Modern Management based on Big Data V
A.J. Tallón-Ballesteros (Ed.)

doi:10.3233/FAIA240269

An Exploration of the Impact of Digital Economy on Bulk Commodity Trade Models and Risk Management

Bo Lyu and Weiyue Yao[1]
School of Business, Beijing Wuzi University, China
ORCiD ID: Bo Lyu https://orcid.org/0000-0001-5991-7639
Weiyue Yao https://orcid.org/0009-0001-0265-3924

Abstract. Bulk commodity circulation trade has stepped into an advanced stage, the traditional trade model can not adapt to the needs of high-quality development of enterprises. If enterprises want to achieve sustainable development, they must try every means to continuously innovate the trade model. Today, with the rapid development of information technology, digital economy has become a key element driving the evolution of global bulk commodity trade models, which are also undergoing profound changes. This paper synthesizes the relevant research on bulk commodity trade models and risk management through the method of literature review, on the basis of which the paper goes on to discuss how the rise and development of the digital economy affects domestic bulk commodity trade s and how emerging risks can be effectively and efficiently managed in this new economic environment. By combing and summarizing the literature, this paper argues that the digital economy improves transaction efficiency and price transparency, reduces costs, and at the same time makes the logistics chain more efficient and controllable and promotes the financialization of bulk commodity trade. The digital economy also brings a series of risks and challenges while bringing opportunities to bulk commodity trade. In the context of digital economy, the emerging risks in bulk commodity trade mainly include information security risk, supply chain risk, technology and network security risk. For the emerging risks in the context of the digital economy, this paper proposes corresponding risk management strategies. In order to make a modest contribution to promote the better development of China's bulk commodity trade.

Keywords. Digital economy, bulk commodity, trade models, risk management

1. Introduction

Bulk commodities refer to basic raw materials that can be used for production and reproduction, such as crude oil, non-ferrous metals, iron and steel, agricultural products, coal, etc., which are characterized by high commodity value, large amounts and large trading volumes. In the context of global economic integration, the international trade of bulk commodity plays an important role in the global economy. According to data released by the General Administration of Customs, in 2023, China's imports of bulk commodities such as energy, ores and food increased by 15.3% year-on-year. Among

[1] Corresponding Author: Weiyue Yao, Business School of Beijing Wuzi University, China; Email: 1228651185@qq.com
This work was supported by the National Social Science Fund of China (No. 21BJY129)

them, imports of energy products such as crude oil, natural gas and coal amounted to 1.158 billion tons, an increase of 27.2%, while imports of iron and aluminum and other metal ores amounted to 1.458 billion tons, an increase of 7.6%. During the same period, imports of agricultural products amounted to 1.64 trillion yuan, an increase of 5%, which shows that China's imports of bulk commodities are expanding in an orderly manner[1].

Traditional bulk commodity circulation enterprises usually take advantage of information asymmetry and upstream and downstream channels to obtain price differentials. However, today, with the evolution of digital technology and the rise of the digital revolution, the world business environment is undergoing unprecedented changes. With the rapid development and wide application of digital technology, bulk commodity prices are becoming more and more transparent, the degree of information asymmetry is decreasing, and the trade model of earning price differences is becoming increasingly unsustainable and innovative. Therefore, this time, there is a need for digital technology to assist bulk commodity enterprises to carry out trade model innovation, in order to achieve the goal of increasing revenue and value. In recent years, the international market environment has changed dramatically, and economic behavior has also changed frequently, which is easy to produce various risks, coupled with the large amount of bulk commodity trade involved, thus affecting the economic benefits of enterprises, and even causing losses.

2. Literature review

2.1. Research on trade models of bulk commodity

In the study of international commodity trade models, Cifarelli et al. analyzed the traditional models of bulk commodity trade, including spot transactions and forward contracts[2]. In recent years, Ding et al. have explored the trend towards the financialization of bulk commodity markets and how this has affected trade models and price volatility[3]. Ge et al.'s study provides a theoretical basis for understanding the role of supply chain management in bulk commodity trade[4]. With the development of technology, electronic trading platforms such as B2B marketplaces have become increasingly important in bulk commodity trade. Liu et al. explored the application of electronic trading platforms in bulk commodity trade[5].

In terms of domestic bulk commodity trade models research, Tan analyzed the characteristics of China's bulk commodity trade finance, and concluded that it is characterized by short-term, self-repayment, combinatorial, cost uncertainty and multiple related subjects[6]. Li et al. found that the traditional trade model of making profits by hoarding and short selling has evolved into a red sea, and under the background of the gradual improvement of industrial efficiency and informatization level, the prices of major circulation products in China have become increasingly transparent[7]. Wang et al. believes that Blockchain is not only a good medicine to solve the long-term pain points in the bulk commodity trade industry, but also very likely to create new business models and profit space in the future[8]. Li explored the characteristics and circulation methods of bulk commodity e-commerce in order to promote the healthy development of China's bulk commodity market[9].

2.2. Research on bulk commodity risk management

In the research of foreign bulk commodity risk management, Sharma et al. used Bayesian modeling as a tool to study supply chain risk assessment and suggested that selection of appropriate risk management strategies must first assess the risks in the supply chain[10]. Hu et al. studied bulk commodity price risk and conducted an in-depth study on the factors affecting bulk commodity price volatility, pointing out that supply and demand, macroeconomic policies and political factors are the main sources of price volatility[11]. Rusnáková noted the use of option strategies to hedge the price of bulk commodity[12]. Bandaly et al. studied the risk management performance of supply chains exposed to foreign exchange risk, bulk commodity price risk and demand uncertainty and developed an integrated risk management model which uses financial derivatives and operational methods to hedge supply chain risks[13].

In the research of domestic bulk commodity risk management, He believes that the changes in the international market environment have brought serious impact on the formation and development of domestic bulk commodity market prices, resulting in domestic production, operation and consumption of commodity enterprises and sectors are facing great difficulties and market risks. As a result, measures such as strengthening risk management in the futures market and innovating the management mode are proposed to effectively cope with the risk of bulk commodity price fluctuations[14]. Li believes that with the development of economic globalization, the trade credit risk of bulk commodity is increasing, in view of this, he proposes to cope with credit risk by constructing a credit risk management system, optimizing the credit risk management mechanism and other measures[15]. Li believes that China's bulk commodity trading laws and regulations are not sound, the lack of existing laws and regulations on China's bulk commodity trade market in many emerging issues, which leads to a lot of transactions in the process of the existence of great legal risks. To address this problem, it is proposed to establish a sound legal system to protect the commodity trade[16]. Jing describes the various types of risks that enterprises may encounter in the epidemic situation, and puts forward some views and suggestions on how to strengthen the control of such risks. For example, for liquidity risk, it is proposed that enterprises should prioritize the mode of fast turnover of goods and short time of capital occupation to cope with liquidity risk when carrying out business design[17] Chen et al. conducted a detailed analysis of market risks in electronic trading of bulk commodity, and risk management measures such as risk reduction through credit rating and guarantee mechanisms[18].

In general, through combing through the literature, it is found that scholars have conducted relatively in-depth research on bulk commodity trade models and risk management, but less attention has been paid to the impact of the digital economy on bulk commodity trade models and the emerging risks of commodities and their corresponding risk management measures in the context of the digital economy. The minor innovation of this paper is that this paper through the literature review method summarizes the bulk commodity trade models and risk management research related research, and on this basis, discusses the development of the digital economy for the impact of the bulk commodity trade models and the emerging risk of bulk commodity in the digital economy background to put forward the corresponding solution strategy, so as to make the commodity enterprises to meet the requirements of the digital economy era, which is related to the current ever-changing market environment. This is closely related to the current changing market environment.

3. Bulk commodity trade

3.1. Classification and trade characteristics of bulk commodity

Bulk commodities are those that can be traded for the production and reproduction of basic raw materials such as crude oil, nonferrous metals, iron and steel, agricultural products, coal, etc. These commodities are divided into three main categories: energy chemicals, metals and agricultural and sideline products.

Table 1. China's bulk commodity industry chain mapping

Category	Energy and chemical industry	Ferrous metal	Non-ferrous metal	Agricultural and sideline products
Upstream	Coal, crude oil, natural gas	Iron ore	Copper concentrate, bauxite, zinc, gold, silver	Corn, rice, wheat, soybeans, cotton, pigs, cattle, sheep
Midstream	Natural rubber, carbinol, chemical fiber, refined oil	Pig Iron, cold tie, rough copper	Copper alloy, copper wire, aluminum alloy, gold and silver products	Soybean oil, olive oil, flour, soybean meal
Downstream	Clothing, tires	Building materials, automobiles, home appliances, electronic communication		Processed food

Compared with traditional trade, the distinctive features of bulk commodity trade include large transaction size and capital requirements, frequent price fluctuations of large magnitude. Bulk commodities have diverse grades, varying levels of standardization, and have different requirements for storage and transportation. The trading characteristics of bulk commodities include three features: standardization of commodities, large supply and demand, and large transaction amounts. First, in order to ensure ease of trading and delivery, bulk commodities often need to follow a uniform set of quality, specification and packaging standards. These standardized products help to enhance market liquidity and efficiency. In addition, the size of bulk commodities is usually between 10,000 tons and 100,000 tons, among which the common commodities are grain, oil seed and metals. Finally, the transaction amounts in bulk commodities trade usually exceed nine figures.

3.2. Global bulk commodity trade risks

Bulk commodity trade involves a wide range of commodities, such as oil, natural gas, metals, agricultural products, etc., the prices and volumes of which have a significant impact on the global economy. In this area, trade participants are exposed to a wide range of risks, some of the main types of which are described below.

(1) Price volatility risk

Price fluctuation risk is the most common and major risk faced by bulk commodity trade. Bulk commodity prices are affected by a variety of factors such as supply and demand, geopolitics, monetary policy, weather changes, etc., and price fluctuations may lead to losses for traders[19].

In the case of a bulk commodity price surge, upstream enterprises may refuse or delay shipments due to higher transportation costs, and may also risk defaulting on contracts already signed with downstream enterprises. When bulk commodity prices plummet, enterprises may bear the loss of the price drop due to holding inventory, which may lead to more serious floating losses if the inventory is large or measures such as price locks are not taken in advance.

(2) Liquidity risk

Bulk commodity trade is of a large scale and has a high demand for capital. In the course of business operation, a large amount of liquidity is usually occupied, and because of the company's limited financial capacity, it usually carries out its trading activities by means of bank credit or short-term loans. Once the market fluctuates, when there is a decrease in the speed of turnover and difficulties in realizing the inventory, if the company fails to sell the inventory to recover the payment within the stipulated time, it cannot obtain sufficient funds in time to pay the debt due, which may lead to the need for the company to face liquidity risk[20].

(3) Credit risk

Credit risk refers to the risk of default, delayed debt repayment, loss of expenses, and difficulty in debt recovery due to poor credit qualification level of suppliers or customers[21]. For example, in the process of bulk commodity trade, the upstream suppliers are difficult to fulfill their payment obligations according to the terms of the contract and fail to deliver on time. Or the supplier's products do not meet the quality standards, which will result in a series of chain reactions such as unclear property rights, loss and destruction of inventory, insolvency of the partner, and finally caused a huge economic loss of the bulk commodity trade company.

3.3. Traditional trade model of bulk commodity

The traditional trade model of bulk commodity enterprises is mainly categorized into two main types: self-operated and agency[22]. The self-operated model implies that traders buy large quantities of goods directly from upstream suppliers and then develop their own sales channels to downstream customers. In this trade model, traders take advantage of information asymmetries and differences in time and space to earn the price difference between purchase and sale. However, the self-operated model also comes with certain risks, which makes traders have to face the risk of price fluctuations and inventory turnover. In the agency model, after signing the agency contract with the customer, the trader purchases bulk commodities from upstream suppliers based on the customer's specific needs, and the customer is required to pay the balance payment and collect the goods within a specified time frame. The agency model locks in profits by using a sell-to-buy approach, whereby the price is determined at the same time as the purchase and sales contracts are signed. The distinctive feature of this trade model is its faster inventory turnover, which reduces the risk faced by traders.

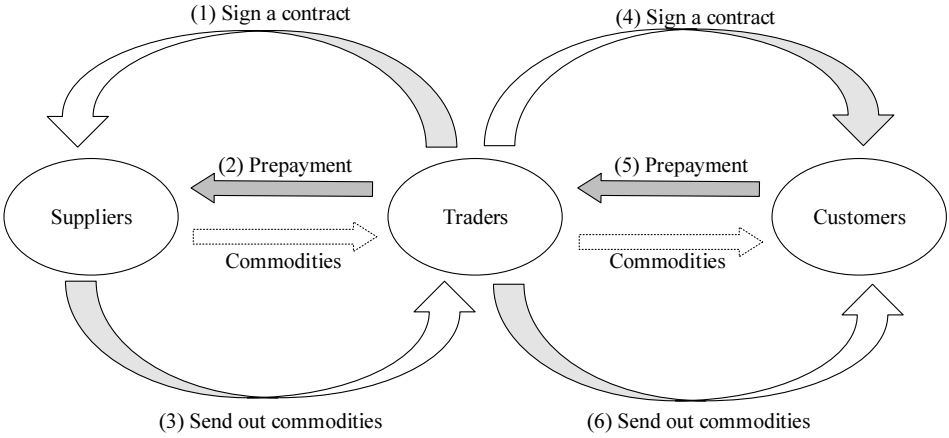

Figure 1. Bulk commodity self-operated model

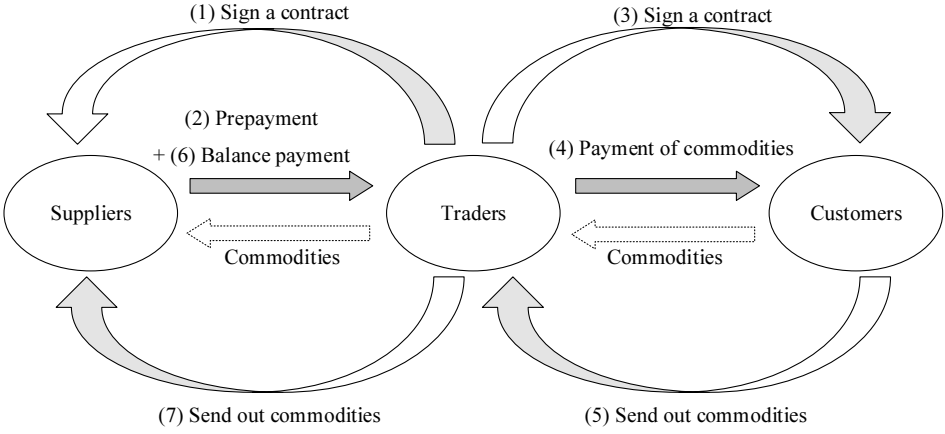

Figure 2. Bulk commodity agency model

4. Bulk commodity trade models in the context of digital economy

4.1. Impact of digital economy on bulk commodity trade models

With the development of the digital economy, the model of bulk commodity trade has also changed dramatically, mainly in the following aspects.

First, e-commerce platforms have become the primary method of trade bulk commodity[23]. The platform provides a centralized marketplace for buyers and sellers to trade instantly. E-commerce platforms increase price transparency, reduce transaction costs and speed up transactions.

Secondly, the application of supply chain management software makes the logistics link of bulk commodity trade more efficient and controllable[24]. Enterprises can monitor the transportation status of goods in real time, optimize the logistics path and reduce transportation costs. At the same time, through the analysis of supply chain data,

enterprises can also better predict market demand, adjust inventory and improve operational efficiency.

Once again, digital economy is of great significance to the sustainable development of China's bulk commodity trade[25]. Against the background of growing global awareness of sustainable development and environmental protection, the green trade model has attracted increasing attention. This model focuses on reducing the environmental impact in the trading process, promoting the application of environmentally friendly raw materials and technologies, and improving the utilization of resources. Through digital carbon footprint tracking and environmental impact assessment, it helps enterprises to better fulfill their environmental obligations, thus promoting the construction of green supply chains.

In addition, digital economy has facilitated the financialization of bulk commodity trade[26]. Using blockchain, artificial intelligence and other technologies, enterprises can realize the digitalization and intelligence of financial services, including financing, insurance and settlement. In this way, the efficiency and security of financial services can be improved, and the capital cost and risk of enterprises can be reduced.

Finally, the application of big data analysis and artificial intelligence has made bulk commodity trade more intelligent. Enterprises can formulate more accurate trade strategies by analyzing historical trading data, market trends and other information. At the same time, intelligent algorithms can also help enterprises predict price fluctuations, assess trade risks, and improve the science and accuracy of decision-making.

In summary, the model of bulk commodity trade in the context of digital economy has become more efficient, transparent, controllable and intelligent. These changes not only improve the competitiveness of enterprises, but also promote the prosperity of bulk commodity trade market.

5. Risk issues and management strategies of bulk commodity trade in the context of digital economy

5.1. Types of emerging risks in bulk commodity

In the context of digital economy, this paper identifies the following three emerging risks for commodity trade enterprises.

(1) Information security risk

As far as information security risks are concerned, the digital economy process has accelerated the informatization and networking of bulk commodity trade, resulting in more centralized and faster transmission of trade information. However, it has also brought about more information security risks. On the one hand, since bulk commodity trade involves a large amount of sensitive data, such as prices, quantities, counterparties, etc., once these data are leaked or illegally accessed, it may cause huge economic losses and reputation risks to enterprises. On the other hand, due to its own reasons, it itself may have some technical defects or security leakage holes, causing the leakage of information.

(2) Supply chain risks

From the perspective of supply chain risk, the introduction of digital technology makes it more transparent and traceable, so that enterprises can more accurately grasp every link and state in the entire supply chain. However, this may also lead to a situation

where the consequences of a problem in any part of the supply chain will spread rapidly and expand, bringing serious consequences to the entire supply chain.

(3) Technology and network security risks

Today, as bulk commodity trade markets become digitized, their technology and network security risks are becoming increasingly prominent. For example, due to system failures, network attack, etc., they may lead to business interruption, data loss or leakage.

5.2. New strategies for bulk commodity risk management

In order to cope with information security risks, bulk commodity enterprises must strengthen information security management and technical prevention. First, security awareness training is an important part of dealing with information security risks. Bulk commodity enterprises can achieve this through regular security training, simulated attack drills and reward systems to ensure that employees understand the importance of information security and know how to identify and respond to potential security threats [27]. Also bulk commodity enterprises should implement a zero-trust security model, i.e., "untrust, verify everything". This means that users need to be authenticated and authorized to access network resources and data, whether they are from internal or external sources. Finally, regular security testing and vulnerability remediation of the system should be conducted to detect and fix potential security risks. To address supply chain risks, firstly, enterprises can establish a diversified supply chain to reduce risks. By working with multiple suppliers, the risk posed to the enterprise by a single supplier is reduced and problems such as supply disruptions can be better addressed. When selecting suppliers, in addition to price and quality, their stability, reliability and sustainability should be assessed. On this basis, enterprises should also strengthen the management and monitoring of all links in the supply chain to ensure the stability and reliability of the supply chain[28]. Secondly, bulk commodity enterprises can strengthen the supply chain financial management, and enterprises can provide supply chain financing, factoring, insurance and other services through cooperation with financial institutions to reduce the capital risk in the supply chain. Finally, set up a multi-level and multi-dimensional risk assessment system, the core of this system is to conduct an all-round and three-dimensional analysis of risk, which not only covers the probability of occurrence and the degree of potential impact of the identified risks, but also further explores the time span that the risk events may last as well as the far-reaching impact on the long-term operation of the enterprise. In order to effectively respond to technology and network security risks, firstly, bulk commodity enterprises must take measures to enhance their own network security protection capabilities. By deploying advanced firewalls, intrusion detection systems, and anti-virus software, etc. to prevent malware and hacker attacks. The protection measures are updated from time to time so as to cope with the ever-changing network threats[29]. Secondly, bulk commodity enterprises can introduce professional network security insurance and consider purchasing professional network security insurance to mitigate financial losses due to network security incidents. This type of insurance can provide financial support and legal backing to help bulk commodity enterprises quickly resume operations after a network security incident. Finally, develop and test a comprehensive disaster recovery plan to ensure that operations can be quickly resumed in the event of a major network attack. In conclusion, in the era of digital economy, bulk commodity enterprises should reduce the risk from multiple perspectives. Only in this way can the enterprise be invincible in the fierce market competition.

6. Conclusion

This paper summarized the relevant studies on bulk commodity trade models and risk management through the method of literature review, and further explored the impact of the digital economy on bulk commodity trade models and the corresponding risk management measures on this basis, from which the paper draws the following conclusions. Digital economy has brought unprecedented growth opportunities for bulk commodity trade, but it also comes with new risks and challenges. The use of e-commerce platforms has improved the transparency and efficiency of bulk commodity trade. The use of supply chain management software has improved the efficiency and controllability of the logistics process of bulk commodity trade. By digitally tracking the carbon footprint and evaluating its environmental impact, it helps enterprises to better fulfill their environmental obligations, thus promoting the construction of green supply chains. Using blockchain, artificial intelligence and other technologies, enterprises can realize the digitization and intelligence of financial services, including financing, insurance and settlement. In this way, the efficiency and security of financial services can be improved, and the cost and risk of capital for enterprises can be reduced. But in the context of the digital economy, China's bulk commodity trade faces risks in terms of information security, supply chain, technology and networks. For this reason, enterprises must carry out continuous innovation and improvement of risk management strategies to better meet the requirements for risk in the digital era. Enterprises should implement a zero-trust security model, build a diversified supply chain and strengthen supply chain financial management, and introduce professional network security insurance to cope with the emerging risks in the context of the digital economy, and only in this way can they achieve sustained development in the digital economy environment.

References

[1] General Administration of Customs. (2024). Press release on annual import and export situation in 2023. https://www.gov.cn/lianbo/fabu/202401/content_6925700.htm.

[2] Cifarelli G, Paladino G, A dynamic model of hedging and speculation in the commodity futures markets, Journal of Financial Markets, Volume 25, 2015, Pages 1-15, ISSN 1386-4181, https://doi.org/10.1016/j.finmar.2015.07.002.

[3] Ding SS, Cui TX, Zheng DD, Du M, The effects of commodity financialization on commodity market volatility, Resources Policy, Volume 73, 2021, 102220, ISSN0301-4207, https://doi.org/10.1016/j.resourpol.2021.102220.

[4] Ge HT, Goetz S, Cleary R, Yi J, Gómez M, Facility locations in the fresh produce supply chain: An integration of optimization and empirical methods, International Journal of Production Economics, Volume 249, 2022, 108534, ISSN 0925-5273, https://doi.org/10.1016/j.ijpe.2022.108534.

[5] Liu SC, Yu ZY, Modeling and efficiency analysis of blockchain agriculture products E-commerce cold chain traceability system based on Petri net, Heliyon, Volume 9, Issue 11, 2023, ISSN 2405-8440, https://doi.org/10.1016/j.heliyon.2023.e21302.

[6] Tan HW. Correct understanding of commodity trade finance [J]. China Foreign Exchange, 2020, (14): 48-50. DOI:10.13539/j.cnki.11-5475/f.2020.14.012.

[7] Li N, Meng T. Research on the transformation path of China's circulation innovation and trade growth model [J]. Reform and Strategy, 2017, 33 (07): 68-70.DOI:10.16331/j.cnki.issn1002-736x.2017.07.016.

[8] Wang XG, Hu JJ. Construction and Evaluation of Blockchain-Based Cross-Border Payment System for Commodities [J]. Supply Chain Management, 2020, 1 (12): 115-128. DOI:10.19868/j.cnki.gylgl.2020.12.010.

[9] Li J. Research on the characteristics and circulation mode of bulk commodity e-commerce[J]. Finance and Economics, 2022, (06):38-40. DOI:10.19887/j.cnki.cn11-4098/f.2022.06.046.

[10] Sharma SK, Sharma S. Developing a Bayesian network model for supply chain risk assessment[J]. Supply Chain Forum: An International Journal, 2016, (5):50-72. https://doi.org/10.1080/16258312.2015.11728693.
[11] Hu GH, Liu S, Wu G, Hu P, Li RQ, Chen LJ, Economic policy uncertainty, geopolitical risks, and the heterogeneity of commodity price fluctuations in China —— an empirical study based on TVP-SV-VAR model, Resources Policy, Volume 85, Part A, 2023, 104009, ISSN 0301-4207, https://doi.org/10.1016/j.resourpol.2023.104009.
[12] Rusnáková, M. Commodity price risk management using option strategies Original Paper. Agricultural Economics, 2015, 61(4). DOI:10.17221/101/2014-AGRICECON.
[13] D.Bandaly, L.Shanker, A.Şatır, Integrated financial and operational risk management of foreign exchange risk, input commodity price risk and demand uncertainty, IFAC-PapersOnLine, Volume 51, Issue 11, 2018, Pages 957-962, ISSN 2405-8963, https://doi.org/10.1016/j.ifacol.2018.08.484.
[14] He J. The use of futures risk management model to avoid the risk of price fluctuations in the bulk commodity market [J]. Enterprise Economy, 2012, 31 (06): 174-177. DOI:10.13529/j.cnki.enterprise.economy.2012.06.040.
[15] Li DS. Exploration of credit risk management and control in bulk trade [J]. China International Finance and Economics, 2017, (03): 119-120. DOI:10.19516/j.cnki.10-1438/f.2017.03.076.
[16] Li WF. Bulk Commodity trade model development and risk issues[J]. Modern Business, 2020, (12):3-4. DOI:10.14097/j.cnki.5392/2020.12.001.
[17] Jing C. Risk management of bulk commodity supply chain enterprises under epidemic situation[J]. Supply Chain Management, 2023, 4(02):34-40. DOI:10.19868/j.cnki.gylgl.2023.02.003.
[18] Chen QG, Zhao J. Risk analysis and control counter measures of bulk commodity electronic trading market[J]. Electronic Commerce, 2015, (10): 30-31+58. DOI:10.14011/j.cnki.dzsw.2015.10.017.
[19] Li YH. Discussion on risk management of bulk commodity trade[J]. Modern Commerce Industry, 2021, 42(24):79-81. DOI:10.19311/j.cnki.1672-3198.2021.24.038.
[20] Zhao H. Risk identification and response strategies of bulk commodity trading enterprises[J]. Enterprise Reform and Management, 2021, (15):10-11. DOI:10.13768/j.cnki.cn11-3793/f.2021.1483.
[21] Zhu FC. Ruminations on the business model and risk management of bulk trade[J]. National Circulation Economy, 2023, (11):29-32. DOI:10.16834/j.cnki.issn1009-5292.2023.11.011.
[22] Liu WL. Research on risk control system of bulk commodity trading enterprises[J]. National Circulation Economy, 2023, (22):48-51. DOI:10.16834/j.cnki.issn1009-5292.2023.22.015.
[23] Li J. Research on the characteristics and circulation mode of commodity e-commerce[J]. Finance and Economics, 2022, (06):38-40. DOI:10.19887/j.cnki.cn11-4098/f.2022.06.046.
[24] Chen J, Liu YH. Digital intelligence enables operations management transformation: from supply chain to supply chain ecosystem[J]. Management World, 2021, 37(11):227-240+14. DOI:10.19744/j.cnki.11-1235/f.2021.0180.
[25] Bai RB. Analysis of the traditional model of commodity supply chain finance [J]. China Collective Economy, 2024, (17): 91-94. DOI:10.20187/j.cnki.cn/11-3946/f.2024.17.007.
[26] Gong YX, Xuan Q, Chen ZM. Application of blockchain federation chain in trade finance[J]. Information Technology and Network Security, 2020, 39(08):6-8+14. DOI:10.19358/j.issn.2096-5133.2020.08.002.
[27] Chen YD,Qiao GM. Research on information security risk prevention under the model of "Internet + finance"[J]. Journal of Soochow University (Philosophy and Social Science Edition), 2015, 36(06):124-130+200. DOI:10.19563/j.cnki.sdzs.2015.06.017.
[28] Bao YQ, Zhang YC, JI Peng,et al. Research on enterprise supply chain risk welcoming mechanism in the context of digitalization[J]. National Circulation Economy, 2024, (07):96-99. DOI:10.16834/j.cnki.issn1009-5292.2024.07.017.
[29] He Y. Try to talk about computer network security problems and response methods [J]. Computer Programming Skills and Maintenance, 2014(23): 82-83. DOI:10.16184/j.cnki.comprg.2014.23.034.