Research Article

Analysis of Financing Risk and Innovation Motivation Mechanism of Financial Service Industry Based on Internet of Things

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It is of practical significance to introduce the Internet of Things technology into the financial service industry and find the driving factors and mechanisms of financial innovation to accelerate the promotion of financial innovation. This article starts from the perspective of banks and other supply chain financial institutions, takes mainstream trading products in the commodity trading market as the research object, uses the LA-VAR model, and fully considers the market price fluctuations and liquidity factors of supply chain financial inventory products. It analyzes the theoretical basis of the continuous innovation of rural financial products. On the basis of analyzing the basic characteristics and types of rural financial product innovation, we explore the connotation of sustainable innovation of rural financial products, clarify the evaluation criteria, and lay a theoretical foundation for continuous dynamic evaluation. Based on technical innovation evaluation theoretical models such as Schumpeter's innovation model, technical specifications-technological track model, and NR relationship model market, we analyze the innovation elements of rural financial products from the external and internal aspects of innovation and discuss the relationship between the factors. The interaction mechanism of rural financial products has established a dynamic mechanism model for the continuous innovation of rural financial products. A fuzzy comprehensive evaluation was made on the continuous innovation power of financial service industry products in a certain area. Using a combination of remote surveys and on-site visits, a questionnaire survey was conducted on financial service industry institutions in a certain region's financial system. Each survey object was required to conduct 120×1067 index comparisons and use the data after processing the arithmetic average Matlab carries out the objective processing of programming. The results show that the LA-VAR model with liquidity indicators can measure the liquidity risk well and more comprehensively evaluate the risk of the inventory pledge financing model. According to the index weights determined by AHP, the development of the financial service industry will be promoted in a targeted manner from the internal construction of financial institutions and the optimization of the external innovation environment.

1. Introduction

At present, the development of the Internet of Things in the financial services industry is in its infancy in the world and has a certain technology, industry, and application foundation, showing a good development trend. The mature Internet of Things technology can realize the connection of all items to the network, thus facilitating people's identification and management control of items [1–3]. In the supply chain management of production and circulation

enterprises, visual tracking of products in the production link, storage link, transportation link, and sales link of the enterprise is realized. The financial services industry uses this visual tracking product as the basic target to carry out financial innovation, create new financial products, services, and sales channels, and provide diversified financing methods and channels, thereby occupying new market areas and improving overall competitiveness [4].

As the Internet of Things technology continues to mature, it is being promoted and used at home and abroad, and

the financial industry is no exception [5, 6]. By using sensors, infrared, and other devices on financial payment terminals, the integration of the Internet of Things and the financial transaction network can be realized. Since the current self-service terminals in the financial industry are large in size, power-consuming, of single function, difficult to monitor, and insufficiently safe, such as ATMs, self-service inquiry machines, and online banking experience machines, it is necessary to accelerate the application of Internet of Things technology in the financial industry [7]. The security precautions of all business areas of the bank are classified as high-risk levels [8]. According to the requirements of China's banking security practice, the bank's business outlets, treasury, and office areas must implement comprehensive security precautions. On the other hand, similar to other industries, these business areas of banks have some security risks that are difficult to prevent with traditional security technology [9]. For example, there is no effective overall solution for the security of self-service banking. For instance, the financial industry has always hoped to solve them as soon as possible. For example, the escort, storage, and opening of cash boxes are very sensitive, and the personnel involved are all highly stressed. If each cash box can be accurately positioned, authorized to open, and authorized to transfer, the safety of the cash box can be ensured [10–12]. The former is provided by banks and other financial institutions with short-term financing, while the latter is solved internally by the supply chain, mainly focusing on the optimization of accounts receivable, inventory, and fixed asset income [13, 14]. The researchers discussed the evolution of financial supply chain management to supply chain finance from the process of the development of the real economy and defined the connotation of supply chain finance as a support [15]. At the same time, they pointed out that the development of this business has realized the development of banks and other financial institutions [16–18]. By constructing a tripartite game model among banks, financing SMEs, and logistics companies, relevant scholars have compared and analyzed the different impacts brought about by the participation of logistics companies and without the participation of logistics companies [19, 20].

First, we perform a comparison with the value of risk when single-variety supply chain financial inventory is used as pledge and explain the empirical results reasonably. The calculation results of the model show that the continuous innovation power of financial service industry products in a certain region is average.

Second, the study confirmed that, as one of the six central provinces and three northeastern provinces to carry out innovation pilot projects, under the leadership of the provincial party committee and the provincial government, various financial institutions have intensified innovation in the financial service industry and achieved certain results. However, compared with the eastern coastal areas, the overall level of the financial industry in a certain area is still relatively backward, the development of the financial service industry is obviously lagging behind, and the

continuous innovation of financial service products is a general reality.

Under the premise of ensuring the rationality and stability of the research data, this paper uses the LA-VAR model to quantify the liquidity risk and market risk of the supply chain financial inventory portfolio composed of rebar and palm oil. Specifically, the technical contributions of this article can be summarized as follows:

The rest of this article is organized as follows. Section 2 discusses related theories and technologies. Section 3 analyzes the financing risk of financial inventory portfolio pledge in the financial service industry supply chain. Section 4 conducts an empirical analysis of the dynamic mechanism of continuous innovation of financial products. Section 5 summarizes the full text.

2. Related Theories and Technologies

2.1. Supply Chain Financial Service Industry Model. In the entire process of the supply chain, cash flow gaps have been generated in prepayments, supply chain financial inventories, accounts receivable, and other links. By classifying these links, three business models of supply chain finance have emerged: confirmation warehouse financing, warehouse financing, and accounts receivable financing.

2.1.1. Confirmation Warehouse Financing. For core enterprises, confirming warehouse financing firstly enhances dealers' sales capabilities, solves the problem of product backlog, expands the market share of products, and obtains greater commercial profits. Secondly, it locks in sales channels in the fierce market competition and obtains the competitive advantage of the industrial chain. Thirdly, there is no need to finance from banks, which not only reduces the cost of funds, but also reduces the occupation of accounts receivable and guarantees collection. For small- and medium-sized enterprises, there is no need to worry about the difficulty of purchasing goods due to shortage of funds. The bank provides financing facilities for them and obtains preferential prices from upstream core enterprise suppliers. Products with large gender differences can also be ordered in off-season and sold in peak seasons to obtain higher profits. For banks, through the business of confirming warehouses, they not only obtain abundant service fees and possible bill discount fees but also master the power to withdraw goods.

2.1.2. Financing Warehouse Model. The business process is shown in Figure 1. The financing model of Rongtongcang takes small- and medium-sized enterprises as the main service objects, based on mobile commodity warehousing, and uses third-party logistics companies as a comprehensive service platform that connects small- and medium-sized enterprises and financial institutions to make the movable property pledge loan business for small- and medium-sized enterprises feasible. The core enterprises in the supply chain are powerful and large-scale enterprises that can help upstream and downstream SMEs solve financing guarantee

FIGURE 1: Schematic diagram of financial services industry financing and warehouse model.

difficulties through guarantees or promises of repurchase. The financing mode of financing can ensure that SMEs have a stable source of supply or sales channels and establish good cooperative relations with core enterprises. With good warehousing, logistics, and evaluation conditions, Rongtongcang not only assists small- and medium-sized enterprises to obtain financing support with the pledge of movable properties stored in Rongtongcang but also helps banks as pledgers solve the problems of pledge valuation, supervision, and auction. In short, through the financing and warehouse model, the movable properties of small- and medium-sized enterprises that banks were not willing to accept in the past are transformed into pledged movable properties that they are willing to accept, thus serving as a new bridge between small- and medium-sized enterprises and banks for financing.

2.1.3. Accounts Receivable Financing Model. Specifically, accounts receivable financing refers to the conditional transfer of accounts receivable formed by credit sales by the demander of funds to a special financing institution, which will provide enterprises with financing, debt recovery, and sales account management, so that companies that use credit sales as the main method can obtain the necessary funds and strengthen the turnover of funds. Generally, accounts receivable financing uses accounts receivable vouchers as the subject matter pledge or transfer, and the term does not exceed the age of the accounts receivable. The main entities are small- and medium-sized enterprises (debt enterprises), core enterprises (debt enterprises), and commercial banks. According to the different sources of repayment, the financing model of accounts receivable is divided into pledge of accounts receivable and transfer of accounts receivable. The first source of repayment for pledge of accounts receivable is the sales income of creditor companies, and the second source of repayment is the accounts receivable paid by the debtor company; and the first source of repayment for the transfer of accounts receivable is directly from the debtor company. For the accounts receivable paid to the bank, the second source of repayment is the sales revenue of the

creditor enterprise. In addition, the financing of accounts receivable can also be introduced as a third-party guarantee by logistics companies, as shown in Figure 2.

Through accounts receivable financing, small- and medium-sized enterprises not only obtain funds without increasing their own liabilities but also improve the company's asset-liability structure. When the sales volume increases, the company can directly convert a large number of sales invoices into funds, with higher flexibility; and the cost is relatively low. At the same time, accounts receivable also have the characteristics of short financing time and high efficiency. The active financing of accounts receivable can also strengthen internal management and make decision-making more scientific.

2.2. Supply Chain Financial Risks. As a financial innovation, the risks faced by supply chain finance include credit risk, financial risk, operational risk, warehouse receipt pledge risk, and information transmission risk. Therefore, how to effectively identify and prevent these risks is the key to the success of supply chain finance.

2.2.1. Different Risk Assessment Objects. Under the traditional credit model, the bank pays attention to the static financial data of a single enterprise, which is the possibility of default caused by the enterprise itself. But, in the context of supply chain, risk is affected not only by the enterprise's own risk factors but also by the supply chain [21]. Therefore, under the supply chain financing model, banks should not only pay attention to the risk factors of SMEs themselves but also examine the overall operational performance of the supply chain in which the SMEs are located, so as to more comprehensively, systematically, and objectively reflect the comprehensive credit status of SMEs in the supply chain.

2.2.2. Different Degree of Risk Aggregation. Traditional credit risk is the risk faced by a single enterprise itself; supply chain financial risk is distributed across the entire supply chain centered on the core enterprise [22]. Once a member

FIGURE 2: Schematic diagram of accounts receivable financing model under the Internet of Things environment.

of the supply chain has a financing problem, the impact will spread to the entire supply chain.

In view of the stability of the model, this paper chooses principal component analysis as the scoring method. Since the model has no assumptions about the distribution of variables, it is not required to assume that the indicators have a multivariate normal distribution. The specific evaluation principles are as follows:

- ① Select a sample to score the indicators and scoring standards in the above list, and each indicator is denoted by b . List the initial data matrix:

$$X = \{x_{ab}\}. \quad (1)$$

- ② Standardize the initial data; the standardized formula is

$$Z_{ij} = \frac{|X_{ij} - \bar{X}_j|}{S_j}. \quad (2)$$

The standardized matrix is obtained after standardization:

$$Z = \{z_{ab}\}. \quad (3)$$

- ③ Calculate the correlation coefficient between every two indicators in the standardized matrix, and obtain the correlation coefficient matrix R :

$$R = \frac{Z \cdot Z'}{a - 1}. \quad (4)$$

- ④ Select the first m principal components with a variance contribution rate of more than 60%, and set the selected i -th principal component as P_i .

$$P_1 = 0.07C_1^* - 0.057C_2^* + 0.017C_3^* - 0.021C_4^* - 0.056C_5^* + 0.087C_6^* + 0.011C_7^*, \quad (5)$$

$$P_2 = -0.043C_1^* - 0.051C_2^* - 0.014C_3^* - 0.023C_4^* + 0.051C_5^* - 0.054C_6^* - 0.014C_7^*, \quad (6)$$

$$P_3 = 0.034C_1^* - 0.037C_2^* + 0.022C_3^* - 0.031C_4^* - 0.086C_5^* - 0.086C_6^* + 0.013C_7^*, \quad (7)$$

$$P_4 = 0.066C_1^* + 0.052C_2^* - 0.016C_3^* + 0.025C_4^* - 0.055C_5^* - 0.092C_6^* + 0.013C_7^*. \quad (8)$$

2.3. Financial Service Industry Innovation in the Internet of Things Environment. The Internet of Things provides the conditions for “visual tracking.” Manufacturing companies mainly apply the Internet of Things to the “supply chain management” of the enterprise. Financial products, innovative products in this area, are called “supply chain

finance.” From the perspective of financial institutions providing services, supply chain finance refers to financial institutions and other third-party service institutions that comprehensively grant credit to the entire supply chain of the industry.

The visual tracking provided by the Internet of Things for financial service industry innovation can solve the above three problems. The process of optimizing supply chain financing is shown in Figure 3. The Internet of Things can realize that the product information flow of enterprises in the production and circulation fields is completely flowed to commercial banks, and commercial banks can have a comprehensive understanding and timely monitoring of enterprises, which saves the time for banks to conduct credit investigations on enterprises again and speeds up loans. With the speed of approval, the capital flow of commercial banks to the production and circulation fields is fast and safe. With complete information, commercial banks can study new financial tools and new business forms, realize financial tool innovation, and extend loans to more types of supply chain financial inventory demanders that can also serve more core enterprises; at the same time, commercial banks use the Internet of Things to fully grasp the production and operation of enterprises after loans, so as to facilitate timely detection and identification of risks, risk control, and management, and improve the efficiency of management after loans. It can also rely on the construction of the Internet of Things electronic technology platform to identify customers more quickly, provide more accurate services, and at the same time broaden its electronic sales promotion channels to achieve innovation in transaction methods.

3. The Financial Service Industry Supply Chain Financial Inventory Portfolio Pledge Financing Risk Analysis

3.1. Risk Analysis of Financial Inventory Pledge in a Single-Variety Supply Chain

3.1.1. Basic Analysis of Financial Inventory Pledges in a Single-Variety Supply Chain. As shown in Figure 4, the price of rebar futures and palm oil futures fluctuated sharply in 48 months. The price trend of rebar and palm oil shows an oscillating trend. During the observation period, the average value of the rebar future contract's median price was 2,700 yuan/ton, the highest price was 5,000 yuan/ton, and the lowest price was 2,500 yuan/ton. The median price of palm oil future contracts is 2,800 yuan/ton, the highest price is 3650 yuan/ton, and the lowest price is 2500 yuan/ton. Such a high level of volatility indicates that there is a great potential risk in the use of rebar and palm oil for supply chain financial inventory pledge financing.

Because the data for GARCH model fitting must be a stationary series, as otherwise it will cause false regression, making the experimental results meaningless, it is necessary to test the stationarity of the time series of future prices to ensure that there is no autocorrelation relationship between the data and time, and it is a stationary series. At present, the most commonly used method of sequence stationarity test is

the ADF unit root test, which performs unit root test on the time series of price changes of rebar and palm oil.

The unit root test result of the price change series shows that the t statistic value of the price change series of rebar is -19.01992 , and the t statistic value of the price change series of palm oil is -21.98863 . The result of the statistics obtained is significantly less than the three confidence levels. Therefore, the null hypothesis can be rejected, and the price change sequence of rebar and palm oil does not have a unit root and is stable. The data can be used for the next GARCH family model fitting.

3.1.2. GARCH Model Fitting of Single-Variety Supply Chain Financial Inventory Pledge. After determining that the price change sequences of the two collaterals are stationary, the next step is to start the fitting estimation of the GARCH family model. First, you check whether the price change sequence of rebar and palm oil follows a normal distribution, as shown in Figure 5. It can be seen from the figure that the assumption that the price change sequence obeys a normal distribution can be rejected.

The average value of the price change series of palm oil is -0.000144 , the standard deviation is 0.009328 , the skewness is 0.450833 , and the skewness is greater than 0, indicating that the price series distribution of palm oil has a long right tail phenomenon.

The GARCH model is constructed for the price change sequence of the two collaterals. The GARCH family models mainly include the GARCH model, the T-GARCH model, and the E-GARCH model. This paper studies the construction of low-level GARCH (1, 1), T-GARCH (1, 1), and E-GARCH (1, 1) models. The GARCH fitting parameter diagram of the rebar price change sequence and the GARCH fitting parameter diagram of the palm oil price change sequence are shown in Figures 6 and 7, respectively.

It can be seen from Figure 8 that, under the confidence of 0.05, the p values of the test results are all less than the critical value of the F statistic, indicating that the residual sequence after the GARCH model fitting has eliminated the ARCH effect, and the model can be used to predict the future estimates of changes in volatility.

3.2. Research on Liquidity Risk of Supply Chain Financial Inventory Portfolio Pledge. It can be seen from Figure 9 that the distribution of supply chain financial inventory portfolio price changes has long tails on both sides. The kurtosis is 2.91, indicating that the price change sequence has the characteristics of sharp peaks and thick tails.

Three GARCH models are fitted to the sequence of supply chain financial inventory portfolio price changes, and the results are shown in Figure 10. It can be seen that p corresponding to the γ value in the E-GARCH (1, 1) and T-GARCH (1, 1) models is greater than 0.05, and, according to the AIC criterion, it is decided to choose the GARCH (1, 1) model.

It can be seen from Figure 11 that the p values of the three distributions all approach 0, indicating that the GARCH family model fits well. The specific model to be

FIGURE 3: Financial commercial bank service process.

FIGURE 4: Trends of rebar median price and palm oil median price.

FIGURE 5: Normal distribution test of rebar and palm oil price change series.

FIGURE 6: GARCH fitting parameter diagram of rebar price change sequence.

selected requires an optimal comparison. The parameters a and b , respectively, indicate the influence of external information on the fluctuation of the price change sequence and the length of time that the fluctuation of the initial price change sequence affects future price sequence fluctuations. The larger the value, the greater the impact. Combined with the principle of the smallest value of AIC and SC, the result shows that the t distribution is most in line with the characteristics of the supply chain financial inventory portfolio price change sequence.

FIGURE 7: GARCH fitting parameter diagram of palm oil price change series.

FIGURE 10: GARCH model fitting parameter diagram of supply chain financial inventory portfolio price change sequence.

FIGURE 8: ARCH LM test results of the volatility fitting residuals of the rebar and palm oil price change series.

FIGURE 9: Normal distribution test of supply chain financial inventory portfolio price change rate series.

4. Empirical Analysis of the Dynamic Mechanism of Financial Products' Sustainable Innovation

4.1. Sample Selection and Data Processing

4.1.1. Sample Size. Under a certain sampling method, the larger the sample size, the higher the estimation accuracy,

FIGURE 11: The result of the hypothetical parameter results of the sequence distribution of supply chain financial inventory portfolio price changes.

but considering the actual situation, it is impossible to conduct a study without capacity.

Because the survey uses the existing PBC mail network, it is basically not limited by fees; the survey is conducted between subordinates, managing departments, and managed departments, and questionnaires such as "no answer" and "invalid" basically do not exist. It is carried out in high-quality population, the overall sample is very similar, extreme differences basically do not exist, and the degree of sample heterogeneity can be ignored.

4.1.2. Data Processing. The questionnaire was sent to the central branch of the People's Bank of China through the Lotus system of the People's Bank of China. Each branch was required to complete 77 questionnaires. A regional branch office itself also completed 16 questionnaires, and the corresponding financial service institutions completed 15 questionnaires. The CVR inspection data is shown in Figure 12.

FIGURE 12: Proportion of CVR inspection data.

4.2. Fuzzy Comprehensive Evaluation of Continuous Innovation Power

4.2.1. CVR Determination Index. The content validity of each index is tested based on the test data of CVR, and the test results are shown in Figure 13. The CVR test values in the figure are all greater than 0.5; that is, it is believed that the measured index can well represent the number of people in the scope of the measurement object exceeding 75% of the total number of people. Therefore, the basic clear indicators can more accurately reflect the content of the continuous innovation power of financial service industry products in a certain area and can be used as indicators for evaluating the continuous innovation power of financial service industry products.

4.2.2. AHP Determines the Weight. Analytic hierarchy process (AHP) is a method to deal with economic, management, and technical issues with complex factors. It decomposes a complex problem into multiple components and further decomposes these factors according to the dominance relationship and arranges them according to the target level, the criterion level, and the index level to form a multiobjective, multilevel model.

The analytic hierarchy process is essentially a way of decision-making thinking. It decomposes complex decision-making problems into different components according to the nature of the problem and the general goal required to achieve and then integrates the judgment of people to determine the overall order of the relative importance of the factors in decision-making. The analytic hierarchy process embodies the basic way of decision-making thinking, namely, decomposition, judgment, and synthesis. The basic idea is to transform the overall judgment of the weights of multiple factors that make up a complex problem into a "pairwise comparison" of these factors and then to judge the overall weight of these elements and finally establish the weight of each factor. RI value is shown in Figure 14.

Using the basic principles of AHP, the data obtained by 120×1067 comparisons of indicators according to Satty's scale are written in matrix form, and the eigenvalues and

FIGURE 13: CVR test value.

FIGURE 14: Average consistency index.

eigenvectors are calculated by Matlab, and the eigenvectors corresponding to the $\lambda_{\max}$ eigenvalues are normalized. Finally, the normalized vectors at all levels are integrated to determine the final weight of each subindicator.

5. Conclusion

The risk value of a supply chain financial inventory combination using rebar and palm oil under all set pledge periods or confidence levels is less than the corresponding risk value of a single variety of supply chain financial inventory pledge of rebar or palm oil. This shows that in the supply chain financial inventory pledge financing business, the supply chain financial inventory portfolio composed of supply chain financial inventory products that are negatively correlated with market price fluctuations is used as the pledge, which can effectively lower banks and other supply chain financial institutions. The calculation results of the pledge rate model established based on LA-VAR show that when the supply chain financial inventory combination constructed by rebar and palm oil is used as pledge, the pledge rate is inversely proportional to the pledge period. The longer the pledge time, the lower pledge rate of the inventory portfolio, but the higher the pledge rate when the corresponding single species is used as pledge under any circumstances. This means that small- and medium-sized enterprises can use a combination of supply chain financial inventory pledge financing strategies with a negative relationship, compared to only using a single-variety supply chain financial inventory pledge, and can obtain more funds under the same overall value of the pledge. The risks borne by banks and other financial institutions have not increased.

According to the basic principles of fuzzy mathematics, the evaluation index is determined according to KPI→CVR which is used for index content validity test→AHP determining index weight. The 1067 pieces of data obtained from the province's survey and the 120×1067 evaluation index pairwise comparison data are substituted into the model.

Data Availability

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

All authors have approved the publication of the manuscript.

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