Research on the Banking and Finance System Under the Mathematical Model of Risky Decision-Making

Yuanlong Gao

The University of Chicago, Chicago, USA

yuanlongg@uchicago.edu

Abstract. In the informationization process of China's commercial banks, how to effectively manage and evaluate them has become an urgent problem for China's commercial banks. The article analyzes the characteristics and risks of the commercial bank's information system. And put forward a method and process of evaluating it, thus constructing a model of risk control and evaluation for the information system of commercial banks.

Keywords: Commercial Bank, Information System, Risk Assessment, Financial System, Risk Decision.

1. Introduction

With the rapid development of China's banking industry, the rationality, effectiveness, economy, usability, security and other issues of its informatization projects have been paid more and more attention by people. Therefore, the problems existing in the information construction of China's banking industry are studied, and corresponding countermeasures and suggestions are put forward. Using advanced assessment methods, improve the information system risk assessment process, and build an assessment model that matches the risk characteristics of commercial banks. This article improves the prevention and response of financial risks by using advanced risk assessment systems and conducting security tests on financial risks using this information model. It also establishes a good internal control risk management system to establish good information security and stable operation.

2. Risk analysis of commercial bank information system

2.1. Basic features of commercial bank information system

After China's accession to the WTO, in the global economic integration process, companies and individuals require a safe and effective method and environment for fund transfer, payment and settlement [2]. Banks have been improving their information management systems to make them more electronic and networked, which has given new features to the information systems of commercial banks.

2.1.1 Characteristics of the management system

By virtualizing the bank outlets, the calculation and management of accounts are separated, and all accounts are handed over to the head office for management, while each branch manages specific businesses, so that business processing Break through the limitations of the department [3]. The organic combination of accounting and business has realized the close connection between the financial system and the financial system, and realized the sharing of user information between different systems. The business process is monitored to realize the safe and reliable operation of the enterprise. The business process of the bank is business-oriented, and all functions are driven by transactions. The accounting department is at the bottom of the business activities, and the business activities are realized by calling the accounting center.

2.1.2 Research on the information management system of Chinese commercial banks

The business scope of the bank includes: deposit, loan, credit card, intermediary business, international business, settlement, collection and payment, automatic withdrawal, POS machine, online banking, etc. This article introduces the current situation and existing problems of informationization construction in commercial banks in China. And corresponding risk control methods were proposed. Figure 1 shows the operational structure of the commercial bank information system.

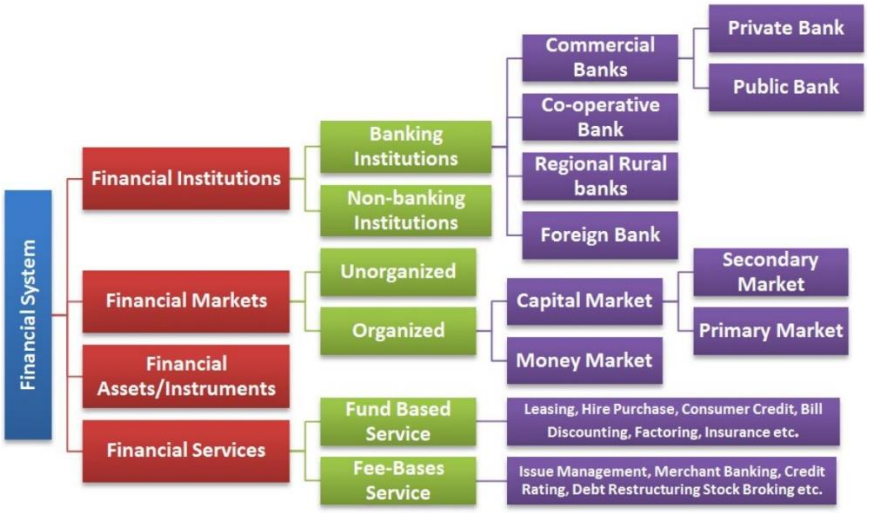

Figure 1. Operational structure of a commercial bank information system

2.1.3 Construction of information system of Chinese commercial banks

The information system structure of commercial banks is divided into three levels: the first is the main accounting, main business support and business reports; the second level is the intermediary service platform, which is the exchange platform for core data and external interfaces [4]. Realize the interaction between the enterprise's internal information and external information; the third peripheral system provides an interface for external data. The results are shown in Figure 2 (picture cited in MI Systems Architecture Implications of Basel II and IAS 39).

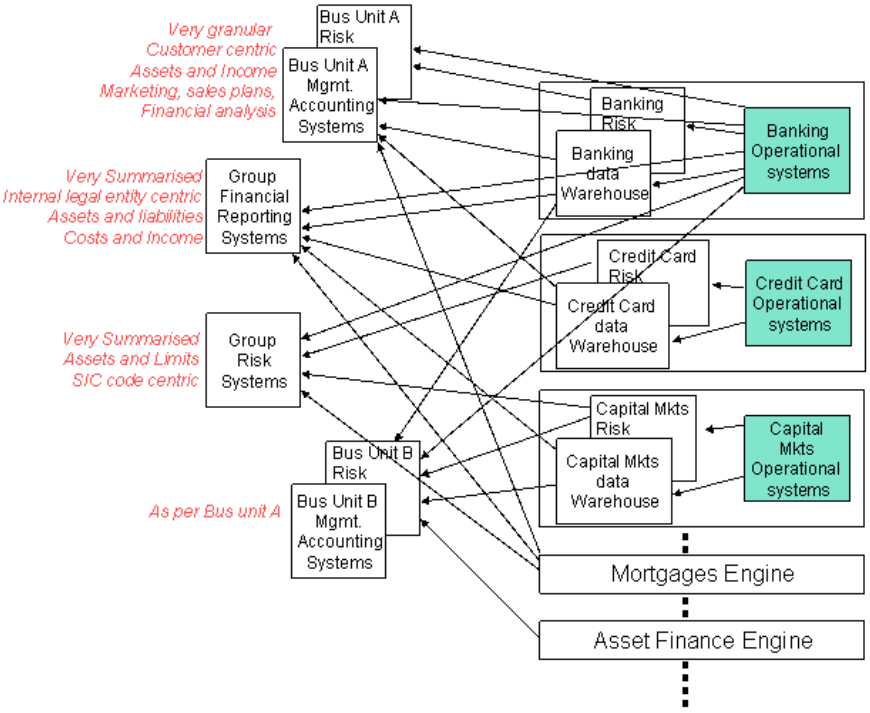

Figure 2. Hierarchical structure of commercial bank information system

2.2. Risk characteristics in the IT system of Chinese commercial banks

The operation of banks has unique requirements on real-time and reliability. Therefore, there are more prominent industry characteristics in China's commercial banks.

2.2.1 Business characteristics of commercial bank IT system

Commercial banks have developed to an "electronic" level based on information technology. In terms of commercial banks, there are very high requirements for data integrity. They have very high standards in terms of business and data availability and security, as well as in the prevention and handling of business interruption and data loss.

2.2.2 Technical features in the information construction of Chinese commercial banks

Although China's commercial banks have a long history of implementing informatization, the informatization construction of commercial banks has been in a relatively closed state for a long period of time. In recent years, with the continuous emergence of new businesses such as online banking and intermediary business and wealth management products, the demand for open information systems has also been increasing. open. With the development of China's banking industry, business exchanges between financial institutions are becoming more and more frequent.

2.2.3 Risk status in the information construction of Chinese commercial banks

The dangers inherent in information systems themselves are increasing. The banking industry has high information technology and product density, because the scope of information technology is getting wider and wider, Information technology has also rapidly developed. This has caused deficiencies in the information technology, software, hardware, and other aspects used in the current information construction of commercial banks. Especially in this situation, once exploited by specific attack methods, it will bring serious harm to the bank's information system. Confidentiality, completeness, effectiveness. The centralization of banking business data makes it difficult to manage it informationally. At present, major commercial banks have successively carried out large-scale data centralization, separating the bank's accounting information from its business organizations, so that banks can shift from accounting and product-centric to customer-centric. However, with the continuous development of banking business, the degree of its informatization is also increasing, and even to a certain extent, it will have a negative impact on banking business.

With the continuous development of Internet financial services, commercial banks are facing unprecedented challenges. The new service models of banks, such as online banking, mobile banking and e-commerce, are not only new profit growth points for banks, but also highlight the Internet risks faced by banks. The danger to employees becomes the greatest danger [6]. According to data analysis, currently only 20%-30% of data leakage incidents occur in Chinese commercial banks, while 70-80% are due to staff mistakes or intentional leakage.

3. Research on MIS-based commercial bank informatization risk assessment model

3.1. The development status and direction of IS risk assessment of commercial banks in China

In some practical work abroad, people have gradually realized that risk assessment plays a pivotal role in ensuring network information security. In the relevant information security and security technical specifications, evaluating security risks is an important link.

The current domestic IT risk assessment work has just started, and mature industry standards have not yet been formed. There is also a lack of a group of specialized personnel who can conduct IT risk assessments. No matter there are many large multinational companies in the world, or there are many relatively large companies in China, they are continuously expanding the information technology they use in their business activities. However, using traditional information technology and risk assessment knowledge, they do not make possible the risk assessment of the "risk-based model", and

this situation has a certain impact on our IT governance and information system risk control. Since the operation and management activities of commercial banks are heavily dependent on information technology, in the risk management of enterprises, the risk control of information technology is a very critical part, and from the perspective of enterprise development strategy, the informationization of enterprises must be Integrate with the overall governance objectives of the enterprise. Therefore, this paper analyzes the current situation and existing problems of the risk assessment of domestic banking information systems, and based on the international experience and the reality of China, conducts a differential analysis [7]. A practical method of information system risk assessment, thus, can make information system risk assessment a qualitative leap in the domestic banking industry.

3.2. A risk assessment method in the information construction of Chinese commercial banks

The currently used risk control and evaluation models can be roughly divided into two types. One is the risk evaluation model based on commercial risk control. This model is based on the traditional risk evaluation theory and therefore focuses more on the The control of business processes and the management of business risks; the second is a risk assessment model focusing on technology control, based on relevant information security norms, focusing on the implementation structure and methods of technology. In reality, the banking industry is facing a large number of information risks, so it is necessary to build a complete set of risk assessment models guided by the overall information management [8]. Therefore, it is necessary to combine the relevant methods of the business risk model and the technical risk model, and analyze the weak links and risk factors in the internal control mechanism of the system itself, so as to identify the bad behavior in the interaction process between the system and the external environment Finally, a qualitative analysis of system weaknesses and security threats is carried out. Construct a risk assessment model among the internal risk elements of the bank information system (Figure 3 is quoted from UNITAS RISK SOLUTIONS).

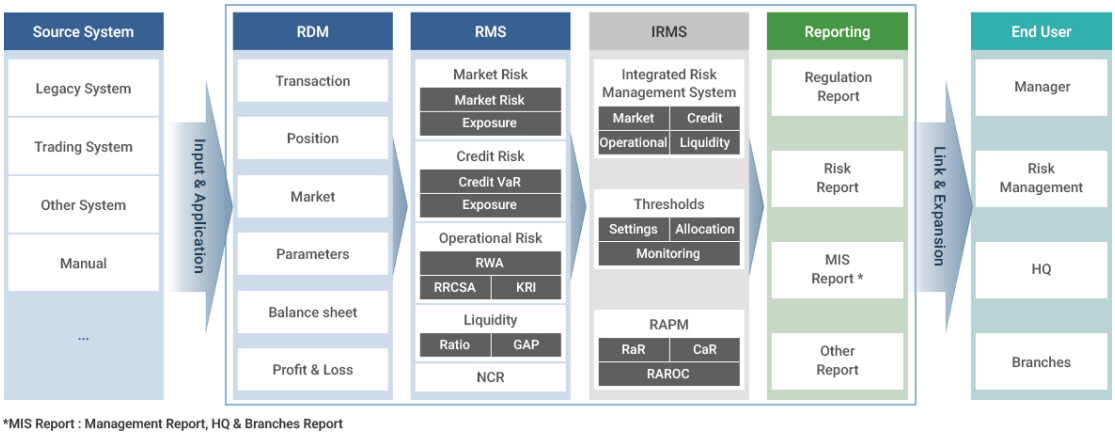

Figure 3. Risk assessment model of MIS

The risk assessment model of the information system consists of three basic units: the core business system of the bank, the risk management of the bank information system, and the methods and techniques of risk assessment. The core business system of a bank is the foundation of an enterprise's business activities, and it is also a reflection of the inherent risks of the enterprise. System risk control includes construction risk control, system data integrity, system function realization, business process risk control, and data migration. The theory and technology of risk assessment are based on assessment and management. According to the needs and characteristics of information system risk management, a variety of risk assessment methods and techniques are used to identify inherent risks and residual risks, so as to evaluate the overall risk of bank information systems.

4. Research on MIS-based risk assessment method for commercial banks

4.1. Realization framework of risk assessment

Commercial banks face damage and loss at any time, and this risk depends on crucial information assets, threats to assets, and vulnerabilities used by threats. To implement the information system risk assessment model, it is necessary to identify information assets and conduct threat and vulnerability analyses. The specific implementation framework is shown in Figure 4 (the picture is quoted in the development of a strategic risk analysis framework for interconnected surface transportation systems). The combination of census and survey is adopted to define and allocate information resources. The threat to the information system mainly comes from the internal risk management of the enterprise and the change of the external risk environment of the enterprise. The weak link comes from the inconsistency between the information system's security and the enterprise's security requirements. The research on the weak link mainly includes: application software evaluation, network architecture evaluation, manual evaluation, tool scanning, security management audit, policy evaluation, etc.

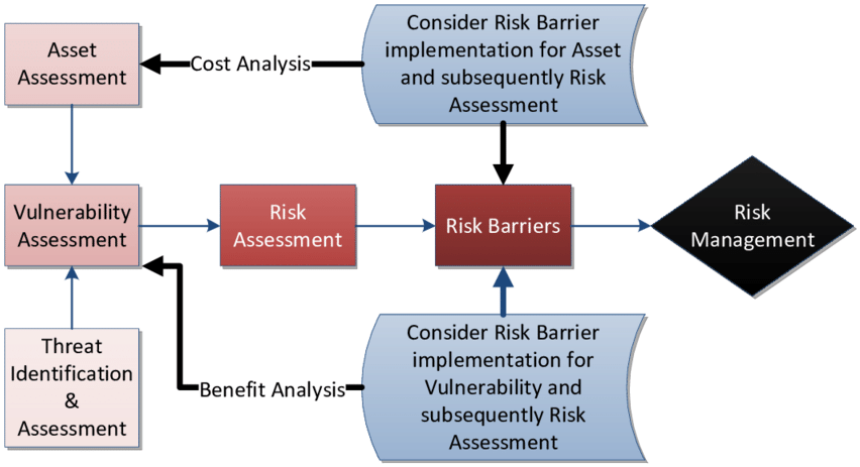

Figure 4. Risk assessment model implementation framework

4.2. Procedures for performing a risk assessment

4.2.1 Analysis of IIS Risk Strategy

Commercial banks should start by formulating IT risk strategies and publish and maintain IT risk strategies within the company, so as to provide protection for IT risks and keep pace with their own development. When conducting information system risk assessment, This article analyzes the feasibility of information system business support, proposes the internal and external environment for technological development, and provides managers with a full understanding of the level of support for information technology, thus gaining a complete understanding of information system risks. Evaluate these strategies based on business development strategies. From Figure 5 it can be seen that the overall risk and the residual risk must first be determined (picture cited in Mapping between Classical Risk Management and Game Theoretical Approaches). Next, classify the various risks that have been identified. Determine the two indicators of strategy and process; finally, determine the effectiveness of process execution.

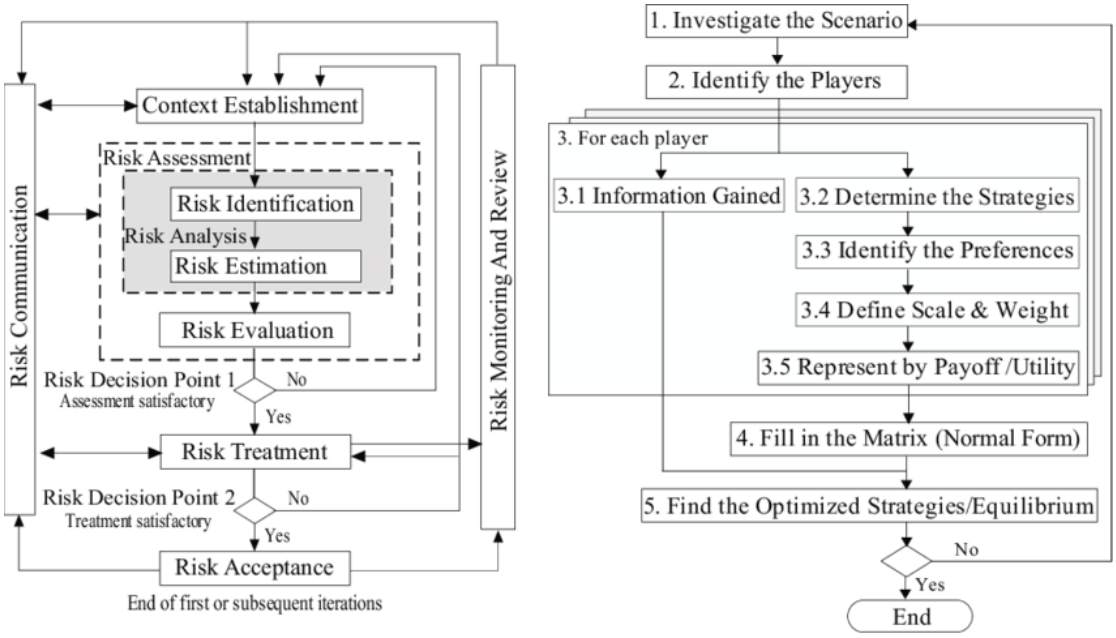

Figure 5. Information system risk strategy and process analysis

4.2.2 The elements of risk assessment are defined in detail

Create a scope table for an IIS risk assessment, such as systems, people, resources, etc. The system's operation includes host system, hardware equipment, personnel management, disaster backup, rights management, etc. Compile the IT process evaluation table, such as the primary process, auxiliary process, the corresponding operation of the process, the main internal risks, risk control methods, etc.

4.2.3 Methods and procedures for clarifying audits

Identify the skills and methods to be used in information system auditing, including: field observation, interview, review, re-execution, knowledge assessment, etc.

4.2.4 Issue audit report

After completing the testing of the system, make an evaluation report. The evaluation results should include the primary content of the evaluation results and the problems existing in the evaluation results.

5. Conclusion

Organically integrate the business and technology evaluation models to construct a series of evaluation models and implementation methods of information system risk evaluation based on commercial banks. This can effectively prevent the conventional evaluation model from being applied to the risk evaluation of commercial banks inequities that arise. And by identifying the assets, threats, vulnerabilities, and risks of commercial banks, control defects, loopholes, and possible risks from inside the information system were discovered. Assist commercial banks in building and improving the internal control system, and based on the needs of business development, determine the purpose and content of informatization construction, and continuously adjust the existing information system management structure and process to make it more. It has provided services for the business management of commercial banks.

References

[1] Zhu Ziyan, Liu Xiaoxing. Systemic Risk Spillover and Vulnerability——A Study Based on Tail Risk Perception of China's Listed Financial Institutions. Financial Economics Research, Vol. 38(2023) No.2, p.20-34.

[2] Lian Jie, Liu Zheyi. The impact of non-financial enterprise shadow banking on systemic financial risk. Modern Marketing, Vol. 10(2021) No.1, p.34-36.

[3] Chong Yuqi, Zhu Wenjun, Miao Tianshuo. Credit decision-making model based on K-means clustering to maximize bank effect. Economics, Vol. 4(2021) No.3, p.30-32

[4] Wu Xueqing. Research on Credit Risk Evaluation of Agricultural SMEs under the Supply Chain Finance Model. Journal of Guiyang University (Natural Science Edition), Vol. 16(2021) No.3, p.54-58.

[5] Wang Yan, Wang Jihong. Structural Monetary Policy, Interbank Business and Systemic Financial Risk. Financial Economics Research, Vol. 36(2021) No.4, p.150-155.

[6] Chen Shaoling, Li Jie, Tan Liming, Yang Haisheng. Research on the High-dimensional Time-varying Measurement and Transmission Mechanism of China's Systemic Financial Risk. World Economy, Vol. 044(2021) No.12, p.28-54.

[7] Zhai Yonghui, Zhao Fei. Research on Systemic Risk Spillover Effects of Real Industry and Banking Industry——Analysis Based on GARCH-Copula-CoVaR Model. Vol. 2 (2021) No.5, p.40-51.

[8] Liu Bing. Research on Financial Stratification Decision Model of Commercial Banks under the Background of Financial Technology. Agricultural Bank of China Journal, Vol. 6 (2022) No.4, 46-48.