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Risk perception affacting the performance of shipping company

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RISK PERCEPTION AFFECTING THE PERFORMANCE OF SHIPPING COMPANIES

by

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

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ABSTRACT

This article is completed through a questionnaire survey. Through the questionnaire, we can get the possibility of risk occurrence and the severity of the consequences felt by the shipping company staff , quantify the risk perception and then get the subjective performance of the shipping company staff. Through the data analysis of SPSS and AMOS, we can see whether different types of risk perception will affect the performance of shipping companies, thereby drawing conclusions to help shipping companies judge the management measures for different types of risks in daily management, and choose whether to transfer to external processing and try to reduce the negative effects of risk perception, including panic and instability within the company.

KEYWORDS: Risk perception, Shipping, Risk, Risk factor.

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LIST OF ABBREVIATIONS

SEM	Structural Equation Modeling
CFA	Confirmatory factor analysis
SPSS	Statistical Product and Service Solutions
AMOS	Analyse of moment structures
EFA	Exploratory factor analysis

1. Introduction

1.1 Background of this dissertation

In recent decades, the shipping industry has gained unprecedented development opportunities under the increasing globalization of the world economy and the increasingly frequent promotion of international trade. The shipping industry has made great contributions to the rapid development and expansion of the world economy and international trade, and has become a basic industry that promotes the globalization of the world economy.

The shipping industry is a field full of risks and uncertainties, and shipping companies are always facing different kinds of risks. First of all, shipping companies need huge capital investment and there are unavoidable financial risks. The average cost of a fifth-generation container ship of 5000TEU is about US$80 million to US$85 million. Secondly, maritime navigation is accompanied by accidental or unforeseen natural disasters and accidents. Thirdly, shipping companies, like other companies, are facing a series of other risk factors such as enterprise internal control, operation management, and information systems. Finally, shipping demand is a derivative demand of international trade, so fluctuations in the world economy and changes in international trade may all become the cause of aggravating risks for shipping companies. Nowadays, the development of the shipping industry is facing huge challenges and pressures, and shipping risk management is even more important. In foreign countries, the risk management of shipping companies has been rapidly developed in developed countries, and gradually formed an emerging management discipline. In China, only a few large shipping companies have a sense of risk prevention and need to be strengthened.

The process of risk management of an enterprise is divided into risk perception, risk assessment, risk response, control, communication and monitoring by COSO in 2017. Risk perception, as the first and one of the most essential step of risk

management should be taken seriously.

Most of the existing researches on risk management of shipping companies focus on the risk itself, its corresponding influencing factors, management methods, etc., but there are few studies from the perspective of risk perception. Risk perception has a significant impact on decision-making when facing with risks. Foreign scholars have more perfect research on the influencing factors of risk perception. For shipping companies, understanding the impact of risk perception of different types of risks on company performance can help shipping companies formulate more reasonable risk management plans, better avoid risks, and improve managers' risk decision-making capabilities, thereby improving the company's ability to cope with various risks.

Current scholars' research on risk perception mainly comes from western developed countries. It can also be seen that the research on risk perception has a positive impact on economic development. There is limited research on risk perception in China, and these studies appeared late.

There is little research related to corporate governance, and even less from the perspective of shipping companies. And most of these studies are limited to the risk perception of shipping company employees, and have not been combined with the performance of shipping companies. So research in this direction is very necessary.

1.2 The purposes of the dissertation

Risk perception is an essential part of the risk management of shipping companies. However, risk perception related research is rare in the shipping field, and the role of risk perception has not been understood and valued by most shipping companies. So the research in this paper can fill this gap.

Risk perception is a subjective concept and can have a significant impact on the behavior of decision makers. In shipping companies, when facing risks, shipping

managers will make risk decisions based on their subjective understanding of risks, and the performance of shipping company employees will also be affected by risk perception, which will directly affect the performance of shipping companies. Therefore, research on risk perception can provide scientific advice for risk management decisions of shipping companies.

Therefore, the purposes of writing this article are mainly as follows:

1. To quantify the risk perception of shipping company staff through a reasonable and scientific questionnaire survey, prove that risk perception has an impact on the performance of the shipping company, and improve the understanding of the role of risk perception of shipping companies.

2. By investigating important risk factors in the shipping industry, combined with research on risk perception, to provide advice on risk management decisions for shipping companies, such as the risk training courses for shipping company employees to enhance their risk response capabilities, and help shipping companies reasonably allocate limited resources for risk management.

3. To fill research gaps related to risk perception in the shipping industry and provide reference for further research related to this topic.-

1.3 Analysis Method

Confirmatory factor analysis has the analytical idea of reducing dimension and allowing measurement error, and has the advantages of investigating the structural relationship between variables, novel analysis idea and strong applicability.

This study validated the risk perception of 7 risk factors using exploratory and confirmatory factor analysis and also tested the moderation effect of the enterprise ownership of shipping companies on the relationship between risk perception and organizational performance by analyzing the collected data with SPSS 24.0 and AMOS 24.0.

The risk perception of risk factors are defined as independent value and the shipping company's performance is defined as dependent variable. The concept model is as followed:

Figure 1 Concept model in this study

Based on the concept model above, the confirmatory factor analysis model is defined as followed:

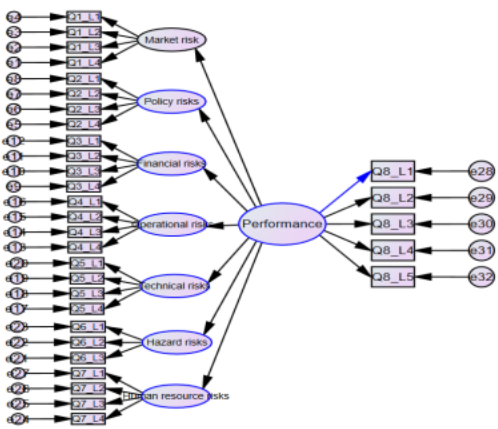

Figure 2 Confirmatory factor analysis model in this study

2.Literature review

2.1. Risk factors for shipping companies

Shipping enterprise risk refers to the uncertainty of the internal and external environment of the shipping company, which may cause the shipping company to deviate from the intended goal or loss of benefits. Sun Shengnan and Chen Jiongdi mentioned that the shipping industry, as a high investment, long payback period, and capital-intensive industry, faces complex and variable risks. Shipping companies not only have the financial risks, operating risks and human resource risks common to common enterprises, but also bear their own unique national risks and natural risks(2015). Hengbin Yin, Zhuo Chen and Yi Xiao divided the risk factors of Chinese shipping companies into seven parts: Market risk (freight fluctuations, oil price fluctuations, exchange rate fluctuations, interest rates changes, etc.), Policy risk (increasingly strict environmental regulations, increased tax burden, tighter regulations, etc.), Financial risk (taxes, liquidity, fund recovery, high, etc.), Operational risk (improper management, information security issues, decision issues, etc.) , Technical risk, Hazard risk and human resource management risk(2018). In the 2008 risk management research of shipping companies, Chang Guibin divided the risks of shipping companies into internal risks and external risks. The internal risks include investment and leasing risks, credit risks, operational management risks and human resources risks. External risks include natural risks, political risks, shipping market risks, and financial risks.

2.2. The concept of risk perception

In 1987, James Short proposed that risk has become a basic aspect of modern social life management. The importance of risk has begun to be recognized, and risk perception, as one of the important components of risk research, has also received extensive attention. What most scholars agree with so far is the definition described by Cunningham. Risk perception is the perception of objectively existing risks by humans using their own perceptions. He divided the perceived risks into the

following two factors: the uncertainty consequence, that is, people's subjective probability of whether or not something happens; and the seriousness of the consequences of wrong decisions, that is, the danger of the consequences of things after they happen. This concept is used in the measurement and quantification of risk perception in this dissertation

2.3. The application of risk perception, specifically in shipping industry

The application of risk perception research is mainly focused on social issues, consumer behavior analysis, environmental issues, safety issues, and so on. Few studies have been combined with corporate governance and corporate behavior. Although there have been some related studies in recent years, they mainly focus on the research of high-tech hi-tech enterprises, multinational enterprises and entrepreneurial enterprises. Xu Hui started by analyzing and evaluating the types of risks in the process of internationalization of enterprises, and on the basis of establishing an integrated international risk perception model, he explored how to build a management and control system for international risks(2004).

However, there is only a little research on the risk perception of shipping companies or shipping-related companies. Hengbin Yin, Zhuo Chen and Yi Xiao identity the risk perception in shipping field, specifically focusing on the moderating effect of Chinese and Korean shipping companies which is highly instructive for investors. It firstly proved that risk perception has effect on the performance of shipping companies. Helle Oltedal analyzed the risk perception in the Norwegian shipping industry from the marine safety angle(2014). Chia-Hsun Chang used a case study of Taiwan to analyze the impact of different factors on the risk perceptions of employees in shipping companies, but the performance of shipping company is not combined with risk perception in the article(2016).

2.4 Shipping enterprise risk management overview

According to the previous understanding of corporate risk, this article interprets shipping company risk as: Shipping company risk refers to the uncertainty of the internal and external environment of the shipping company, which may cause the shipping company to deviate from the predetermined goal or loss of interest.

Risk management of shipping companies refers to the identification of the risks of shipping companies. On the basis of analysis, the risk evaluation and control technology is optimized to achieve the process of effective control and risk management with the minimum risk management cost.The purpose is to prevent and reduce risks

Loss, to ensure the smooth progress of the business process, and to maximize the economic benefits of shipping companies. Since the internal and external environment of shipping companies is always constantly developing and changing, the risk management process should also be a continuous cycle.

2.5. Related methods

2.5.1. Research methods

Data collection in the early stage of perceived risk measurement is mainly by interviews, questionnaires, focus groups and other methods. In the past, scholars mainly used questionnaires for the measurement of risk perception, and used a few measurement items to measure it, which has the advantages of simplicity, feasibility, and low cost.

In the research on shipping-related risk perception mentioned above, questionnaire surveys and interview research methods are used. Because risk perception is a subjective concept, the results obtained by using shipping company staff and managers as the survey objects are scientifically oriented. Chia-Hsun Chang proposed a method for quantifying risk perception. First, the results of the

questionnaire were analyzed and quantified, and then the probability of risk occurrence was multiplied by the risk result. This method has great guiding significance for this paper.

2.5.2. Confirmatory factor analysis

Confirmatory factor analysis(CFA) has been used in analyzing how risk perception affecting the performance of shipping companies in 2018 by Hengbin Yin, Zhuo Chen & Yi Xiao. It is a multivariate statistical method developed on the basis of exploratory factor analysis(EFA). Researchers have understood the internal relationship between latent factors and measured variables， and only need to study the load level of each measurable variable on the potential factor and to verify the degree to which the data fits with the hypothetical model. Confirmatory factor analysis(CFA) can not only be used as the basis for other statistical tests but also can be applied separately to the determination of reliability and validity and theoretical effectiveness. This is the basic CFA model:

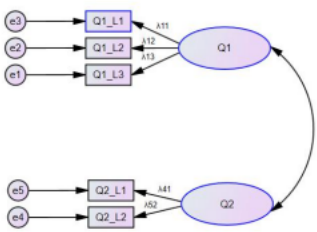

Figure 3 Basic CFA model

The corresponding model is：

$$x_1 = \lambda_{11} f_1 + e_1$$
$$x_2 = \lambda_{21} f_1 + e_2$$
$$x_3 = \lambda_{31} f_1 + e_3$$
$$x_4 = \lambda_{42} f_2 + e_4$$
$$x_5 = \lambda_{51} f_2 + e_5$$

In the formula, $x_1 \sim x_5$ are observed variables, f_1, f_2 are latent factors, $\lambda_{ij} (i = 1,2,3,4,5; j = 1,2)$ is factor loading to be estimated, and $e_1 \sim e_5$ The measurement error of each measurable variable.

3 Research methodology

3.1. Measurement for risk perception for shipping companies

3.1.1. The definition of risk perception

Risk perception refers to people's perception and understanding of risky things and risk characteristics. Risk assessment and risk management are assessment and management activities based on people's existing risk perception level, so risk perception is an important part of it. Risk perception is the first step taken by enterprises to carry out risk management when they are engaged in operations, and it is also the premise and basis for further implementation of risk prevention.

When conducting risk management, it is usually judged according to the probability of occurrence of the risk and the severity of the consequences. However, in the shipping industry, many risks, especially those with more serious consequences, are actually difficult to predict scientifically from an objective perspective. Therefore, in many cases, it is necessary to rely on the subjective

judgment of the shipping company for risk assessment and management. This is why this article studies the impact of subjective risk perception on shipping company performance.

3.1.2. The definition of risk.

Although risk is a widely used term, but due to different levels of understanding, or different perspectives of risk research, its strict definition has not yet reached consensus in academia.

(1) Risk is the uncertainty of the eventual possible outcome of the event.

AH Mowbray (1995) called risk as uncertainty; C. A. Williams (1985) defined risk as the change in future results under a given condition and a certain period of time; March & Shapira believes that risk is the uncertainty of the possible outcome of things which can be measured by the variance of the income distribution; Brnmiley believes that risk is the uncertainty of the company 's income stream; Markowitz and Sharp define the risk of securities investment as the degree of change in various possible yields of the securities asset, and use the variance of the yield rate to measure. The concept of quantifying risk has changed the perception of risk among investors. Due to the convenience of variance calculation, this definition of risk has been widely used in practice.

(2) Risk is the uncertainty of loss occurrence.

J. S. Rosenb (1972) defines risk as the uncertainty of loss, and FG Crane (1984) believes that risk is the uncertainty of future losses. Ruefli defined the risk as the chance of an adverse event or set of events. And this view is divided into two types of subjective doctrine and objective doctrine. Subjective doctrine believes that uncertainty is a subjective, personal and psychological concept, is individuals' subjective estimates of objective things and cannot be measured on an objective scale. The scope of uncertainty includes the uncertainty of occurrence, the uncertainty of

occurrence time, the uncertainty of occurrence conditions and the severity of occurrence results uncertainty. Objective doctrine is based on the premise of objective existence of risk and the observation of risk accidents. It is defined by mathematical and statistical viewpoints. It is believed that risk can be measured by objective scales. For example, Peffer defines risk as the size of the objective probability of the measured degree. F.H. Knight believes that risk is a measurable uncertainty.

(3) Risk is the extent to which loss may occur.

Duan Kailing believes that risk can be derived as an adverse deviation of the expected loss, in which the so-called disadvantage refers to the insurance company or the insurance company. For example, if the actual loss rate is greater than the expected loss rate, this positive deviation is a negative deviation for the insurance company, i.e. the risk to the insurance company. Markowitz ruled out the possibility that the rate of return was higher than the expected rate of return, proposed the following concept of risk, that is, the risk of realized returns falling below the expected rate of return, and measured the underlying risk by semivariance.

(4) Risk refers to the size of the loss and the likelihood of occurrence.

On the basis of summing up various risk descriptions, Zhu Shuzhen (2002) defined the risk as the size of the loss suffered by the actor due to the uncertainty of various results and the size of the probability of such loss. She believed that the risk is a two-digit concept. The risk is measured by the size of the loss and the probability of the loss. Wang Mingtao (2003) defined the risk is as: the likelihood of adverse outcomes in decision-making programmes over a period of time and the extent of possible losses due to various uncertainties in the decision-making process. It includes the probability of loss, the number of possible losses, and the variability of the loss, where the degree of possible loss is at the most important position.

(5) Risk is the result of the interaction of risk components.

Risk factors, risk events and risk outcomes are the basic components of risk, and risk factors are the necessary conditions for risk formation and the prerequisite for risk generation and existence. Risk event is an event in which unexpected changes in external environmental variables lead to risk outcomes, and it is a sufficient condition for risk existence and occupies a central position in the whole risk. Risk events are a bridge between risk factors and risk outcomes. It is the medium in which risk is transformed into reality. According to the mechanism of risk formation: risk is that in a certain period of time, with the corresponding risk factors as a necessary condition and the corresponding risk event as the full condition, the possibility of the actor to bear the corresponding risk outcome(Xiaoting, G, 2002). The connotation of risk lies in the possibility that it is presented by the progressive connection of risk factors, risk accidents and risk results within a certain period of time(Qing, Y, 2000).

(6) Define risk using standard statistical measurement methods for volatility.

In the report on Practices and Principles of Derivative Securities issued in 1993, the market risk of a known position or combination is defined as: the maximum possible loss with a certain credit interval after a certain time interval, and this method is named Value at Risk, or VaR method. In 1996, the Bank for International Settlements in the "Basel Agreement Amendment" has also allowed banks to use their own internal risk valuation model to establish capital to deal with market risk. The measurement method of "under normal market environment was used, and given a certain time interval and confidence level, and expecting the maximum loss (or worst-case loss)" to define and measure financial risk. This method is also referred to as the VaR method (P. Jorion, 1997).

(7) Use the stochastic nature of uncertainty to define risk.

The uncertainty of risk includes two types of ambiguity and randomness. Uncertainty of ambiguity mainly depends on the inherent fuzzy attributes of risk, and it needs to be described and studied by the method of fuzzy mathematics; while

uncertainty of randomness is mainly due to the multi-cause of external risks and need to be described and studied using the methods of probability theory and mathematical statistics.

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According to the random nature of uncertainty, in order to measure the relative risk degree of a certain risk unit, Hu Yida, Shen Houcai and others proposed the concept of risk degree, that is, under specific objective conditions and a specific time, the ratio of the mean square error between the actual loss and the predicted loss to the mathematical expectation of the predicted loss.

3.1.3. Identification of risks for shipping companies

The current trend of ocean shipping liberalization is intensifying. The international shipping market is becoming more and more competitive. The development of the world economy and international trade is increasingly affected by the world economy. The impact of changes in international trade has caused strong fluctuations in the international shipping market. In addition, the chance of a ship sailing on the sea affected by natural disasters is much greater than that of land. At the same time, the occurrence of major international political emergencies will also have a major impact on the shipping industry.

According to the previous understanding of corporate risk, this article interprets shipping company risk as: Shipping company risk refers to the uncertainty of the internal and external environment of the shipping company, which may cause the

shipping company to deviate from the predetermined goal or loss of interest.

After a lot of literature reading and sorting, this article selected the following seven core and major risks of shipping companies for research: Market risks, Policy risks, Financial risks, Operational risks, Technical risks, Hazard Risks and Human resource risks.

3.1.3.1 Market risks.

The main market risks faced by shipping companies include: cyclical volatility risk, cost risk, freight rate fluctuation risk and competition risk in the shipping market.

(1) Cyclical volatility risk in the shipping market

The shipping industry is a typical cyclical one. As a derivative demand of international trade, the shipping market is susceptible to fluctuations caused by the influence of domestic and international economies (Yongmin, Z, 2014).

To a certain extent, the cyclical fluctuations in the shipping market are the reflection of the cyclical fluctuations of the economy in the shipping market. The impact of economic fluctuations on shipping companies is mainly reflected in the volume of international trade. When the volume of international trade is greatly reduced, the shipping volume of shipping companies will also decline, which will affect the shipping price. There is a very strong positive correlation between the world economy, global trade and ocean shipping.

(2) Cost risk.

Cost risk is an important part of the market risk of shipping companies. Fuel costs account for a high proportion of shipping costs for shipping companies, making shipping companies very sensitive to changes in oil prices (Jiahui, Z, 2019). Taking container shipping companies as an example. According to Ronen's research, the cost of fuel oil accounts for 20% to 60% of the total operating cost. In recent years, as the

price of crude oil continues to rise, the proportion of fuel costs in total operating costs continues to increase, and some have even exceeded 60%. Therefore, shipping companies are facing severe cost risks

(3) Freight rate fluctuation risk.

There is a huge risk of freight price fluctuation in the shipping market, which has an important impact on the profitability and market competitiveness of shipping companies. Shipping freight rates are affected by factors such as world economy, politics, transportation costs, raw material prices, fuel prices, labor costs, capital costs of ship purchases (loans, interest, taxes, etc.), shipping market structure and other factors. In the past few years, freight rates in the shipping market have fluctuated violently. Between 2003 and 2008, freight rates in the shipping market increased by 300%. However, due to the impact of the financial crisis, freight rates have fallen 95%, causing no small loss to shipping companies (Jiahui, Z, 2019).

(4) Competition risk.

With the development of homogenization of services for shipping companies, competition in the shipping market is becoming increasingly fierce, especially due to factors such as the financial crisis, the European debt crisis and the slowdown in China's economic growth, the demand for shipping and transportation has dropped significantly.

At the same time, in the heyday of the development of the shipping industry (2003-2007), shipping companies have expanded their shipping capacity in order to expand revenue and seize market share, resulting in a serious surplus of shipping capacity and further intensified competition among shipping companies.

3.1.3.2 Policy risks.

Shipping policy is the specific policy adopted by the government for the domestic shipping industry. It is a general term for the attitude, policies and measures

of a government to treat its own fleet for the purpose of developing maritime trade transportation and improving the balance of payments. If a shipping company fails to understand the relevant policies of the port state's shipping in time, it may bring risks such as ship detention and fines.

In this paper, recent four important risk factors of policy risks in considered: tighter regulations, increased tax burdens, stricter environmental regulations and social instabililty.

With changes in international policies and changes in relations between countries, shipping policies will be affected to a certain extent. For example, in this trade war between the U.S and China, the two countries have adopted policies to increase tariffs on certain types of goods, which affect the import and export of goods, which in turn affect the development of the transportation and shipping industries.

In addition, shipping companies will have to adapt to increasingly strict environmental protection policies. The International Maritime Organization has already made strict requirements on the fuel we use and the content of sulfur or nitrogen oxides emitted during shipping, and this requirement will become more stringent in the future. The relevant government departments of the Baltic and North American regions will surely introduce very strict environmental protection policies in this regard. This also means that shipping companies must respond to new changes and adopt new technologies to meet this requirement.

Also, unstable factors such as strikes, riots, wars, etc. that occur when ships dock at the port or in the country will adversely affect the operations of shipping companies, thereby causing losses to shipping companies.

Regarding the political environment risk, the trade of shipping enterprises is seriously damaged by the political turmoil such as political conflict, war and workers' strike, and whether the policy risk is reasonable and applicable, affects the

healthy development of the shipping enterprise.

3.1.3.3. Financial risks.

In recent years, with the continuous improvement of China's economic level, the national government has begun to increase the development of marine transportation routes in order to balance the economy in various fields. However, in actual operation and management, it is found that interest rate risk, exchange rate risk, investment risk and credit risk have a relatively important impact on the development of shipping companies. If these problems are not resolved, it is easy to trigger a corporate financial crisis.

(1) Interest rate risk.

Interest rate risk mainly exists in loans and bonds issued by commercial banks. Declining market interest rates pose risks to commercial bank loans and bond issuance financed by fixed interest rates; loans and bond issuance financed by floating interest rates are at risk due to rising market interest rates.

(2) Exchange rate risk.

Within a certain period of time, international shipping companies may suffer foreign exchange risk due to exchange rate fluctuations in assets or liabilities denominated or valued in foreign currencies during financing, ship investment, and daily business activities.

In the financing, the currency of the loan of the international commercial bank may be inconsistent with the currency of the shipbuilding investment to be paid, and the time the loan is obtained and the time required to be paid may also be inconsistent, thus causing corresponding exchange rate risk.

The foreign government shipbuilding financing credits obtained are used for the foreign shipbuilding quotation and settlement in the currency of the loan country, so the foreign exchange risk will be borne by the shipowner or shipping company.

(3) Credit risk.

In the actual operation, the shipping market buying and selling method is mainly based on the credit sales operating mode, which leads to the shipping company's management method and content often being in a passive state. In the state of credit funds, the creditor has the initiative in the entire market. Once the company fails to receive the receivables for a long time, it will bring high risks to the company 's finances, resulting in financial "black holes", "bad debts" and "dead debts".

(4) Investment risk.

Ship investment risk is a major risk faced by shipping enterprises, if the purchase of shipbuilding investment can not correctly break the trend of the shipping market and the ship market, high-priced shipbuilding encountered the shipping market trough, high-cost ship low tariff market operation, enterprises will face huge cost pressure and risk.

At this stage, China's shipping market is in a high-speed development stage, some enterprises in order to occupy more market share, began to blindly expand the capital market investment, which to some extent also increased the investment risk of enterprises themselves.

Because the cost of the ship itself is high, shipping enterprises want to expand the operation must choose better quality equipment ships, and a large number of ships in the early stage is not able to recover the cost, which is bound to bring some financial pressure to enterprises. And the uncertain risk of investment in shipping industry is high, the environmental factors of international shipping investment are full of uncertainty, the internal and external environment of ship investment is likely to change, after the environmental factors change, investors need to adjust the ship investment to adapt to the change of environmental factors, thus forming the uncertainty of ship investment. This uncertainty is the most direct cause of ship investment risk. In addition, ships are affected by many uncertainties in the course of

transport. These unpredictable risks can seriously increase the investment risk of ships. At the same time, investment involving more areas and industries, shipping enterprise managers are not good at all investment industries and professions, once involved in a broader management will appear loopholes, which will inevitably bring some investment risk to their own operations. Many enterprise shipping companies lack risk assessment of other partners during their operations, resulting in a much higher risk to the business than in other industries.

3.1.3.4. Operational risks

Operational risk refers to the loss of economy, personnel, equipment and other factors that a shipping enterprise may suffer in its business activities, subject to adverse factors from outside or inside the enterprise, as well as the mistakes of business decision-making.

In this paper, four main risk factors of operation risks is included to measure the risk perception: vessel operational errors, documentation errors, errors in decision making, information security errors.

3.1.3.5. Technical risks

The role of technological innovation in shipping enterprises is very important, it has both potentially high efficiency, but also has potential high risk. With the development of science and technology, the technology of the shipping industry is also improving. If you can't keep up with the pace of the development of the environment, the shipping company will face the risk of high cost, low efficiency, and be eliminated by the market. At the same time, the security of internal technology is also very important, because it guarantees the competitiveness of a shipping enterprise in the market. In-house process design and planning are also important because it guarantees the company's productivity and science, ensuring

that everything is planned and carried out within the right, rigorous framework.

3.1.3.6. Hazard risks

(1) Risk of cargo or container damange

Whether the transportation of goods can arrive in good condition and on time is related to the reputation of the enterprise and the competitiveness of shipping, which in turn affects the economic interests of the enterprise.

(2) Personnel risk on board

According to the Statistics of the International Maritime Organization, 80% of the occurrence of marine vessels is caused by human factors, in the reef, fire, explosion accident, the proportion of man-made factors as high as 90%, in the collision accident, the human factor is as high as 95% (Guibin, C, 2008). Therefore, how to overcome human insecurity has become the key to ensure the safety of ships. As a decisive factor in the safety of ships, the safety of the crew is not only related to the crew's own and their families, but also to the interests of all parties concerned, but also the safety and health of the shipping industry.

(3) Risks of natural disaster

Natural risk mainly refers to the possibility that the means of transport of shipping enterprises will travel on natural waterways, through different geographical areas and different climatic zones, due to changes in natural conditions, resulting in loss of goods, casualties and so on. In addition to natural risks caused by adverse weather conditions, improper operation of shipping companies can also exacerbate the emergence of natural risks. For example, in order to save costs, shipping enterprises rent old ships for transport, resulting in difficult quality of transport vessels to ensure, increasing the incidence of sea-loss accidents.

3.1.3.7. Human resource risks

Human resource risk refers to the risk related to the management and control of human resources, such as the recruitment or flow of technical staff, the shortage of senior crew, the morale status of employees, etc. are the factors that constitute the human resources risk of shipping enterprises. According to statistics, 80% of maritime accidents are caused by human factors, which shows that shipping enterprises face a huge human resources risk. Shipping companies should carefully select candidates, ensure the talent pool of important positions, and minimize the occurrence of employee turnover.

In this paper, these four risk factors are included: changes or loss of key operational, management or technical personnel, shortage of senior crew, risk of insufficient managerial capacity and risk of insufficient effectiveness of compensation and benefits mechanism.

3.1.5. Measurement of risk perception through a questionnaire survey

3.1.5.1. Quantification method of risk perception

Risk is always associated with loss, so taking loss as the starting point of research is also a routine practice adopted by many studies. The composition of risk has two basic elements: (1) The occurrence of adverse events or losses, that is, the negative characteristics of risk ; (2) The probability of an adverse event or loss occurring, that is, the probability of the event occurring. The first element of risk emphasizes whether an adverse event or loss exists. The second element of risk emphasizes the magnitude of the probability of loss occurring, that is, the concept of usage to specify risk. The probability of loss refers to the probability or chance of loss occurring within a certain period of time.

The most general meaning of risk can be expressed as a function of the probability of an event and its consequences:

$R = F(P, C)$

In the formula:

R: risk level

P: Probability of event

C: Consequence of the incident

This definition emphasizes the probability of an unfortunate event, that is, the risk is the possibility that an event has unintended consequences. Therefore, the analysis of risk must include the possibility of unfortunate events and the magnitude of the consequences. Risk scale method is used to calculate the respondents' risk perceptions through combining these two elements together.

Risk scale is usually calculated through the level of risk likelihood multiplied with the level of risk consequence.

In this study, I firstly multiply the probability of occurrence of the risk factor in each risk category and the severity of the risk consequence, and then take the average to get the risk perception degree of the risk. There are seven types of risks so the procedure is performed seven times. The equation can be formed as equation(1)

$$R_k = \frac{1}{N}\sum_{r=1}^{N} R_r^k = \frac{1}{N}\sum_{r=1}^{N} l_r \cdot c_r \text{ , for } 1 \le r \le N \quad (1)$$

Where

N the total number of risk factors in this type of risk

r the index of the risk factors

k the index of the types of risk

R_K the mean value of risk perception of the type of risk k

R_r^k the mean value of risk perception of the risk factor r in the type of risk k

l_r the possibility of the risk factor r

c_r the severity of the risk consequence

3.1.5.2. Designation of the questionnaire survey

(1) Dimensions of the questionnaire survey

This paper collects the subjective perceptions of the main risks mentioned above by the shipping company employees through a questionnaire survey.

Based on the risk categories identified in the previous section and their corresponding risk factors, the dimensions of the questionnaire survey are shown in the following table:

Question Number	Dimension	Qusetions
Q1_L1	Market risk	Risk of cyclical fluctuations in the shipping market
Q1_L2		Cost risk (mainly fuel price)
Q1_L3		Freight price fluctuation risk
Q1_L4		Competition risk
Q2_L1	Policy risks	tighter regulations
Q2_L2		increased tax burdens
Q2_L3		stricter environmental regulations
Q2_L4		social instability（Strikes, unrest, etc.）
Q3_L1	Financial risks	Interest rate change
Q3_L2		Exchange rate changes
Q3_L3		Credit risk (accounts receivable)
Q3_L4		Investment risk
Q4_L1	Operational risks	vessel operational errors

Q4_L2		documentation errors
Q4_L3		errors in decision making
Q4_L4		information security errors
Q5_L1		a lack of technological innovation
Q5_L2	Technical risks	a lack of advanced equipment and facilities
Q5_L3		technology leak
Q5_L4		a lack of process design and planning abilities
Q6_L1		Risk of cargo or container damage
Q6_L2	Hazard risks	Personnel risk on board
Q6_L3		Risks of natural disaster
Q7_L1		Changes or loss of key operational, management or technical personnel
Q7_L2	Human resource risks	Shortage of senior crew
Q7_L3		Risk of insufficient managerial capacity
Q7_L4		Risk of insufficient effectiveness of compensation and benefits mechanism

Table 1 Dimensions of the questionnaire survey in risk perception

(2) Value standard

The value standard of these questions is using a five-point Likert scale to measure the level of the possibility of risk factors and the consequence (Chia-Hsun, C, 2016). More specifically, in this questionnaire, the respondents were asked on their subjective judgment on the possibility of risk factors and the consequence. And that explained why these data can be used to measure the risk perception of shipping

companies.

Likert scale is a kind of psychological response scale, often used in questionnaires, and is currently the most widely used scale in survey research. When the subjects responded to the items of this questionnaire, they specified their degree of agreement with the statement.

Likert scale is one of the most commonly used scoring and summing scales. These items of the same construct are scored using the summation method, and individual or individual items are meaningless. It was improved by American social psychologist Likert in 1932 on the basis of the original total scale. The scale consists of a set of statements. Each statement has five answers: "strongly agree", "agree", "not necessarily", "disagree", and "strongly disagree", which are recorded as 5, 4, 3, respectively. 2. 1. The total score of each respondent's attitude is the sum of the scores obtained from his answers to each question. This total score can indicate his strength or his different status on this scale.

The value standard used in this article is shown in the following table:

Value standard		
Description value	Probability	Severity of consequence
1	rare	insignificant
2	unlikely	minor
3	possible	moderate
4	likely	major
5	almost certain	catastrophic

Table 2 Value standard of risk perception

3.2. Measurement for shipping companies' performance

3.2.1. Dimension of questionnaire survey about shipping companies' performance

In this article, four indicators that best reflect the operating conditions of shipping companies are selected to measure the performance of shipping companies, as shown in the following table:

Q8_L1	performance	company sales
Q8_L2		profitability
Q8_L3		market share
Q8_L4		growth
Q8_L5		management effectiveness

Table 3 Dimension of questionnaire survey about shipping companies' performance

When distributing the questionnaire, only select respondent positions with the position of deputy manager and above to answer questions about company performance to ensure the accuracy and scientificity of the results.

3.2.2. Value standard

The value standard of shipping companies' performance used in this article is shown in the following table:

Value standard		
Description value	Probability	Severity of consequence
1	rare	insignificant
2	unlikely	minor

3	possible	moderate
4	likely	major
5	almost certain	catastrophic

Table 4 Value standard of shipping companies' performance

3.3. Hypotheses

This article mainly studies the six seven major risks faced by shipping companies, and measures the degree of risk perception through the probability of the occurrence of risk factors and the severity of the consequences. We assume that the shipping companies' risk perceptions of these seven risks all have a negative impact on the shipping company's performance, and determine whether the hypothesis is true through data analysis.

During the questionnaire collection process, we collected four different types of enterprise properties from state-owned enterprises, foreign enterprises, joint ventures, and Chinese-funded enterprises to verify the moderating effect of enterprise nature on shipping company performance.

H1：Market risk has influence on shipping companies' performance

H2：Policy risks has influence on shipping companies' performance

H3：Financial risks has influence on shipping companies' performance

H4：Operational risks has influence on shipping companies' performance

H5：Technical risks has influence on shipping companies' performance

H6：Hazard risks has influence on shipping companies' performance

H7：Human resource risks has influence on shipping companies' performance

4.Results

4.1. Results for questionnaire

The questionnaire was conducted in the form of an electronic questionnaire and received 102 responses.

4.1.1. Characteristics of the respondents

		Number	%
Enterprise	State-owned shipping company	50	44.6%
	China-invested shipping company	30	26.8%
	Foreign-invested shipping company	28	25.0%
	Sino-foreign joint venture shipping company	4	3.6%
Working_years	Less than 3 years	8	7.1%
	3-5 years	4	3.6%
	5-8 years	14	12.5%
	More than 8 years	86	76.8%
Position_level	Below deputy manager level	22	19.6%
	Above deputy manager level	90	80.4%

Table 5 Characteristics of the respondents

Of the 112 questionnaires collected in this survey, 50 were from employees of

state-owned shipping enterprises (44.6%) and 30 from employees of Chinese shipping enterprises (26.8%), showing that the majority of the participants in the survey belonged to enterprises with Chinese capital investment. In the working year, with 86 participants (76.8%) working for more than eight years in their shipping companies, it can be seen that the participants in this survey are professionals with extensive experience in the shipping field, which also guarantees the accuracy of the results of this survey. In the position level, 90 participants were held above the manager level (80.4%), so they knew the inside of their shipping company and gave a more valuable response. Their more accurate judgment on the state of shipping companies is also helpful to the scientific nature of the survey results.

4.1.2. Quantification results analysis

(1) Quantification of performance of the shipping companies

In this questionnaire survey, the shipping company employees gave an average score of 3.91 for the company's sales performance and future development. It can be seen that although the shipping industry is currently in a somewhat difficult period, the shipping company employees, especially the senior employees (the major of attendants), and they are still optimistic about the current performance and future prospects of shipping companies.

The questionnaire survey on the five questions related to the performance of the shipping company, all of which scored more than 3.5 points, it can be seen that the satisfaction of the internal staff of the shipping company with the company is relatively high, and they feel confident about the future of the shipping company.

Descriptive statistics of shipping companies performance

	Effective answer	Min	Max	Average	Standard deviation
Company_sales	90	2	5	3.91	.701
Profitability	90	2	5	3.82	.747
Market_share	90	1	5	3.67	.929
Growth	90	2	5	3.91	.763
Management effectiveness	90	1	5	3.67	.769

Table 6 Descriptive statistics of shipping companies performance

(2) Quantification of the risk perception of market risk

Market risk			
Risk of cyclical fluctuations in the shipping market	Cost risk (mainly fuel price)	Freight price fluctuation risk	Competition risk
5.00	5.00	5.00	4.00
4.00	5.00	5.00	5.00
2.45	2.45	2.45	2.45
2.45	5.00	2.45	2.45
2.45	2.45	2.45	2.45
5.00	5.00	4.00	4.00
5.00	5.00	3.00	3.00
3.00	3.00	1.00	3.00
3.00	3.00	4.00	4.00
5.00	4.00	4.00	5.00
2.00	2.00	2.00	2.00

2.00	4.00	3.00	2.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	3.00
2.00	4.00	2.00	4.00
2.00	2.00	2.00	2.00
5.00	4.00	4.00	3.00
5.00	5.00	5.00	2.00
5.00	4.00	4.00	4.00
5.00	4.00	5.00	5.00
5.00	5.00	5.00	2.00
2.00	2.00	2.00	2.00
4.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
1.00	1.00	1.00	1.00
1.00	2.45	1.00	2.45
3.00	3.00	3.00	4.00
2.45	2.45	2.45	3.00
3.00	3.00	2.45	3.00
4.00	4.00	2.45	4.00
2.45	2.45	2.45	2.45
4.00	3.00	4.00	3.00
2.45	4.00	2.45	4.00
4.00	4.00	4.00	3.00
4.00	5.00	4.00	4.00
4.00	5.00	4.00	5.00
1.00	1.00	2.45	2.45

3.00	3.00	3.00	4.00
2.45	3.00	2.45	2.45
2.45	3.00	4.00	2.45
3.00	2.00	3.00	3.00
3.00	2.00	1.00	2.00
2.00	4.00	2.00	4.00
4.00	1.00	4.00	4.00
3.00	3.00	5.00	3.00
4.00	4.00	5.00	4.00
1.00	2.00	3.00	2.00
3.00	3.00	4.00	4.00
4.00	5.00	5.00	5.00
5.00	4.00	5.00	3.46
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
1.00	2.00	2.00	3.46
2.00	2.00	2.00	2.00
2.00	5.00	2.00	2.00
3.46	3.46	5.00	3.46
5.00	3.00	3.00	3.00
2.00	2.00	2.00	5.00
5.00	4.00	3.00	4.00
4.00	4.00	1.00	4.00
3.00	3.00	3.00	3.00
3.00	4.00	4.00	4.00
3.00	3.00	2.00	3.00

3.00	4.00	4.00	3.00
2.00	2.00	2.00	3.00
3.00	2.00	2.00	2.00
3.00	3.00	4.00	4.00
1.00	1.00	2.00	4.00
2.00	2.00	2.00	2.00
3.87	2.00	2.00	2.00
2.00	2.00	2.00	1.00
2.00	2.00	2.00	3.87
2.00	4.00	2.00	2.00
3.87	3.87	2.00	2.00
4.00	4.00	2.00	4.00
3.87	2.00	2.00	3.87
3.87	3.87	2.00	3.87
4.00	4.00	2.00	4.00
3.00	1.00	1.00	3.00
3.00	2.00	3.00	3.00
4.00	4.00	3.00	4.00
3.00	2.00	3.00	3.00
3.00	3.00	4.00	3.00
4.00	3.00	1.00	3.00
4.00	4.00	4.00	5.00
5.00	5.00	4.00	5.00
1.00	2.00	3.00	3.00
3.00	2.00	2.00	3.00
4.00	4.00	3.00	4.00

2.00	1.00	1.00	2.00
5.00	5.00	4.00	4.00
3.00	3.00	3.00	3.00
4.00	2.00	4.00	4.00
2.00	2.00	1.00	1.00
2.00	1.00	2.00	3.00
5.00	4.00	4.00	3.00
4.00	4.00	4.00	4.00
5.00	4.00	4.00	5.00
1.00	2.00	2.00	2.00
4.00	4.00	5.00	5.00
1.00	1.00	1.00	1.00
2.00	5.00	5.00	2.00
2.00	2.00	1.00	3.00
3.00	4.00	3.00	3.00
3.00	1.00	2.00	3.00
1.00	1.00	2.00	1.00
3.00	3.00	1.00	3.00
2.00	3.00	5.00	3.00
1.00	1.00	1.00	1.00
2.00	2.00	2.00	2.00
2.00	1.00	1.00	1.00

Table 7 Quantification of the risk perception of market risk

(3) Quantification of the risk perception of policy risks

Policy risk			
Tighter regulations	Increased tax burdens	Stricter environmental regulations	Social instability（Strikes, unrest, etc.）
4.00	4.00	4.00	4.00
5.00	4.00	5.00	5.00
5.00	5.00	4.00	4.00
5.00	4.00	5.00	5.00
4.00	5.00	4.00	4.00
5.00	4.00	5.00	5.00
4.00	4.00	5.00	4.00
3.00	4.00	2.00	2.00
3.00	4.00	3.00	3.00
3.00	4.00	3.00	3.00
5.00	4.00	4.00	4.00
3.00	4.00	4.00	4.00
5.00	4.00	5.00	5.00
3.00	2.00	1.00	2.00
3.00	3.00	2.00	4.00
2.00	2.00	3.00	3.00
4.00	4.00	5.00	5.00
5.00	4.00	5.00	3.00
3.00	3.00	3.00	5.00
4.00	2.00	4.00	3.00
4.00	3.00	4.00	4.00
4.00	3.00	4.00	4.00

3.00	2.00	3.00	3.00
4.00	5.00	5.00	4.00
5.00	3.00	5.00	5.00
1.00	1.00	1.00	1.00
2.45	2.45	1.00	3.00
3.00	4.00	3.00	4.00
3.00	4.00	4.00	3.00
2.45	2.45	4.00	2.45
3.00	4.00	3.00	3.00
4.00	5.00	5.00	4.00
5.00	4.00	5.00	5.00
4.00	5.00	5.00	5.00
4.00	4.00	4.00	2.45
4.00	3.00	5.00	4.00
3.00	3.00	3.00	5.00
3.00	2.45	2.45	2.45
2.45	2.45	3.00	2.45
4.00	1.00	1.00	2.45
3.00	2.00	5.00	5.00
4.00	2.00	2.00	3.00
3.00	4.00	2.00	3.00
3.00	3.00	3.00	4.00
5.00	5.00	4.00	4.00
4.00	3.00	3.00	5.00
3.00	4.00	4.00	4.00
3.00	3.00	1.00	2.00

2.00	2.00	4.00	2.00
5.00	5.00	5.00	5.00
4.00	5.00	5.00	4.00
3.46	2.00	3.46	3.46
2.00	2.00	1.00	1.00
1.00	1.00	1.00	1.00
4.00	4.00	4.00	2.00
5.00	4.00	4.00	2.00
5.00	5.00	5.00	5.00
5.00	4.00	5.00	5.00
2.00	1.00	1.00	3.00
2.00	1.00	1.00	3.00
3.00	2.00	3.00	3.00
1.00	3.00	3.00	3.00
2.00	1.00	1.00	1.00
1.00	1.00	1.00	2.00
4.00	4.00	4.00	4.00
4.00	2.00	2.00	3.00
1.00	2.00	1.00	3.00
1.00	1.00	1.00	1.00
3.87	3.87	3.87	4.00
3.87	2.00	3.87	4.00
1.00	1.00	1.00	2.00
3.87	3.87	3.87	3.87
1.00	1.00	2.00	4.00
3.87	1.00	2.00	1.00

3.87	3.87	3.87	3.87
3.87	3.87	3.87	3.87
4.00	4.00	4.00	4.00
4.00	4.00	4.00	5.00
3.00	5.00	4.00	4.00
1.00	3.00	1.00	2.00
1.00	2.00	1.00	2.00
4.00	2.00	2.00	2.00
3.00	3.00	1.00	2.00
2.00	2.00	2.00	2.00
4.00	3.00	4.47	3.00
3.00	3.00	4.47	4.47
1.00	3.00	1.00	4.47
1.00	1.00	1.00	2.00
1.00	1.00	1.00	2.00
2.00	2.00	1.00	2.00
1.00	1.00	1.00	1.00
2.00	2.00	3.00	3.00
5.00	5.00	5.00	5.00
3.00	2.00	3.00	3.00
3.00	3.00	3.00	4.00
4.00	3.00	4.00	2.00
4.00	3.00	4.00	2.00
2.00	3.00	3.00	3.00
3.00	3.00	3.00	3.00
5.00	4.00	4.00	4.00

2.00	1.00	2.00	1.00
3.00	3.00	3.00	3.00
1.00	1.00	1.00	1.00
1.00	2.00	2.00	2.00
3.00	5.00	4.00	4.00
4.00	4.00	1.00	2.00
3.00	3.00	3.00	3.00
1.00	2.00	2.00	2.00
1.00	2.00	3.00	3.00
2.00	2.00	4.00	2.00
1.00	1.00	2.00	3.00

Table 8 Quantification of the risk perception of policy risks

(3) Quantification of the risk perception of financial risks

Financial risk			
Interest rate change	Exchange rate changes	Credit risk (accounts receivable)	Investment risk
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
2.45	2.45	3.00	2.45
5.00	4.00	4.00	4.00
4.00	4.00	4.00	3.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	2.00
4.00	4.00	5.00	4.00

4.00	4.00	5.00	5.00
2.00	2.00	3.00	2.00
3.00	3.00	3.00	3.00
2.00	5.00	3.00	3.00
5.00	5.00	5.00	5.00
4.00	5.00	4.00	4.00
3.00	3.00	3.00	3.00
4.00	4.00	5.00	5.00
5.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
5.00	5.00	4.00	5.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00
3.00	3.00	3.00	3.00
5.00	5.00	5.00	5.00
1.00	1.00	1.00	1.00
3.00	1.00	1.00	2.45
4.00	4.00	4.00	4.00
3.00	3.00	3.00	3.00
4.00	3.00	4.00	4.00
5.00	5.00	5.00	5.00
3.00	3.00	3.00	3.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	2.45
4.00	4.00	4.00	1.00

5.00	5.00	5.00	5.00
2.45	4.00	4.00	4.00
3.00	3.00	3.00	3.00
3.00	2.45	2.45	3.00
2.45	2.45	2.45	2.45
3.00	3.00	3.00	2.00
3.00	3.00	3.00	3.00
3.00	3.00	3.00	3.00
4.00	4.00	4.00	4.00
5.00	5.00	4.00	5.00
3.00	3.00	3.00	3.00
2.00	3.00	3.00	2.00
3.00	3.00	3.00	3.00
5.00	5.00	5.00	5.00
3.46	3.46	3.46	3.46
4.00	4.00	4.00	4.00
4.00	5.00	4.00	5.00
3.46	2.00	3.46	3.46
3.46	1.00	2.00	3.46
4.00	4.00	4.00	2.00
5.00	4.00	4.00	5.00
5.00	5.00	4.00	2.00
2.00	3.00	3.00	3.00
4.00	4.00	5.00	2.00
4.00	4.00	5.00	1.00
4.00	3.00	4.00	2.00

4.00	4.00	5.00	3.00
3.00	3.00	2.00	1.00
3.00	3.00	3.00	3.00
4.00	4.00	3.00	3.00
3.00	3.00	3.00	3.00
3.00	3.00	2.00	2.00
4.00	4.00	4.00	4.00
3.87	2.00	2.00	3.87
3.87	2.00	2.00	3.87
3.87	1.00	1.00	2.00
2.00	2.00	2.00	3.87
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00
2.00	2.00	3.87	4.00
2.00	2.00	3.87	3.87
3.87	3.87	3.87	3.87
4.00	5.00	4.00	5.00
2.00	3.00	3.00	2.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00
4.00	4.00	4.00	4.00
3.00	3.00	2.00	2.00
3.00	2.00	3.00	3.00
4.00	4.00	4.00	3.00
5.00	5.00	5.00	5.00
3.00	3.00	3.00	3.00

3.00	1.00	2.00	1.00
3.00	1.00	2.00	1.00
1.00	1.00	1.00	1.00
4.00	4.00	4.00	3.00
2.00	3.00	3.00	2.00
4.00	4.00	4.00	4.00
3.00	2.00	3.00	2.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	3.00
2.00	2.00	2.00	3.00
4.00	5.00	4.00	5.00
2.00	2.00	2.00	3.00
5.00	5.00	5.00	5.00
1.00	1.00	1.00	1.00
5.00	2.00	2.00	2.00
3.00	2.00	3.00	3.00
3.00	3.00	3.00	3.00
5.00	5.00	5.00	5.00
3.00	2.00	3.00	3.00
2.00	2.00	2.00	2.00
3.00	3.00	3.00	3.00
3.00	1.00	1.00	1.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00

Table 9 Quantification of the risk perception of financial risks

(4) Quantification of the risk perception of operational risks

Operational risk			
Vessel operational errors	Documentation errors	Errors in decision making	Information security errors
5.00	5.00	2.00	2.00
5.00	5.00	2.00	2.00
4.00	4.00	5.00	5.00
2.45	2.45	2.45	2.45
4.00	4.00	4.00	4.00
5.00	4.00	5.00	5.00
5.00	4.00	5.00	5.00
3.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	5.00	5.00	5.00
3.00	5.00	3.00	3.00
2.00	2.00	2.00	2.00
4.00	5.00	4.00	4.00
4.00	5.00	4.00	4.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00
5.00	5.00	5.00	5.00
4.00	4.00	5.00	5.00
4.00	4.00	5.00	5.00

2.00	3.00	4.00	4.00
2.00	4.00	1.00	1.00
4.00	3.00	3.00	3.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
3.00	3.00	3.00	3.00
2.45	2.45	2.45	2.45
3.00	3.00	5.00	5.00
2.45	2.45	2.45	2.45
4.00	4.00	5.00	5.00
2.45	2.45	2.45	2.45
4.00	4.00	4.00	4.00
2.45	2.45	2.45	2.45
4.00	4.00	3.00	3.00
2.45	2.45	2.45	2.45
5.00	5.00	5.00	5.00
5.00	4.00	5.00	5.00
3.00	3.00	4.00	4.00
5.00	5.00	5.00	5.00
2.45	2.45	2.45	2.45
2.00	2.00	2.00	2.00
3.00	3.00	3.00	3.00
2.00	2.00	2.00	2.00
4.00	3.00	4.00	4.00

5.00	4.00	5.00	5.00
2.00	2.00	2.00	2.00
4.00	5.00	3.00	3.00
3.00	3.00	3.00	3.00
5.00	4.00	5.00	5.00
3.46	5.00	5.00	5.00
4.00	4.00	4.00	4.00
4.00	5.00	5.00	5.00
2.00	2.00	2.00	2.00
3.46	4.00	3.46	3.46
2.00	2.00	2.00	2.00
5.00	5.00	5.00	5.00
4.00	5.00	5.00	5.00
2.00	2.00	2.00	2.00
4.00	3.00	4.00	4.00
4.00	3.00	4.00	4.00
2.00	2.00	2.00	2.00
5.00	5.00	5.00	5.00
2.00	2.00	2.00	2.00
4.00	5.00	4.00	4.00
4.00	2.00	3.00	3.00
3.00	3.00	3.00	3.00
3.00	3.00	3.00	3.00
4.00	3.00	4.00	4.00
2.00	2.00	2.00	2.00

2.00	2.00	2.00	2.00
3.87	3.87	3.87	3.87
2.00	1.00	4.00	4.00
2.00	4.00	4.00	4.00
2.00	2.00	2.00	2.00
4.00	3.87	3.87	3.87
4.00	3.87	3.87	3.87
3.87	4.00	3.87	3.87
2.00	2.00	2.00	2.00
4.00	5.00	3.00	3.00
3.00	2.00	2.00	2.00
3.00	2.00	2.00	2.00
4.47	4.47	4.47	4.47
4.47	4.47	3.00	3.00
2.00	2.00	2.00	2.00
4.47	4.47	3.00	3.00
5.00	5.00	5.00	5.00
2.00	2.00	3.00	3.00
3.00	3.00	3.00	3.00
3.00	3.00	3.00	3.00
4.00	4.00	4.00	4.00
1.00	2.00	1.00	1.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00

2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00
2.00	3.00	3.00	3.00
2.00	3.00	3.00	3.00
4.00	5.00	5.00	5.00
4.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
2.00	2.00	2.00	2.00
2.00	2.00	3.00	3.00
3.00	3.00	2.00	2.00
5.00	5.00	5.00	5.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00
3.00	4.00	1.00	1.00
3.00	3.00	5.00	5.00
2.00	2.00	2.00	2.00
1.00	2.00	1.00	1.00

Table 10 Quantification of the risk perception of operational risks

(5) Quantification of the risk perception of technical risks

Technical risks			
A lack of technological innovation	A lack of advanced equipment and facilities	Technology leak	A lack of process design and planning abilities

4.00	4.00	5.00	4.00
5.00	5.00	5.00	5.00
2.45	2.45	2.45	3.00
4.00	4.00	5.00	4.00
4.00	4.00	4.00	3.00
5.00	5.00	4.00	5.00
5.00	5.00	4.00	5.00
4.00	5.00	5.00	4.00
5.00	4.00	4.00	5.00
5.00	4.00	4.00	5.00
2.00	2.00	3.00	2.00
3.00	3.00	3.00	3.00
2.00	5.00	3.00	3.00
4.00	3.00	4.00	3.00
4.00	5.00	4.00	3.00
4.00	4.00	3.00	3.00
5.00	4.00	4.00	3.00
5.00	5.00	5.00	4.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	5.00
4.00	3.00	4.00	4.00
4.00	3.00	4.00	4.00
4.00	4.00	4.00	3.00
5.00	5.00	5.00	4.00
3.00	3.00	3.00	3.00
2.45	3.00	3.00	4.00

5.00	5.00	5.00	4.00
5.00	5.00	5.00	5.00
3.00	2.45	3.00	3.00
1.00	3.00	1.00	2.45
4.00	4.00	3.00	3.00
4.00	4.00	4.00	4.00
5.00	3.00	4.00	3.00
5.00	3.00	3.00	5.00
5.00	3.00	4.00	4.00
4.00	4.00	4.00	5.00
5.00	5.00	4.00	5.00
4.00	1.00	1.00	4.00
2.45	2.45	1.00	2.45
1.00	2.45	2.45	1.00
3.00	4.00	4.00	5.00
3.00	3.00	3.00	3.00
3.00	2.45	3.00	3.00
5.00	4.00	3.00	3.00
5.00	5.00	5.00	5.00
2.00	2.00	2.00	2.00
3.00	4.00	3.00	3.00
1.00	2.00	2.00	1.00
1.00	3.46	1.00	2.00
5.00	5.00	4.00	4.00
4.00	4.00	4.00	4.00
3.46	3.46	3.46	3.46

2.00	1.00	1.00	1.00
1.00	1.00	1.00	1.00
5.00	3.46	4.00	4.00
5.00	5.00	5.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	5.00
2.00	1.00	1.00	1.00
4.00	5.00	5.00	5.00
3.00	4.00	4.00	4.00
3.00	2.00	3.00	1.00
3.00	4.00	4.00	5.00
5.00	5.00	5.00	3.00
5.00	5.00	5.00	4.00
3.00	3.00	3.00	3.00
2.00	4.00	2.00	3.00
5.00	4.00	3.00	3.00
3.87	2.00	2.00	2.00
3.87	2.00	2.00	2.00
2.00	3.87	3.87	4.00
4.00	4.00	4.00	3.87
3.87	3.87	3.87	3.87
3.87	3.87	3.87	3.87
1.00	3.87	2.00	2.00
1.00	3.87	2.00	2.00
1.00	2.00	2.00	2.00
4.00	4.00	4.00	3.00

3.00	4.00	3.00	3.00
3.00	2.00	2.00	1.00
3.00	2.00	2.00	1.00
3.00	3.00	3.00	3.00
1.00	2.00	2.00	1.00
1.00	1.00	3.00	1.00
3.00	3.00	1.00	2.00
4.47	2.00	2.00	2.00
4.47	4.47	4.47	4.47
1.00	4.47	2.00	1.00
1.00	4.47	2.00	1.00
1.00	2.00	3.00	2.00
4.00	4.00	3.00	3.00
3.00	2.00	3.00	3.00
5.00	4.00	4.00	4.00
2.00	3.00	1.00	1.00
4.00	4.00	5.00	5.00
4.00	5.00	4.00	4.00
4.00	5.00	4.00	4.00
3.00	3.00	3.00	3.00
1.00	2.00	2.00	1.00
5.00	5.00	3.00	3.00
1.00	2.00	2.00	1.00
1.00	1.00	3.00	2.00
1.00	2.00	2.00	2.00
2.00	3.00	2.00	1.00

3.00	2.00	2.00	2.00
1.00	2.00	2.00	2.00
5.00	5.00	4.00	5.00
3.00	1.00	1.00	2.00
4.00	3.00	2.00	4.00
2.00	3.00	5.00	4.00
1.00	1.00	2.00	2.00

Table 11 Quantification of the risk perception of technical risks

(6) Quantification of the risk perception of hazard risks

Hazard risks		
A lack of technological innovation	A lack of advanced equipment and facilities	Technology leak
5.00	5.00	5.00
5.00	1.00	1.00
5.00	5.00	5.00
5.00	4.00	5.00
4.00	4.00	5.00
4.00	4.00	4.00
4.00	4.00	4.00
3.00	3.00	3.00
5.00	4.00	5.00
5.00	4.00	5.00
4.00	5.00	5.00
3.00	3.00	3.00

3.00	3.00	3.00
5.00	4.00	5.00
4.00	3.00	5.00
3.00	3.00	3.00
5.00	5.00	4.00
5.00	2.00	2.00
5.00	5.00	5.00
3.00	5.00	3.00
5.00	4.00	5.00
5.00	4.00	5.00
2.00	2.00	4.00
5.00	5.00	5.00
2.00	2.00	2.00
2.45	2.45	2.45
4.00	3.00	3.00
3.00	3.00	3.00
4.00	4.00	2.45
5.00	4.00	5.00
3.00	3.00	3.00
4.00	4.00	3.00
2.45	2.45	2.45
4.00	4.00	4.00
3.00	3.00	5.00
3.00	4.00	3.00
3.00	4.00	5.00

4.00	4.00	3.00
4.00	4.00	4.00
3.00	3.00	3.00
3.00	3.00	3.00
2.00	2.00	3.00
3.00	4.00	4.00
4.00	5.00	5.00
3.00	4.00	3.00
3.00	4.00	5.00
3.00	4.00	3.00
2.00	2.00	2.00
3.46	4.00	3.46
4.00	5.00	5.00
4.00	4.00	4.00
3.46	5.00	4.00
2.00	2.00	3.46
1.00	2.00	2.00
3.46	3.46	5.00
3.46	5.00	5.00
5.00	4.00	5.00
5.00	2.00	2.00
2.00	2.00	2.00
2.00	2.00	2.00
3.00	3.00	3.00
4.00	2.00	2.00

4.00	4.00	4.00
4.00	5.00	4.00
3.00	5.00	3.00
2.00	2.00	3.00
4.00	4.00	3.00
5.00	5.00	5.00
2.00	2.00	2.00
2.00	2.00	2.00
2.00	2.00	2.00
2.00	3.87	2.00
3.87	3.87	3.87
3.87	3.87	3.87
3.87	3.87	3.87
3.87	3.87	3.87
3.87	3.87	3.87
4.00	4.00	5.00
3.00	4.00	3.00
2.00	2.00	1.00
2.00	2.00	1.00
4.47	3.00	3.00
2.00	4.47	4.47
2.00	2.00	2.00
3.00	4.47	3.00
3.00	4.47	3.00
1.00	1.00	1.00

1.00	1.00	1.00
1.00	1.00	3.00
1.00	5.00	5.00
5.00	2.00	2.00
3.00	1.00	1.00
2.00	2.00	2.00
4.00	4.00	4.00
3.00	5.00	3.00
2.00	2.00	2.00
2.00	2.00	2.00
5.00	5.00	4.00
3.00	4.00	3.00
5.00	5.00	5.00
2.00	2.00	3.00
2.00	3.00	2.00
2.00	3.00	2.00
3.00	3.00	2.00
3.00	3.00	3.00
2.00	3.00	3.00
4.00	4.00	2.00
2.00	2.00	2.00
2.00	2.00	2.00
2.00	3.00	3.00
2.00	2.00	2.00

Table 12 Quantification of the risk perception of hazard risks

(7) Quantification of the risk perception of human resource risks

Human resource risks			
Changes or loss of key operational, management or technical personnel	Shortage of senior crew	Risk of insufficient managerial capacity	Risk of insufficient effectiveness of compensation and benefits mechanism
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	3.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	3.00
5.00	4.00	4.00	5.00
5.00	4.00	5.00	5.00
5.00	4.00	5.00	5.00
5.00	4.00	4.00	5.00
3.00	3.00	3.00	3.00
5.00	5.00	5.00	5.00
4.00	4.00	5.00	4.00
3.00	3.00	3.00	5.00
4.00	4.00	4.00	5.00
4.00	5.00	5.00	5.00
5.00	4.00	4.00	5.00

5.00	5.00	5.00	5.00
2.00	2.00	2.00	2.00
2.00	2.00	2.00	2.00
3.00	3.00	3.00	3.00
5.00	5.00	5.00	4.00
1.00	1.00	1.00	1.00
1.00	1.00	3.00	3.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
4.00	3.00	3.00	4.00
4.00	4.00	4.00	4.00
5.00	3.00	4.00	5.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00

4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
5.00	5.00	4.00	5.00
5.00	5.00	4.00	5.00
5.00	5.00	4.00	5.00
4.00	4.00	5.00	4.00
4.00	4.00	5.00	4.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
4.00	4.00	5.00	4.00
4.00	4.00	5.00	4.00
4.00	5.00	4.00	4.00

4.00	3.87	4.00	4.00
4.00	4.00	3.87	4.00
4.00	3.87	4.00	4.00
4.00	4.00	4.00	4.00
4.00	3.87	3.87	4.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
5.00	5.00	5.00	5.00
4.00	4.00	4.00	4.00
5.00	4.00	4.00	5.00
5.00	5.00	5.00	5.00
4.47	3.00	5.00	4.47
5.00	5.00	5.00	5.00
4.47	3.00	5.00	4.47
5.00	5.00	5.00	5.00
4.47	4.47	4.47	4.47
4.47	4.47	4.47	4.47
4.47	4.47	4.47	4.47
4.47	4.47	4.47	4.47
4.00	4.00	4.00	4.00
3.00	3.00	3.00	3.00
3.00	3.00	3.00	3.00
3.00	3.00	3.00	3.00
4.00	4.00	4.00	4.00

4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00
4.00	4.00	4.00	4.00

Table 13 Quantification of the risk perception of human resource risks

4.1.3 Summary table

Summary table

Risk perception of market risk	Risk perception of policy risk	Risk perception of financial risk	Risk perception of operational risk	Risk perception of technical risks	Risk perception of technical risks	Risk perception of human resource risks	Performance
4.75	4.00	5.00	3.50	4.25	5.00	5.00	4.6
4.75	4.75	5.00	3.50	5.00	2.33	5.00	4.8
2.45	4.50	2.59	4.50	2.59	5.00	5.00	2
3.09	5.00	4.25	2.45	4.25	4.67	4.00	3.8
2.45	3.75	3.75	4.00	3.75	4.33	3.75	3.4
4.50	5.00	4.00	4.75	4.75	4.00	5.00	5
4.00	4.50	4.00	4.75	4.75	4.00	4.00	4
2.50	2.50	3.50	3.75	4.50	3.00	3.75	3.2
3.50	3.00	4.25	4.00	4.50	4.67	4.50	4.2
4.50	3.00	4.50	4.00	4.50	4.67	4.75	4.6
2.00	4.50	2.25	4.75	2.25	4.67	4.75	2.2
2.75	3.75	3.00	3.50	3.00	3.00	4.50	3
4.00	5.00	3.25	2.00	3.25	3.00	3.00	3.2
3.75	2.00	5.00	4.25	3.50	4.67	5.00	5
3.00	3.00	4.25	4.25	4.00	4.00	4.25	4.2
2.00	2.75	3.00	2.00	3.50	3.00	3.50	3
4.00	4.75	4.50	2.00	4.00	4.67	4.25	4.6
4.25	4.50	4.25	5.00	4.75	3.00	4.75	4.2
4.25	3.75	5.00	4.50	5.00	5.00	4.50	5
4.75	3.25	4.75	4.50	4.25	3.67	5.00	4.8

4.25	4.00	2.00	3.25	3.75	4.67	2.00	2
2.00	4.00	2.00	2.00	3.75	4.67	2.00	2
4.75	3.00	3.00	3.25	3.75	2.67	3.00	3
5.00	4.00	5.00	5.00	4.75	5.00	4.75	5
1.00	4.50	1.00	4.00	3.00	2.00	1.00	1
1.73	1.00	1.86	3.00	3.11	2.45	2.00	1.8
3.25	2.23	4.00	2.45	4.75	3.33	4.00	4
2.59	3.50	3.00	4.00	5.00	3.00	4.00	3
2.86	3.50	3.75	2.45	2.86	3.48	4.00	3.8
3.61	2.84	5.00	4.50	1.86	4.67	4.00	5
2.45	3.25	3.00	2.45	3.50	3.00	5.00	3
3.50	4.50	4.00	4.00	4.00	3.67	5.00	4
3.23	4.75	4.00	2.45	3.75	2.45	3.50	4
3.75	4.75	3.61	3.50	4.00	4.00	4.00	3.2
4.25	3.61	3.25	2.45	4.00	3.67	4.25	2.8
4.50	4.00	5.00	5.00	4.25	3.33	5.00	5
1.73	3.50	3.61	4.75	4.75	4.00	5.00	3.6
3.25	2.59	3.00	3.50	2.50	3.67	5.00	3
2.59	2.59	2.73	5.00	2.09	4.00	5.00	2.6
2.98	2.11	2.45	2.45	1.73	3.00	5.00	2
2.75	3.75	2.75	2.00	4.00	3.00	4.00	2.6
2.00	2.75	3.00	3.00	3.00	2.33	4.00	3
3.00	3.00	3.00	2.00	2.86	3.67	4.00	3
3.25	3.25	4.00	3.75	3.75	4.67	5.00	4
3.50	4.50	4.75	4.75	5.00	3.33	4.00	5
4.25	3.75	3.00	2.00	2.00	4.00	4.00	3

2.00	3.75	2.50	3.75	3.25	3.33	4.00	2
3.50	2.25	3.00	3.00	1.50	2.00	5.00	3
4.75	2.50	5.00	4.75	1.87	3.64	4.75	5
4.37	5.00	3.46	4.62	4.50	4.67	4.75	3
4.00	4.50	4.00	4.00	4.00	4.00	4.75	4
4.00	3.10	4.50	4.75	3.46	4.15	4.25	2.8
2.12	1.50	3.10	2.00	1.25	2.49	4.25	1.6
2.00	1.00	2.48	3.60	1.00	1.67	4.00	1
2.75	3.50	3.50	2.00	4.12	3.97	5.00	3.6
3.85	3.75	4.50	5.00	4.75	4.49	5.00	4
3.50	5.00	4.00	4.75	4.00	4.67	4.00	5
2.75	4.75	2.75	2.00	4.25	3.00	4.00	4.8
4.00	1.75	3.75	3.75	1.25	2.00	5.00	1.4
3.25	1.75	3.50	3.75	4.75	2.00	4.00	1.8
3.00	2.75	3.25	2.00	3.75	3.00	5.00	2.8
3.75	2.50	4.00	5.00	2.25	2.67	4.00	2.2
2.75	1.25	2.25	2.00	4.00	4.00	4.00	1.4
3.50	1.25	3.00	4.25	4.50	4.33	5.00	1
2.25	4.00	3.50	3.00	4.75	3.67	5.00	4
2.25	2.75	3.00	3.00	3.00	2.33	4.00	3
3.50	1.75	2.50	3.00	2.75	3.67	4.25	1.6
2.00	1.00	4.00	3.75	3.75	5.00	4.25	1
2.00	3.90	2.94	2.00	2.47	2.00	4.25	3.2
2.47	3.44	2.94	2.00	2.47	2.00	3.97	3.6
1.75	1.25	1.97	3.87	3.44	2.00	3.97	1.2
2.47	3.87	2.47	2.75	3.97	2.62	3.97	4

2.50	2.00	2.00	3.50	3.87	3.87	4.00	1.8
2.94	1.97	2.00	2.00	3.87	3.87	3.94	2.4
3.50	3.87	2.97	3.90	2.22	3.87	4.00	4
2.94	3.87	2.94	3.90	2.22	3.87	5.00	5
3.40	4.00	3.87	3.90	1.75	3.87	4.00	4
3.50	4.25	4.50	2.00	3.75	4.33	5.00	5
2.00	4.00	2.50	3.75	3.25	3.33	4.00	4
2.75	1.75	2.00	2.25	2.00	1.67	4.50	4.6
3.75	1.50	2.00	2.25	2.00	1.67	5.00	5
2.75	2.50	4.00	4.47	3.00	3.49	4.24	4
3.25	2.25	2.50	3.74	1.50	3.65	5.00	5
2.75	2.00	2.75	2.00	1.50	2.00	4.24	4
4.25	3.62	3.75	3.74	2.25	3.49	5.00	5
4.75	3.74	5.00	5.00	2.62	3.49	4.47	4
2.25	2.37	3.00	2.50	4.47	1.00	4.47	4
2.50	1.25	1.75	3.00	2.12	1.00	4.47	4
3.75	1.25	1.75	3.00	2.12	1.67	4.47	4
1.50	1.75	1.00	4.00	2.00	3.67	4.00	4
4.50	1.00	3.75	1.25	3.50	3.00	3.00	3
3.00	2.50	2.50	2.00	2.75	1.67	3.00	3
3.50	5.00	4.00	2.00	4.25	2.00	3.00	3
1.50	2.75	2.50	2.00	1.75	4.00	4.00	4
2.00	3.25	2.00	2.00	4.50	3.67	4.00	4
4.00	3.25	2.25	2.75	4.25	2.00	4.00	4
4.00	3.25	2.25	2.75	4.25	2.00	4.00	4
4.50	2.75	4.50	4.75	3.00	4.67	4.00	4

1.75	3.00	2.25	4.75	1.50	3.33	4.00	4
4.50	4.25	5.00	5.00	4.00	5.00	4.00	4
1.00	1.50	1.00	4.00	1.50	2.33	4.00	1.4
3.50	3.00	2.75	2.00	1.75	2.33	4.00	1.6
2.00	1.00	2.75	2.50	1.75	2.33	4.00	1.6
3.25	1.75	3.00	2.50	2.00	2.67	4.00	2
2.25	4.00	5.00	5.00	2.25	3.00	4.00	2.4
1.25	2.75	2.75	2.00	1.75	2.67	4.00	1.6
2.50	3.00	2.00	2.00	4.75	3.33	4.00	4.8
3.25	1.75	3.00	2.25	1.75	2.00	4.00	2
1.00	2.25	1.50	4.00	3.25	2.00	4.00	3.4
2.00	2.50	2.00	2.00	3.50	2.67	4.00	3.2
1.25	1.75	2.00	1.25	1.50	2.00	4.00	1.4

Table 14 Summary table

4.2 Results for CFA

4.2.1 Reliability verification

	Factor	Question number	Cronbach's Alpha
Risk	Market risks	4	0.842
	Policy risks	4	0.876
	Financial risks	4	0.897
	Operational risks	4	0.915
	Technical risks	4	0.895
	Hazard risks	3	0.851
	Human resource risks	4	0.92
	Total	27	0.919

Performance	5	0.959

Table 15 Reliability verification

The reliability coefficients are: 0.842 for Market risks, 0.876 for Policy risks, 0.897 for Financial risks, 0.915 for operational risks, 0.895 for Technical risks, 0.851 for Hazard risks, 0.92 for Human resource risks, and 0.959 for shipping companies' performance.

According to the reliability analysis, Cronbach 's Alpha in all dimensions is greater than 0.8, indicating that the reliability of the questionnaire is very good.

4.2.2 Results of confirmatory factor analysis

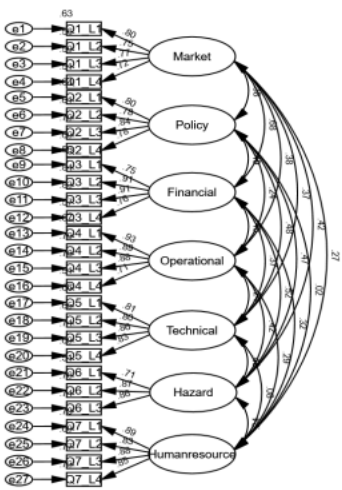

Figure 4 CFA model

MIN	IN/DF	MR	FI	GFI	FI	LI	FI	FI
77	1.4	0	0	0	0	0	0	0
1.305	39	.069	.849	.812	.872	.950	.957	.957

Table 16 SEM model fit about CFA model

Goodness-of-fit metrics (x2 = 771.305, RMR = 0.069, GFI = 0.849, AGEI = 0.812, NFI = 0.872, IFI = 0.950, TLI = 0.957, and CFI = 0.957) indicate that the model is acceptable.

Variable	Items	Factor loading	Coefficient	S.E	t-value	CR	AVE
Market risks	Q1_L4	0.76	0.717			0.8494	0.765049
	Q1_L3	0.705	0.767	0.13	8.956	0.8494	0.765049
	Q1_L2	0.669	0.745	0.131	8.794	0.8494	0.765049
	Q1_L1	0.626	0.797	0.13	9.253	0.8494	0.765049
Policy risks	Q2_L4	0.719	0.778			0.9101	0.847585
	Q2_L3	0.841	0.839	0.109	11.211	0.9101	0.847585
	Q2_L2	0.819	0.78	0.097	10.424	0.9101	0.847585
	Q2_L1	0.69	0.8	0.1	10.568	0.9101	0.847585
Financial risks	Q3_L4	0.727	0.755			0.8824	0.807713
	Q3_L3	0.77	0.912	0.089	12.509	0.8824	0.807713
	Q3_L2	0.765	0.915	0.097	12.528	0.8824	0.807713
	Q3_L1	0.728	0.747	0.09	10.016	0.8824	0.807713
Operational risks	Q4_L4	0.784	0.714			0.8827	0.809568
	Q4_L3	0.696	0.884	0.105	11.339	0.8827	0.809568
	Q4_L2	0.781	0.887	0.108	10.585	0.8827	0.809568

	Q4_L1	0.817	0.934	0.107	10.868	0.8827	0.809568
	Q5_L4	0.723	0.833			0.8868	0.813572
Technical	Q5_L3	0.725	0.861	0.079	13.188	0.8868	0.813572
risks	Q5_L2	0.789	0.804	0.081	11.782	0.8868	0.813572
	Q5_L1	0.765	0.813	0.089	12.207	0.8868	0.813572
	Q6_L3	0.917	0.863			0.9261	0.898443
Hazard	Q6_L2	0.872	0.871	0.079	13.187	0.9261	0.898443
risks	Q6_L1	0.845	0.713	0.082	10.075	0.9261	0.898443
	Q7_L4	0.613	0.854			0.8557	0.775758
Human	Q7_L3	0.803	0.877	0.066	14.628	0.8557	0.775758
resource	Q7_L2	0.805	0.833	0.075	13.342	0.8557	0.775758
	Q7_L1	0.693	0.886	0.069	15.13	0.8557	0.775758

Table 17 Confirmatory factor analysis result

The comprehensive reliability (CR) of each factor is higher than the reference value of 0.70, and each average variance extraction (AVE) is higher than the reference value of 0.50, which indicates that the items used are sufficiently representative

4.2.3 Correlation analysis

	M± SD	1	2	3	4	5	6	7
Human resource	4.10±0.60	0.776						
Hazard	3.13±1.03	0.399***	0.898					
Technical	3.15±1.08	0.38***	0.269***	0.814				
Operational	3.24±1.06	0.419***	0.291***	0.28***	0.810			

Financial	3.16±1.02	0.47***	0.227***	0.488***	0.23***	0.808		
Policy	3.01±1.06	0.501***	0.444***	0.356***	0.219***	0.477***	0.848	
Market	3.04±0.97	0.393***	0.381***	0.303***	0.247***	0.353***	0.668***	0.765

Table 18 Correlation analysis result

The area that is darkened with diagonal lines indicates the AVE value.

***p < .001

The table above shows the comparison between the AVE and the square correlation of the two structures. These data indicate that AVE is greater than the square correlation. The comparison shows that all variables have acceptable discriminant validity.

4.2.4 Hypothesis testing

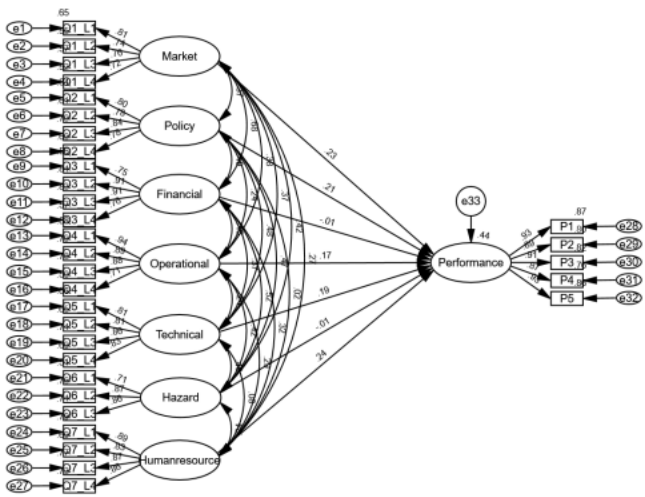

Figure 5 Hypothesis testing model

CMIN	P	CMIN/DF	RMR	GFI	AGFI	NFI	TLI	IFI	CFI
771.305	0	1.769	0.074	0.791	0.747	0.839	0.911	0.923	0.922

Table 19 SEM model fit about Hypothesis testing model

Goodness-of-fit metrics (x2 = 771.305, RMR = 0.074, GFI = 0.791, AGEI = 0.747, NEI = 0.839, IFI = 0.911, TLI = 0.923, and CFI = 0.922) indicate that the model is acceptable.

Index	Meaning	Ideal model quality
x^2 / df	Probability of model correctness	<2
RMR	Root of the mean square residual	<0.1
GFI	Goodness-of-fit index	Close to 1
AGEI	Index to show that the evaluation model does not fit	<0.05
CFI	Comparative fit index	>0.90
NFI	Non-Normed Fit Index	>0.90
TLI	Tucker-Lewis	>0.90
IFI	incremental fit index	>0.90

Table 20 SEM Model fit index

	Hypothesis			Estimate	S.E.	C.R.	P	Accept or not
F1	Market risk	→	Performance	-0.225	0.147	-2.159	0.031*	O
F2	Policy risk	→	Performance	-0.215	0.112	-2.358	0.018*	O
F3	Financial risk	→	Performance	0.006	0.135	0.05	0.96	X
F4	Operational risk	→	Performance	-0.168	0.099	-2.156	0.031*	O
F5	Technical risk	→	Performance	-0.188	0.091	-2.326	0.02*	O
F6	Hazard risk	→	Performance	0.011	0.099	0.126	0.9	X
F7	Human resource risk	→	Performance	-0.243	0.142	-3.375	***	O

Table 21 Direct effects in the entire model.

H1： Market risk has an influence on shipping companies' performance was supported because $\beta = -0.225$, $p < 0.05$ and the influence is negative.

H2： Policy risks has an influence on shipping companies' performance was supported because $\beta = -0.215$, $p < 0.05$ and the influence is negative.

H3： Financial risks has an influence on shipping companies' performance was rejected because $\beta = 0.006$, $p > 0.05$ and the hypothetical results show that financial risk has no significant effect on performance.

H4: Operational risks has an influence on shipping companies' performance was supported because $\beta = 0.168$, $p < 0.05$ and the influence is negative.

H5： Technical risks has an influence on shipping companies' performance was supported because $\beta = -0.188$, $p < 0.05$ and the influence is negative.

H6： Hazard risks has an influence on shipping companies' performance was rejected because $\beta = 0.011$, $p > 0.05$ and the results show that the hazard risk has no significant impact on performance.

H7: Human resource risks has an influence on shipping companies' performance was supported because $\beta = -0.243$, $p < 0.001$ and the influence is neagtive.

5. Discussions and conclusions

5.1 Findings

This study explores the impact of risk perception on shipping companies' performance. The research results show that the risk perception of Market risk, Policy risk, Operational risk, Technical risk, Human resource risk has a negative impact on the performance of shipping companies, while Financial risk and Hazard risk have no negative impact on the performance of shipping companies.

Since most of the participants in the questionnaire survey are employees of state-owned enterprises, and state-owned enterprises are usually able to receive financial assistance from the state, the financial risk exerts less pressure on shipping companies, and shipping company employees have a lower level of risk perception. Although Hazard Risk is a risk that occurs immediately and has a large loss, because of the low probability of occurrence, the associated risk perception has no significant negative impact on the performance of the shipping company.

5.2 Suggestions for Shipping companies

76.8% of the shipping company employees who participated in this questionnaire survey have worked in the company for more than eight years, so their questionnaire survey results are of great reference value and the conclusions of this questionnaire survey can be applied to the management of shipping companies.

The results of the questionnaire survey help shipping companies determine what risks can be bare and what risks need to be handled with caution immediately. At the same time, it also helps shipping companies to determine what risks can be resolved internally, and what risks are best managed externally to avoid panic and instability within shipping companies and affect staff operations.

For the types of risk perception that have a greater impact, appropriate training can be arranged for employees to improve their ability to cope with risks and their

understanding of the risks, thereby alleviating the adverse impact of risk perception on the performance of shipping companies.

5.3 Limitations of this study

The sample size of this questionnaire survey is relatively small, and 71.4% of the participants in the questionnaire survey are from state-owned enterprises or Chinese-funded enterprises. Value, and the reference value for the managers of foreign shipping companies is relatively small, which is also the limitation of this questionnaire survey.In addition, there are many other methods of measuring risk perception besides the methods used in this article. Therefore, the risk perception degree measured by only one method is not the most accurate and cannot fully explain the risk perception. Complexity. Moreover, the questions raised by this article for each type of risk perception are limited, but risk perception will be interfered and affected by many other factors, so the accuracy of the results is not high enough, and these other influencing factors can also become the direction of subsequent research.

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APPENDIX I

Risk Perception Survey of Shipping Enterprises

The results of this questionnaire are only used for graduate thesis completion, not for other purposes. The content of the questionnaire is the risk perception of shipping enterprise staff, mainly from the possibility of different types of risks and the severity of the consequences, please fill in according to the subjective judgment. Note: Extreme factors such as outbreaks are not taken into account.

thank you for filling in.

1. basic information :[Matrix]*

Department :	_____
Position:	_____

2. your years of work [single topic]*

○ less than 3 years ○3-5 years ○5-8 years ○8 years or more

3. please select [single topic] according to your position *

○ Assistant Manager Level ○ Assistant Manager Level and above

4. Please comment on the following aspects of corporate performance (the "Assistant Manager Level and Above" candidate selected in Question 3 of the questionnaire will jump to Question 4)

(The higher the value, the higher the satisfaction)[Matrix Scale Problem]*

	1	2	3	4	5
Sales performance	○	○	○	○	○
Profitability	○	○	○	○	○
Market share	○	○	○	○	○
Prospects for development	○	○	○	○	○
Enterprise internal managemen	○	○	○	○	○

t efficiency					

The following topics will be divided into seven major risk types, which are divided into different risk factors, from the possibility of occurrence, and the severity of the consequences.

The meaning of the score represents the following figure, please refer to the following criteria to complete the questionnaire:

Value standard		
Description value	Probability	Severity of consequence
1	rare	insignificant
2	unlikely	minor
3	possible	moderate
4	likely	major
5	almost certain	catastrophic

5. risk of cyclical volatility in shipping markets

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5

Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

6. cost risk (mainly fuel prices)

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

7. price volatility risk

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

Competition risk 8. industry

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequenc	○	○	○	○	○

es					

9. risks from stricter shipping policies

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

10. Risk of increased tax burden

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5

Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

11. Risks from increasingly stringent environmental policies

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

12. Risks of social instability (e.g. strikes, disturbances, etc.)

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

13. Risk of changes in bank interest rates

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

14. Risk of exchange rate movements

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5

Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

15. Credit risk (e.g. delays in accounts receivable)

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

16. Investment risks (e.g., risks resulting from higher investment costs of the ship itself and greater uncertainty in the transport process)

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk	○	○	○	○	○

consequences					

17. Risks resulting from errors in the transport of ships

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

18. Risks associated with ship-related document errors

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

19. Risk of decision-making in management

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

20. Information security risks

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

21. Risks resulting from lack of technological innovation

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk	○	○	○	○	○

occurrence					
Severity of risk consequences	○	○	○	○	○

22. Risks resulting from lack of advanced equipment and facilities

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

23. Risks from technology leaks

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

24. Risks resulting from lack of process design and planning capacity

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

25. Risk of damage to goods or containers

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

26. Personnel risk on board

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

27. Natural disaster risk

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

28. Risks resulting from changes or loss of key business, management or technical personnel

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○

Severity of risk consequences	○	○	○	○	○

29. Risks resulting from shortage of officers

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

30. Risks associated with inadequate managerial capacity

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○

31. Risks resulting from lack of effectiveness of compensation and benefits mechanisms

*The greater the value, the greater the likelihood that the risk will occur and the greater the severity of the risk consequences [matrix problem]**

	1	2	3	4	5
Possibility of risk occurrence	○	○	○	○	○
Severity of risk consequences	○	○	○	○	○