

Retraction

Retracted: Credit Risk Assessment of e-Commerce Supply Chain Finance of SMEs Based on Dynamic Reward and Punishment Perspective

Discrete Dynamics in Nature and Society

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] B. Chen, X. Bao, and K. Xu, "Credit Risk Assessment of e-Commerce Supply Chain Finance of SMEs Based on Dynamic Reward and Punishment Perspective," *Discrete Dynamics in Nature and Society*, vol. 2021, Article ID 9702473, 9 pages, 2021.

Research Article

Credit Risk Assessment of e-Commerce Supply Chain Finance of SMEs Based on Dynamic Reward and Punishment Perspective

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In view of problems such as lack of dynamism, limited research subjects, and lack of future development trends in previous studies, the paper takes small and microenterprises (SMEs) as research objects under the background of e-commerce supply chain finance. Based on the perspective of dynamic rewards and punishments, credit rewards and punishment value and time weights are embedded in the static evaluation results obtained by the traditional TOPSIS method. The Grey relative analysis method is used to reflect the development trend of enterprises' credit and to build the traditional TOPSIS model and the credit risk evaluation model of e-commerce supply chain finance of SMEs by the improved TOPSIS method based on the dynamic perspective of rewards and punishments. Finally, the model is applied to SMEs credit risk evaluation of e-commerce supply chain finance to verify the feasibility and rationality of the model.

1. Introduction

With the gradually deepening development of the Internet information technology, the rapid rise of e-commerce, and supply chain finance turning from offline to online, e-commerce platform has also carried on the combination of supply chain finance and platform. According to sohu.com, in 2014, Alibaba opened “thousand county wan village” program. By 2017, rural Taobao has covered 29 provinces in China. Alibaba has basically formed the agricultural supply chain finance model of “enterprise + peasant household + insurance + e-commerce,” and the rural e-commerce supply chain finance has been gradually developed. Sohu's website is <https://www.sohu.com/>. The role of SMEs in China's economic development cannot be ignored, but their important role in economic development has not eased their financing problems. Statistics from the Commerce Department show that the financing results of SMEs are not optimistic. 68% of SMEs due to credit problems every year caused more than 600 billion yuan of losses. Commerce Department's website is <http://www.mofcom.gov.cn/>. Therefore, its own credit risk is a stumbling block in the process of solving the financing problem. The credit scoring mechanism of existing

e-commerce platforms mainly uses the score accumulation method, such as Taobao, which has some drawbacks [1]. The existing e-commerce SMEs only rely on cumulative user evaluation to measure the credit rating, which is obviously not reasonable and comprehensive enough. Therefore, this paper tries to make a more reasonable and comprehensive evaluation of the credit of SMEs under the background of e-commerce supply chain finance through model optimization and case application so as to achieve the purpose of improving the dynamic, rationality, and comprehensiveness of the credit of existing e-commerce SMEs.

There should be a reasonable and comprehensive index system and appropriate methods for credit evaluation. Previous scholars mainly conducted the following studies in terms of the index system building and credit evaluation methods selecting: In terms of index system building, some scholars built is suitable for the supply chain under the background of the financing of small microenterprise credit evaluation index system [2–8]. Different from the traditional credit rating, the establishment of a credit risk evaluation system from different perspectives in the supply chain financial environment provides new ideas for the credit rating of SMEs [9]. Other scholars [10–14] have constructed credit

evaluation index systems applicable to different types of e-commerce and online business enterprises. However, the index system in the existing research pays more attention to the financial indicators of enterprises, such as profitability indicators, solvency indicators, and so on [3], which is not completely applicable to the credit evaluation of e-commerce SMEs. Existing studies are characterized by diversity in method selection. For example, Kavčáková and Kočišová [15] used data development analysis in credit risk analysis. Zhang et al. [16] and Li [17] used the TOPSIS method, Xiao et al. [18] used support vector machine, Dahiya et al. [19] used hybrid-bagging algorithm for credit risk evaluation, Jiang et al. [20] applied the CPT-TODIM method, and Chi-Keung Li et al. [21] used F-score, but the dynamic nature of the method still needs to be strengthened. To sum up, there are relevant studies on credit evaluation of SMEs. The established index system pays more attention to financial indicators, but for SMEs in the context of e-commerce supply chain finance, its financial data is difficult to obtain, so there is a problem that the existing index system cannot be fully applicable to the credit risk evaluation of SMEs in the context of e-commerce supply chain finance. At the same time, although various evaluation methods are used in existing research, the applied methods do not reflect the characteristics of dynamic changes of credit of SMEs in e-commerce supply chain finance.

Based on the problems of the index system in previous studies not being fully applicable to the credit evaluation of e-commerce SMEs, and the evaluation method not dynamic enough, this article is based on the dynamic perspective of rewards and punishments in the traditional TOPSIS method on the basis of the static credit evaluation, in combination with disciplinary value factor, the time factor, and the future development of credit, using improved TOPSIS method to building a small microenterprise credit evaluation model based on dynamic perspective and applies the model in the e-commerce supply chain financing small microenterprise credit evaluation.

The results show that: First, the improved TOPSIS model based on the dynamic rewards and punishment perspective is feasible in the credit dynamic evaluation of SMEs in e-commerce supply chain finance. Secondly, the model is optimized on the basis of the traditional model by integrating the factors of credit rewards and penalties, time, and future credit development. Third, the application of this model helps to improve the dynamic, comprehensive, and rationality of credit evaluation of e-commerce SMEs and reduce the financing constraints of e-commerce SMEs.

The structure of the rest of the article is as follows: Section 2 elaborates construction of the credit evaluation system for e-commerce SMEs, Section 3 describes construction of the dynamic credit evaluation model, Section 4 gives a description of case application and comparative analysis, and Section 5 concludes the study.

2. Construction of the Credit Evaluation System for e-Commerce SMEs

2.1. Determination of the Index System. Due to its easy access, financial indicators are often applied by previous scholars in

the construction of a credit evaluation index system for SMEs. However, for SMEs in the context of e-commerce supply chain finance, such as Taobao, financial data are generally difficult to obtain. Therefore, financial indicators in previous studies are not applicable to the index system in this paper. Credit 5C analysis is one of the common methods for credit risk analysis. 5C includes five aspects: character, capacity, capital, collateral, and condition. Considering the importance of indicators, data availability, and the particularity of research problems, this paper improves the index system based on the credit 5C analysis method and builds the credit risk evaluation index system for SMEs in e-commerce supply chain finance from three aspects: store qualification level, product quality level, and service quality level. The credit risk evaluation index system of e-commerce SMEs is shown in Table 1. In Table 1, the indexes that do not indicate the literature source are newly added indexes.

2.2. Determination of Index Weight. The weight of the index represents the importance of the index. The reasonable weighting of the index is very important to the rationality of the credit evaluation result. The weights determined by the subjective method are often affected by the subjective judgment of the experts, while the objective method relies too much on the sample data. Based on the above, this paper adopts the triangle fuzzy method and the coefficient of variation method to get the subjective and objective weights of the indicators, respectively, and then uses the additive synthesis method to integrate the subjective and objective weights to get the combined weights.

A triangular fuzzy method is a method combining triangular fuzzy numbers and expert scores. When using this method, experts should first grade the indicators according to Table 2. After getting the scoring results, $F_i = a_i + 4b_i + c_i/6$ is used to calculate the triangle fuzzy score F_i . And then, we use $\beta_i = F_i / \sum_{i=1}^n F_i$ to integrate each index weight and get β_i .

The coefficient of variation method is an objective weighting method. It refers to the method that directly uses the index information to calculate the coefficient of variation and determines the weight according to the proportion of the coefficient of variation. $CV = \delta/\mu$ is used to calculate the coefficient of variation of the indicators, where δ represents the standard deviation, μ represents the mean value of the index data, and $w_i = CV / \sum_{i=1}^n CV$ is used to integrate the coefficient of variation to obtain the objective weight w_i of each indicator. The combined weight of the additive synthesis method is determined by the coefficients assigned to subjective and objective weights, and the final combined weight is equal to the product of subjective weight coefficient and subjective weight plus the product of objective weight coefficient and objective weight [23]. The formula to calculate the combination weight by using the additive synthesis method is as follows:

$$W_i = \alpha \times \beta_i + (1 - \alpha) \times w_i. \quad (1)$$

In formula (1), w_i represents index combination weight, β_i and w_i represent subjective weight value and objective

TABLE 1: The e-commerce SMEs credit risk evaluation index system.

Level indicators	Index number	The secondary indicators	Indicators shown	Literature sources
Store qualification	A1	Fixed number of years of registration	The opening time of enterprises has a positive impact on enterprise credit	Li [10];
	A2	Seller's credit rating	There is a significant positive correlation between seller credit rating and enterprise credit	Li [10];
	A3	Customer satisfaction	Customer's favorable comment rate on products can positively affect enterprise credit	---
	A4	Number of fans	The more followers you have, the better your credit is	---
	A5	Number of fans increased	The more fans added in each data collection cycle, the better the credit level	---
	A6	Passed the gold seller certification or not	Pass gold seller certification; the credit level is better	---
	A7	Passes the individual industrial and commercial certification or not	Pass individual industry and commerce certification, credit level is better	---
	A8	Quantity of goods in the store	An enterprise's comparative advantage in the number of products can be transmitted to the credit level channel	---
	A9	Credit ranking in the city where the store is located	The overall ranking of the city's credit level can positively affect the store credit	Wang et al. [22];
Product quality level	B1	Descriptive coincidence rate	The degree of conformity between the physical object and the description positively reflects the credit level of the store	Liang, et al. [11];
	B2	The order number	Order quantity positively affects enterprise credit level	Li [10];
	B3	Order growth rate	The growth rate of orders in each data collection cycle is positively reflecting the level of corporate credit	Li [10];
	B4	Reasonable degree of price	The comparative advantage of the product price and similar products can be transmitted to the credit level channel	Wang et al. [22];
	B5	Range of change in prices of major commodities	Main commodity prices can reflect the quality of products and then reflect the store credit level	---
	B6	The number of comments	The higher the number of comments, the higher the credit level	Li [10];
	B7	Negative comment rate	The higher the negative review rate, the lower the credit level	Li [10];
	B8	Collection rate	The higher the collection rate, the higher the credit level	---
	B9	Number of product parameter disclosure items	The quantity of product parameter disclosure has a positive impact on enterprise credit	Liang, et al. [11];
Service quality level	C1	Service attitude	The better the enterprise service attitude, the higher the enterprise credit level	---
	C2	Customer service response speed	The faster the customer service response, the higher the credit level of the enterprise	Wang and Li [14];
	C3	Logistics service	The faster the product logistics, the higher the enterprise credit level	Wang and Li [14];
	C4	Sound condition of packing of the goods	The better the packing, the better the credit	Li [10];
	C5	Speed of goods delivery	The faster the delivery, the higher the credit level	Liang, et al. [11];
	C6	Speed of return and exchange of goods	The faster the exchange rate, the higher the credit level	Wang et al. [22];
	C7	Express service level	The better the express service level, the higher the credit level	Wang et al. [22];
	C8	The freight fee	Whether the goods are free of mail is a positive reaction to the enterprise's credit level	---
	C9	The number of services promised by the seller	The more services an enterprise promises, the higher its credit will be	---

TABLE 2: Scoring criteria for the fuzzy weight of indicators.

Indicator importance	Fuzzy number
Very low (VL)	(0, 0, 0.1)
Low (L)	(0, 0.1, 0.3)
Medium to low (ML)	(0.1, 0.3, 0.5)
Medium (M)	(0.3, 0.5, 0.7)
Medium to high (MH)	(0.5, 0.7, 0.9)
High (H)	(0.7, 0.9, 1.0)
Very high (VH)	(0.9, 1.0, 1.0)

weight value, respectively, α represents the proportion of subjective weight in combination weight, and in this paper, α takes 50%.

3. Construction of the Dynamic Credit Evaluation Model

3.1. Static Credit Evaluation Model of e-Commerce SMEs under the TOPSIS Method. The model construction steps are summarized as follows:

- (i) Step 1: assume that there are m e-commerce SMEs participating in the evaluation; that is, A_j ($j=1, 2, \dots, m$), each enterprise has n secondary indicators C_i ($i=1, 2, \dots, n$). According to the above information, the original matrix $r = (x_{ij})_{m \times n}$ is constructed with m rows and n columns, and each index value is normalized to obtain the standardized matrix $R = (\tilde{x}_{ij})_{m \times n}$.
- (ii) Step 2: use triangle fuzzy method and coefficient of variation method to determine the subjective and objective weight of indicators, respectively, and use the additive synthesis method to integrate the subjective and objective weight. The specific calculation steps are shown in 1.2. The weights of indicators obtained are, respectively, w_1, w_2, \dots, w_i .
- (iii) Step 3: mark e-commerce small microenterprise A_i optimal value in n secondary indexes for x_i^+ , the worst value of x_i^- , and meet $x_i^+ = \max_{j=1,2,\dots,m} x_{ij}$, $x_i^- = \min_{j=1,2,\dots,m} x_{ij}$; then the ideal solution is $A^+ = (x_1^+, x_2^+, \dots, x_n^+)$, and the negative ideal solution is $A^- = (x_1^-, x_2^-, \dots, x_n^-)$.
- (iv) Step 4: use $d_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - x_j^+)^2}$ and $d_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - x_j^-)^2}$ to calculate the index weighting Euclidean distance for positive and negative ideal solutions, where $v_{ij} = w_i \times x_{ij}$ v_{ij} represents the weighted index value of the i -th second-level index of the e-commerce SMEs, w_i represents the weight of the second-level index, and d_i^+ and d_i^- , respectively, represent the weighted Euclidean distance between the e-commerce SMEs and the positive and negative ideal solutions.
- (v) Step 5: use $y_i(t) = d_i^-/d_i^+ + d_i^-$ to calculate each SME and the degree of deviation from the ideal solution, where $y_i(t)$ represents the degree to which e-commerce SMEs deviate from the negative ideal

solution. If $y_i(t) = 1$, it means $A_i = A^+$. If $y_i(t) = 0$, it means $A_i = A^-$. The closer the value of $y_i(t)$ is to 1, the closer the e-commerce SME is to the positive ideal solution. Thus, the credit of the e-commerce SME is the best. After the proximity of each e-commerce SMEs is calculated, the selected m e-commerce SMEs are ranked according to the calculation results.

3.2. Construction of the Credit Evaluation Model of e-Commerce SMEs Based on the Improved TOPSIS Method from the Perspective of Dynamic Rewards and Punishments. The model construction steps are summarized as follows:

- (i) Step 1: assume that there are m e-commerce SMEs participating in the evaluation, that is, A_j ($j=1, 2, \dots, m$), each enterprise has n secondary indicators C_i ($i=1, 2, \dots, n$). The ability of e-commerce SMEs to cope with risks is represented by their corresponding reward and punishment values. At the same time, the value of rewards and punishments is proportional to the store credit level. The calculation formula of reward and punishment value is as follows:

$$\Delta y_i(t) = \frac{1}{m-1} \sum_{k=1, k \neq i}^m \{y_i(t) - y_k(t)\}. \quad (2)$$

In equation (2), $\Delta y_i(t)$ refers to the credit reward and penalty value of the evaluation object O_i , $y_i(t)$ refers to the static comprehensive evaluation value of the evaluated object O_i at time t , and $y_k(t)$ refers to the static comprehensive evaluation value of other sample enterprises except for the evaluated object O_i at time t . After calculating the reward and punishment value, the value is embedded into the static credit evaluation result to get the decision matrix Z^* considering the reward and punishment, $Z^* = (y_i(t) + \Delta y_i(t))_{m \times T}$.

- (ii) Step 2: after Z^* is obtained, the static comprehensive evaluation value is aggregated with the TOPSIS method. Firstly, the time weight was calculated by using the "Houjinbogu Method," which was integrated with Z^* to obtain the initial decision matrix Z^{**} , and then the positive and negative ideal solutions were calculated. In dynamic evaluation, an upward trend in credit level over a continuous period is always preferred. Based on this preference, the positive ideal solution should also show an upward trend in continuous time, with the value in two states of constant or increasing, so that the credit level can continue to rise. Therefore, equation (3) is used to determine the positive ideal solution. Compared with the positive ideal solution, the negative ideal solution decreases in trend and is not preferred by others. Therefore, the negative ideal solution is determined by equation (4).

$$y^+(t) = \max\{y^+(1), y^+(2), \dots, y^+(T)\}, \quad (3)$$

$$y^-(t) = \min\{y_i^-(T)\}. \quad (4)$$

In equation (3), $y^+(1) = \max\{y_i^+(1)\}$, $y^+(2) = \max\{y_i^+(1), y_i^+(2)\}$, $\dots, y^+(T) = \max\{y_i^+(1), y_i^+(2), K, y_i^+(T)\}$.

(iii) Step 3: after the positive and negative ideal solutions are obtained, formulas (5) and (6) are used to calculate the distances d_i^+ and d_i^- between each scheme and the positive and negative ideal solutions. Formula (7) is used to calculate the bonding progress between each scheme and the ideal solution U_i after the credit rewards and penalties and time are embedded.

$$d_i^+ = \sqrt{\sum_{i=1}^T (y_i(t) - y^+(t))^2}, \quad (5)$$

$$d_i^- = \sqrt{\sum_{i=1}^T (y_i(t) - y^-(t))^2}, \quad (6)$$

$$U_i = \frac{d_i^-}{d_i^+ + d_i^-}. \quad (7)$$

(iv) Step 4: the future credit development trend of an enterprise is reflected by its corresponding grey relative score. Since the ideal state of credit level is the state of continuous increase, let the ideal credit set in each time state be Y^* ,

$$Y^* = \{y^*(1), y^*(2), \dots, y^*(T)\}. \quad (8)$$

In equation (8), $y^*(1) = \max\{y_i^*(1)\}$, $y^*(2) = \max\{y_i^*(1), y_i^*(2)\}$, $\dots, y^*(T) = \max\{y_i^*(1), y_i^*(2), \dots, y_i^*(T)\}$. An ideal credit shape can be obtained from equation (8). According to the principle of the grey relational degree method, equation (9) is used to calculate the degree of similarity between each evaluation object and the ideal credit shape:

$$\begin{cases} \xi_i(t) = \frac{\min_{i \in m}(\min|Y^*(t) - y_i(t)|) + \rho \max_{i \in m}(\max|Y^*(t) - y_i(t)|)}{|Y^*(t) - y_i(t)| + \rho \max_{i \in m}(\max|Y^*(t) - y_i(t)|)}, \\ \xi_i = \frac{1}{T} \sum_{t=1}^T \xi_i(t). \end{cases} \quad (9)$$

In equation (9), ξ_i is the grey relative score, and its value is proportional to the ideal credit shape. The larger the value is, the better the future credit development trend of the evaluation object is, and the evaluation value in the credit evaluation should also increase. Otherwise, it will decrease; ρ is the resolution coefficient, the size of ρ is inversely proportional to the resolution, the value range of ρ is (0, 1), and the resolution is the best when $\rho \leq 0.5463$, so the value of ρ is usually 0.5.

credit status, γ represents the coefficient that attaches importance to the future credit status, Usually because the current credit status is stable and the future credit status is unknown, so $\theta = 0.8, \gamma = 0.2$.

(v) Step 5: finally, risk coping ability, initial credit level, and future credit development potential are fused through $Z_i = \theta U_i + \gamma \xi_i$, where θ and γ are the adjustment coefficients, and $\theta + \gamma = 1$, θ represents the coefficient that attaches importance to the current

The comparison of the construction process between the traditional model and the improved model is shown in Figure 1.

In Figure 1, the left side shows the steps of traditional model building, and the right side shows the steps of improved model building. The differences between the traditional model and the improved model are shown between the left side and the right side. The adding of rewards and punishments value, time weight, and grey relation analysis make it different from the traditional model.

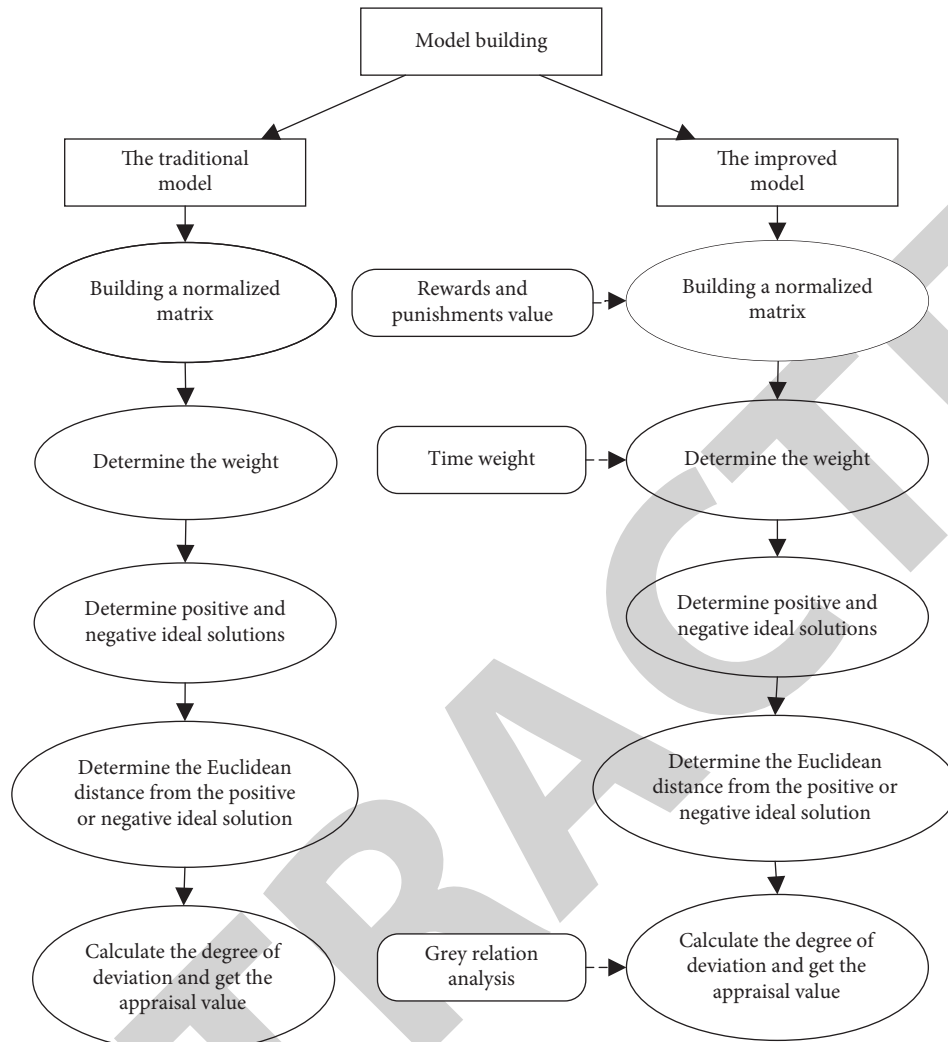


FIGURE 1: Flowchart of the traditional model and improved model.

4. Case Application and Comparative Analysis

This paper takes Taobao, the largest shopping website in Asia, as an example, and selects 20 SMEs as samples (No. $T1-T20$), manually obtaining the relevant index data in the index system. Taobao’s website is <https://www.taobao.com/>. Samples selection follows the principle of similar comparability, and data acquisition is characterized by availability and time sequence. The data acquisition period is 7 days, and the first data acquisition date is January 13, 2020. The last data acquisition date is April 27, 2020, including a total of 16 periods of data.

The above data were calculated and processed according to the model steps, and the evaluation results are shown in Table 3 .

The credit rating of 20 samples as of April 27, 2020, is compared and analyzed with the dynamic, comprehensive

credit rating value in Table 3. The results are shown in Table 4.

Through the comparison in Table 4, it can be found that when using the model in this paper to evaluate credit, the credit level of all stores has changed. Among them, 7 stores’ credit levels have increased, which is marked $T1, T2, T6$, etc. and 13 stores’ credit levels have decreased, which is marked $T3, T4, T5$, etc. Among the stores with improved credit levels, the store with the number $T16$ increased the most, which increased 17 places. In fact, store $T16$ opens only 1 year, depending on the rules of the buyers’ evaluation reflect accumulated credit situation, it cumulated less buyers’ comments, so the store interface shows a low level of credit. But in this article, we use our improved method to rank its credit level again, and we found that its credit rank obviously increased, which fully shows that the credit level of store $T16$ is underestimated. Similarly, store $T3$ has been open for 9

TABLE 3: Dynamic evaluation results.

Store number	Initial credit level	Rank	Development trend similarity	Rank	Dynamic comprehensive credit	Rank
T1	0.8845	5	0.7782	3	0.8632	5
T2	0.5751	16	0.4801	17	0.5561	16
T3	0.6256	15	0.5886	12	0.6182	15
T4	0.7395	10	0.5984	11	0.7113	11
T5	0.9167	4	0.7467	5	0.8827	4
T6	0.9842	1	0.8799	1	0.9633	1
T7	0.5706	17	0.4937	16	0.5552	17
T8	0.5622	18	0.4691	18	0.5436	18
T9	0.8243	7	0.7018	7	0.7998	7
T10	0.6895	14	0.5290	15	0.6574	14
T11	0.5059	19	0.4286	19	0.4905	19
T12	0.8409	6	0.6493	8	0.8026	6
T13	0.8050	8	0.7108	6	0.7861	8
T14	0.7109	13	0.6359	10	0.6959	13
T15	0.9276	2	0.8518	2	0.9124	2
T16	0.9187	3	0.7777	4	0.8905	3
T17	0.0000	20	0.3055	20	0.0611	20
T18	0.7309	12	0.6460	9	0.7139	10
T19	0.7335	11	0.5553	14	0.6979	12
T20	0.7861	9	0.5704	13	0.7430	9

TABLE 4: Credit comparison table.

Store number	Credit rating on Taobao	Rank	Dynamic comprehensive credit	Rank
T1	3 silver	8	0.8632	5
T2	1 silver	19	0.5561	16
T3	5 silver	2	0.6182	15
T4	3 silver	8	0.7113	11
T5	2 gold	1	0.8827	4
T6	3 silver	8	0.9633	1
T7	3 silver	8	0.5552	17
T8	3 silver	8	0.5436	18
T9	3 silver	8	0.7998	7
T10	4 silver	6	0.6574	14
T11	3 silver	8	0.4905	19
T12	5 silver	2	0.8026	6
T13	5 silver	2	0.7861	8
T14	4 silver	6	0.6959	13
T15	2 silver	17	0.9124	2
T16	4 drill	20	0.8905	3
T17	3 silver	8	0.0611	20
T18	3 silver	8	0.7139	10
T19	1 gold	2	0.6979	12
T20	1 silver and 3 drill	18	0.7430	9

years and accumulated a large number of buyer comments, so its credit level displayed on the store interface is high. However, after the comprehensive evaluation in this paper, its credit level has dropped 13 places, indicating that its credit level is overestimated.

5. Conclusion

With the rapid development of the Internet and the rapid growth of the number of e-commerce SMEs, it is far from enough to rely only on cumulative buyer evaluation for credit evaluation. This paper takes e-commerce SMEs as the research object and constructs a credit evaluation index

system for e-commerce SMEs. Based on the dynamic perspective, an improved model is constructed on the basis of static results calculated from the traditional model, and the feasibility of the model is verified by case application research. It can promote the credit evaluation of e-commerce SMEs more reasonably.

At the same time, this paper combines the triangular fuzzy evaluation method and coefficient of variation method, credit reward, and punishment value, grey relative analysis method, and TOPSIS method. The objective weighting can't determine the weight of important qualitative indexes, which determines the necessity and rationality of using the triangle fuzzy method and coefficient of

variation method to determine weight. The addition of credit reward and punishment value makes credit evaluation dynamic; The combination of credit reward and punishment value, grey relative analysis method, and TOPSIS method makes the results reasonable and comprehensive, which makes it possible to apply the improved TOPSIS method based on the dynamic reward and punishment perspective in the credit evaluation of SMEs of e-commerce supply chain finance.

This paper still has the following limitations: First, the data acquisition time is short. Since manual data collection is required, the workload is heavy, and the data need to be collected manually every once in a while; the data period involved in this paper is short; Second, the sample selection has certain limitations. This paper only selects one kind of SMEs in Taobao and does not extend to more categories of enterprises. In the following in-depth research, the time span and industry span of the sample will be expanded with the help of big data and artificial intelligence tools, and the evaluation index of text attributes will be combined to further optimize the credit evaluation index system. At the same time, other research methods will be further expanded to explore the use of other methods for dynamic credit risk evaluation of SMEs in e-commerce supply chain finance so as to comprehensively explore a more optimized evaluation method. The research will continue to obtain data with a longer duration, and the enterprise category will be expanded to further explore the applicability of the improved model.

Data Availability

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

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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