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ORIGINAL ARTICLE

Multiparty game research and example analysis in supply chain finance system based on MPDE theory

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Abstract Under the supply chain financial model, financial institutions (such as commercial banks) no longer supply directly to financing companies, but instead face the entire supply chain. Now this model has become a new area to solve the financing difficulties of SMEs. In the supply chain finance system, each node on the chain can pursue its own best interests. The core nodes (commercial banks, small and medium-sized enterprises, third-party logistics companies) can coordinate and monitor their behavior with each other, and can achieve mutual benefit and efficient operation of the supply chain. This paper studies the theory of meshless partial differential equations (MPDE), and uses game theory and information economics theories and methods to establish corresponding multiparty game models. The application of this game model to the members of supply chain finance was explored. Mathematical derivation and example analysis prove that the model is reasonable, and it also provides a way to make the supply chain operate most efficiently and maximize the benefits.

1. Introduction

Financing difficulties for SMEs is a worldwide problem. With the tightening of monetary policy, the rise of raw material prices, the continuous appreciation of the renminbi, and the sudden changes in the foreign economic environment, the financing problems of SMEs have become increasingly serious. Supply chain finance, a financial innovation financing model, has developed rapidly in recent years, and has become a brand area with great potential for solving SME financing and expanding commercial banking business [1–4]. As a relatively new research field, there are not many systemic researches on supply chain finance at home and abroad and have achieved in-depth results. Some literatures only reflect the basic ideas of supply chain finance and describe their concepts and values [5–8]. Systematic research and analysis of chain finance and related theories are lacking in the analysis of the economic theoretical basis for its existence and development; or it is only focused on the perspective of logistics, the concept of supply chain financial financing models, participating members, and operations Conceptual analysis of processes, etc., but the quantitative mechanism in these businesses is less studied,

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the research depth is not enough, and the comprehensiveness is not strong.

The finite element method (FEM) is a numerical calculation method developed in the 1950s. In FEM, a complex-shaped continuum (problem domain) is divided into units, that is, finite units, and the units are connected by a topology diagram called a grid [9–11]. In order to overcome these difficulties, the idea of getting rid of cells or grids during numerical processing naturally came into being, and the meshless method was developed [12,13].

The research on the game equilibrium of the supply chain financial model has received extensive attention. Scholars have analyzed the decision variables of various participants and the game equilibrium situation under different financing models. Based on the performance of the financing system when the game is in equilibrium, the decision-making situation of each participant's financing or operation is pointed out. Some scholars also make comparisons on different financing methods based on the analysis of financing equilibrium and point out the advantages and disadvantages of different financing methods. This kind of research lays a solid theoretical foundation for the study of supply chain financial game equilibrium and coordination strategies, and provides a methodological reference to a certain extent.

As supply chain finance is a complex and comprehensive economic organization, it can closely integrate multiple stakeholders and organically play a one plus one greater than two effect [14–16]. Therefore, for the supply chain finance financing model, it is necessary to carry out in-depth research. For the research on supply chain finance, there is no in-depth and systematic research. Although there are a few references to the basic concepts of supply chain finance, the basic ideas and values of supply chain have not been comprehensively and thoroughly studied.

This paper introduces the element-free Galerkin method based on the moving least squares method, gives the method of entering discrete equations into two types of nonlinear partial differential equations, and successfully applies the discrete algorithm to the supply chain financial model.

2. Research model of meshless partial differential equation in supply chain finance financing model

2.1. Supply chain financial financing model

"Supply chain finance" is a new proposition. At present, there are few discussions on supply chain financing, and there isn't even an accepted definition of supply chain finance. This article believes that the so-called supply chain finance is a financing activity based on the supply chain. It refers to a commercial bank that provides comprehensive financial services to a single enterprise in an industrial chain or multiple companies upstream and downstream from the perspective of the entire industrial chain to promote the supply chain. The "production-supply-sales" chain of core enterprises and upstream and downstream supporting small and medium-sized enterprises is stable and flowing smoothly, and an industrial ecology of mutually beneficial coexistence and sustainable development of financial institutions, supply chain enterprises and logistics companies is established. The framework of the symbiotic unit of the supply chain financial system is shown in Fig. 1.

The supply chain financial financing model has the following basic characteristics:

(1) Systematic. Systematic thinking holds that the three system characteristics of purpose, relevance, and integrity are the three system principles. The supply chain financial system is a complete system composed of a series of elements with specific functions and organic connections with each other. It has clear input, processing and output elements. Its ultimate purpose is to achieve value-added supply chain and overall competitiveness.
(2) Collective rationality. From the perspective of game theory, under the supply chain financial system, the decision-making behaviors of enterprises (including financial institutions) directly affect each other. Table 1 shows the three types of financing models for supply chain finance.
(3) Complexity and greater uncertainty. The members of the supply chain financial system include financial institutions, core large enterprises, upstream and downstream SMEs, as well as supporting third-party logistics companies, related information software providers, the objects considered include capital flows, logistics and information flows; The methods include information sharing, coordination, and organizational cooperation, which are quite complex and face greater uncertainty.

2.2. Meshless partial differential equations

The meshless method does not need to generate grids in numerical calculations, but constructs discrete control equations of interpolation functions according to some randomly distributed coordinate points, which can conveniently simulate flow fields of various complex shapes. Another type is Gridless methods based on Euler's method, such as the Gridless Euler / N-S algorithm (Gridless Euler / Navier-Stokes solution algorithm) and Element Free Galerkin (EFG) [17–19].

The meshless method can conveniently use the coordinate point calculation to simulate the calculation of the complex shape flow field. A more common method in the meshless method is the Radious Basis Function method, which mainly uses a combination of a certain radial basis function (such as (MQ) f (r) = r ˆ 5) to approximate the original function. Among the above methods, the meshless Galerkin method has become the most influential and widely used meshless computing method. In the construction of a supply chain financial model game analysis model, we can use the meshless Galerkin method for mathematical models. Construction can improve the accuracy of result analysis.

3. Research method of supply chain finance based on meshless partial differential equation

3.1. Principle of the element-free Galerkin method

EFG breaks through the limitation of the element mesh in the traditional finite element analysis. In the case of large

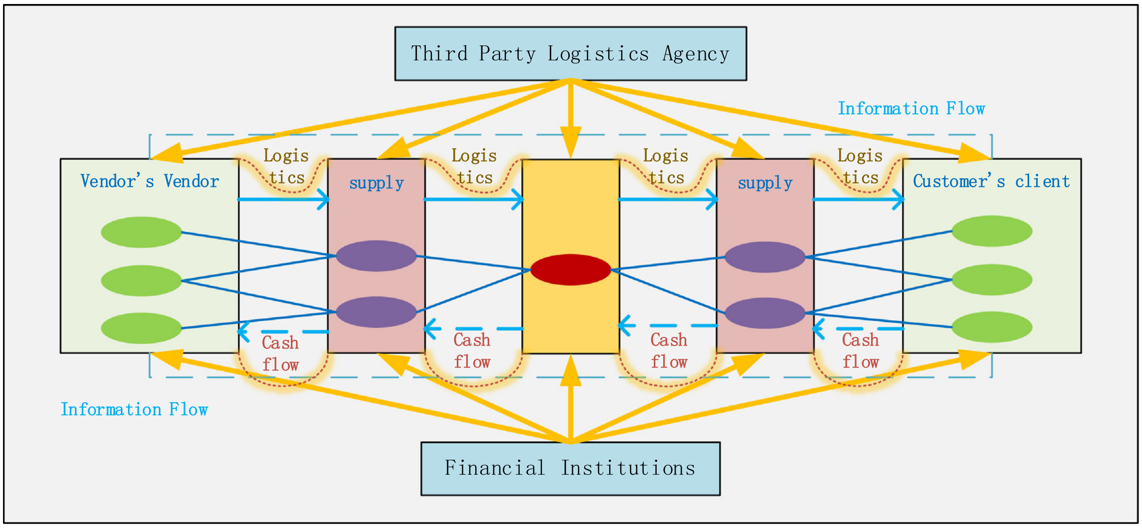

Fig. 1 Supply chain financial ecosystem structure.

Table 1 Three types of financing models for supply chain finance.

Type	Financing model	Third party involved	Stage	Pledge	Position	Financing use
Debt control	Receivables	No	Accounts receivable due for sales of goods	Claims	Upstream supplier bond companies	Purchase required raw materials or other
Real right control	Prepaid	Yes	Order raw materials Payment of raw materials	Pre-purchased goods	Downstream distributor manufacturer	Payment in installments Right to take delivery in batches
	Inventory category	Yes	Stable inventory at any time	Stock	Business on any node	Purchase required raw materials or other

deformation of the structure, the problem of mesh distortion will not occur, and it has the advantages of high accuracy, convenient post-processing, and fast convergence. Therefore, in recent years, it has received extensive attention and rapid development. The basic idea of the method is simply the following three steps:

(1) The shape function is obtained by moving the least squares method.
(2) The Galerkin method is used to obtain the equivalent integral equation, and the essential boundary conditions are processed to obtain the Galerkin weak form of the differential equation;
(3) Grid the background grid, and use the background grid to integrate to obtain the system discrete equation.

3.2. Moving least squares method

The moving least squares method was proposed by Lanscaster and Salkamkas in 1992. Hypothetical solution domain Ω have n nodes x_i (i = 1, 2......, N), The value of the desired function U(x) at this node is known, and is written as u_i, which is $u_i = u(x_i)$, Our goal is to construct the function to be sought Ω and the global approximation function U(x) in the solution domain $u^h(X)$. Now consider a subdomain or neighborhood Ω_x that contains a calculation point × (the calculation point in EFG generally refers to a Gaussian point, and the node generally refers to the point obtained when the background mesh is divided). Located in the global solution domain*m*, the local approximation in the subdomain Ω_x is:

$$u^h(x,\bar{x}) = \sum_{i=1}^{m} p_i(\bar{x})a_i(x) = P^T(\bar{x})a(x) \quad (1)$$

Usually we use the monomial as the basis function, of course, sometimes there are other functions, such as trigonometric functions. Taking the monomial as an example, the following lists the cases of one to three dimensional bases:

The monomial basis function in one-dimensional space is:

Linear base:

$$P^T(\bar{x}) = [1, x], \ m = 2 \quad (2)$$

Quadratic basis:

$$P^T(\bar{x}) = [1, x, x^2], \ m = 3 \quad (3)$$

The monomial basis function in two-dimensional space is:

Linear base:

$$P^T(\bar{x}) = [1, x, y], \ m = 3 \quad (4)$$

Quadratic basis:

$$P^T(\bar{x}) = [1, x, y, x^2, xy, y^2], \ m = 6 \quad (5)$$

The monomial basis function in three-dimensional space is: Linear base:

$$P^T(\bar{x}) = [1, x, y, z],\ \ \mathrm{m} = 4 \tag{6}$$

Quadratic basis:

$$P^T(\bar{x}) = \left[1, x, y, z, x^2, xy, y^2, yz, z^2, xz\right],\ \ \mathrm{m} = 10 \tag{7}$$

Now we are solving every node in the domain Ω, which is x_i (i = 1,2.......N), Define such a weight function:

$$\mathrm{w}_i(x) = w(x - x_i) \tag{8}$$

That is, the function value of W_i in a neighborhood Ω_{xi} around the node x_i is non-zero, and the function values outside this neighborhood Ω_{xi} are all zero, which means that the weight function is tightly supported. Neighborhood Ω_{xi} is called the influence area of Node x_i or the support area of Node x_i. Generally, we take the influence area as rectangular or circular, which is good for our calculation, as shown in Fig. 2.

For the undetermined coefficient a(x) in Eq. (1), we can find it by defining the weighted square norm L_2:

$$\begin{aligned} J &= \sum_{i=1}^{n} w_i(x)\left[u^h(x, x_i) - u(x_i)\right]^2 \\ &= \sum_{i=1}^{n} w_i(x)\left[\sum_{j=1}^{m} p_j(x_j)a_j(x) - u_i\right]^2 \end{aligned} \tag{9}$$

Here n is the number of nodes x in the neighborhood the calculation point x. In order to be consistent with the notation of formula (1). J is the minimum, which is the minimum of the weighted sum of squared errors, that is:

$$\begin{aligned} \frac{\partial J}{\partial a_k(x)} &= 2\sum_{i=1}^{n} w_i(x)\left[\sum_{j=1}^{m} p_j(x_j)a_j(x) - u_i\right]^2 p_k(x_i) \\ &= 0\ \ \mathrm{k} = 1, 2, 3..., \mathrm{m} \end{aligned} \tag{10}$$

Writing the formulas of formula (10) as a matrix has

$$\mathrm{A(x)a(x)} = \mathrm{B(x)u} \tag{11}$$

where

$$\mathrm{A(x)} = \sum_{i=1}^{n} w_i(x)p(x_i)p^T(x_i) \tag{12}$$

$$B(x) = [w_1(x)P(x_1)\ w_2(x)P(x_2)\ ...w_n(x)P(x_n)] \tag{13}$$

$$u = [u_1, u_2, ..., u_n]^T \tag{14}$$

The undetermined coefficient a(x) can be obtained from formula (11)

$$a(x) = A^{-1}(x)B(x)u \tag{15}$$

Substituting Eq. (15) into Eq. (1), we obtain the function to be solved. The local best approximation function $u^h(X)$ in the sense of weighted least squares in the neighborhood q of the calculation point x.

$$\mathrm{u}^h(x) = \mathrm{u}^h(x, \bar{x}) \tag{16}$$

Where we call Φ(x) the shape function of x at the calculation point

$$\phi_i(x) = \sum_{j=1}^{m} p_j(x)(A^{-1}(x)B(x))_{ji} \tag{17}$$

$$\phi(x) = [\phi_1(x), \phi_2(x), \phi_3(x), ..., \phi_n(x)] = p^T(\bar{x})A^{-1}(x)B(x)u \tag{18}$$

A local approximation of the calculation points has been established in the above content. When we establish local approximations for all points in the solution domain Ω, the set of these approximate values constitutes the approximate function of the function U(x) to be sought in the entire solution domain. As shown in Fig. 3, the reason why this method is called moving least squares is that as the calculation point × changes (moves), the neighborhood also changes (moves), and then an approximation is performed by weighted least squares. Replace all global approximations with all local approximations.

3.3. The properties of the element-free Galerkin method and its partial derivatives

From the expression of the shape function, we can see that the smoothness of $\Phi_i(x)$ is determined by the basis function and weight function. Let $C^q(\Omega)$ be the continuous differentiable function space of order q, if

$$\begin{aligned} &w_i(x) \in C^q(\Omega)(i = 1, 2, ..., n), \\ &p_j(x) \in C^l(\Omega)(j = 1, 2, 3, ..., m) \end{aligned} \tag{19}$$

Then

$$\phi_i(x) \in C^S(\Omega), s = \min(q, l) \tag{20}$$

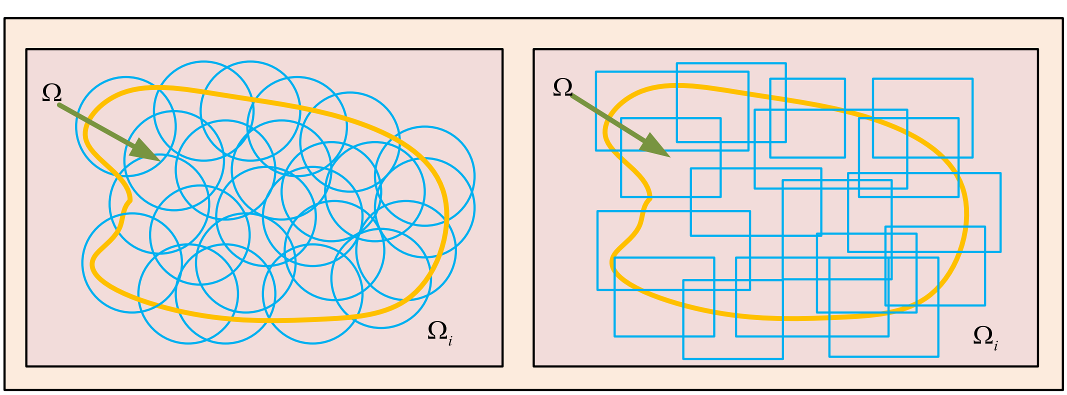

Fig. 2 The influence area of a node, the left is a circular influence area, and the right is a rectangular influence area.

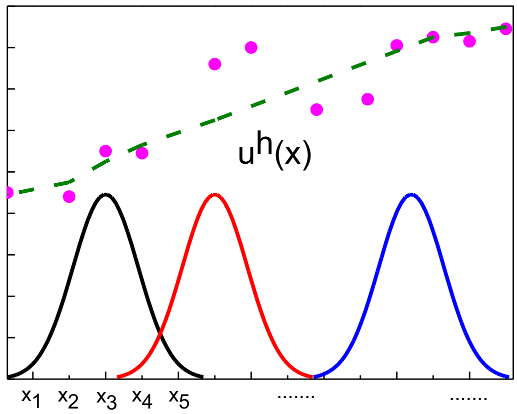

Fig. 3 Moving least squares.

In general, the shape function is consistent, that is:

$$\sum_{i=1}^{n}\phi_i(x) = 1$$
$$\sum_{i=1}^{n}\phi_i(x)x_i = x \tag{21}$$
$$\sum_{i=1}^{n}\phi_i(x)y_i = y$$

But the shape function does not satisfy the Kronecher delta property. When this property is reflected on the approximate function, it makes $u^h(x_i) \neq u(x_i) = u_i$. As shown in Fig. 4, this is exactly the same, so that the meshless method based on the moving least squares approximation cannot be directly added to the boundary like a finite element when processing the boundary.

Kronecher delta properties:

$$\delta_{ij} = \begin{cases} 1 & i=j \\ 0 & i\neq j \end{cases} \tag{22}$$

The shape function does not satisfy the Kronecher delta property: $\phi_i(x_j)\neq\delta_{ij}$

In practical problems, the derivative of the function to be sought is often required, so our approximate function also needs to be derived. However, the process of deriving the

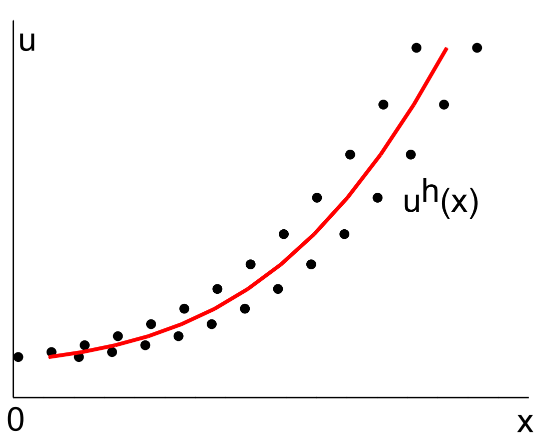

Fig. 4 Approximate function formed by MLS approximation.

approximate function is the shape function. Taking the two-dimensional case as an example, the calculation process of the partial derivative of the shape function is as follows:

$$\phi(x) = r(x)B(x), r(x) = P^T(x)A^{-1}(x) \tag{23}$$

Since A(x) is a symmetric matrix, it can be written as

$$p(x) = A(x)r^T(x) \tag{24}$$

Find the partial derivatives of x and y on both sides of formula (24), and get

$$P_x(x) = \mathrm{A}_x(x)r^T(x) + A(x)r_x^T(x) \tag{25}$$

$$P_y(x) = \mathrm{A}_y(x)r^T(x) + A(x)r_y^T(x) \tag{26}$$

Among them, $P_x(x)$, $P_y(x)$, $A_x(x)$, $A_y(x)$ in formula (25) and formula (26) are already known. By formula (23) and formula (24), vector $r_x(x)$, $r_y(x)$ can be calculated, and then substituted into formula (27) can calculate the mixed partial derivative$r_{xy}(x)$.

$$P_{xy}(x) = \mathrm{A}_{xy}(x)r^T(x) + A_x(x)r_x^T(x) + A(x)r_{xy}^T(x) + A_y(x)r_x^T(x) \tag{27}$$

By substituting $r_x(x)$, $r_y(x)$ and $r_{xy}(x)$, obtained in the above process into the following two formulas, the first derivative and mixed derivative of the shape function can be obtained. Higher-order derivatives can be derived similarly.

$$\phi_x(x) = r_x(x)B(x) + r(x)B_x(x) \tag{28}$$

$$\phi_{xy}(x) = r_{xy}(x)B(x) + r_x(x)B_y(x) + r_y(x)B_x(x) + r(x)B_{xy}(x) \tag{29}$$

In order to have a visual understanding of shape functions, this article gives some images of shape functions. The following shape functions and their derivatives are all obtained using cubic spline functions as weight functions. Fig. 5 shows the shape function and the first derivative of the shape function in the two-dimensional case.

4. Game analysis of financial financing model in supply chain based on meshless partial differential equation

First, analyze the debt control financing model without third party participation. The basic idea of this model is: Small and medium-sized enterprises at the junction of the supply chain have a creditor's right of the core enterprise, which can use this creditor's right as a pledge to apply for a credit loan from the bank, that is, use the credit strength of the core large enterprise (Counter-guarantee of debt companies), SMEs can both obtain bank financing and reduce the credit risk of banks to a certain extent. Here, we will use the game theory method to establish an appropriate mathematical model to conduct a systematic study of financing issues in supply chain finance and explore a balanced choice between banks and enterprises.

Assume that a small and medium-sized enterprise needs to finance L for a project, the project success probability is $\alpha(0 < \alpha < 1)$, and if the project success rate of return is β, the expected return on the bank loan part of the project cost of the SME is $\alpha\beta L$, the interest income on the loan required by the bank is R, Inspection and supervision cost is C,

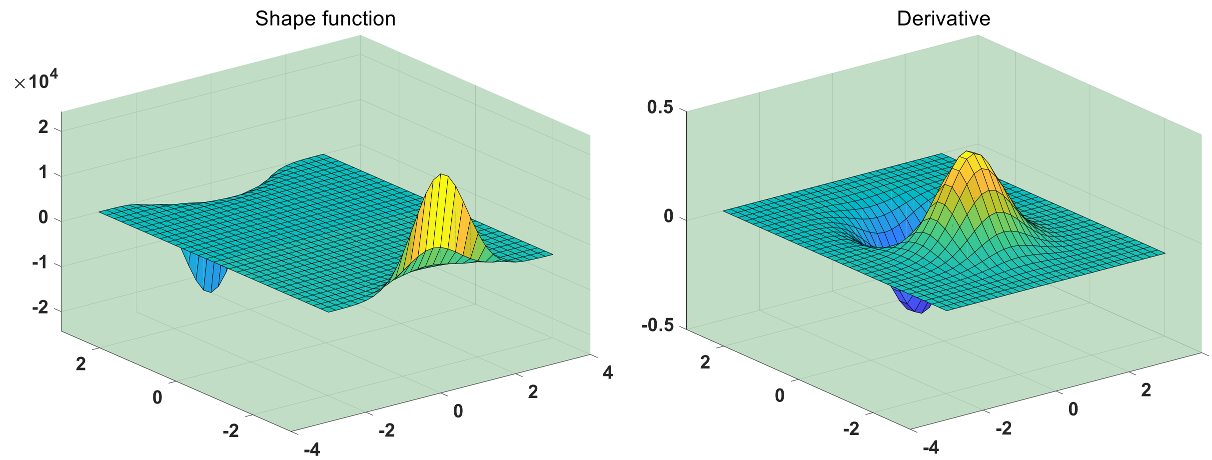

Fig. 5 Two-dimensional MLS shape function of cubic spline weight function and its derivative.

αβL-R > 0, 0 < C < R, For the sake of simplicity, it is assumed that there are no interest rate restrictions and the bank is in an interest rate liberalization market; the transaction costs between banks and SMEs are zero and their discount rate is δ(0 < δ < 1, assuming that the discount rate is the same for each period). Therefore, we designed a repeated game payment matrix for banks and enterprises with complete information, as shown in Table 2.

If a given bank chooses a "loan" strategy, and when a given SME chooses a "repayment" strategy, the total discounted future earnings of this SME are:

$$\Pi_{C1} = (\alpha\beta L - R)(1 + \delta + \delta^2 + \delta^3 + \ldots) = \frac{\alpha\beta L - R}{1 - \delta} \quad (30)$$

When the SME chooses the "reliance on account" strategy, the first cooperation gain is αβL. In the future games, the bank will implement the "cold strategy":

Table 2 Repeated game analysis of complete information of banks and enterprises.

Commercial Bank	SMEs		
		Repay	Deny
	Loan	$\frac{R-C}{1-\delta}, \frac{\alpha\beta L-R}{1-\delta}$	$-L-C, \alpha\beta L+L$
	Not loan	0,0	0,0

$$\Pi_{C2} = \alpha\beta L + R + 0(\delta + \delta^2 + \delta^3 + \ldots) = \alpha\beta L + R \quad (31)$$

When $\Pi_{C1} \geqslant \Pi_{C2}$:

$$\alpha \geqslant \frac{R + L - \delta L}{\delta\beta L} \quad (32)$$

In other words, the bank takes the success probability of the SME project as a basis, and given the probability of the success of the SME project (32). The financing model of supply chain finance provides new ideas to solve this problem. Table 3 is the accuracy analysis of the data results of the element-free Galerkin method. It can be seen from Table 3 that when taking, the error gradually becomes smaller. When taking, the accuracy can reach 0.001.

From the perspective of the supply chain, the supply chain finance with the participation of third parties, the three parties of commercial banks, logistics enterprises and small and medium-sized enterprises that require loans can achieve the best, maximize the unit product profit, and achieve the "win-win" goal. First of all, for commercial banks, on the one hand, the supply chain finance that logistics companies participate in can help them expand their loan size, reduce credit risk, and even assist it in disposing of some non-performing assets; on the other hand, the top and bottom customers of logistics companies are banks The potential target customer group is that by conducting business with logistics companies, banks can well grasp these customers and provide them with financial services.

Table 3 Precision analysis of data results.

Exact solution	$\Delta x = 0.1$	Error	$\Delta x = 0.01$	Error	$\Delta x = 0.001$	Error
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
49.8312	55.0306	5.2006	51.2125	0.4561	49.8454	0.0017
98.6721	108.9573	10.2873	99.1479	0.8341	99.6576	0.0013
145.524	160.6759	15.1759	148.7741	1.1257	148.2254	0.0129
184.3367	204.0826	19.7526	190.3457	1.6547	189.2849	0.0145
228.1734	251.0733	23.9033	231.1654	1.8655	229.1552	0.0234
263.1145	294.5445	27.5447	269.2419	2.2651	260.6587	0.0188
296.8378	326.3908	30.5647	294.3481	2.5321	291.6512	0.0129
312.6779	344.5097	32.7412	318.7841	2.6981	315.3214	0.0157
327.5124	363.7966	34.8742	330.3257	2.3654	327.8475	0.0071
335.3387	369.1475	35.1247	337.2123	2.8147	332.3221	0.0062

5. Conclusion

Through the game analysis of the supply chain financial model, this paper understands the advantages of the supply chain model, and provides an effective way to solve the financing problem of small and medium-sized enterprises. The restrictions on enterprises themselves bring a lot of convenience to the financing of small and medium-sized enterprises. In this paper, the partial differential equation method is used to analyze the financing mode of supply chain finance, and the relationship between the members of the supply chain financial ecosystem is studied. This mechanism proves the economic basis of supply chain finance. In our case study, we can draw a conclusion: banks are based on the probability of success of SME projects. The financing model of supply chain finance provides new ideas for solving this problem. With the method based on MPDE theory, the data can be accurately simulated and analyzed. From the simulation results. When the bank adopts the corresponding strategy, the accuracy can reach 0.001. Grid free partial differential equation has a good performance in the supply chain, but it still needs to further optimize and improve the existing supply chain financing model to promote the healthy development of supply chain financing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

[1] R. Banisch, C. Hartmann, A sparse Markov chain approximation of LQ-type stochastic control problems, Math. Control Relat. F. 6 (3) (2016) 363–389.
[2] L.L.B. Wu, D. Wu, Dynamic pricing and risk analytics under competition and stochastic reference price effects, IEEE Trans. Ind. Inf. 12 (3) (2015) 1282–1293.
[3] P.M. Jordan, B. Kaltenbacher, Introduction to the special volume"Mathematics of nonlinear acoustics: New approaches in analysis and modeling, Evol. Equat. Control Theory 5 (3) (2016) 447–491.
[4] M. Rosa, M.L. Gandarias, Multiplier method and exact solutions for a density dependent reaction-diffusion equation, Appl. Mathem. Nonlinear Sci. 1 (2) (2016) 311–320.
[5] M. Akhmet, M.O. Fen, Homoclinic and heteroclinic motions in economic models with exogenous shocks, Appl. Mathem. Nonlinear Sci. 1 (1) (2016) 1–10.
[6] D.W. Brzeziński, Accuracy problems of numerical calculation of fractional order derivatives and integrals applying the Riemann-Liouville/Caputo formulas, Appl. Mathem. Nonlinear Sci. 1 (1) (2016) 23–44.
[7] A. Shvets, A. Makaseyev, Deterministic chaos in pendulum systems with delay, Appl. Mathem. Nonlinear Sci. 4 (1) (2019) 1–8.
[8] V. Singh, N.R. Murphy, V. Balasubramanian, et al, Competitive binding predicts nonlinear responses of olfactory receptors to complex mixtures, in: Proceedings of the National Academy of Sciences, 2019, pp. 9598–9603.
[9] W.A. Abbasi, Z. Wang, D.A. Abbasi, Supply chain finance: generation and growth of new financing approach, J. Finan. 5 (2) (2017) 50–57.
[10] R. Caldentey, M. Haugh, A cournot-stackelberg model of supply contracts with financial hedging and identical retailers, Found. Trends® Technol., Inform. Operat. Manage. 11 (1–2) (2017) 124–143.
[11] D.A. Wuttke, E.D. Rosenzweig, H.S. Heese, An empirical analysis of supply chain finance adoption, J. Oper. Manage. 65 (3) (2019) 242–261.
[12] G. Filbeck, S. Kumar, J. Liu, et al, Supply chain finance and financial contagion from disruptions: Evidence from the automobile industry, Int. J. Phys. Distrib. Logist. Manage. 46 (4) (2016) 414–438.
[13] S.F. Wamba, A. Gunasekaran, R. Dubey, et al, Big data analytics in operations and supply chain management, Ann. Oper. Res. 270 (1–2) (2018) 1–4.
[14] M. van Bergen, M. Steeman, M. Reindorp, et al, Supply chain finance schemes in the procurement of agricultural products, J. Purchasing Supply Manage. 25 (2) (2019) 172–184.
[15] M. Wandfluh, E. Hofmann, P. Schoensleben, Financing buyer–supplier dyads: an empirical analysis on financial collaboration in the supply chain, Int. J. Logist. Res. Appl. 19 (3) (2016) 200–217.
[16] C. Bals, Toward a supply chain finance (SCF) ecosystem–Proposing a framework and agenda for future research, J. Purchasing Supply Manage. 25 (2) (2019) 105–117.
[17] P. Kouvelis, L. Dong, D. Turcic, Introduction to the special issue on supply chain finance, Found. Trends® Technol., Inform. Operat. Manage. 10 (2017) 209–219.
[18] H. Li, L. Mai, W. Zhang, et al, Optimizing the credit term decisions in supply chain finance, J. Purchasing Supply Manage. 25 (2) (2019) 146–156.
[19] J. Chen, Y.W. Zhou, Y. Zhong, A pricing/ordering model for a dyadic supply chain with buyback guarantee financing and fairness concerns, Int. J. Prod. Res. 55 (18) (2017) 5287–5304.