified investment needs of investors.
3) Trading services for financial derivatives such as stocks, bonds, futures, and options.

The services of securities companies cover:

1) Provide investment consultation and advice for investors to help them make more sensible investment decisions.
2) Customer account management services, including account opening, fund custody, trading settlement, etc.
3) Customized services for high - net - worth clients or institutional clients.

The supporting business process network of a securities

company refers to a series of inter - related and co - operative processes and mechanisms constructed within the securities company in order to effectively provide these products and services:

1) Risk management processes, evaluating and controlling investment risks to ensure the safety of client assets and the stable operation of the company.
2) Compliance review processes to ensure that the company's business activities comply with laws, regulations, and regulatory requirements.
3) Information technology support processes to ensure the stable operation of the trading system, the safe storage and transmission of data.
4) Marketing and customer acquisition processes to attract new customers and maintain existing customer relationships.

4.2.4. Business Network System

The products and services provided by securities companies to users, along with their support processes, are governed and determined by an interconnected and interacting complex network system that exists within a network system composed of internal organizational network control, rule network control, responsibility network control, risk network control, and industry regulatory network. This complex network system is the business network system.

Organizational network control refers to the network formed by the internal organizational structure and management levels of securities companies, including the division of labor and cooperation among various departments, reporting relationships, and decision - making processes. This determines how information circulates within the company and who is responsible for executing and supervising various tasks.

Rule network control encompasses a series of rules and regulations formulated by the company, such as trading rules, compliance requirements, and internal operating procedures. These rules ensure that the company's operations are carried out within a legal and compliant framework and guarantee the consistency and standardization of business operations.

Responsibility network control clarifies the specific responsibilities and authorities of each position and employee in the business process, enabling work tasks to be clearly assigned and executed, avoiding chaos and risks caused by unclear responsibilities.

Risk network control involves the identification, assessment, and control of various possible risks, including market risks, credit risks, and operational risks. By establishing risk models and monitoring mechanisms, the stable operation of the company is ensured.

The industry regulatory network refers to the requirements and supervision from external regulatory agencies. Securities companies must abide by relevant laws, regulations, and regulatory policies to maintain the order of the financial market and the interests of investors.

These five networks are interconnected and interact with each other, jointly forming the business network system of securities companies. For example, the setup of the organizational network must meet the requirements of the rule network, and at the same time, the clarification of the responsibility network helps in the effective control of the risk network. The industry regulatory network restricts and regulates the entire system, ensuring that the business activities of securities companies are legal, fair, and transparent. In this complex network system, any change or problem in one part may affect other parts. Therefore, comprehensive and dynamic management and coordination are required to ensure the smooth development and continuous development of the business of securities companies.

4.2.5. Profile of Users' Basic Deterministic Attributes

Users' basic deterministic attributes are the contents filled in by users when registering business forms in securities companies. They are basic social attributes and basic business information and are, in principle, deterministic contents existing within the same securities company.

Users' basic deterministic attributes are the contents filled in by users when registering business forms in securities companies. They are basic social attributes and basic business information and are, in principle, deterministic contents existing within the same securities company. Specifically, they include:

Basic Social Attributes:

1) Date of Birth: Helps to understand the age group of the user and possible investment cycle preferences.
2) Place of Origin/Birthplace: May reflect the potential influence of regional culture on investment concepts.
3) Occupation: The income stability and risk - bearing capacity of different occupations vary.

Family Income Level: It is an important factor in evaluating investment ability and risk - bearing capacity. Basic Business Information:

1) Securities Account Number: Used to identify and manage the user's trading account in the securities company.
2) Account - opening Date: Records the time when the user starts doing business in this securities company.
3) Asset Scale: Includes the total value of various assets such as cash, stocks, and funds.
4) Investment Experience: For example, whether there has been experience in stock trading, fund investment, etc., and the number of years of investment.
5) Investment Goals: Such as short - term profit - making, long - term asset appreciation, stable preservation, etc.
6) Risk Preference: Ranging from conservative, stable to aggressive.

The comprehensive analysis of these attributes can provide an important basis for securities companies to better understand user needs, provide personalized services, and

conduct risk management.

4.2.6. Profile of the User - Behavior - Level Homomorphism - Consistency Model

The profile of the user - behavior - level homomorphism - consistency model refers to constructing a comprehensive model description that can reflect the homomorphism - consistency characteristics of users at the behavioral level through the collection, organization, and analysis of user - behavior data in a specific business scenario or system environment. It mainly includes:

1) Behavior Pattern Recognition. Analyze the sequences of users' behavioral operations at different time periods and in different situations. For example, in the field of securities trading, observe whether users tend to hold stocks for a long time or frequently engage in short - term trading; on e - commerce platforms, analyze whether users are habitually browsing specific - category products or randomly browsing, etc. Identify patterns such as high - frequency behaviors, typical behavior paths, and the periodicity of behaviors. For example, a user makes a fixed - amount fund - fixed - investment every beginning of the month, which is a periodic behavior pattern.
2) Preferences and Tendencies. This includes users' functional preferences, style preferences, and price sensitivity towards products or services. For example, in music apps, some users may prefer rock - style music, while others prefer classical music; on travel - booking platforms, some users have an obvious preference for high - star - rated hotels, while others pay more attention to cost - effectiveness. It also covers users' acceptance of different interaction methods. For example, some users like simple and clear interface operations, while others can adapt to complex but feature - rich interaction interfaces.
3) Decision - making Process Analysis. Explore the factors considered by users when making decisions and the ways of decision - making. For example, when purchasing electronic products, some users will make a decision after comparing in detail the parameters and user reviews of different brands and models, while some users may be more influenced by brand awareness. Analyze the trade - off process when users face multiple choices, such as how users make trade - offs between risk and return when choosing wealth - management products.

4.2.7. User Business Perception, Cognition and Environmental Detection

User business perception, cognition and environmental detection are complex issues involving multiple fields and levels.

In the context of securities companies, user business perception, cognition and environmental detection have unique connotations and importance.

In terms of user business perception, it covers customers' intuitive feelings about the smoothness of the securities trading process, the rationality of trading costs, the richness of investment products and the stability of returns. For example, whether the response speed of the trading system is fast, whether the collection of handling fees is clear and transparent, whether it is convenient to obtain a diverse range of investment options, and whether the investment returns meet expectations, all of which will directly affect customers' satisfaction with the services of securities companies.

In terms of user cognition, it involves customers' views on the reputation, professional ability, risk management level and innovation ability of securities companies. Customers will evaluate whether securities companies have a good market reputation, whether investment advisors have professional knowledge and experience, whether they can effectively control risks to protect asset safety, and whether they can timely launch innovative products and services that adapt to market changes.

Environmental detection is crucial in securities companies. Environmental factors that need to be detected include macro - economic situations, changes in financial policies and regulations, industry competition situations and development trends of fintech. For example, the growth or recession of the macro - economy will affect the overall performance of the securities market, the adjustment of financial policies may change investment rules and opportunities, fierce industry competition will prompt securities companies to continuously improve service quality and reduce costs, and the progress of fintech may change trading methods and customer service models.

In general, if securities companies have an in - depth understanding and grasp of user business perception, cognition and environmental detection, they can better meet customer needs, adapt to market changes, and enhance their own competitiveness and sustainable development capabilities.

4.2.8. User Business Iterative Learning and Cognition Degree

In the context of securities companies, user business iterative learning and cognition degree are crucial aspects.

User business iterative learning refers to the ability of users to continuously learn and adapt to new business models and operation processes as the market environment, financial products, and services keep changing. For the clients of securities companies, this means continuously getting to know newly - launched investment products, adjustments to trading rules, and updates to risk - management strategies, etc.

Cognition degree focuses on the extent to which users understand various businesses and services provided by securities companies. This includes the understanding of the characteristics and risk - return features of different investment products, the evaluation of the brand image and professional capabilities of securities companies, and the grasp of market trends and investment opportunities. A higher cognition de-

gree helps users make more sensible investment choices and strengthens their trust and loyalty to securities companies.

Securities companies can improve users' business iterative learning ability and cognition degree in various ways, such as carrying out investor education activities, providing personalized training courses, regularly holding market - analysis lectures, and optimizing customer - service channels to answer users' questions in a timely manner.

4.2.9. User Consumption Strategies and Return - on - Earnings Feedback Incentives

User consumption strategies and return - on - earnings feedback incentives are important business means for securities companies.

User consumption strategies usually include:

1) Product - differential Pricing: Develop different price strategies according to different investment products and services to meet the needs and payment capabilities of different users.
2) Package Combinations: Launch package combinations of multiple investment products and services to encourage users to purchase more services and increase their consumption amounts.
3) Promotional Activities: For example, offer handling - fee discounts and new - user preferential offers during specific periods to attract users to conduct transactions.
4) Personalized Recommendations: Based on users' investment preferences and trading histories, recommend suitable investment products and services to users to increase their willingness to consume.

Return - on - earnings feedback incentives usually include:

1) Point Rewards: Users' trading activities can accumulate points, which can be used to exchange for gifts, handling - fee reductions, or other privileges.
2) Cash Rebates: For users who reach a certain trading scale or activity level, give a certain proportion of cash rebates.
3) Priority Services: Provide special services such as priority customer service and exclusive investment advisors for high - consumption or active users.
4) Honorary Rewards: Set up honorary titles such as "Gold - Medal Investor", give certain honors and display opportunities to outstanding users, and enhance their sense of achievement and belonging.

These strategies and incentive measures aim to improve users' consumption enthusiasm, increase users' stickiness and loyalty to securities companies, and at the same time promote the business growth and profitability of the company.

4.3. Technical Analysis

4.3.1. User Action Strategies, Behavioral Risks and Their Transmission Networks or Paths

In securities companies, user action strategies, behavioral risks and their transmission networks or paths are very important research areas. User action strategies usually include choices in aspects such as investment decisions, trading frequency, and asset allocation. Behavioral risks stem from psychological biases of users such as over - confidence, herd behavior, and loss aversion, which lead to investment mistakes or market instability. In terms of transmission networks or paths, for example, a panic - selling by one user may trigger others to follow suit, thereby affecting the price trends of the entire market.

(i). Steps to Establish a Model of the Behavioral Risk Transmission Network or Path of Securities Company Users

1) Clarify research objectives and problems. Determine the specific problems that the model aims to solve, such as predicting the impact of specific events on users' investment behaviors and possible risk transmission paths.
2) Data collection and organization. Collect users' trading data, including trading records, position - holding situations, buying and selling times and prices, etc. Collect users' personal information, such as age, asset scale, investment experience, risk preference, etc. Obtain market data, such as overall market trends, industry dynamics, and policy changes.
3) Define user behaviors and risk types. Determine the user behaviors to be studied, such as buying and selling decisions, position - adjustment frequencies, and herd - following operations. Identify possible risk types, such as market risks, credit risks, and liquidity risks.
4) Construct the user network. Establish connections among users according to the relationships between them, such as social contacts, common investment portfolios, and affiliated investment groups. Graph theory or network analysis methods can be used to represent the user network.
5) Determine the risk transmission mechanism. Analyze how user behaviors are affected by risk factors and how this influence spreads in the user network. For example, how panic spreads from one user to others.
6) Select the modeling method. Statistical models, machine - learning algorithms (such as neural networks, decision trees) or agent - based models can be used. Select an appropriate method according to the characteristics of the data and the research problem.
7) Model training and verification. Train the model using historical data. Verify the accuracy and reliability of the model with reserved test data.
8) Sensitivity analysis. Test the sensitivity of the model to different parameters and input variables to evaluate the stability of the model.
9) Optimization and improvement. Optimize and improve the model according to the verification results and sensitivity analysis.

10) Model application and monitoring. Apply the model to actual scenarios, monitor its effectiveness and continuously update and adjust it according to new data.

(ii). Technical Difficulties and Solutions

1) Complexity and diversity of data. The amount of data in the securities market is huge, including trading data, user information, and market quotes, etc., and the data formats are diverse.

Solution: Adopt data cleaning, conversion, and integration techniques, establish a unified data warehouse, and use big - data processing frameworks for efficient storage and management.

2) Uncertainty and randomness of behaviors. Users' investment behaviors are affected by multiple factors and are highly uncertain and random, making it difficult to model accurately.

Solution: Combine statistical methods and machine - learning algorithms, such as using probabilistic graphical models and stochastic processes to describe uncertainty, and at the same time capture complex non - linear relationships through deep learning.

3) Dynamics of network structures. The relationships between users and risk - transmission paths will change dynamically with time and market changes.

Solution: Use real - time data updates and dynamic network analysis methods, such as using stream - data processing techniques and online - learning algorithms, so that the model can adapt to changes in network structures.

4) Interpretability of the model. Complex models may be difficult to explain the basis for their decisions and predictions, resulting in difficulty in being trusted and applied.

Solution: Select a model architecture with certain interpretability, such as decision trees and rule - based models, or use model - explanation techniques, such as feature - importance analysis and local - explanation models.

5) Computational resource requirements. Processing large - scale data and the training and running of complex models may require a large amount of computational resources.

Solution: Utilize cloud - computing platforms or distributed - computing frameworks, such as Hadoop (Hadoop: Open source frameworks for processing big data) and Spark (Spark: Distributed computing engine), to meet the computational requirements.

6) Accuracy of risk assessment. Accurately assessing the magnitude and spread range of risks is challenging, especially in extreme market situations.

Solution: Conduct stress tests and scenario analyses, combine historical extreme - event data and simulation experiments, and continuously optimize the risk - assessment model.

7) Integration of cross - domain knowledge. It is necessary to integrate knowledge from multiple fields such as finance, mathematics, statistics, and computer science, and there are difficulties in knowledge integration and application.

Solution: Form an interdisciplinary team to promote communication and cooperation among experts in different fields and jointly overcome difficulties.

4.3.2. Profile of Business - Behavior - Level Homomorphism - Consistency Model

The profile technology of the business - behavior - level homomorphism - consistency model in securities companies is a complex yet technically important means with significant application value, mainly used for comprehensive, accurate, and consistent description and analysis of specific objects (such as clients and business processes of securities companies) under different conditions. Conceptually, "homomorphism" means that under different environments, conditions, or operations, the characteristics and relationships of the objects depicted by the model remain relatively stable and comparable. "Consistency" emphasizes that the results output by the model are coherent and reliable in various situations without contradictions or large deviations.

(i). Methods for Establishing the Profile of the Business - Behavior - Level Homomorphism - Consistency Model in Securities Companies

1) Data Collection and Pre - processing. Collect various business data of securities companies, including trading data, client information, risk - management data, and market data. Clean, denoise, standardize, and normalize the data to ensure data quality and consistency.
2) Feature Engineering. Extract meaningful features from the original data, such as clients' trading frequency, trading - amount distribution, portfolio composition, risk - assessment indicators, etc. Use statistical analysis and domain knowledge to create features that can reflect the essence of business behavior.
3) Clustering Analysis. Use clustering algorithms, such as K-Means (K-Means: Clustering algorithm), hierarchical clustering, etc., to group clients or business activities with similar business - behavior patterns.
4) Classification Algorithm. Apply classification algorithms, such as decision tree, random forest, support vector machine, etc., to classify and label different business behaviors.
5) Association - rule Mining. Look for association relationships between business behaviors, for example, the association between certain trading behaviors and specific market conditions.
6) Deep - learning Methods. Utilize neural networks, such as convolutional neural network (CNN) (CNN: Convolutional Neural Network) or recurrent neural network (RNN) (RNN: Recurrent Neural Network), to capture complex business - behavior patterns and time - series

features.

7) Model Fusion. Combine the results of multiple models, improve the accuracy and stability of the model through weighted averaging, ensemble learning, etc.
8) Visualization Technology. Present the analysis results in the form of intuitive charts, graphs, etc., to help understand and explain business - behavior patterns.
9) Continuous Optimization and Verification. As new data continuously accumulates, continuously optimize model parameters and feature selection. Use cross - validation and other techniques to verify the performance and consistency of the model.
10) Domain - expert Participation. Invite business experts from securities companies to participate in the model design and evaluation to ensure that the model conforms to the actual business logic and requirements.

(ii). Steps to Establish the Homomorphism - Consistency Model Profile

1) Data Collection. Collect relevant data from multiple sources, including internal business systems (such as trading records, client information), external data sources (such as market data, industry reports), etc.
2) Data Pre - processing. Clean the data, handle missing values, outliers, and duplicate data. Standardize or normalize the data to make different variables comparable.
3) Feature Engineering. Extract meaningful features from the original data. This may include calculating statistics (mean, variance, etc.), constructing derivative variables (such as ratios, differences), and performing feature encoding (such as converting categorical variables into numerical values), etc.
4) Selection of Appropriate Data - mining Algorithms. For example, clustering algorithms (such as K - Means, hierarchical clustering) are used to discover groups with similar behavior patterns. Classification algorithms (such as decision tree, random forest, support vector machine) are used to classify and mark behaviors.
5) Model Training. Train the selected algorithm using the prepared data.
6) Model Evaluation. Evaluate the performance of the model using the validation set, such as accuracy, recall, F1 - value, etc. Conduct cross - validation to obtain more reliable evaluation results.
7) Model Optimization. Adjust the parameters of the model according to the evaluation results, or try different algorithms and feature combinations to improve model performance.
8) Establishment of Model Profile. Based on the trained and optimized model, generate corresponding profile descriptions for each individual or group, including behavior patterns, feature labels, etc.
9) Consistency Check. Check whether the generated profiles are consistent within different data subsets or time periods. This can be done by comparing the profile - feature distributions, clustering results, etc. of different subsets or time periods.
10) Model Update and Maintenance. As new data continuously accumulates, regularly update the model to reflect changes in business behavior, ensuring the accuracy and timeliness of the profiles. Throughout the process, it is necessary to combine domain knowledge and business requirements, continuously adjust and optimize the methods to establish an effective homomorphism - consistency model profile.

(iii). Technical Difficulties and Solutions in the Profile of Business - Behavior - Level Homomorphism - Consistency Model

1) Heterogeneity and Complexity of Data. Data from different business systems and channels have diverse formats and complex structures, making it difficult to integrate and process uniformly.

Solution: Adopt data - cleaning, - conversion, and - standardization techniques, establish a unified data warehouse, and use data - fusion methods to integrate multi - source data.

2) Dynamic Changes in Behavior Patterns. Business behaviors change continuously with time, market environment, and users' own situations, making them difficult to capture and model.

Solution: Use time - series analysis and dynamic models, such as Hidden Markov Model, Kalman Filter, etc., to update and adjust model parameters in real - time.

3) Feature Selection and Extraction. Selecting and extracting highly relevant and representative features for business behaviors from massive data is challenging.

Solution: Combine domain knowledge and feature - engineering techniques, such as Principal Component Analysis, Mutual Information, etc., to screen and construct features.

4) Interpretability of the Model. Complex models may be difficult to explain their decision - making processes and output results, which is not conducive to business understanding and application.

Solution: Select a model structure with certain interpretability, such as decision tree, linear regression, etc., or adopt model - explanation techniques, such as Local Interpretable Model - Explanations (LIME) (LIME: Local Interpretable Model - agnostic Explanations), SHAP (SHAP: Shapley Additive Explanations) values, etc.

5) Processing High - Dimensional Data. Business - behavior data often has high - dimensionality, resulting in high - computing costs and difficult model training.

Solution: Adopt dimension - reduction techniques, such as Singular Value Decomposition, t-SNE (t-SN: t-distributed Stochastic Neighbor Embedding), etc., or use distributed - computing frameworks to accelerate processing.

6) Ensuring Consistency. Maintain the consistency of the model profile in different scenarios and conditions, and

avoid deviations and inconsistencies.

Solution: Establish strict data - labeling and quality - control processes, conduct multiple rounds of verification and cross - validation, and use ensemble - learning methods to synthesize the results of multiple models.

7) Generalization Ability of the Model. The model has insufficient generalization ability in new data and different business scenarios, which may lead to inaccurate profiles.

Solution: Adopt regularization techniques to prevent over - fitting, add data - augmentation methods, and introduce transfer - learning and meta - learning strategies.

(iv). Application Scenarios of the Profile of Business - Behavior - Level Homomorphism - Consistency Model in Securities Companies

1) Client - Risk Assessment and Management.

Analyze clients' investment behaviors, trading frequencies, asset allocations, etc., and construct risk profiles. For example, identify clients who take excessive risks in order to provide timely risk warnings and interventions.

2) Investment - Strategy Recommendation.

According to clients' historical trading behaviors and risk preferences, provide them with personalized investment - strategy suggestions. For example, recommend stable portfolios to conservative clients and high - risk - high - return investment opportunities to aggressive clients.

3) Market - Trend Prediction.

Analyze the trading behaviors and investment tendencies of a large number of clients to predict short - term and long - term market trends. For example, if a large number of clients suddenly sell a large amount of a certain type of stock, it may indicate that this sector is about to face a downward trend.

4) Employee - Behavior Monitoring and Training.

Profile the business - operation behaviors of securities employees, monitor whether there are any violations or abnormal operations, and at the same time provide targeted directions for employee training.

5) Business - Process Optimization.

Study the behavior paths and time consumption of clients when handling various businesses, find out the bottlenecks and problem points in the process, and optimize and improve them.

6) Client - Segmentation and Precision Marketing.

Segment clients into different groups according to their trading behaviors and investment habits, and formulate specific marketing plans for each group to improve marketing effectiveness and customer satisfaction.

7) Anti - Fraud Detection.

By analyzing clients' trading patterns and capital flows, identify possible fraudulent behaviors, such as abnormal high - frequency trading or sudden large - amount capital transfers.

8) Partner - Evaluation.

Profile the business behaviors of institutions or enterprises cooperating with securities companies, and evaluate the stability and potential risks of the cooperation.

These scenarios can help securities companies better understand clients and their own businesses, and improve operational efficiency and risk - management levels.

4.3.3. Business Network Isomorphic Consistency Model System

The business network isomorphic consistency model system in securities companies is a rather complex and professional concept. It refers to a set of model systems constructed for securities companies, aiming to ensure that various business networks of the company are isomorphic and consistent in terms of structure, function, and behavior. The purpose of such a system is usually to improve business efficiency, risk - management capabilities, and compliance. Through the modeling and analysis of business networks, potential problems and optimization points can be discovered, rational allocation of resources can be achieved, and the operation methods and results of the business can be predictable and stable under different business scenarios and conditions.

(i). Main Steps in Constructing the Business Network Isomorphic Consistency Model Syste

1) Requirement Analysis. Communicate with the business departments and relevant stakeholders in the securities company to clarify the goals and functional requirements of the system. Determine the scope of the business networks that need to be modeled, such as trading networks, risk - management networks, and customer - service networks.
2) Data Collection. Collect data related to the business networks, including business processes, organizational structures, trading records, risk indicators, and customer information. Ensure the accuracy, completeness, and consistency of the data.
3) Business Process Modeling. Use process - modeling tools and methods, such as BPMN (BPMN: Business Process Modeling Notation), to visually model business processes. Clearly define the inputs, outputs, activities, and decision - making points of each process step.
4) Network Structure Modeling. Determine the nodes and connection relationships in the business network. Nodes can represent business departments, positions, systems, etc., and connections represent the information flow, capital flow, or work flow between them. Graph theory or network - analysis methods can be used to construct the network - structure model.
5) Define Consistency Rules. Clearly define which aspects in the business network need to be isomorphic and consistent, such as the order of process steps, data formats, and approval authorities. Define these consistency rules in a clear and quantifiable manner.

6) Model Construction and Verification. Use appropriate modeling techniques and tools, such as mathematical models and simulation software, to construct the business network isomorphic consistency model. Verify the model with actual data or simulated data to check whether the model accurately reflects the actual business situation.
7) Model Optimization. Optimize and adjust the model according to the verification results to improve the model's accuracy and reliability.
8) System Integration. Integrate the modeling results into relevant information systems to enable real - time monitoring and control of the consistency of the business network.
9) Continuous Monitoring and Update. Establish a monitoring mechanism to continuously track changes in the business network and update the model and consistency rules in a timely manner.

Throughout the entire modeling process, cross - departmental collaboration and the integration of professional knowledge are very important, and it is necessary to continuously adjust and improve according to the actual business situation.

(ii). Tools and Technologies for Constructing the Business Network Isomorphic Consistency Model

1) Process - Modeling Tools. BPMN (Business Process Modeling Notation) Tools: Such as Bizagi (Bizagi: Process modeling tools), Signavio (Signavio: Process modeling tools), etc., are used for visual modeling and analysis of business processes. UML (UML: Unified Modeling Language) Tools: Such as Enterprise Architect (Enterprise Architect: Enterprise-level modeling tools), StarUML (StarUML: Visual modeling tools), etc., can be used to draw various business - related models, including activity diagrams, state diagrams, etc.
2) Data - Analysis and - Processing Tools. Python (Python: High-level programming language): A powerful programming language with rich data - analysis and machine - learning libraries, such as Pandas (Pandas: Data processing tools based on NumPy), NumPy (NumPy: The core library for scientific computing in Python), Scikit – learn (Scikit - learn: Python libraries for machine learning), etc. R Language (R Language: programming language for data analysis and statistics): Commonly used for statistical analysis and data visualization.
3) Database - Management Systems. Oracle (Oracle: Database management system), MySQL (MySQL: Database management system), SQL Server (SQL Server: Database management system), etc., are used for storing and managing business data.
4) Data - Mining and - Machine - Learning Tools. TensorFlow (TensorFlow: Deep learning frameworks), PyTorch (PyTorch: Deep learning frameworks): Deep - learning frameworks. SPSS (SPSS: Statistical analysis software), SAS (SAS: Statistical analysis software): Professional statistical - analysis software.
5) Network - Analysis Tools. Gephi (Gephi: Open-source network analysis and visualization software): Used for analyzing and visualizing network structures.
6) Simulation Software. AnyLogic (AnyLogic: General-purpose modeling and network analysis tools): Supports multiple modeling methods, including system - dynamics, discrete - event, and agent - based modeling. Arena (Arena: Discrete event simulation and automation software): Commonly used for discrete - event simulation.
7) Model - Verification and - Testing Tools. Junit (JUnit: Model validation and testing frameworks), TestNG (TestNG: Model validation and testing frameworks) (for code - based models) are used for unit testing.
8) Visualization Tools. Tableau (Tableau: Visualization tools), PowerBI (PowerBI: Visualization tools): Used for data visualization and presentation of analysis results.
9) Version - Control Tools. Git (Git: Version control tools): Helps with team collaboration and model - version management.
10) Enterprise - Architecture Tools. The TOGAF (TOGAF: The Open Group Architecture Framework) framework and related tools help plan and design the overall architecture of the enterprise.

When choosing tools and technologies, comprehensive consideration needs to be given to factors such as the specific requirements of the project, the technical capabilities of the team, and the budget [6, 12].

(iii). Types of Important Problems in the Securities Industry That the Isomorphic Consistency Model System Can Solve

1) Eliminate Information Silos. Integrate data from different business systems and departments to ensure the circulation and sharing of information, and avoid decision - making mistakes and business delays caused by poor information flow.
2) Improve Risk - Management Capabilities. Ensure the consistency of risk assessment and monitoring, so that risks can be accurately identified and quantified under different business and market conditions, early warnings can be issued in advance, and effective risk - control measures can be taken.
3) Optimize Business Processes. Discover and eliminate redundant and inconsistent links in business processes, improve business - processing efficiency, and reduce operating costs.
4) Strengthen Compliance Management. Ensure that all business operations comply with regulations and inter-

nal rules, reduce the occurrence of violations, and lower compliance risks.

5) Improve Customer - Service Quality. Provide customers with a consistent service experience, so that regardless of the channel through which customers interact with the securities company, they can receive the same level and standard of service.
6) Promote Business Innovation. Quickly promote new business models and products throughout the company, reducing the cost and risk of innovation.
7) Support Precision Marketing. Based on a unified and accurate customer profile, formulate personalized marketing plans to improve marketing effectiveness and customer satisfaction.
8) Improve the Scientific Nature of Decision - Making. Provide management with comprehensive, consistent, and accurate information to support more scientific strategic decision - making and resource allocation.
9) Ensure the Accuracy and Reliability of Data. Avoid incorrect analysis and decision - making deviations caused by inconsistent data.
10) Enhance Market Competitiveness. Improve the competitiveness of securities companies in the market by improving operational efficiency, optimizing service quality, and enhancing risk - management levels.

(iv). Technical Difficulties and Solutions of the Business Network Isomorphic Consistency Model in Securities Companies

Technical Difficulties:

1) Data Complexity Multi - source Data Integration. Securities company business involves multiple different business systems, such as trading systems, clearing systems, and risk - management systems. Each system may have different data formats, storage methods, and data standards. During the integration of these multi - source data, problems such as data missing, data duplication, and data conflicts may exist.

Data Real - time Nature and Accuracy. Securities market trading data changes in real - time, and it is a challenge to ensure that the data in the business network isomorphic consistency model reflects market changes in real - time. Problems such as delays and packet losses may occur during data transmission, affecting the accuracy of the data.

2) System Compatibility Heterogeneous System Integration. Securities companies may use business systems developed by different manufacturers, which are built based on different technical architectures and platforms. Achieving seamless integration between these heterogeneous systems and ensuring their collaborative work in the isomorphic consistency model is one of the technical difficulties.

Version Update and Maintenance. Each business system will continuously carry out version updates and upgrades. New versions may introduce new functions, change data interfaces, or adjust business processes. It is necessary to ensure that the isomorphic consistency model can adapt to these changes and avoid model failure due to system upgrades.

3) Model Construction and Optimization Model Complexity Control. Constructing an isomorphic consistency model that can accurately reflect the complex business logic of securities companies is inherently very difficult. An overly complex model may lead to problems such as low computational efficiency and poor maintainability. A balance needs to be found between the model's accuracy and complexity.

Model Performance Optimization. As the business scale expands and the amount of data increases, the performance of the model may gradually decline. How to optimize the model algorithm and improve the model's computational efficiency and response speed is a problem that needs to be solved.

4) Security and Compliance Data Security. Securities business involves a large amount of sensitive customer information and trading data. When constructing the business network isomorphic consistency model, it is necessary to ensure the security of data during transmission, storage, and processing. Prevent security events such as data leakage and tampering from occurring.

Compliance Requirements. The securities industry is strictly regulated, and the model must meet the requirements of relevant laws, regulations, and regulatory policies. Compliance rules may be continuously updated, and the model needs to be adjusted in a timely manner to ensure compliance [5, 9].

Solutions:

1) For Data Complexity

Data Standardization and Cleaning. Formulate unified data standards and specifications, and standardize the data of each business system. Through data - cleaning techniques, remove noise from the data, correct errors in the data, and handle missing values in the data to ensure data quality.

Real - time Data Synchronization Technology. Adopt efficient data - synchronization technologies, such as message queues and data replication, to ensure that the data of each business system can be synchronized to the isomorphic consistency model in real - time. Establish a data - monitoring mechanism to discover and handle problems in the data - transmission process in a timely manner.

2) For System Compatibility

Middleware Technology. Use middleware to shield the differences between heterogeneous systems and realize the interconnection between different systems. Middleware can provide a unified data interface, message format, and communication protocol, reducing the difficulty of system integration.

Continuous Integration and Testing. Establish a continuous integration and testing environment. Whenever a busi-

ness system is updated, test and verify the isomorphic consistency model in a timely manner. Through automated - testing tools and processes, ensure that the model can adapt to system changes.

3) For Model Construction and Optimization

Modular Design. Design the isomorphic consistency model in a modular manner, and each module is responsible for handling specific business logic. This can reduce the complexity of the model, improve the model's maintainability and extensibility. Algorithm Optimization and Parallel Computing. Optimize the algorithms in the model, select efficient algorithms and data structures. Use parallel - computing technology to allocate computing tasks to multiple computing nodes for simultaneous execution, improving the model's computational efficiency.

4) For Security and Compliance

Encryption and Access Control. Encrypt sensitive data, and use encryption algorithms to ensure data security during data transmission and storage. Establish a strict access - control mechanism, and control access to data and the model according to user roles and permissions.

Compliance - Management System. Establish a compliance - management system, track changes in regulatory policies in real - time, and integrate compliance requirements into the design and operation process of the isomorphic consistency model. Conduct regular compliance audits to ensure that the model always complies with the requirements of laws and regulations.

(v). Main Application Scenarios of the Business Network Isomorphic Consistency Model in Securities Companies

1) Cross - market Trading

Scenario Description: Customers of securities companies may trade in different securities markets (such as the stock market, bond market, futures market, etc.). In this case, it is necessary to ensure that trading instructions are consistent and executed efficiently in the business networks of each market.

Model Application: The isomorphic consistency model can integrate trading systems in different markets, enabling traders to issue trading instructions on a unified interface. These instructions will be isomorphically transformed and distributed according to the rules and business - network architectures of each market, ensuring the accuracy and timeliness of trading. For example, when conducting cross - market arbitrage trading, the model can quickly coordinate buying and selling operations in different markets, improving trading efficiency.

2) Execution of Complex Trading Strategies

Scenario Description: Many investors adopt complex trading strategies, such as quantitative - trading strategies and portfolio - trading strategies. These strategies may involve multiple securities varieties, different trading - time windows, and multiple trading conditions.

Model Application: Through the isomorphic consistency model, securities companies can transform complex trading strategies into a unified format that the business network can understand and execute. The model can disassemble and optimize each element in the trading strategy, so that it is executed according to the same logic at different business nodes, ensuring the consistency and stability of the trading strategy. For example, when executing a quantitative - trading strategy, the model can ensure that the execution effect of the trading algorithm remains consistent in different trading periods and market environments.

3) Risk Assessment and Monitoring

Scenario Description: Securities companies need to conduct real - time assessment and monitoring of risks in various business activities, including market risks, credit risks, and operational risks. Data generated by different business departments and business systems are all related to risks.

Model Application: The isomorphic consistency model can integrate data from various business systems and process it according to unified risk - assessment indicators and models. In this way, the risk - management department can monitor changes in risk indicators in real - time under an isomorphic business - network view and discover potential risk hazards in a timely manner. For example, when the market fluctuates greatly, the model can quickly summarize trading data, position - holding data, and other information, calculate risk indicators such as Value - at - Risk (VaR), and synchronize risk - warning information throughout the business network.

4) Risk - compliance Management

Scenario Description: The securities industry is strictly regulated, and securities companies need to ensure that all business activities comply with laws, regulations, and regulatory requirements. Compliance rules involve multiple business links, such as customer - account opening, trading operations, and information disclosure.

Model Application: Using the isomorphic consistency model, securities companies can embed compliance rules into each node of the business network to ensure that all business activities are carried out under an isomorphic compliance framework. When regulatory policies change, compliance rules can be quickly adjusted in the model and synchronized to the entire business network to ensure business compliance. For example, in anti - money - laundering compliance checks, the model can uniformly coordinate data processing and rule - checking in links such as customer - identity identification and trading monitoring.

5) Customer - Account Management

Scenario Description: Customers may have multiple accounts in a securities company, such as stock accounts, fund accounts, and wealth - management accounts. Information about these accounts needs to be shared and synchronized between different business departments and business systems.

Model Application: The isomorphic consistency model

can establish a unified view of customer accounts and integrate business processes and data related to each account. Whether it is a customer querying account information, handling account - related business (such as account - opening, account - closing, transfer, etc.), or the securities company internally conducting account management and service, operations can be carried out in the isomorphic business network, improving the efficiency and quality of customer service. For example, when a customer needs to transfer funds from a stock account to a wealth - management account, the model can ensure the consistency of account information and the smoothness of the business process.

6) Personalized - Service Recommendation

Scenario Description: Based on customers' investment preferences, risk - bearing capacities, trading histories, etc., securities companies hope to provide customers with personalized investment advice and service recommendations.

Model Application: Through the isomorphic consistency model, securities companies can integrate customers' data in various business systems and construct a comprehensive customer profile. Based on this profile, in the isomorphic business network, different service departments (such as investment - advisory departments, product - sales departments, etc.) can provide personalized services to customers. For example, investment advisors can recommend investment products that match customers' risk preferences according to the customer profile, and the degree of personalization of the service remains consistent during the customers' interaction with different business departments [5, 9].

4.3.4. Business Risk Perception, Identification and Environmental Risk Detection

Securities companies face a variety of risks in their business operations, among which business risk perception, identification and environmental risk detection are of crucial importance.

Business risk perception and identification mainly include acute awareness and accurate judgment of market risks, credit risks, operational risks, etc. Market risks may stem from fluctuations in securities prices, changes in interest rates and exchange rates, etc. Credit risks may occur in cases such as client defaults and counterparties' inability to fulfill contracts. Operational risks may originate from flaws in internal processes, human errors or system malfunctions, etc.

Environmental risk detection covers aspects such as the macro - economic environment, changes in policies and regulations, and the competitive situation in the industry. Macroeconomic instability, such as economic recession or inflation, will have a wide - ranging impact on the securities market. Adjustments in policies and regulations, such as changes in tax policies and regulatory rules, may directly affect the business models and profitability of securities companies. Intensified industry competition, the entry of new market participants or changes in the strategies of existing competitors, will also bring competitive pressure and risks.

For securities companies, establishing an effective risk monitoring and assessment system, using advanced data analysis techniques and models, and cultivating a professional risk management team are the keys to doing a good job in business risk perception, identification and environmental risk detection, so that risk response measures can be taken in a timely manner to ensure the stable operation and sustainable development of the company.

4.3.5. Association Between the Business Network and the User Network in the Securities Company and Its Functions

The association between the business network and the user network means that under specific circumstances, various businesses and services in the business network are connected and interact with the user network to meet the needs of users. Such associations can occur in different fields and scenarios.

(i). There Are Multi - Aspect Association Relationships Between the Business Network and the User Network in the Securities Company

1) Information transmission and interaction.

Market data provision. The business network of the securities company transmits real - time market quotations, stock prices, trading data and other information to the user network. Users receive this data through trading software, market - quote terminals, etc., so as to understand market dynamics in a timely manner and make investment decisions. For example, the real - time stock price fluctuations, trading volumes and other information that users see on the stock - trading software are all pushed by the business network of the securities company.

Trading instruction transmission. Users issue trading instructions for buying and selling stocks, funds, etc. on their own network terminals (such as computers, mobile phones, etc.), and these instructions are transmitted to the business network system of the securities company through the network. The securities company conducts corresponding trading operations according to the user's instructions to complete the securities trading process. For example, when an investor clicks the "buy" or "sell" button on the mobile phone, the trading instruction will be transmitted to the securities company through the network for processing.

2) Account management and services.

Account information synchronization. The business network of the securities company stores user account information, including fund balances, position holdings, trading records, etc. This information will be synchronized with relevant applications or platforms in the user network, facilitating users to check their account status at any time. Taking the securities trading APP as an example, after logging in,

users can see the asset status of their accounts, the types and quantities of stocks held, etc., and this information is synchronized from the business network of the securities company.

Personalized service push. Based on the account data and trading behavior analysis of users in the business network, the securities company can push personalized services and product recommendations to the user network. For example, according to the investment preferences and risk - bearing capabilities of users, recommend suitable wealth - management products, investment portfolio suggestions, etc. for them.

3) Risk control and security protection.

Identity verification and authorization. The business network of the securities company verifies and authorizes the trading requests initiated by the user network through multiple methods (such as passwords, fingerprint recognition, digital certificates, etc.), ensuring that only legal users can operate, preventing account theft or unauthorized trading from occurring. For example, when logging in to a securities trading account, users need to enter the correct password and possible verification codes, etc. for identity verification.

Trading risk monitoring. The securities company uses the monitoring system of the business network to monitor and analyze users' trading behaviors and market risks in real - time. Once abnormal trading or potential risks are detected (such as large - scale stock price fluctuations, abnormal trading volumes, etc.), measures can be taken in a timely manner, such as restricting trading, warning users of risks, etc., to protect the investment safety of users and the stability of the market.

4) Business expansion and customer relationship maintenance.

Online business handling. Users can handle various businesses on the business platform of the securities company through the network, such as account opening, account closing, data modification, password reset, etc., without having to go to the business department of the securities company in person, which improves the efficiency and convenience of business handling and also helps the securities company expand its business coverage. For example, new users can complete the account - opening application process online through the official website or mobile APP of the securities company.

Customer feedback and communication. Users feed back problems, opinions and suggestions to the securities company through network channels (such as online customer service, e - mail, social media, etc.), and the business network of the securities company can receive and process this information in a timely manner, communicate and interact with users, thereby continuously improving service quality, enhancing customer satisfaction and strengthening customer stickiness.

(ii). Security Risks and Safeguard Measures in the Association Between the Business Network of the Securities Company and the User Network

1) Risks at the network protocol level.

Common security risks of IPv4 (IPv4: Network Protocol Version) and IPv6 (IPv6: Network Protocol Version). Application - layer attacks (such as cross - site scripting, SQL injection, DDoS (SQL DDoS: Distributed Denial of Service (DDoS) attack), etc.), malicious devices (such as malicious Wi - Fi access points) and traffic - based denial - of - service attacks pose threats to both IPv4 and IPv6 networks. Moreover, since IPv6 applications are relatively few, relevant security risks may not have been fully exposed and repaired, and professionals proficient in maintaining IPv6 networks are also in short supply.

IPv6 - specific security risks. New fields in the IPv6 packet structure (such as flow labels, RHO (RHO: Channel State Information (CSI) parameters), routing headers, etc.) and new protocols in the IPv6 protocol family (such as the neighbor discovery protocol, etc.) may have vulnerabilities and are easily exploited to launch sniffing, DOS (DOS: Denial of Service attack) and other attacks. Moreover, different types of devices may generate security risks due to coding, implementation and other problems when implementing the IPv6 protocol stack. For example, hop - by - hop extension header attacks, neighbor discovery protocol attacks, DAD (DAD: Duplicate Address Detection) attacks, prefix spoofing attacks, MLD (MLD: Multicast Listener Discovery Protocol) attacks, etc., and there may also be risks such as using IPv6 addresses embedding IPv4 addresses to bypass protection, end - to - end transparency problems caused by not using NAT, and bypassing security checks brought by hiding IPv6 in IPv6 tunnels.

2) Security risks of IPv6 transition mechanisms.

Dual - stack scheme. Running two logical channels, IPv4 and IPv6, simultaneously in the network increases the exposure surface of devices/systems, which means that security protection nodes such as firewalls, IPS (IPS: Intrusion Prevention System), and WAF (WAF: Web Application Firewall) need to be configured with dual - stack strategies at the same time, doubling the complexity of policy management and increasing the chances of the protection being breached. In addition, some operating systems enable the IPv6 automatic address configuration function by default, making a hidden IPv6 channel exist in the IPv4 network. If this channel is not configured for protection, attackers can use it to launch attacks, and the complexity of the dual - stack system increases, which will lead to increased performance consumption and higher failure rates of network security protection nodes.

Tunnel scheme. Some tunnel schemes only require the tunnel entrance and exit nodes to simply encapsulate and decapsulate packets, lacking built - in authentication, encryption and other security functions. Attackers may intercept tunnel packets, forge user addresses and pretend to be legal

users to launch attacks. For example, in IPv6 over IPv4, there are security risks such as attackers forging inner and outer - layer IP addresses to launch spoofing attacks. At the same time, since some tunnel schemes do not check the tunnel - encapsulated content, attackers can carry IPv4 traffic in IPv6 packets, causing the attack traffic of the original IPv4 network to pass through security protection under the "cover" of IPv6 and pose a threat.

Translation scheme. Translation nodes, as IPv6 - IPv4 interconnection nodes, are prone to security risks and face common DDoS attack threats such as address pool exhaustion. Attackers can initiate address translation requests to translation nodes by forging a large number of IPv6 addresses, consuming their IPv4 resources in the address pool, and at the same time causing legal users to be unable to obtain IPv4 addresses, thereby causing the IPv4 network to be unable to be accessed normally and leading to network paralysis.

3) User data security risks.

Data leakage. During the interaction between the business network and the user network, if security protection measures are not in place, sensitive information such as users' personal information (such as names, ID numbers, contact information, account information, etc.) and trading data may be stolen by hackers. For example, due to system vulnerabilities or network attacks, the database is invaded, and user data is stolen and sold on the dark web. This will not only violate user privacy but also may bring economic losses to users, such as the misappropriation of account funds.

Data tampering. Attackers may tamper with users' trading instructions, entrusted information and other data during network transmission to seek personal gains. For example, changing a user's buy instruction to a sell instruction, or modifying the trading price, quantity, etc., resulting in the user's trading result being different from the expected one and causing economic losses. In addition, tampering with users' personal information may cause problems in user identity authentication and affect the normal use of securities services by users.

Data loss. Due to hardware failures, software errors, human misoperations or natural disasters, servers or databases storing user data may malfunction, resulting in data loss. If there is no perfect data backup and recovery mechanism, users' data may not be recoverable, affecting users' trust in the securities company as well as their own investment decisions and trading record inquiries.

4) Identity authentication and authorization risks.

Weak identity authentication. If the identity authentication method adopted by the securities company is not strong enough, such as only using a simple combination of username and password, and the password setting requirements are not strict (such as short length, low complexity), it is easy for attackers to obtain the user account password through brute - force cracking, dictionary attacks, etc., pretend to be the user and enter the system for illegal operations, such as transferring funds, conducting false trading, etc.

Authentication bypass. There may be vulnerabilities or defects in identity authentication in the system, enabling attackers to bypass the normal authentication process and directly access protected resources and functions. For example, by exploiting logical vulnerabilities in the system or unauthorized interfaces, obtaining user identity credentials or directly entering the trading page to conduct malicious trading operations.

Unauthorized access. If internal employees or third - party partners of the securities company are granted permissions exceeding those required for their work, they may abuse these permissions to access user data or conduct unauthorized operations. For example, customer service personnel should only be able to query users' basic information and trading records, but due to improper permission settings, they can modify users' account settings or trading instructions, causing losses to users.

5) Application system security risks.

System vulnerabilities. The software of the securities business system may have various vulnerabilities, such as buffer overflows, code injections, cross - site scripting attacks (XSS), etc. Attackers can use these vulnerabilities to obtain system control, steal sensitive information or disrupt the normal operation of the system. For example, by exploiting buffer overflow vulnerabilities to execute malicious code, thereby controlling the server and further affecting the stability and security of the entire securities trading system. Malware infection. If terminal devices (such as computers, mobile phones, etc.) in the user network are infected with viruses, Trojans, worms and other malware, they may spread the malware to the system of the securities company when interacting with the business network of the securities company, causing the network and system of the securities company to be infected. These malware may steal user information, destroy data, interfere with the normal operation of business, and may even be used to launch large - scale network attacks.

Interface security issues. There are usually interfaces for data interaction between the business network of the securities company and external systems (such as bank systems, exchange systems, etc.) or systems of third - party service providers. If the security design of these interfaces is not perfect and strict access control and data verification are not carried out, attackers may invade the system through the interfaces, tamper with or steal data. For example, if the interface does not strictly verify the format and content of input data, attackers can construct malicious data input, causing the system to be abnormal or data leakage.

6) Network communication security risks.

Network monitoring. Attackers can use network monitoring tools to capture data packets transmitted between the business network of the securities company and the user network in the network, and obtain sensitive information from them, such as users' login credentials, trading instructions, etc. Even if the data is encrypted during transmission,

if the encryption algorithm is not strong enough or the key management is poor, attackers may still be able to crack the encrypted content.

Man - in - the - middle attacks. Attackers can insert their own devices or programs in the middle of the communication link between the user and the securities company, pretend to be the user or the securities company to communicate with the other party, and thus obtain or tamper with the communication content. For example, when a user conducts online trading, an attacker intercepts the user's trading request, modifies the trading parameters and then sends them to the securities company, or tampers with the response information of the securities company and then returns it to the user, causing the user to suffer losses.

Denial - of - service attacks. Attackers send a large number of request data packets to the business network or user network of the securities company, causing network bandwidth to be occupied and server resources to be exhausted, making normal users unable to access the securities business system or conduct trading. This attack may cause the paralysis of the securities trading system and seriously affect the business operation of the securities company and the trading experience of users.

7) Security protection measures.

Construct a multi - layer security defense system. Deploy multiple security products from the network boundary to the internal system, such as firewalls (to prevent illegal external access), intrusion detection and prevention systems (to monitor and resist intrusion behaviors in real - time), WAF (Web application firewalls, to protect websites and applications), etc., to form multi - dimensional protection. Strengthen user identity authentication and access control. Adopt multi - factor authentication (such as passwords, fingerprints, tokens, etc.) to ensure that the user identity is real and reliable. Finely divide different user roles and permissions, and strictly limit users' access to sensitive data and functions. For example, only personnel with specific permissions can view and operate customers' trading records, financial information, etc.

Protect data security and privacy. Encrypt the storage and transmission of customer data to prevent data leakage and tampering. For example, use SSL/TLS to encrypt network communication and encrypt customer information stored in the database. At the same time, formulate strict data privacy policies, clearly define the rules for collecting, using and sharing customer data, and ensure that customer privacy is protected.

Conduct security audits and monitoring. Establish a security audit system to record log information such as user operation behaviors and system operation status, so as to detect abnormal behaviors and security events in a timely manner. Through real - time monitoring systems, monitor network traffic, system performance, etc., and issue early warnings and take corresponding measures in a timely manner once abnormalities occur.

Strengthen employee security awareness training. Regularly carry out security training for employees to improve their security awareness and prevention capabilities, make them understand the latest security threats and response methods, and avoid security vulnerabilities caused by employee negligence or improper operations.

8) Stable operation measures.

Adopt a reliable technical architecture. Build a highly available and scalable technical platform, and use advanced technologies such as cloud computing and distributed systems to ensure that the system can handle high - concurrent access and large - scale data processing and ensure the continuity and stability of services. For example, through distributed databases and distributed caches, improve data read - write performance and system response speed.

Conduct strict quality control: In the software development process, follow strict quality standards and specifications, and conduct sufficient tests, including unit tests, integration tests, system tests, performance tests, etc., to ensure the correctness and stability of software functions. For personalized service customization functions, conduct key tests and verifications to ensure that they meet design requirements and user needs.

Establish a perfect operation and maintenance management system. Equip with a professional operation and maintenance team to monitor and maintain the system 24/7. Formulate detailed operation and maintenance processes and emergency response plans, regularly patrol, back up and optimize the system, and timely handle system failures and performance problems. For example, when the system fails, it can quickly switch to the standby system or perform fault recovery to reduce the impact on user services. Ensure compatibility and stability with external systems. If the personalized service customization function involves interaction with external systems (such as bank systems, data providers, etc.), the securities company will establish a stable cooperative relationship with relevant parties, clarify interface specifications and data transmission standards, and conduct sufficient joint - debugging tests to ensure the compatibility of both systems and the stability of data transmission.

Continuously optimize and improve. Continuously optimize and improve the personalized service customization function according to user feedback, business development and technological progress. Constantly improve the functional modules, improve system performance and user experience to adapt to the ever - changing market demands and security environment [5, 9].

4.3.6. Association from the User Network to the Business Network and Its Functions

The association from the user network to the business network is of great significance. This association is first reflected in information transmission. Information such as requirements and trading instructions in the user network can be accurately and quickly transmitted to the business network, ensuring the timeliness and accuracy of trading. For

example, instructions for buying and selling stocks issued by users on the client side can reach the business system for processing in a timely manner. Secondly, the association helps to realize the optimal allocation of resources. By analyzing the data in the user network, the business network can allocate resources more accurately and provide users with personalized services and products. Thirdly, it can strengthen risk control. The business network can monitor trading behaviors and data in the user network in real - time, detect abnormal situations in a timely manner, and prevent potential risks. In addition, this association also helps to enhance the user experience. Fast and stable information transmission and accurate services can increase users' satisfaction and loyalty to securities companies.

(i). Key Points in Implementing the Association from the User Network to the Business Network in Securities Companies

1) Network Architecture Design

Layered Design: Generally, the network will be divided into multiple layers, such as the user access layer, the core switching layer, and the business service layer. The user access layer is responsible for connecting and communicating with user terminal devices (such as computers, mobile phones, etc.), receiving users' requests and data. The core switching layer mainly conducts high - speed data switching and routing to ensure the rapid transmission of data in the network. The business service layer contains various specific business systems and servers for processing users' business requests. For example, in the network of a certain securities company, users connect to the company's user access layer devices through home broadband or mobile networks, and then the data is quickly forwarded through the core switching layer and reaches the trading system server in the business service layer for processing.

Redundancy Design: In order to improve the reliability and availability of the network, redundant devices and links will be used. For example, there are multiple core switches as backups for each other. When one of them fails, the other can immediately take over the work to ensure the uninterrupted operation of the network. At the same time, the network links connecting each layer will also have redundant backups to prevent network interruption caused by a single - link failure. In this way, even if some devices or links have problems, the connection between the user network and the business network can remain stable.

2) Security Protection Mechanisms

Firewall: Deploy a firewall between the user network and the business network to conduct strict access control and filtering on the incoming and outgoing network traffic. The firewall can block unauthorized access and malicious attacks according to preset rules, and only allow legitimate user requests and data to pass through. For example, set rules to only allow traffic on specific ports (such as ports used for trading) to pass through and prohibit access to other unnecessary ports, thereby improving network security. Encryption Technology: Encrypt the data transmitted between the user and the business network to prevent the data from being stolen or tampered with during transmission. Common encryption methods include SSL/TLS encryption, which is used to protect the data security of users during login, trading, etc. For example, information such as account numbers and passwords entered by users on the online trading platform will be encrypted before being transmitted to the business network. Even if intercepted by hackers, it is difficult to obtain the real content.

Identity Authentication and Authorization: Adopt multiple identity authentication methods to ensure that only legitimate users can access the business network. For example, use authentication means such as usernames and passwords, digital certificates, and dynamic passwords. At the same time, authorize their operations in the business network according to the users' identities and permissions, and limit users to only access the business functions and data they are allowed to access. For example, ordinary users may only be able to perform trading query and order - placing operations, while administrator users can perform system configuration and management operations.

3) Data Transmission and Communication Protocols

Efficient Communication Protocols: Commonly used network communication protocols such as HTTP (HTTP: Network communication protocol) and HTTPS (HTTPS: Network communication protocol) are usually adopted to realize data transmission between the user network and the business network. These protocols have wide applications and good compatibility and can ensure the reliable transmission of data. For example, when a user accesses a securities company's trading website through a browser, the browser and the server will use the HTTP/HTTPS protocol for communication, and the user's trading requests, query instructions, and other data are transmitted in a specific format within the framework of the protocol.

Real - time Data Push: In order to enable users to obtain updates of business information in a timely manner, such as real - time changes in stock prices and feedback on trading status, real - time data push technology will be adopted. For example, using the Websocket (Websocket: Full - duplex Communication Protocol) protocol, etc., the server can actively push the latest data to the user's terminal device without the user constantly refreshing the page to obtain new information, improving the user experience and the timeliness of data.

4) Middleware and Interface Technologies

Use of Middleware: Middleware is a software layer located between the user network and the business network. It can provide some common functions and services and simplify the interaction and data processing process between the two. For example, message - oriented middleware can be used to asynchronously transmit messages between different systems to realize the reliable transmission and processing of user

requests; data cache middleware can cache some commonly used data, improve the data access speed, and reduce the direct access pressure on the business system.

Interface Specification and Definition: Clearly define the interface specifications between the user network and the business network, including interface parameters, data formats, and calling methods. In this way, both the user - side application programs and the business - side systems can interact according to the unified interface standards. For example, define an interface for submitting trading orders, specify the order format, required fields, return result format, etc., so that users can submit orders in the same way on different trading terminals, and the business system can also accurately receive and process the order data.

5) System Integration and Collaborative Work

Front - end and Back - end System Integration: Tightly integrate the front - end systems (such as trading clients, mobile applications, etc.) on the user network side with the back - end systems (such as trading processing systems, risk management systems, databases, etc.) on the business network side. Through various integration technologies and tools, ensure that the operations of front - end users can be accurately transmitted to the back - end systems for processing, and the processing results of the back - end systems are fed back to the front - end users in a timely manner. For example, when a user clicks the "buy stock" button on the trading client, the front - end system will send relevant data to the back - end trading processing system in the agreed format. After the trading processing system completes the trading operation, it will return the trading result to the front - end system for display to the user. Cross - system Collaborative Work: Within a securities company, there are often multiple different business systems that need to work together to complete a complete business process. For example, the trading system needs to interact with the account management system, the clearing system, and the risk management system. By establishing communication mechanisms and data - sharing mechanisms between systems, seamless docking and collaborative work between these systems are realized to ensure that users' business requests can be smoothly transferred and processed between various systems. For example, when a user conducts a transaction, the trading system not only has to complete the trading matching but also has to notify the account management system to update the user's account balance and at the same time transmit the trading information to the clearing system for subsequent clearing and settlement work.

(ii). Common Application Scenarios of the Association from the User Network to the Business Network

1) Online Trading. Users issue instructions for buying and selling securities through the network platform (web page or mobile application), and these instructions are quickly transmitted to the trading system in the business network to complete the trading operation.
2) Portfolio Management. Users enter their asset allocation goals, risk - bearing capabilities, etc. on the network side, and the analysis tools in the business network generate and adjust investment portfolio suggestions for users based on these data.
3) Real - time Market Quotation Push. The business network obtains the latest securities market quotation data and pushes it to users in real - time through the user network, allowing users to understand market dynamics in a timely manner.
4) Information Services. The business network collects information such as financial information and research reports from multiple channels, sorts and screens them, and presents them to users through the user network to help users make investment decisions.
5) Intelligent Investment Advisory. Using the user profile, investment preferences, etc. data collected by the user network, the intelligent algorithms in the business network provide users with personalized investment suggestions and asset allocation plans.
6) Risk Assessment and Early Warning. The business network continuously monitors users' investment portfolios and market changes. When users' investment risks reach a certain threshold, risk early - warning prompts are sent to users through the user network.
7) Account Management. Users can view their account assets, trading records, position holdings, etc. through the network and perform transfer - in and transfer - out operations of account funds.
8) Social Investment. Build a social investment community in the user network, where users share investment experiences and viewpoints, and the business network analyzes and integrates these information to provide references for other users.
9) Quantitative Trading Interface. Provide professional investors or institutions with a quantitative trading interface connecting to the business network through the user network to realize the execution of automated trading strategies.
10) Financial Product Sales. Display and recommend various financial products to users in the user network, and users complete product purchase and subscription operations online.

In short, the association from the user network to the business network is a key factor for securities companies to achieve efficient operation, optimize services, control risks, and enhance competitiveness.

4.3.7. User Behavior Risks and Their Preferences

User behavior risks and their preferences are complex issues that involve multiple fields and aspects. Understanding the manifestations of user behavior risks, the impact of user behavior preferences on risks, as well as the methods of user behavior risk assessment and management is of great signif-

icance for enhancing the security and reliability of systems, platforms or services and protecting the interests of users.

The behavioral risks of users in securities companies mainly include excessive trading risk, herd investment risk, concentrated investment risk, ignoring risk tolerance, and information asymmetry risk. Users may make incorrect investment decisions due to limited access to information or inaccurate interpretation of information. The investment preferences of users show diverse characteristics such as risk-seeking, moderate, conservative, short-term investment preference, and long-term investment preference. Therefore, it is necessary to fully understand the behavioral risks and investment preferences of users so as to provide them with appropriate investment suggestions and product services, and at the same time effectively carry out risk management.

(i). Technical Difficulties and Solutions in Assessing User Behavior Risks

The assessment and management of user behavior risks and preference risks in securities companies are important links in safeguarding the rights and interests of investors and maintaining market stability.

1) Data collection and integration. Collecting users' trading behaviors, browsing records, account information, etc. from multiple channels, and these data are in diverse formats, making integration difficult. A unified data warehouse can be established, and ETL (ETL: Extract, Transform, Load) tools can be used to clean, transform, and integrate the data.
2) Complexity of behavior analysis. Accurately interpreting the motives and potential risks behind user behaviors is challenging and requires considering numerous factors and complex associations. Machine - learning algorithms and data - mining techniques can be used to establish complex behavior models, and at the same time, the knowledge and experience of domain experts can be combined for analysis.
3) Real - time monitoring and response. Real - time monitoring of changes in user behaviors and timely response place high demands on system performance and processing speed. Stream - processing technology and high - performance computing frameworks can be adopted to realize real - time data processing and analysis and quickly trigger early - warning and response measures.
4) Privacy protection. When processing user - behavior data, it is necessary to ensure that user privacy is not leaked. Encryption technology can be used to encrypt the storage and transmission of sensitive data, strictly control data - access permissions, and follow relevant privacy regulations.
5) Model accuracy and adaptability. The constructed risk and preference models may lose accuracy due to market changes and changes in user behaviors and need to be continuously adjusted and optimized. New data can be regularly used to retrain and validate the models, and an adaptive - learning mechanism can be introduced to enable the models to adapt to changes dynamically.
6) Visualization display. Presenting complex analysis results to business personnel and users in an intuitive and easy - to - understand way for easy understanding and decision - making. Data - visualization tools can be used to design clear and concise charts and reports, highlighting key information and trends.
7) System integration. Integrating with other business systems of securities companies (such as trading systems, customer - management systems, etc.) to ensure data flow and consistency. Unified interface standards and specifications can be formulated, and middleware technology can be used to achieve seamless docking and data interaction between systems.
8) Large - scale data processing. Facing a vast amount of user - behavior data, the cost of processing and storage is high, and high demands are placed on hardware and infrastructure. The elastic computing and storage resources provided by cloud - computing platforms can be utilized to flexibly expand according to business requirements and reduce costs.

(ii). New Trends in the Assessment Methods and Management of User Behavior Risks

There is broad room for innovation in the assessment methods of user behavior risks in aspects such as artificial intelligence and machine learning, comprehensive evaluation of multi-source data, real-time dynamic evaluation, analysis of user behavior persistence, assessment of cross-domain behavior risks, and combination with user behavior flowcharts.

1) Assessment Methods Based on Artificial Intelligence and Machine Learning. With the continuous development of science and technology, artificial intelligence and machine learning technologies have shown great potential in the assessment of user behavior risks. For example, deep learning algorithms can be utilized to analyze a large amount of user behavior data, automatically extract features and conduct risk assessment.
2) Comprehensive evaluation combining multi-source data. A single data source is often difficult to comprehensively and accurately assess the risks of user behaviors. Therefore, conducting comprehensive evaluation by combining multi-source data can integrate various aspects of data such as users' device information, network behaviors, and social relationships, and analyze user behaviors from multiple perspectives. Meanwhile, social network data can also be utilized to analyze users' social relationships and behavior patterns to discover potential risky behaviors.
3) Real-time dynamic evaluation. Traditional methods for assessing user behavior risks are often based on static

data and find it difficult to reflect changes in user behavior in real time. Therefore, real-time monitoring technologies can be utilized to conduct real-time tracking and analysis of user behavior, so as to promptly identify potential risky behaviors.

4) Analysis of the Continuity of User Behavior. The continuity of users' behaviors can reflect their integrity and risk levels. By analyzing users' continuous behaviors, it is possible to encourage users to provide continuous honest services and solve the problems of credit speculation and periodic deception.
5) Risk assessment of cross-domain behaviors. In the mobile application and Internet environments, cross-domain access behaviors may pose security risks. Therefore, conducting risk assessment on cross-domain behaviors is an important research direction.
6) Risk assessment combined with the flowchart of user behaviors. By extracting the flowchart of user behaviors, the deep-seated relationships between user participation behaviors and potential risks can be unearthed.

4.3.8. Risks of the Business Network System Structure and Their Control Strategies

The structural risks of the business network system can be classified into several types, such as the risk of single point of failure, the risk of network congestion, the risk of system compatibility, the risk of data storage, the risk of security vulnerabilities, and the risk of insufficient disaster recovery. The corresponding control strategies are as follows:

1) Redundancy design. Configure key components and devices redundantly, such as servers and network links, to ensure that they can be quickly switched to standby devices in case of a single - point - of - failure, maintaining the continuous operation of the system.
2) Traffic management and optimization. Adopt traffic - control technologies, such as QOS (QOS: Quality of Service), to assign priorities to different types of business data, ensuring the timely transmission of important data. At the same time, plan and expand network bandwidth reasonably to cope with peak traffic.
3) Compatibility testing and standardization. Conduct sufficient compatibility tests during system construction and upgrading to ensure the compatibility of new devices and software with the existing system. Establish unified technical standards and specifications to reduce risks caused by compatibility problems.
4) Data management and backup. Regularly assess data - storage requirements and expand and optimize storage capacity. Adopt multiple data - backup strategies, including local backups and off - site backups, and conduct regular recovery tests to ensure data recoverability.
5) Security protection and monitoring. Deploy security measures such as firewalls, intrusion - detection systems, and encryption technologies, conduct regular security - vulnerability scans and repairs, strengthen security - awareness training for employees, and establish a real - time security - monitoring mechanism to detect and respond to security threats in a timely manner.
6) Disaster - recovery planning and drills. Develop a comprehensive disaster - recovery plan, clarify the recovery processes and division of responsibilities in different disaster scenarios. Conduct regular disaster - recovery drills to test and improve the effectiveness of the disaster - recovery plan and ensure that the business can be quickly recovered in an emergency.

By identifying these risks and adopting corresponding control strategies, securities companies can improve the stability, security, and reliability of the business network system and ensure the normal operation of the business.

4.4. Extended Definition of User Profiles and Their Applicability

We need to process, model, and analyze the obtained information data and record sets to infer users' behavior preferences, consumption or purchase preferences, behavior risks and their risk identification, users' contributions to the company and their potential contribution values, etc. For this purpose, with the help of the concept of user profiles, it is extended into two parts: user deterministic - attribute profiles and non - deterministic - behavior - model profiles. For the former, advanced statistical techniques can be used to achieve the data processing and analysis goals. For the latter, it is necessary to classify the user - behavior - level data space and establish a behavior - level homomorphism - consistency model system. The user - behavior - level homomorphism - consistency model system is a functional operator defined on the user - behavior space. The initial space of the user - behavior space can be pre - built by the empirical knowledge of industry or field business experts (user - behavior - space - construction engine, and this built - up space can be expanded in the initial space after new behaviors are discovered), and then the user - behavior - level observed - data space is classified, grouped, and category - mined. Newly discovered user - behavior categories are directly labeled and added to the operations of expanding the user - behavior space.

The homomorphism - consistency inference model of the user - behavior - level state is a functional operator or function of the user in his behavior space. After structuring, it can be generalized as a business - perception and environmental - information - detection - and - collection operator, a user - business - experience - and - learning operator, a user - analysis - and - - evaluation operator, and a user - decision - action operator. Through the homomorphism - consistency inference model of the behavior - level state, user - behavior trends and preferences, behavior - risk preferences, behavior - risk - spread - and - - transfer preferences, etc. can be inferred. It can also be applied to user - business - related - risk

identification, risk management and control, and countermeasures.

4.5. Extended Definition of Business Network Profiles and Their Applicability

We process, model, and analyze the observed - data space at the business - behavior - level within the securities company, and the basic understanding is that for every deterministic business (product + service and its process) provided by the securities company to users, there is invariably a complex business network system supporting it internally. See Figure 1. Under the systems of organizational management and control, rule management and control, responsibility management and control, risk management and control, and industry supervision, this business network system will show different behavioral performances for different users or the same user at different times. On the user side, it is the user experience and other business - behavior effects that retain users. The business processes of the securities company and their inter - relationships expressed in Figure 1 show that any product and service pushed to the user side is a typical complex network system. This complex network system establishes behavioral and structural associations around the core - value - creation process and the core - value - creation - support process of the securities company and operates and is observed under the constraints of a series of rules, regulations, and internal controls.

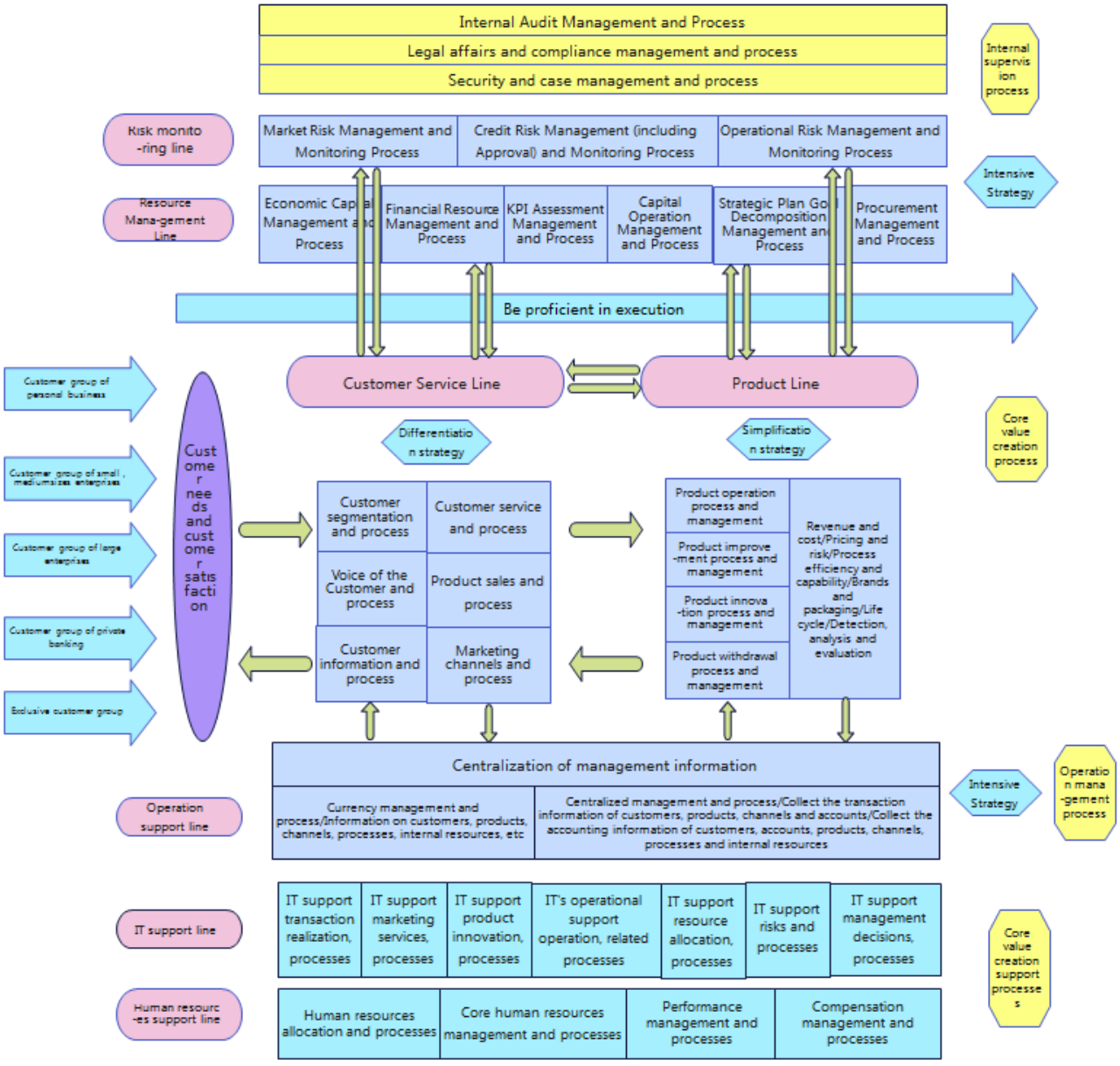

Figure 1. *Business Processes and Interrelationships of Securities Companies.*

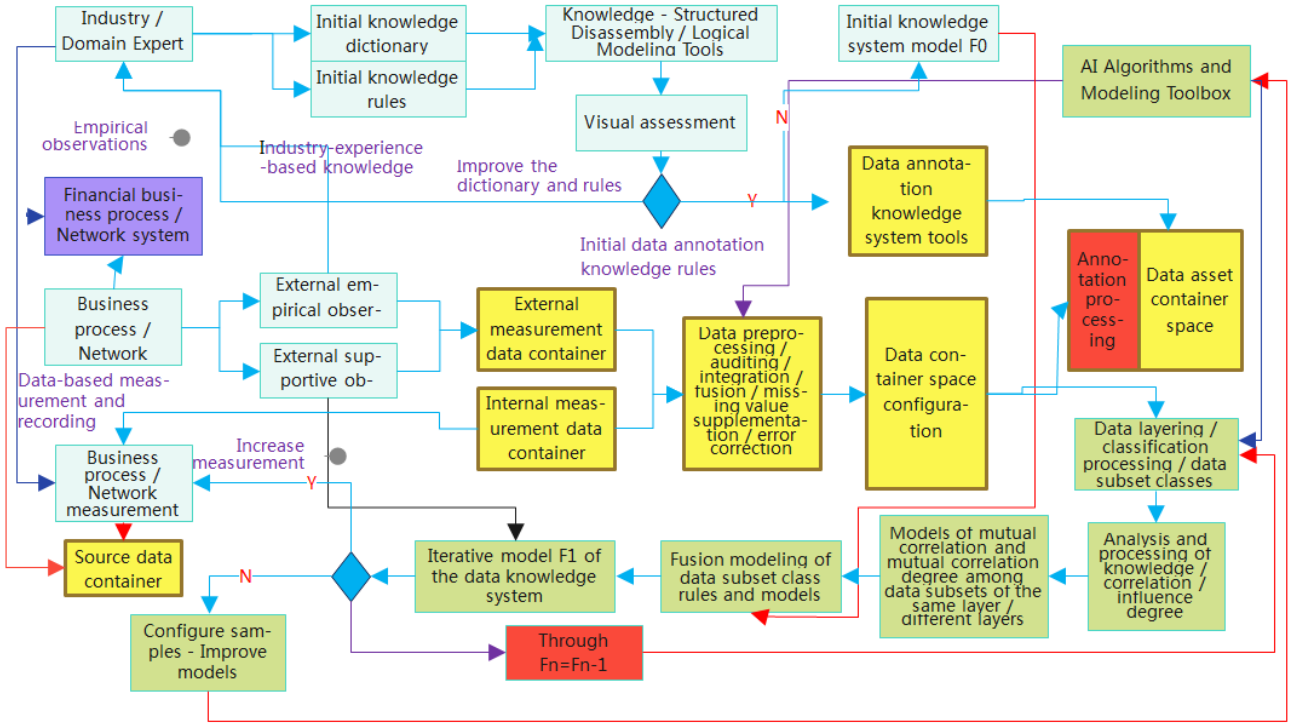

Figure 2. *Modeling process for isomorphism and consistency of the business network systems of securities companies.*

Therefore, the business network system is presented as business - behavior - level observed data records on the user side. This part of the business network profile model is to classify business - behavior levels and model their homomorphism - consistency. Then, with the given management and control system as the constraint target, evaluate whether the business - behavior - level risks are under control, and mine and identify the causes of business - behavior - level risks and their influence degrees or risk costs.

Since the business network system is designed by the securities company according to certain rules and patterns, its structure can be modeled for isomorphic - consistency. To model the isomorphic - consistency of the securities company's business, it is necessary to introduce the empirical knowledge of industry or field business experts to build the initial structure model of the business network. Then, use the business - behavior - level observed records to correct and run - in the initial structure model of the business network, and iterate repeatedly to approximate the real business network structure model, so as to realize the isomorphic - consistency modeling and analysis of the business network system. This is a structured functional operator (function) established on the business - network - behavior - classification space. Moreover, it is a set of pan - function network diagrams of multi - node, multi - level, mutually - related and interacting sub - functional operators (functions) under certain rule constraints. Its structure needs further analysis and definition. The process is shown in Figure 2.

Through the structured isomorphic - consistency model of the business network, the inherent risks of the business network can be identified and control strategies can be designed (including identification criteria and conditions, threshold setting and triggering early warnings, case accumulation and online application, evaluation of risk mitigation and emergency handling strategies, improvement and patching of the business network, etc.), and it can be analyzed whether the risks originate from users or are induced by the business network, and the business network's anti - risk - impact level and its recovery and repair capabilities can be measured.

4.6. The Associated Network Between Business Network Profiles and User Profiles and Their Degree of Influence

4.6.1. The Essence of Business Network Profiles

Business network profiles are about the business - behavior - level homomorphism - consistency modeling and business - network - isomorphic - consistency modeling of the business network system, not simply data mining and advanced attribute statistics. Therefore, in essence, business network profiles are data models borrowed to express the business network system, and they themselves describe the isomorphic - consistency and homomorphism - consistency characteristics of a complex network system.

4.6.2. User Profiles are the Description and Analysis of the Market Network System of Users and Their Potential Users

Therefore, the user profiles of securities companies can be

extended into two sets of system - description mappings:

One set of system - description mapping is a deterministic profile system of users' social attributes, such as gender, age, educational experience, work experience, income, residential area, occupation, role, main social relations, family relations, marital status, children situation, violations of laws and regulations, bad habits, property and economic situation, etc.

The other set of system - description mapping is a user - behavior - level homomorphism - consistency system, which is non - deterministic, and there are certain patterns of mutual influence and interaction among users within a certain range. The user - behavior - level homomorphism - consistency system is a structured model system that exists independently for each user and contains four functional subsystems: a business - information - perception - and - environmental - cognition functional subsystem, a knowledge - cognition - and - iterative - learning functional subsystem, a behavior - analysis - and - - effect - evaluation functional subsystem, and a decision - and - - action subsystem.

Taking the first set of system - description mapping as an index, an equivalent classification analysis of the second set of system - description mapping can be carried out. According to behavior equivalence classes and behavior - homomorphism - consistency, the user - network - association - and - - interaction relationships can be identified, and a user - association - - interaction - and - - influence - network profile can be established.

In this way, the association model of the business network connecting to the user network points to precise marketing in the market and the activation of users' consumption behaviors. The association model of the user network connecting to the business network points to users' business experiences and the identification of sources of business risks.

Build an association model of business - to - user direction. To activate users' consumption behaviors, it is necessary to discover user nodes with large influence degrees and their behavior classes in the user network, build an association model of business - to - user direction here, and design influence - degree - action strategies in a targeted manner.

Countermeasures and action strategies for preventing business risks require identifying users' risk behaviors and their risk preferences in the user network, evaluating the conduction patterns and characteristics of users' risk behaviors to the business network, and also evaluating the risk - pressure level of the business network system in terms of structure against users' risk behaviors and the cost of risk mitigation.

4.7. Three Achievements in Big - Data Analysis and Business Application Progress

Expand the user profile into a multi - dimensional deterministic - attribute profile and a multi - state - integrated behavior - level homomorphism - consistency profile model. Model the user - behavior - level observed data and conduct big - data analysis to obtain the user - deterministic - - attribute profile and the user - behavior - level classification - perspective model system, including user - behavior risks, consumption attributes, and purchase preferences, etc.

Expand the business - network profile into the modeling and analysis of the business - behavior - level homomorphism - consistency profile model and the business - structure - isomorphic - consistency profile model. Conduct profile modeling and big - data analysis on the business - behavior - level observed data of the securities company to obtain the statistical - homomorphism - consistency profile model of business behaviors and predict the statistical - homomorphism - consistency trends of business behaviors. In addition, introduce the empirical knowledge of industry or field experts to establish a structured - empirical - model system for a given business, and perform correction AI training on the structured - empirical - model system of the business according to the business - behavior - observed data to approximate and obtain the structured - isomorphic - consistency profile model system of the business, so as to conduct quantitative analysis and trend deduction on business risks and costs, discover the internal risk points of the securities company's business from the structure of the business - network system, and evaluate the internal - risk - management - and - - control strategies and their effects.

Conduct quantitative analysis on the network association, influence, and interaction between the business - network profile and the user profile (here, the business refers to the internal - business network composed of products and services provided by the securities company to users, and the user itself is a network relationship). This can achieve business - marketing analysis and precise product pushing, and can also discover risk loopholes and improvement directions for the company's own business.

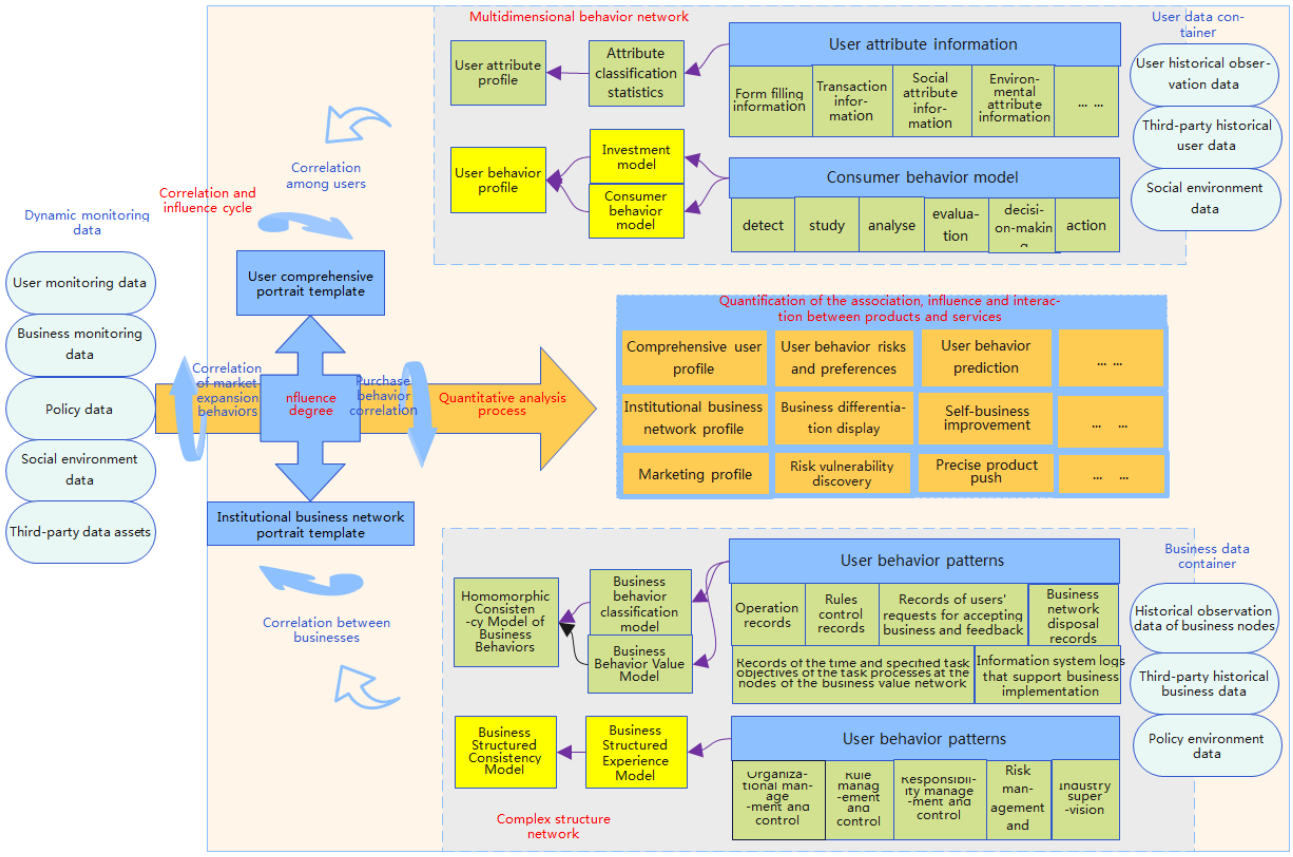

Figure 3. *The correlation model that connects the profile of the business network system of a securities company with the profile of the user network system.*

4.8. Algorithm and Modeling Framework

Previously, we have discussed from the aspects of market demand and the architecture framework design of big - data modeling and analysis for the securities company business, and presented the extended user profiles, business network profiles and their application values. Next, from the perspectives of algorithms and modeling, we will discuss one by one the structured model frameworks of user profiles, business network profiles, and the association relationships, interactions, and influence relationships between them.

4.8.1. Basic Assumptions

1) The sets of business - observation data and user - observation data of the securities company are stored in different data containers respectively. These data are mainly divided into the following parts: business - behavior - observation data, user - basic - attribute data, user - behavior - observation data, user - business - association data, industry - rules - and - regulations data, user - business - environmental - support data, business - internal - environmental - support data, business - risk - early - warning - rules - and - - emergency - plan - support data, industry - business - case - support data, etc.
2) There are empirical - knowledge frameworks and initial models of industry or field experts for both the business network system and user behaviors.
3) Users have the independent ability to obtain information, can continuously learn and recognize the consumption environment, product and service knowledge, make action decisions in their own favor without interference, and tend to choose positive - return trends.
4) The set of user - behavior - level - observation data contains behavior traces. Through the analysis of user - behavior traces, the external influencing factors of user behaviors and their interaction processes can be discovered.
5) The set of user - behavior - - observation data is hierarchical. The classification subsets of the behavior - - observation - data set at the same level can generate unpredictable and unforeseeable behavior states during the interaction process.
6) From the perspective of the industry itself, the big - data - AI - application system for financial business is a data - knowledge - system - modeling - and - - analysis platform for the observation - data space of the homomorphism at the main - behavior - level and the isomorphism at the main - structure - level of the complex - network system of financial business. The so - called homomorphism at the main - behavior - - level is man-

ifested as the behavior - level - equivalent - consistency of the main - body activities, main - body behaviors, and the interactions between main - bodies observed from the data. The so - called isomorphism at the main - structure - - level is manifested as the structure - level - equivalent - consistency of the main - body activities, main - body behaviors, and the interactions between main - bodies observed from the data. All the homomorphism - level and isomorphism - level models established based on the observation - data space are collectively referred to as data - knowledge - system models.

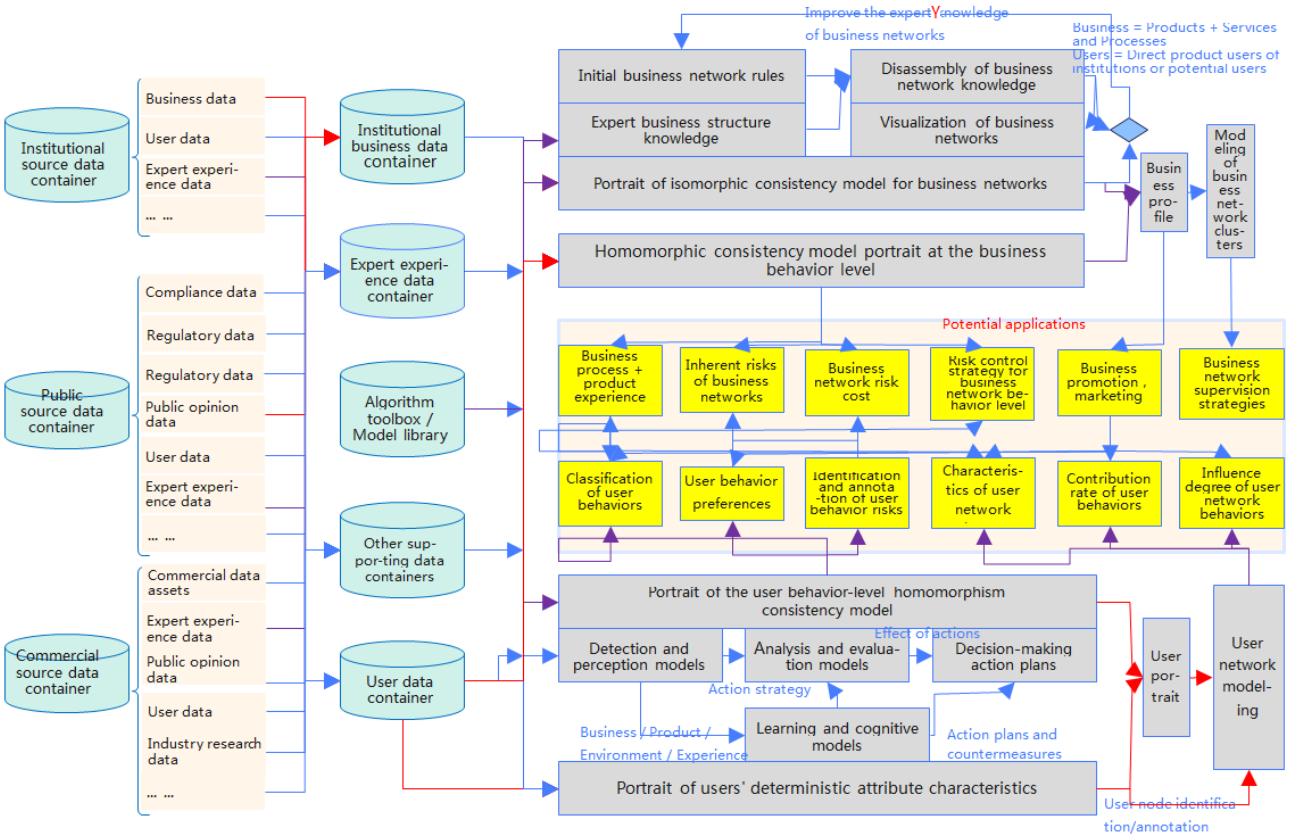

Figure 4. *The framework of the structured knowledge system model for the business of securities companies.*

7) To obtain the behavior - level analysis and structure - level - penetrative presentation of business operations from the observation - data space and obtain the data - knowledge - system model, it is necessary to disassemble the relationships shown in Figure 1 into a structured - knowledge - system model of the securities company business required for the analysis and modeling of the observation - data space through the joint efforts of financial - industry experts and experts in management, information, and applied mathematics. This model is generally built under the leadership of industry and management experts, but it requires experts in information and applied mathematics to conduct cross - industry - structured disassembly and logical - processing modeling. This is an initial industry/field - knowledge - system model. In the initial - knowledge - system model, requirements for data sources of the industry - observation - data space, data - annotation requirements, behavior - level - attribute - and - - state - - indicator requirements, structure - level - interaction - - characteristic - and - - performance requirements, abnormal - origin - - tracing - and - - steady - - state - - control - - strategy requirements, etc. will be provided.
8) According to the data source requirements of the industry - observation data space, we can configure the data - space management system and the data - annotation knowledge system to obtain the initial data - resource space and its data - resource - service management system; in the subsequent iterative process of data - space - knowledge - system modeling, it is necessary to continuously iteratively expand and improve the data - resource space and its data - resource management system.

4.8.2. Data - Space Processing Requirements and Basic Steps

Step1: Pre - processing of the industry - observation data space, data auditing and rule auditing, data integration and fusion processing, handling of missing/censored data, data

error correction, visualization, etc.

Step2: According to the initial knowledge - system model, stratify the data, classify, identify, annotate, and analyze the association and influence degree of the data at the same layer.

Step3: Define the observed - data subsets of the interaction between data classes at the same layer and analyze the data - association rules and the mutual - influence - action model between data subsets.

Step4: Define the association rules and the mutual - influence - action model between observed - data subsets at different layers.

Step5: Starting from the initial knowledge - system model, use the network - generation method to perform data, model, and rule - fusion modeling on the observed - data space of the securities - business complex - network system to obtain the data - knowledge - system model.

Step6: Run - in and perform consistency evaluation on the data - knowledge - system model to determine the homomorphism - consistency and isomorphism - consistency of the data - knowledge - system model.

Step7: The evaluation results can be roughly divided into one or a combination of the following four situations: pass, insufficient data, inaccurate/insufficient use of samples, inappropriate selection of the basic model.

4.8.3. According to the Evaluation Results, It Is Necessary to Switch to the Following Four Types of Processing

1) If it passes, the output model is transferred to the data - knowledge - system model library, and it is transferred for further business analysis. After being fused with the data - annotation knowledge system, annotate the data with uncertain annotations, and output the improved data resources.
2) If the data is insufficient, explore whether the source - data resources are sufficient and transfer to the source - data - resource - collection - processing subsystem.
3) If the samples are used inaccurately/insufficiently, supplement data samples from the data space, and further subdivide or re - classify the classified - observed - data subsets.
4) If the basic model is inappropriately selected, modify the parameters or structure of the basic model, explore supplementing or adding new basic models, and improve the algorithm.

The above processing and analysis process is shown in Figure 2.

5. Conclusion

Securities companies possess various types of data, including personal attribute information, asset and transaction records, user earnings data, and external data. On this basis, securities companies can utilize the above-mentioned data in combination with their own and external business networks to obtain descriptive images of business scenarios. Through the business network system, they can establish user association, interaction, and impact network profiles, conduct modeling and analysis, thereby obtaining more accurate and scientific data analysis and business applications, realizing refined user services, providing suitable services and products for users, and avoiding risks to achieve a win-win situation for both the company and users.

Abbreviations

CRM	Customer Relationship Management
ID	Identification Number
Hadoop	Open Source Frameworks for Processing Big Data
Spark	Distributed Computing Engine
K-Means	Clustering Algorithm
CNN	Convolutional Neural Network
RNN	Recurrent Neural Network
LIME	Local Interpretable Model - Agnostic Explanations
SHAP	Shapley Additive Explanations
t-SN	t-distributed Stochastic Neighbor Embedding
BPMN	Business Process Modeling Notation
Bizagi, Signavio	Process Modeling Tools
UML	Unified Modeling Language
Enterprise Architect	Enterprise-Level Modeling Tools
StarUML	Visual Modeling Tools
Python	High-Level Programming Language
Pandas	Data Processing Tools Based on NumPy
NumPy	The Core Library for Scientific Computing in Python
Scikit - learn	Python Libraries for Machine Learning
R language	Programming Language for Data Analysis and Statistics
Oracle, MySQL, SQL Server	Database Management System
TensorFlow, PyTorch:	Deep Learning Frameworks
SPSS, SAS	Statistical Analysis Software
Gephi	Open-source Network Analysis and Visualization Software
AnyLogic	General-purpose Modeling and Network Analysis Tools
Arena	Discrete Event Simulation and Automation Software
JUnit, TestNG	Model Validation and Testing Frameworks
Tableau, PowerBI, Git	Version Control Tools

TOGAF	The Open Group Architecture Framework
IPv4, Pv6	Network Protocol Version
SQL DDoS	Distributed Denial of Service Attack
RHO	Channel State Information Parameters
DOS	Denial of Service Attack
DAD	Duplicate Address Detection
MLD	Multicast Listener Discovery Protocol
IPS	Intrusion Prevention System
WAF	Web Application Firewall
HTTP, HTTPS	Network Communication Protocol
Websocket	Full - duplex Communication Protocol
ETL	Extract, Transform, Load
QOS	Quality of Service

Author Contributions

Huimin Li is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author Huimin Li is employed by Zhongtai Securities Co., Ltd. The viewpoints, data collection and analysis process of this research are all independent of the company and free from its interference. The author declares that there are no conflicts of interest.

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Biography

Huimin Li, male, is the Managing Director and Senior Economist of Zhongtai Securities Co., Ltd. senior economist. He holds a master's degree in engineering, a doctorate in management, and a postdoctoral degree in mechanics from Tianjin University. His major is Management Science and Engineering. He has published more than 30 papers in domestic and foreign journals, participated in more than 3 scientific research projects at or above the provincial and ministerial level and won awards. He has successively served as the director of the research institute, the general manager of the derivatives department, and the general manager of the retail business department in the securities company, focusing on the application research of management decision-making and nonlinear dynamic systems in the financial securities industry.