Hindawi
Wireless Communications and Mobile Computing
Volume 2022, Article ID 7668474, 11 pages
https://doi.org/10.1155/2022/7668474

Research Article

Risk Evaluation and Forecast Behavior Analysis of Supply Chain Financing Based on Blockchain

Qixuan Rao and Weibin Li

School of Accounting, Harbin University of Commerce, Harbin 150000, China

Correspondence should be addressed to Weibin Li; lwb1234560429@163.com

Received 11 March 2022; Revised 25 March 2022; Accepted 9 June 2022; Published 6 July 2022

Academic Editor: Zhiguo Qu

With the deepening of globalization and the improvement of the fineness of production division and cooperation, various forms of suppliers coexist, and the supply chain network becomes complex and fragmented. Traditional supply chain management mode and purchasing mechanism cannot respond to the changes of the times in time, and enterprises and suppliers cannot connect. As a new type of financial service, supply chain finance plays an important role in solving the financing difficulties and expensive problems of SMEs. However, in recent years, traditional supply chain finance has encountered many problems, and it has gradually become a trend to empower traditional supply chain finance with blockchain technology. This paper proposes a blockchain supply chain financing risk assessment and behavior prediction algorithm. By analyzing the development status of supply chain business, it puts forward corresponding preventive measures to effectively improve the efficiency of supply chain financing. Firstly, the paper puts forward the double-chain management system and constructs the double-chain management architecture and operation flow; Thirdly, the weighting method of enterprise financing risk evaluation index based on variance homogeneity test is put forward to explain; Finally, five enterprises are tested on the data set, and the performance of TPR, FPR, Precision, Recall, F-Measure, and Accuracy is compared. Different enterprises have the problem of supply chain financing risk.

1. Introduction

With the continuous extension of the supply chain of modern enterprises, industry pain points such as invisible information and great financing risks are constantly emerging. The emergence of blockchain technology provides new opportunities for the sound development of supply chain financing system. Literature [1] expounds the risk management practice of banks as supply chain finance (SCF) service providers. Using 4,014 evaluation and approval reports, five risk management factors are constructed, and their functions are tested with second-hand data. Reference [2] presents the results of a systematic literature review to understand the current status of SCF and working capital research. Literature [3] starts from the standardization of green supply chain finance, and the carbon trading process gives extra green income incentives to the supply chain, further encourages both sides of the supply chain to improve the green degree of the supply chain, and pursues the double promotion of economic benefits and green benefits of the supply chain. Literature [4] expounds the ABS research on reverse factoring supply chain finance of urban investment companies. In reference [5], aiming at the financing risk of commodity trading platform, the supply chain financial financing game under the traditional trading platform is analyzed and discussed. Literature [6] focuses on SCF solutions suitable for e-commerce enterprises of fresh agricultural products. Literature [7] explores the role of financial service providers (FSP) in evaluating the supply chain credit of small- and medium-sized enterprises (SME) and how they help SMEs obtain supply chain financing (SCF) through the established digital platform using Big Data Analysis (BDA). Literature [8] tries to find the best responsibility structure to maintain the highest income and the lowest risk. Help managers make financial decisions based on results.

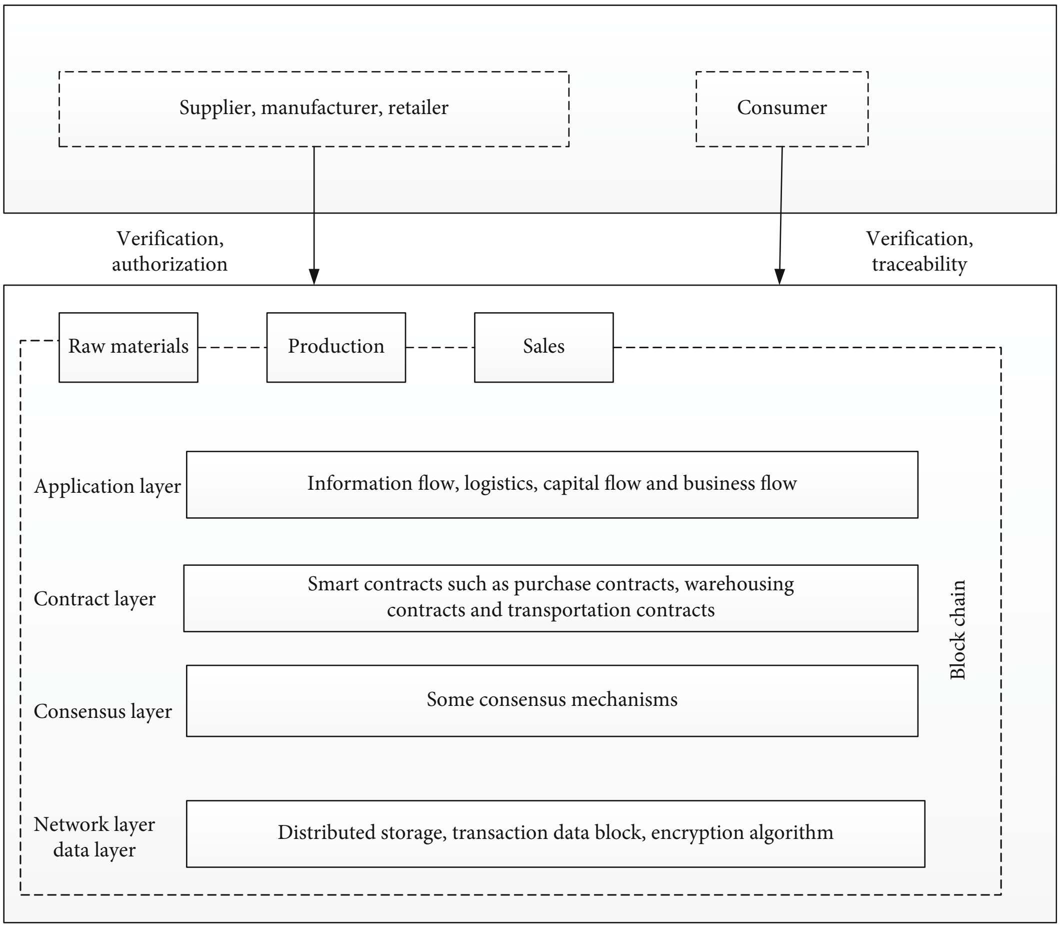

Figure 1: Dual-chained architecture.

Literature [9] analyzes the financing situation of real estate industry in recent five years, and takes Evergrande Real Estate as an example to analyze the problems existing in the current capital structure of real estate enterprises, and puts forward constructive suggestions to solve the problems. Literature [10] developed a comprehensive three-dimensional model of financing risk assessment, which effectively solved the problem of PPP financing risk assessment and could better control risks. Literature [11] identified these risks in the power industry as inherent commercial, financial, and political classifications of project financing, and [12] evaluated using failure mode and impact analysis (FMEA). Literature [13], based on the present situation of traffic enterprise risk in China, attempts to apply the multilevel fuzzy comprehensive assessment method to risk assessment. Literature [14] analyzes the background and definition of supply chain risk in procurement and logistics. Reference [15] studies the Bayesian network method to measure the risk of circular supply chain, which can help supply chain managers and risk experts focus on areas that are more vulnerable to risks. A case study of Lean Green Performance Hybrid Supply Chain Risk Management based on AHP, RCA, and TRIZ was presented in [16]. Reference [17] examines supply chain relationship factors and network risks in order to better understand the demand for C-SCRM guarantee. Literature [18] explains the potential supply chain risks reviewed on February 24th. In order to improve the effect of enterprise supply chain risk assessment, literature [19] improves the traditional neural network algorithm, combines machine learning method and supply chain risk assessment time requirements to set up system function modules, and constructs the overall system structure. Reference [20] aims to develop a decision model to support supply chain risk management in petroleum industry. Reference [21] constructs an optimization model for perishable products supply chain of agricultural supply chain to determine the optimal risk management strategy to maximize the expected profit of decision-makers under the uncertainty of demand and price. Literature [22] identifies a complete list of various available data sources for text mining, methods, and risks related to outsourcing in the clothing industry. Literature [23] evaluates the premise and consequences of supply chain risk management capability, and shows that the fit between information processing capability and demand enhances supply chain risk management capability, which in turn enhances supply chain elasticity.

Literature [24] aims to summarize the existing literature on risk factors in supply chain management in an uncertain and competitive business environment. The purpose of literature [25] is to theoretically assume and empirically explore the relationship among global supply chain risks,

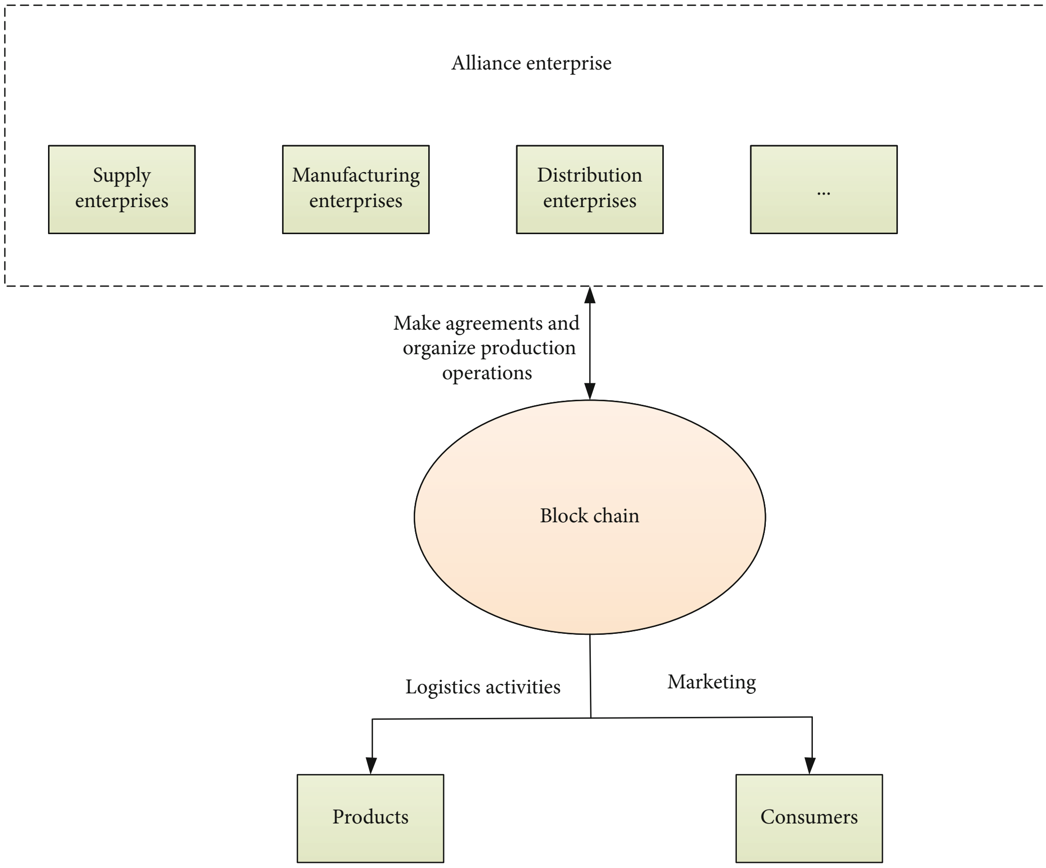

Figure 2: Operation flow of double chain.

supply chain elasticity, and mitigation strategies, taking supply chain elasticity as dynamic capability and elasticity as intermediary premise to solve supply chain risks in procurement, manufacturing, and delivery.

2. Double-Chain Management System

2.1. Architecture of Blockchain. The basic architecture of blockchain and the supply chain management architecture based on blockchain technology are divided into four aspects: data layer, algorithm layer, contract layer, and application layer. The data layer extracts the information required by each link of the supply chain through RFID, NFC, GPS, and other technologies, and stores the involved information synchronously in the blockchain; it can manage data through P2P protocol, authentication mechanism, and communication mechanism, and realize information sharing among different subjects; the algorithm layer encapsulates the common algorithm of the whole system, which is the key to realize blockchain technology to ensure that the supply chain is not attacked by malicious nodes in the network; the core of the contract layer is intelligent contract, which is realized by writing contract code. Once the preset conditions are met, the contract will be automatically triggered and executed immediately, improving work efficiency and enhancing mechanism trust; the application layer is a platform for information exchange among members of each node in the supply chain management system, and the end consumers can also realize the purpose of product traceability through this platform. The double-chained architecture is shown in Figure 1:

2.2. Double-Chain Operation Process. There are three different types of objects involved in the management and operation system of double chain, namely, enterprises, products, and consumers. The specific operation process is shown in Figure 2:

Participating enterprises of all parties in the supply chain cooperate with third-party blockchain service enterprises, build a supply chain management system architecture based on blockchain, and sign intelligent contracts according to the agreements related to the transaction process of goods and funds made by supply enterprises, manufacturing enterprises, and distribution enterprises. In the process of raw material procurement, raw material production, and product distribution, a series of link information from production to distribution is collected through big data, visualization, and other technical means, and finally, the information is sent to the blockchain system.

2.3. Problems Encountered in Supply Chain Finance. At present, the contradictions and conflicts faced by all parties involved in supply chain finance show that the current supply chain finance has reached a crossroad, and we need to calm

Table 1: Classification standard of sample enterprises.

	Table type	Table type Table type(P)	Operating income (10,000 yuan)	Total assets (10,000 yuan)
Real estate	Table large	——	Q>250000	$C > 60000$
	Medium	——	$1000 \leq Q < 250000$	$4000 \leq C < 1500000$
	Small	——	$200 \leq Q < 1000$	$2000 \leq C < 5000$
	Micro	——	$Q < 200$	$C < 300$
Industry	Table large	$P > 1000$	Q>25000	$C > 60000$
	Medium	$300 \leq P < 1000$	$1000 \leq Q < 25000$	$4000 \leq C < 1500000$
	Small	$20 \leq P < 300$	$200 \leq Q < 1000$	$2000 \leq C < 5000$
	Micro	$P < 20$	$Q < 300$	$C < 300$
Construction industry	Table large	——	Q>40000	$C > 60000$
	Medium	——	$1000 \leq Q < 25000$	$4000 \leq C < 2500000$
	Small	——	$200 \leq Q < 1000$	$2000 \leq C < 5000$
	Micro	——	$Q < 400$	$C < 400$

down and rationally develop supply chain finance. The first is industrial enterprises. Under the call of rolling up their sleeves and working hard, they have shown a strong impulse to test the water in supply chain finance and have become factoring companies or financial companies, taking supply chain finance as the key to industrial development and an important source of future corporate profits. The current development trend is not very healthy, enterprises cannot let financial companies give themselves a large amount of funds for financing, and financial institutions still have concerns about the good credit guarantee of enterprises. Some industrial enterprises engage in self-finance, use their own financial licenses to finance their upstream and downstream, and become "two banks", resulting in monopolized and bullying financial activities, which makes upstream and downstream enterprises feel worse and worse about supply chain finance, followed by financial institutions. Under the social environment that the state and governments at all levels call for supporting the development of small- and medium-sized enterprises, various commercial banks have set up trade banking departments to contribute to the financial financing of enterprise supply chain, in order to show their concern and support for supply chain finance. However, the reality is that financial institutions have never grasped it. The supply chain finance business is still not divorced from the main credit, and relying on core enterprises is still the fulcrum of risk control for most banks. Digital technologies such as Internet of Things, artificial intelligence, blockchain, and advanced analysis have become the means and gimmicks for banks to decorate their facades and publicize to the outside world. Supply chain finance has a situation of "big slogan and small action" in commercial banks.

3. Financing Risk Evaluation Algorithm and Modeling

3.1. Standardized Method of Financing Risk Assessment. There is no need to standardize the qualitative classification index and the quantitative index between [0, 1]. The positive, negative, and interval indexes of some indexes should be standardized, respectively, to solve the dimension problem of indexes.

Assuming that $u_{i,j}$ is the initial data of the i-th evaluation index of j enterprises and the number of enterprises participating in financing risk evaluation is n, then:

When the quantitative index of an index is positive, its standardization method is formula:

$$x_{i,j} = \frac{u_{i,j} - \min\left(u_{i,j}\right)}{\max\left(u_{i,j}\right) - \min\left(u_{i,j}\right)} \quad (0 \leq j \leq n). \tag{1}$$

When the quantitative index of an index is negative, its standardization method is formula:

$$x_{i,j} = \frac{\max\left(u_{i,j}\right) - u_{i,j}}{\max\left(u_{i,j}\right) - \min\left(u_{i,j}\right)} \quad (0 \leq j \leq n). \tag{2}$$

If the probability P_i =1, the entropy of the evaluation is equal to zero, which shows that there is no uncertainty in the risk evaluation, and the risk evaluation result is completely determined.

Let h_1 be the left boundary and h_2 the right boundary of the ideal interval of a certain interval. The standardization method of this index is formula:

$$x_{i,j} = \left\{ \begin{array}{c} 1 - \dfrac{h_1 - u_{i,j}}{\max\left[h_1 - \min\left(u_{i,j}\right), \max\left(u_{i,j}\right) - h_2\right]}, u_{i,j} < h_1 \\ 1 - \dfrac{u_{i,j} - h_2}{\max\left[h_1 - \min\left(u_{i,j}\right), \max\left(u_{i,j}\right) - h_2\right]}, u_{i,j} > h_2 \\ 1, h_1 \leq u_{i,j} \leq h_2 \end{array} \right\}. \tag{3}$$

Table 2: Model performance data sheet.

Indicators	TPR	FPR	Precision	Recall	F-Measure	Accuracy
Enterprises A	0.521	0.311	0.433	0.452	0.442	0.412
Enterprises B	0.652	0.332	0.365	0.553	0.462	0.423
Enterprises C	0.641	0.361	0.492	0.593	0.511	0.403
Enterprises D	0.512	0.291	0.371	0.492	0.521	0.461
Enterprises E	0.582	0.273	0.441	0.502	0.482	0.442

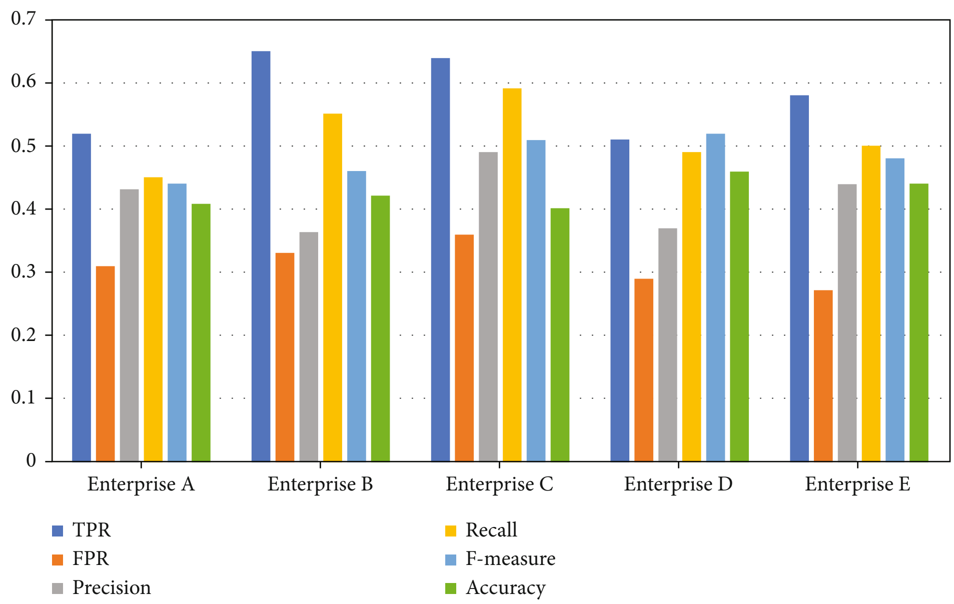

Figure 3: Performance diagram of Logistic regression model.

Table 3: Model performance data sheet.

Indicators	TPR	FPR	Precision	Recall	F-Measure	Accuracy
Enterprises A	0.531	0.311	0.433	0.452	0.442	0.412
Enterprises B	0.632	0.332	0.362	0.551	0.462	0.423
Enterprises C	0.625	0.364	0.491	0.584	0.513	0.403
Enterprises D	0.519	0.293	0.372	0.494	0.522	0.454
Enterprises E	0.583	0.272	0.445	0.503	0.481	0.444

The proportion of financing risk evaluation index is defined as formula:

$$f_{i,j} = \frac{x_{i,j}}{\sum_{j=1}^{n} x_{i,j}}. \quad (4)$$

Let M_i be the entropy value of the i-th enterprise internet financing credit evaluation index, then the entropy value of the i-th enterprise financing risk evaluation index is defined as the formula:

$$M_i = -\frac{1}{\ln(n)} \left[\sum_{j=1}^{n} f_{i,j} \ln f_{i,j} \right]. \quad (5)$$

The formula of entropy weight a_i of financing risk evaluation index is as follows:

$$a_i = \frac{1 - M_i}{m - \sum_{i=1}^{m} M_i}. \quad (6)$$

3.2. The Formula of Entropy Weight a_i of Financing Risk Evaluation Index Is as Follows.

$$r_{i,h} = \frac{\sum_{j=1}^{m} \left(x_{i,j} - \overline{x_h} \right)}{\sqrt{\sum_{j=1}^{m} \left(x_{i,j} - \overline{x_h} \right)^2 \sum_{j=1}^{m} \left(x_{h,j} - \overline{x_h} \right)^2}}. \quad (7)$$

Assuming that e_i is the amount of information contained in the i-th evaluation index and b_i is the CRITIC weighting

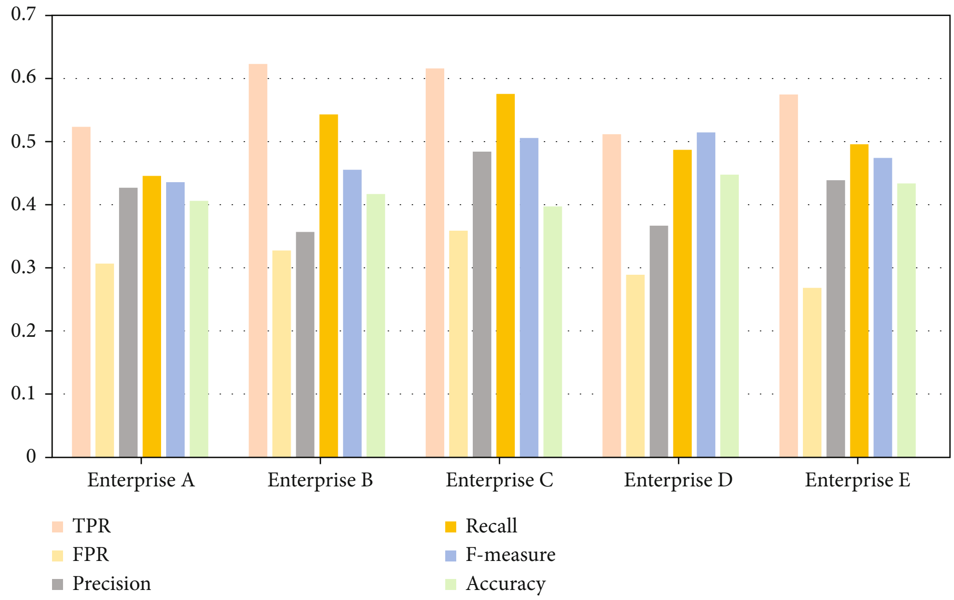

Figure 4: Performance diagram of DT model.

Table 4: Model performance data sheet.

Indicators	TPR	FPR	Precision	Recall	F-Measure	Accuracy
Enterprises A	0.631	0.211	0.833	0.752	0.842	0.812
Enterprises B	0.732	0.132	0.862	0.751	0.762	0.823
Enterprises C	0.725	0.264	0.891	0.784	0.713	0.803
Enterprises D	0.719	0.193	0.772	0.894	0.722	0.854
Enterprises E	0.783	0.212	0.745	0.883	0.881	0.844

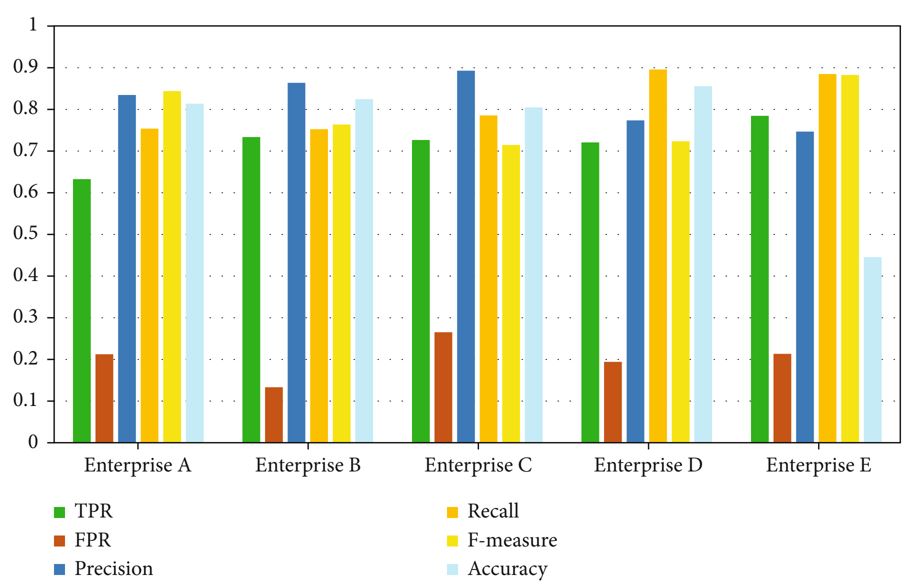

Figure 5: Performance diagram of integrated Logistic-RS model.

Table 5: Model performance data sheet.

Indicators	TPR	FPR	Precision	Recall	F-Measure	Accuracy
Enterprises A	0.831	0.213	0.933	0.852	0.882	0.932
Enterprises B	0.832	0.182	0.862	0.851	0.862	0.913
Enterprises C	0.825	0.204	0.891	0.884	0.873	0.863
Enterprises D	0.919	0.113	0.872	0.894	0.792	0.884
Enterprises E	0.883	0.211	0.845	0.893	0.886	0.944

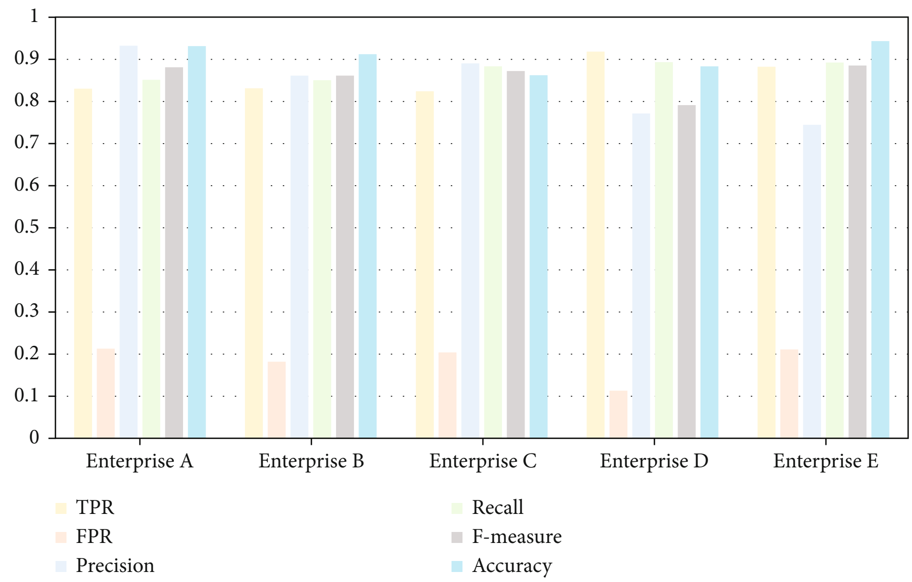

Figure 6: Performance diagram of integrated DT-RS model.

value of the i-th evaluation index, the formula is as follows:

$$e_i = v_i \sum_{h=1}^{m} (1 - r_{i,h}), \quad (8)$$

$$b_i = \frac{e_i}{\sum_{i=1}^{m} e_i} \times 100\%. \quad (9)$$

3.3. Weighting Method of Enterprise Financing Risk Evaluation Index Based on Variance Homogeneity Test. Where n_1 represents the sample number of enterprise default, n_0 represents the sample number of enterprise performance, and n is the sample number of all enterprises. The expression is as follows:

$$\overline{D_i^{(k)}} = \frac{1}{n_k} \sum_{j=1}^{n_k} \overline{D_i^{(k)}} (k = 1, 0), \quad (10)$$

$$\overline{D_i} = \frac{1}{2} \left(\overline{D_i^{(1)}} + \overline{D_i^{(0)}} \right), \quad (11)$$

Let F_i be the index i variance homogeneous weighting test, and the formula is as follows:

$$F_i = \frac{(n-2) \left\lfloor n_1 \left(D_i^{(1)} - \overline{D_i} \right)^2 + n_0 \left(D_i^{(0)} - \overline{D_i} \right)^2 \right\rfloor}{\sum_{j=1}^{n_1} \left(D_{i,j}^{(1)} - \overline{D_i^{(1)}} \right)^2 + \sum_{j=1}^{n_0} \left(D_{i,j}^{(0)} - \overline{D_i^{(0)}} \right)^2}. \quad (12)$$

The weight formula is as follows:

$$c_i = \frac{F_i}{\sum_{i=1}^{m} F_i}. \quad (13)$$

3.4. Weighting Method of Financing Risk Evaluation Index Combination. In order to comprehensively consider the effect of a single objective weighting method on the effectiveness of enterprise Internet financing risk evaluation, the above three objective weighting algorithms are combined linearly, and the Internet financing risk evaluation indicators are combined and weighted. The combination weight

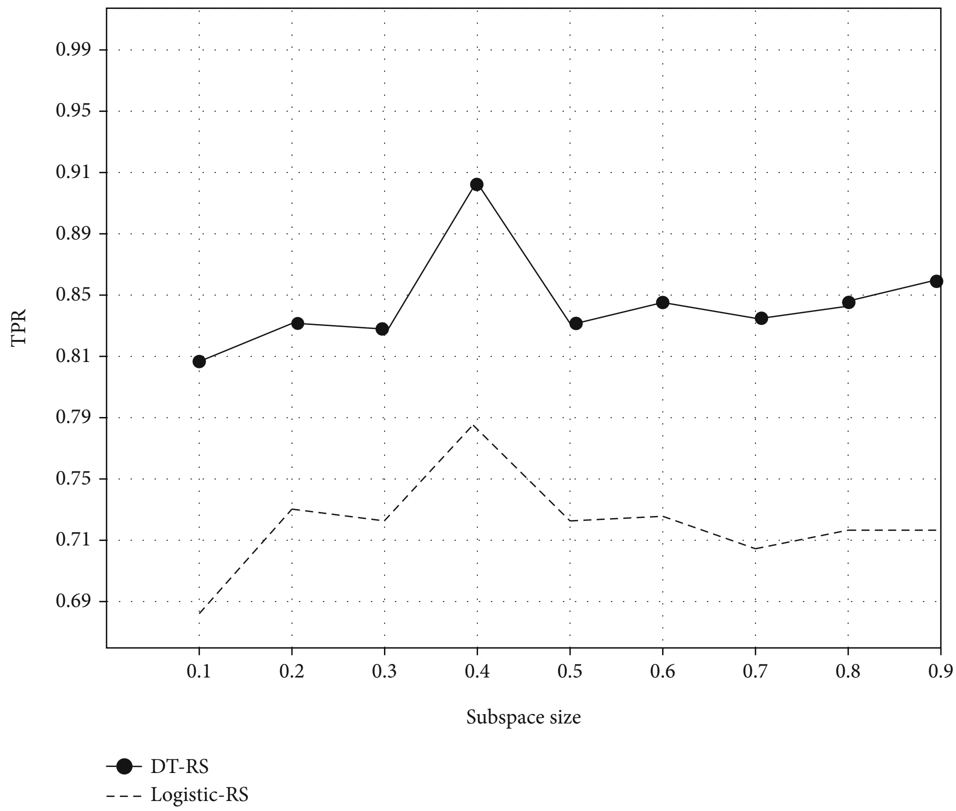

Figure 7: Comparison of TPR values.

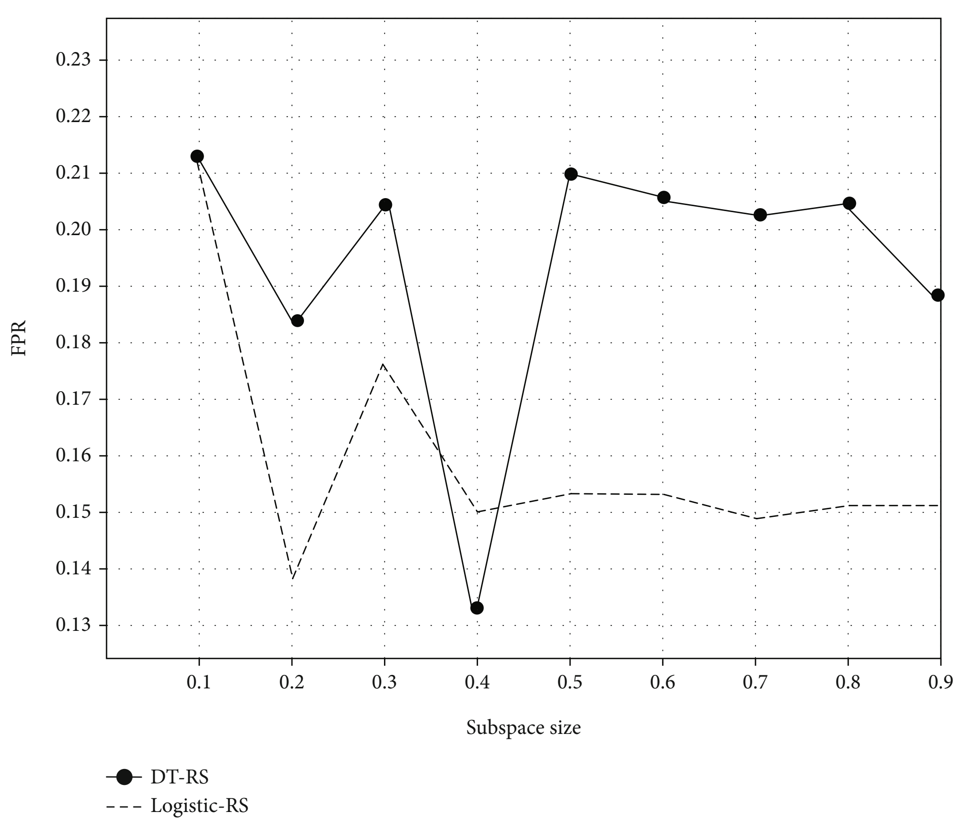

Figure 8: Comparison of FPR values.

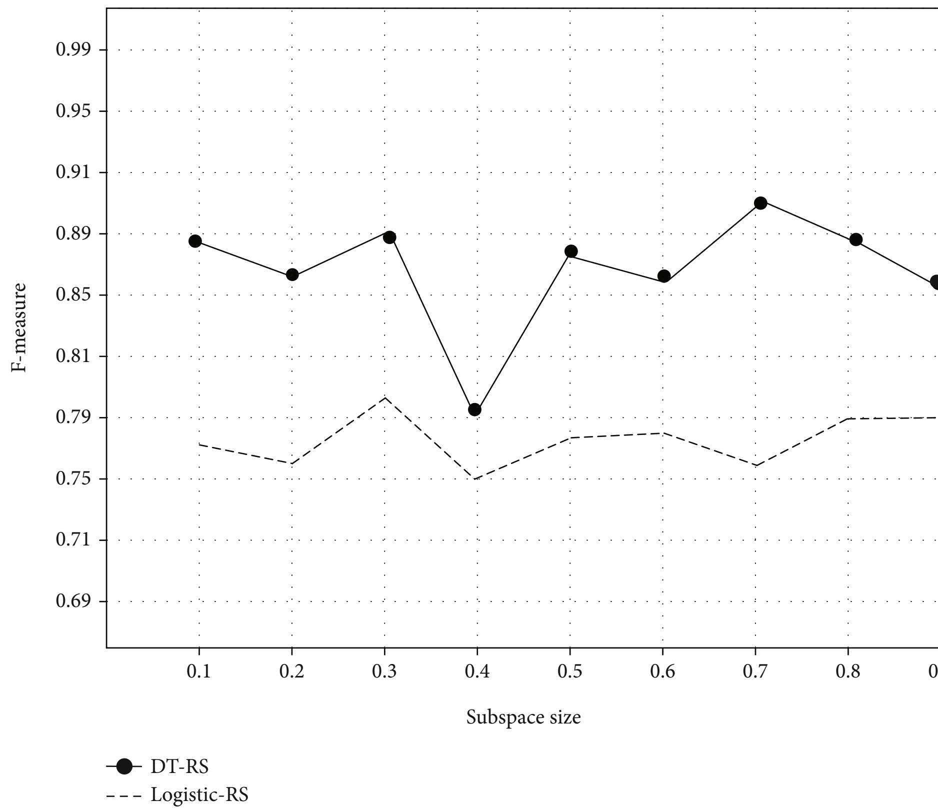

Figure 9: F-Measure value comparison chart.

Table 6: Comprehensive comparison of indicators.

	Logistic	Logistic-RS	DT	DT-RS
TPR	0.719	0.832	0.681	0.871
FPR	0.182	0.112	0.732	0.829
Precision	0.876	0.931	0.785	0.863
F-Measure	0.811	0.936	0.693	0.891
Recall	0.812	0.896	0.686	0.794
Accuracy	0.831	0.871	0.772	0.795

formula is as follows:

$$w_i = \gamma_1 a_i + \gamma_2 b_i + \gamma_3 c_i, \quad (14)$$

where $\gamma_1 > 0, \gamma_2 > 0, \gamma_3 > 0 \;\; \gamma_1 + \gamma_2 + \gamma_3 = 1$.

3.5. Entropy Evaluation Model of Financing Risk. When the enterprise financing risk evaluation may be in several different credit states, and the probability of each state is $p_i(i = 1, 2L, \cdots, n)$, the entropy of the evaluation is as follows:

$$E = -\sum_{i=1}^{n} p_i \log p_i. \quad (15)$$

Extreme value of entropy property:

$$\mathrm{E}(p_1, p_2, L, p_i) \le E\left(\frac{1}{n_1}, \frac{1}{n_2}, L, \frac{1}{n_i}\right) = \log n_i. \quad (16)$$

Additivity of entropy properties:

$$E(AB) = E(A) + E(B). \quad (17)$$

The imposition of entropy properties:

$$E(AB) = E(A/B) + E(B), \quad (18)$$

$$E(AB) = E(B/A) + E(A). \quad (19)$$

3.5.1. Modeling Process. The modeling steps of financing risk assessment for small and micro enterprises are as follows:

(1) Select the enterprise $K\,(K = 1, 2\,L, M)$ to be evaluated

(2) Establishing the evaluation index system, the evaluation index $P_i(i = 1\;2L, n)$

(3) Construct enterprise financing risk index level matrix X, whose element X_{ik} is the index level value of K Enterprise

(4) Choose the best quality X_i^*

(5) Define the proximity of X_{ik} to X_i^*, D_{ik} as follows:

$$D_i \begin{cases} \frac{X_{ik}}{X_i^*} X_i^* = \max \{X_{ik}\} \\ \frac{X_i^*}{X_{ik}} X_i^* = \max \{X_{ik}\} \end{cases}. \quad (20)$$

(6) Get the matrix:

$$d_{ik} = D_{ik} / \sum_{i=1}^{n} \sum_{k=1}^{m} D_{ik}. \quad (21)$$

(7) Calculate conditional entropy:

$$E_i = -\sum_{k=1}^{m} \frac{d_{ik}}{d_i} \ln \frac{d_{ik}}{d_i}. \quad (22)$$

(8) Entropy value indicating the importance of financing risk evaluation index i:

$$e(d_i) = \frac{1}{\ln m} E_i = -\frac{1}{\ln m} \sum_{k=1}^{m} \frac{d_{ik}}{d_i} \ln \frac{d_{ik}}{d_i}. \quad (23)$$

(9) Determine the evaluation weight of the evaluation index i:

$$Q_i = \frac{1}{n - Ee} [1 - e(d_i)]. \quad (24)$$

$$Ee = \sum_{i=1}^{n} e(d_i), \text{且} Q_i \text{ Satisfy } 0 \leq Q_i \leq 1 \sum_{i=1}^{n} Q_i = 1. \quad (25)$$

(10) Decision calculation formula:

$$S_k = \sum_{i=1}^{n} Q_i (d_i^* - d_{ik}), k = 1, 2, L. \quad (26)$$

4. Experiment

4.1. Sample Selection. We have selected three different enterprises: real estate, industry, and construction. Each type of enterprise is divided into four enterprises with different scales: large, small, medium, and micro. The statistics of the number of employees, operating income, and total assets are as shown in Table 1:

4.2. Experimental Testing. This paper compares the predictive effects of Logistic regression, DT, integrated Logistic-RS, and DT-RS on the financing risk of different supply chain levels.

Using Logistic regression model, five small- and medium-sized enterprises in housing industry, industry, and construction industry are selected for performance experimental test. The data are shown in Table 2:

According to the data in the above table, the performance data statistical chart of Logistic regression model is shown in Figure 3:

Using DT model, five small- and medium-sized enterprises are selected for performance experimental test in housing industry, industry, and construction industry. The data are shown in Table 3:

According to the data in the above table, the performance index data of DT model is counted into a bar chart, as shown in Figure 4:

Using the integrated Logistic-RS model, five small- and medium-sized enterprises in housing industry, industry, and construction industry are selected for performance experimental test. The data are shown in Table 4:

According to the data in the above table, the performance index data of the integrated Logistic-RS model is counted into a bar chart, as shown in Figure 5:

Using integrated DT-RS model, five small- and medium-sized enterprises in housing industry, industry, and construction industry are selected for performance experimental test. The data are shown in Table 5:

According to the data in the above table, the performance index data of the integrated DT-RS model is counted into a bar chart, as shown in Figure 6:

4.3. Model Optimization Comparison. According to the charts of the four prediction models, RS has the optimization effect on the original classification prediction model. To verify this conclusion, we set Logistic-RS model and DT-RS model under different subspace scales to compare the results of TPR, FPR, and F values. As shown in Figures 7–9:

4.4. Contrast Experiment. There are many prediction indicators of supply chain financing risk. The four prediction models Logistic regression, DT, integrated Logistic-RS, and DT-RS are finally compared with the comprehensive sample results. The data are shown in Table 6:

5. Conclusion

In order to make the risk financing of small- and medium-sized enterprises healthy and sustainable development, many uncertain factors have been added to the economic development environment of our country because of the harmonization of global economic development. The purpose of this paper is to improve the accuracy of SME supply chain financing risk prediction and improve the level of supply chain financing risk control and management. The results are as follows:

(1) The financing risk of an enterprise is closely related to the profit of the enterprise, and the financing risk of an enterprise with more profits is relatively low

(2) The integrated machine learning algorithm RS can significantly improve the prediction performance of the original classification model. The prediction accuracy of Logistic-RS model and DT-RS model is obviously better than that of Logistic regression model and DT model regardless of sample data

(3) Comparing the TPR, FPR, and F values of Logistic-RS model and DT-RS model, Logistic-RS model is more practical and superior than DT-RS model

(4) The combined weighting method is more practical than single weighting method, CRITIC algorithm weighting method, and variance homogeneity test method

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

References

[1] H. Ying, L. Chen, and X. Zhao, "Application of text mining in identifying the factors of supply chain financing risk management," *Industrial Management & Data Systems*, vol. 121, no. 2, pp. 498–518, 2021.

[2] J. Z. Chiu and C. C. Hsieh, "A systematic literature review of the roles, financing mechanisms, and working capital under supply chain finance," *International Journal of Management, Economics and Social Sciences*, vol. 10, no. 2-3, 2021.

[3] X. Z. Kun and Z. K. Jing, "Research on brand led green supply chain financing strategy considering carbon trading," *Finance*, vol. 12, no. 1, pp. 102–116, 2021.

[4] "On the ABS research on the reverse factoring supply chain finance of urban investment company," *Finance*, vol. 11, no. 6, pp. 574–578, 2021.

[5] W. Zhao and H. Jiankun, "Supply chain financing game of commodity platform based on blockchain," *Frontiers in Economics and Management*, vol. 2, no. 11, 2021.

[6] X. Ning, "Financing decisions analysis of e-commerce supply chain finance for fresh agricultural products in China," *The Journal of Financial Research*, vol. 5, no. 2, p. 1, 2021.

[7] H. Song, M. Li, and Y. Kangkang, "Big data analytics in digital platforms: how do financial service providers customise supply chain finance?," *International Journal of Operations & Production Management*, vol. 41, no. 4, pp. 410–435, 2021.

[8] T. Hongxing, "Management and control of debit financing risk: a new perspective," *Journal of Statistics and Management Systems*, vol. 24, no. 4, pp. 865–872, 2021.

[9] G. J. Yi, "Financial risk of real estate enterprises from the perspective of financing structure—take Evergrande real estate as an example," *Modern management*, vol. 11, no. 5, pp. 441–446, 2021.

[10] L. Ping and B. Bing, "An integrated three-dimensional model on financing risk evaluation for PPP power plant projects based on WSR," *Bio Technology: An Indian Journal*, vol. 10, no. 10, 2014.

[11] D. M. Nikolić, "Project finance risk evaluation of the electric power industry of Serbia," *Energy Policy*, vol. 39, no. 10, pp. 6168–6177, 2011.

[12] D. Jonathan and V. John, "Hidden supply chain risk and incoterms®: analysis and mitigation strategies," *Journal of Risk and Financial Management*, vol. 14, no. 12, pp. 619–619, 2021.

[13] W. Leyan, "A multi-level fuzzy comprehensive assessment for supply chain risks," *Journal of Intelligent & Fuzzy Systems*, vol. 41, no. 4, pp. 4947–4954, 2021.

[14] Y. Guo, "What determines supply chain risk in the age of globalization? Implications for procurement and logistics risk management," *Forum*, vol. 10, no. 3, p. 20, 2021.

[15] C. Madhukar, A. Saurabh, and K. Girish, "Measuring circular supply chain risk: a Bayesian network methodology," *Sustainability*, vol. 13, no. 15, pp. 8448–8448, 2021.

[16] F. E. Essaber, R. Benmoussa, R. De Guio, and S. Dubois, "A hybrid supply chain risk management approach for lean green performance based on AHP, RCA and TRIZ: a case study," *Sustainability*, vol. 13, no. 15, pp. 8492–8492, 2021.

[17] C. Hampton, S. G. Sutton, V. Arnold, and D. Khazanchi, "Cyber supply chain risk management: toward an understanding of the antecedents to demand for assurance," *Journal of Information Systems*, vol. 35, no. 2, pp. 37–60, 2021.

[18] A. La Forest, "Feb. 24 review of potential supply chain risks," *Automotive News*, vol. 95, no. 6983, 2021.

[19] L. Shaoqin, "Enterprise supply chain risk assessment based on improved neural network algorithm and machine learning," *Journal of Intelligent & Fuzzy Systems*, vol. 40, no. 4, pp. 7013–7024, 2021.

[20] O. O. Aroge, "Decision-making model for supply chain risk management in petroleum industry," *International Journal of Decision Sciences, Risk and Management*, vol. 9, no. 4, 2020.

[21] R. Pritee, "Agricultural supply chain risk management under price and demand uncertainty," *International Journal of System Dynamics Applications (IJSDA)*, vol. 10, no. 2, pp. 17–32, 2021.

[22] S. S. Mehdi, L. Michael, and F. Michael, "Text mining for supply chain risk management in the apparel industry," *Applied Sciences*, vol. 11, no. 5, pp. 2323–2323, 2021.

[23] Y. Jie, "Antecedents and consequences of supply chain risk management capabilities: an investigation in the post-coronavirus crisis," *International Journal of Production Research*, vol. 59, no. 5, pp. 1573–1585, 2021.

[24] G. Amulya and J. Jestin, "Supply chain risk management: literature review," *Risks*, vol. 9, no. 1, pp. 16–16, 2021.

[25] J. Um and N. Han, "Understanding the relationships between global supply chain risk and supply chain resilience: the role of mitigating strategies," *Supply Chain Management: An International Journal*, vol. 26, no. 2, pp. 240–255, 2020.