

Research on Benefit Distribution of Green Supply Chain Finance under Uncertainty Demand Conditions

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Abstract: With the increasing awareness of environmental protection, green supply chain finance has been widely recognized. However, due to the imperfect profit distribution mechanism, its development is blocked. Therefore, this study attempts to integrate this concept into green supply chain finance, so as to better solve the problem of benefit distribution in the uncertain environment, and to construct a benefit distribution model of green supply chain finance with multiple goals based on the Shapley-value method. According to the research results, when the expected profit of an enterprise exceeds the index profit, the Shapley value method will be used to reasonably allocate resources reasonably. In addition, through government supervision, Pareto efficiency will also be improved, which can not only solve the fair conflict when enterprises develop green finance, but also ensure the fair distribution of resources and make the use of resources more orderly.

With global warming and resource depletion, many businesses are starting to consider adopting a more sustainable supply chain management model to reduce pollution and resource consumption. However, due to the limitation of technology and resources, many enterprises cannot implement effective green supply chain management. Therefore, the utilization of technologies and resources such as reverse recycling and secondary manufacturing will greatly improve the economic benefits of enterprises. When the market demand is unknown, if the enterprise cannot take the right way to process the customer's orders, they will face a variety of complex challenges. Due to the rapid changes of the market, the operation of the supply chain is also greatly affected. In order to achieve sustainable development, enterprises must pay attention to environmental protection, and strengthen the investment in environmental protection, so as to gain more market share. In view of the challenges of green supply chain, many scholars are trying to explore a new solution from multiple perspectives. After a comprehensive analysis, we build a multi-dimensional, sustainable and multi-objective optimization model, which can achieve a win-win situation of economic benefits and environmental protection under the premise of protecting resources. With the rapid development of the latest technology, traditional financial institutions are undergoing great changes, and the progress of information technology and communication technology enables Internet finance to become more popular. Therefore, enterprise green supply chain finance has become an important issue in the financial field today, which has been highly valued by scholars.

At present, the research of green supply chain is increasingly focusing on the optimization of

reverse logistics, but in the research of supply chain development, the "green" factor and the uncertainty of demand are still an important consideration factor. Therefore, in the case of uncertain demand of green supply chain, it is necessary to strengthen the research of "green" factors from multiple perspectives, and discuss the sustainable development of green supply chain in combination with the actual situation.(1) In the process of enterprise development, it is crucial to choose the right supply chain factory, and the methods to solve these problems include: (2) optimizing the transportation process, improving the greening of supply chain management, and considering the possibility of equipment changes. In addition, financing is also an important factor to determine the development of enterprises. In order to promote the development of small and medium-sized enterprises, China has adopted a variety of financing policies, but due to the imbalance of capital supply and demand and risk management, the quality of financial services is not ideal, and the financing efficiency is relatively low.

1. Literature Review

In recent years, the song distance and Huang Qian member in 2005-2017 CSSCI literature analysis found that the domestic study of supply chain finance although compared with foreign late, but has made great progress, from the introduction of the basic concept to a deeper discussion and practical application, from the combination of theory to practice, shows that the domestic is actively explore the development of supply chain finance, in order to better meet the needs of social and economic development, to better meet the needs of society, so as to promote the sustainable development of social economy. It's been less than a decade. With the integration of the global economy, an environmentally friendly lifestyle has become an indispensable part of today's world. In the fierce market competition, enterprises must pay attention to environmental protection, and increase the investment in the green supply chain, to meet the changing market demand. Liu Jian and Mahua define supply chain as an integrated system of information, capital, logistics and other links, which are connected to each other in production, sales and service to achieve sustainable development. Researchers Xie Taifeng and others have made an in-depth exploration of the influencing factors of green supply chain finance, and found that the interest rate of green financing is higher than the traditional financing model, which makes it the best choice for small and medium-sized enterprises to get more financing opportunities. As the 2008 global financial crisis and the continued spread of COVID-19 continued, many smes faced financing difficulties because the risks of green financing are extremely expensive. To reduce this risk, banks must take stricter measures to strengthen the supervision of green financing and further improve the relevant credit policies to ensure their effectiveness. Ming-zheng Chen stressed that building green financial system has become an important part of China's national strategy, and at present, China is in an era of high quality development oriented, increasingly prominent systemic risk, the external financial environment becomes more and more complex, it also for green supply chain financial risk control provides new opportunities and challenges^[1].

2. Benefit Distribution Research

Benefit distribution is an important economic management model that aims to determine the benefits of partners and, through quantitative analysis to determine the contribution of each member in the overall economy. In recent years, foreign scholars have begun to study this concept in depth, and proposed a new benefit distribution model in 1952. By adopting a reasonable commissioning approach, MoraschK and zhao h et al, Deeply discussed the production cost and profit distribution of enterprises, and compared it with multiple supply chains, Find that the revenue distribution between core enterprises and retailers is closely related to the interests of the entire supply chain;

DucaJV and VanhooseDD by deeply exploring the nature of market competition, proposed a new profit-sharing model, the results show that, with the increasingly fierce competition in the market, the demand for cooperation between enterprises is also growing in; besides, JensenM And MecklingW also discussed in depth how companies can effectively distribute their benefits, and apply it to practice^[2]. Although a large number of studies on supply chain benefit distribution have been carried out abroad, in general, these studies still need to be strengthened. In particular, the research on the overall income distribution of the supply chain lacks perfection. Therefore, at present, the domestic researchers are exploring a based on contribution and risk of profit distribution pattern, this mode of research content include: MouWeiming using game theory, the green supply chain finance applied to textile enterprise manufacturing, not only effectively alleviate the financing difficulties, but also help to promote the green sustainable development of small and medium-sized enterprises. Yang and Duan pointed out that when manufacturers face financial constraints, retailers should adopt a financing strategy of advance payment discount 0 to obtain more financing opportunities to promote the construction of a green supply chain. In order to promote green development, retailers should take effective incentives to encourage manufacturers to develop products with lower carbon and environmental performance to expand the market and enhance their competitiveness. Shi Yanfei and Gao Hong used Stackelberg game theory to study how distribution reports affect the effect of trade cooperation and determine the best cooperation strategy according to different profit levels. Through the profit distribution mechanism combining contribution and risk, the profits between enterprises can be effectively combined with all the possible risks in the supply chain. Through in-depth research, Xu Hui and Zhou Ting found that supply chain finance can have a positive impact on the ecological environment, but there are also many challenges, such as credit, trading, management, the instability of investment returns, and the impact of policies. Yang Xiaoye through the application of Logit model, the green supply chain financial risk assessment, and compared with the BP neural network model evaluation results, found that in the case of fewer sample enterprises, Logit model evaluation effect is more prominent, it shows that the green supply chain financial risk assessment index system can accurately reflect the state of the core enterprise and recyclers, provide strong support for financiers^[3].

3. Green Supply Chain Gold under the Condition of Uncertainty

3.1 Research Hypothesis on the Benefit Distribution of Green Supply Chain Finance

This paper aims to study how to effectively implement the green supply chain, which includes considering the prevention and protection of environmental pollution, and how to achieve sustainable development through location selection and transportation. To this end, we propose a dual objective planning model that can meet the requirements of sustainable development and effectively balance environmental impact with investment costs, so as to achieve the best economic benefits. After detailed case studies, we find that the changing trend of the multilevel green supply chain resolution scheme is significantly affected by the uncertain demand, and this impact in turn may be further extended to a smaller range. As market demand changes, sellers' expectations may improve. However, due to the instability of the market, producers may invest so much that the number of products on the market exceeds expectations, which creates a backlog of inventory. Furthermore, uncertainty demands can lead to changes in total costs and environmental issues compared to deterministic demands. As the fluctuation trend of uncertain demand becomes more gradual, the fluctuation of total cost becomes smaller and smaller. Therefore, in terms of supply chain control, the same investment is far greater than only the investment. In addition, in order to reduce greenhouse gas emissions, we can take measures to limit their emissions and thus reducing the impact on the environment. Through the comprehensive consideration of various factors and the

changing market demand, the company can develop a perfect supply chain decision-making plan to achieve the optimal decision-making effect.

3.2 Brief review of Previous Efficiency Theories

In today's society, the theory of division of labor, relative efficiency and Pareto efficiency are all indispensable theories, which play a vital role in promoting the development of modern economic theory. Some scholars have laid a good foundation for today's formal expression and mathematical modeling of these theories. Pareto efficiency is a narrow concept, refers to an efficiency limited to economic activities, this efficiency is limited to configuration. , But also contains other efficiencies, such as production efficiency. However, Pareto efficiency itself does not solve practical problems, nor improve the economic development of the economy, and may even lead to market chaos. It is generally believed that the efficiency is an antagonistic relationship, which is reflected in the interaction between input and output, thus verifying the theory of minimum input and maximum profit. Efficiency is a universal concept that covers a variety of different classification methods and has important implications^[4]. Various concepts of efficiency should be deeply explored in order to better explain various economic phenomena, and combine static efficiency, configuration efficiency, dynamic efficiency and production efficiency to build a complete social total efficiency concept, so as to provide strong theoretical support for the development of modern economics. To promote the development of small and medium-sized enterprises, it is crucial to provide a good financing environment. This can not only help companies cope with market challenges, but also improve the efficiency of financial markets. Therefore, we must constantly improve and perfect the existing financing mechanism to meet the needs of enterprises. In order to promote the healthy development of small and medium-sized enterprises, the government should strengthen the improvement of the credit guarantee system, combine the successful experience of large enterprises, improve the problems existing in small and medium-sized enterprises, standardize the relevant process system, so as to improve the competitiveness of small and medium-sized enterprises. At the same time, the government should provide as many guarantees as possible to help them achieve sustainable development.

3.3 Another Important Assumption of Green Finance the Inter-Period Capital Asset Pricing Model

In 1964, American scholars borrowed the asset portfolio theory and created the inter-period capital asset pricing model, which became the core of modern financial market price theory and was widely used in various investment decisions, enterprise management and other aspects.

According to asset pricing theory, Merton believes that when information is asymmetric and there is no friction, asset prices follow ITO's law^[5], meaning that changes in value are not influenced by investors' preferences. Therefore, Merton extended the capital pricing model to the intertemporal capital pricing model to more accurately reflect the volatility of asset prices. Through Merton's efforts, he successfully derived the option pricing formula by using the continuous time model, which was not only verified by many empirical studies, but also widely used in practical operation. He pointed out that investors' needs can be summarized into two aspects: one is the expected return, the other is the expected income. In the optimal allocation of a static portfolio, a mean-one-variance component is necessary to effectively withstand possible adverse effects. If the market suffers, but there is a securities that yields higher returns, sensible investors would consider buying the securities for hedging. With the increasing demand for hedging, the core problem of the inter-period capital asset pricing model is how to accurately describe the asset pricing equation, so as to better predict the market price changes. The inter-period capital asset pricing model proposed

by Merton is widely used in the option market, which can effectively restrain the uncertainty of capital investment, thus making the option price more fair and just. Subsequently, the scholars further explored the option pricing formula, which laid a good foundation for the development of the option market. Merton's theoretical framework suggests that long-term investment in green supply chains does not lead to a decline in expected yields. Nor will it lead to increased market risk. This view lays the foundation for the development of green supply chain finance, making it a viable way of sustainable development.

3.4 Benefit Distribution Theory of green Supply Chain Finance

In response to the variability of customer needs while reducing environmental pollution, we established a multi-objective green supply chain resolution model, which includes the introduction of green factor to increase overall investment while strictly implementing relevant regulations. In order to promote the development of small and medium-sized enterprises^[6], we have combined the current time and environment, built a variety of financing modes, and constantly improve and optimize the relevant rules and regulations to meet the financing needs of different enterprises, but also to build a credit guarantee system with Chinese characteristics. By adopting a market-oriented way, the threshold of small and medium-sized enterprises can be effectively lowered, so that more enterprises can obtain a good reputation and development in the competitive market. To this end, we should minimize administrative intervention in guarantee institutions and guarantee services, and at the same time strengthen support for the state to promote the healthy development of the economy. We should put the needs of enterprises first, establish special service agencies to meet their needs, and strengthen the training of enterprise managers, so as to better promote the development of small and medium-sized enterprises. The investment cost of the green supply chain resolution is the key factor in determining the relationship between the two parties, so enterprises should be careful to obtain the maximum economic return at the minimum cost.

4. Conclusion

This paper aims to explore how we can effectively with complex environmental changes to create a green supply chain. After systematic analysis and practice, we find that even in the face of strict environmental constraints, third-party regulators can give full financial support to enterprises, so that enterprises can smoothly carry out daily business activities. If the expected return of the company is higher than the actual return, then under the Shapley value method, the company will distribute the income in a reasonable way. However, if the expected return of the company is lower than the actual income, then the company will face the corresponding punishment, and the extent of the punishment will be determined according to the actual income. After systematic reform, the efficiency of Pareto will be greatly improved, which can not only effectively alleviate the injustice faced by the development of green finance, but also fully consider the contributions of all participants, so as to realize the fair and reasonable distribution of interests. By combining relevant theories and models, we propose a more reasonable benefit distribution scheme to support the development of green supply chain enterprises. Despite the feasibility of this scheme, there are still some limitations. Therefore, we will study the enterprises in the green supply chain and their upstream and downstream organizations, and verify the accuracy of this model through the actual network supply chain. To better analyze the uncertainty demands, we chose a three-level supply chain model. The application of blockchain technology can broaden the research field, but there are still many shortcomings. Therefore, future research should focus on how to improve the compulsion and fairness of benefit distribution among supply chain partners.

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