Research on Risk Evaluation of Chinese Resource-based Enterprises' Overseas M&A

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Abstract— *There is great uncertainty in overseas M&A of resource-based companies. Based on existing literature, expert experience, and World Bank data, this article identifies risk factors for the environment of Chinese resource-based companies' overseas mergers and acquisitions, and establishes the basis of political risk, economic risk, Social risk and resource risk are a risk evaluation index system with first-level indicators. The Delphi method is used to determine the index weight, the evaluation index is classified according to the data released by the World Bank and other recognized classification rules, the variable weight principle is introduced to establish an incentive variable weight evaluation model, and 10 countries are selected for model application. The evaluation results show that Malaysia, Canada, Indonesia, and Australia are low-risk countries and will continue to deepen their investment relationships; the United States, Saudi Arabia, and Kazakhstan are medium-risk countries and can expand their investment cooperation in the future; Zambia, South Africa and Russia are high-risk countries. For risky countries, mergers and acquisitions should be carried out cautiously on the basis of weighing the degree of risk. Finally, relevant suggestions are put forward to help resource-based companies reduce the risk of mergers and acquisitions, and provide decision-making basis for government departments to formulate overseas mergers and acquisitions policies for resource-based companies and implement classified management.*

Keywords— *Resource-based enterprise, Overseas M & A, Risk Assessment.*

I. INTRODUCTION

Resources are the foundation of China's national economic development. In recent years, China's economy is facing a new normal of overcapacity and slowing growth. The demand for minerals, crude oil and other energy sources will continue to decline in the future. This is a challenge for all countries and companies in the world. Challenges also provide opportunities. Overseas M&A is the main method of foreign direct investment by resource-based companies. Data shows that China's mining industry's outbound investment accounted for 11% of the total outbound direct investment flow in the first seven months of 2018, and the amount of overseas M&A transactions increased from US$28.7 billion in 2016. Increased to 36.7 billion U.S. dollars in 2018. In the context of the continuous strengthening of international cooperation, the continuous decline of financing costs, and the wave of mergers and acquisitions set off around the world, if Chinese resource-based companies can identify, quantify and early warning of key risks in a complex environment, the efficiency and success rate of mergers and acquisitions There is bound to be considerable progress. At the same time, with the continuous development of the world economy and the increasing complexity of international relations, the inducing factors of overseas mergers and acquisitions risks are becoming more and more diversified, new risk signals emerge in an endless stream, and the various risks faced by Chinese resource-based enterprises in overseas mergers and acquisitions continue Present. Therefore, scientific evaluation of the macroeconomic risks of overseas mine project mergers and acquisitions is of great significance for alleviating the bottleneck of Chinese resource-based enterprises and smoothly realizing the internationalization of Chinese resource-based enterprises.

II. RESEARCH STATUS

A. Causes of Risk

From a macro perspective, many scholars have conducted relevant studies on the macro risks of resource-based companies' overseas mergers and acquisitions in terms of political risks, economic risks, and social risks. As "energy security" is related to the political and economic sensitivity of the host country, many Scholars analyzed the political risks of overseas mergers and acquisitions of resource-based companies. Cheng Jinhua and Tong Sheng (2006) two scholars found that interest groups, local wars, taxation systems, rents, and third-country intervention would all trigger political risks in overseas mergers and acquisitions; He Jinhua and Tian Zhilong (2018) analyzed and studied Myitsone in Myanmar The risks faced by Chinese companies in the case of hydropower projects and the importance of natural risk assessment. In addition, He Lei (2011) used the HHM modeling method to study and analyze the macro-environmental risks of resource-based overseas mergers and acquisitions, and proposed the importance of natural risk assessment in overseas mergers and acquisitions for resource-based companies. Wu Shu (2013) pointed out in an empirical study on overseas mergers and acquisitions of Chinese resource-based companies that in addition to the macroeconomic environment and political system environment, we must also pay attention to the impact of cultural differences on overseas mergers and acquisitions.

B. Research Method

In terms of M&A risk evaluation, commonly used evaluation methods include analytic hierarchy process, entropy method, fuzzy comprehensive method, BP neural network, variable weight evaluation model, etc. In terms of entropy method and variable weight evaluation model, Haiyan

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Zhai (2018) obtained the characteristics of Zijin Mining's operations from Zijin Mining's development strategy and financial statement analysis, adopted a checklist method, and performed risk identification work based on the risk classification standards studied by previous scholars. , And used the entropy method, the explicit distance and the grey comprehensive evaluation method to evaluate Zijin Mining's overseas mergers and acquisitions, and combined Zijin's own situation to propose countermeasures, which provided reference for Zijin's future operations and selection of overseas mergers and acquisitions. Feasible suggestions. Zhang Yanling (2018) used the variable weight evaluation model to evaluate the 10 major trading countries with more than 95% of China's total iron ore imports, and quantified their resource risks, political risks, economic risks, and other risks. Comprehensive import risk assessment of the major trading countries, and put forward recommendations on the optimization of China's iron ore import structure and the prevention of import risks. In general, there are relatively few studies on the combination of entropy method and variable weight evaluation model to evaluate the macroeconomic risks of resource-based enterprises' overseas mergers and acquisitions, which has certain research value.

Entropy method is a comprehensive evaluation method for multiple objects and multiple indicators, and it is an excellent method for decision-making. According to the principle of information entropy and the characteristics of information transmission, the entropy method reflects the importance of indicators through the degree of confusion of the data itself, and is often used as a technical means of decision analysis in management disciplines. According to the principle of information theory, information is the order level of the measurement system, and entropy is the disorder level of the measurement system. The smaller the index information entropy, the more information it reflects, and the more it contributes to the final evaluation, the greater the weight. high. When the evaluation system has multiple objects and multiple indicators, this method is often used by decision makers to analyze decision-making, and it is currently the most widely used objective weighting method. The function of the variable weight model is to solve the extreme indicators that may exist in the risk evaluation, which may seriously affect the evaluation results.

III. RISK EVALUATION INDEX SYSTEM

A. The Construction Principle of the Index System

When evaluating the risks of overseas mergers and acquisitions of Chinese resource-based enterprises, the selection and measurement of evaluation indicators are crucial to the evaluation results. Therefore, the establishment of a scientific evaluation indicator system is the premise and the key. Resource-based companies' overseas mergers and acquisitions risk classifications are diverse and complex, and involve a wide range of content. When constructing an indicator system and selecting indicators, the evaluation results should be accurate, reasonable, and scientific. This is also a prerequisite for effective countermeasures to avoid

risks. Therefore, the main principles followed in the establishment of the index system in this article are as follows:

a. Scientific principles.

Only when the indicators meet the scientific requirements can we finally get reasonable research results. Therefore, the selected indicators should be clear in concept, clear in connotation, and based on reality. They should not only reflect the connotation of import risk and the degree of risk reasonably, but also the relevant calculation and measurement should conform to academic standards.

b. Systematic principles.

The risk of resource-based companies' overseas mergers and acquisitions is an intricate category, which is closely related to resource conditions, political environment, economic environment, and social environment. When selecting indicators, these factors and the inter-factors must be considered comprehensively. Internal connection, do not miss key indicators as much as possible, and comprehensively measure and measure M&A risks.

c. The principle of simplicity.

Although the risk evaluation of overseas mergers and acquisitions is a huge and complex systemic issue, which is restricted by various factors, it does not mean that the more indicators are selected, the better. Too many indicators or excessive overlap of indicators will not only lead to confusion in the evaluation conclusions , And also make the results inaccurate and unreasonable. Therefore, the index selection should be based on the systematic and comprehensive foundation of in-depth mining of those indexes that can highly represent the research goals.

d. The principle of operability.

The establishment of the indicator system is to serve the evaluation results. Therefore, the establishment should not be too complicated. It should be considered whether it can be realized in reality. The indicators should be quantified as much as possible. The data for measuring the indicators should be true, effective and easy to obtain. The method model has operability.

B. The Identification of Main Risk Factors

This article combines past research results and comprehensive research objectives, mainly based on identifying risk factors, and constructing a set of resource-based enterprise overseas M&A risk evaluations based on the principles of establishing an indicator system, including 4 main risk indicators and 14 secondary sub-risks Factor evaluation index system. As shown in TABLE I.

a. Political stability:

The stability of the national political situation of overseas M&A targets will have a direct impact on resource extraction, production, and trade. The more stable the political situation of the host country, the more favorable it is for the long-term operation of the M&A project, and the lower the political risk of the M&A project.

b. Government corruption:

The lower the corruption of the host country government, the higher the success of overseas M&A transactions. On the contrary, the lower the transparency of M&A transactions, the

greater the uncertainty of the M&A process, which also virtually increases the costs and risks of M&A.

TABLE I.

Primary indicators	Secondary indicators	Sources of data
Political risk I_1	Political Stability I_{11}	China's Overseas Investment Country Risk Rating 2018
	Government Corruption I_{12}	Global Corruption Index Report In 2018
	Bilateral Relations I_{13}	China's Overseas Investment Country Risk Rating 2018
	Environmental Policy I_{14}	China's Overseas Investment Country Risk Rating 2018
	Legal Level I_{15}	China's Overseas Investment Country Risk Rating 2018
Economic risk I_2	Economic Stability I_{21}	World Bank
	Trade Openness I_{22}	China's Overseas Investment Country Risk Rating 2018
	Investment Openness I_{23}	China's Overseas Investment Country Risk Rating 2018
	CPI Growth Rate I_{24}	World Bank
Social risk I_3	Education Level I_{31}	UNESCO
	Social Security I_{32}	China's Overseas Investment Country Risk Rating 2018
	Cultural Distance I_{33}	HOFSTEDE
Natural resource risk I_4	Geographic Climate I_{41}	GLOBAL CLIMATE RISK INDEX
	Resource Status I_{42}	USGS

c. Bilateral relations:

The quality of the bilateral relationship between the target country of overseas M&A and China has a direct impact on the overseas mergers and acquisitions of Chinese resource-based companies. The more stable and friendly the relationship between the target country and China, the more favorable it is for Chinese companies' overseas M&A.

d. Environmental policy:

The development and utilization of resources by resource-based enterprises can provide local employment opportunities and economic benefits, but at the same time, it also destroys the local environment to a certain extent. As people's awareness of environmental protection has increased, a series of environmental problems caused by resource development have gradually been paid attention to. Boycotts of high-polluting companies have occurred from time to time. Therefore, the environmental policies of the host country will also affect resource-based companies overseas. M&A has an impact.

e. Legal level:

The higher the legal level of a host country for cross-border mergers and acquisitions, the more guaranteed the property rights and contracts of Chinese companies; the better the legal environment of the host country, the lower the risk of Chinese companies' mergers and acquisitions in that country.

f. Economic stability:

The host country of overseas mergers and acquisitions can maintain sustained, stable and coordinated economic development for a long time, which means that the country's economic stability is high, and it also shows that the macroeconomic risk of investing in the country is low.

g. Trade openness:

Countries with higher trade openness can attract investment to a greater extent, which will make it easier for foreign multinational companies to enter the country, and it will also make it easier for multinational investors to understand the national conditions of the target country , Trade openness is measured by the ratio of the country's total import and export value to GDP.

h. Investment openness:

The higher the investment openness of the target country for overseas mergers and acquisitions, the higher the level of open economy in that country, the higher the transparency and predictability of foreign investment, and the better the overall investment environment.

i. CPI growth rate:

A host country with a higher CPI is not conducive to the short-term wealth effect of mergers and acquisitions. The economic environment of the host country has a significant influence on the wealth effect of cross-border mergers and acquisitions. Resource-based companies should be more cautious when making decisions. Choosing countries with lower CPI growth rates can reduce merger and acquisition costs and debt costs, and is more conducive to corporate value creation.

j. Educational level:

Educational level is used as a criterion for evaluating the education level of a country's citizens, and at the same time, it also reflects the country's creativity and production level to a certain extent. Therefore, the higher the education level of the host country, the more it can attract foreign investment and mergers and acquisitions [52].

k. Social security:

To invest and develop in other countries, Chinese companies need a safe and sound social environment, and they are bound to face related social security risks. Good social security creates a good investment and development environment. Generally speaking, social risk refers to the risks and property or personal losses that may occur in the host country, such as civil unrest, rioting social security disturbances, strikes, and violent crimes such as robbery, kidnapping, etc., to Chinese enterprises and their employees abroad.

l. Cultural distance:

When Chinese resource-based companies participate in overseas mergers and acquisitions and open up new markets, they need to work hard to adapt to the humanistic environment of the host country. Many cases where Chinese companies failed in overseas mergers and acquisitions or did not meet expectations after mergers and acquisitions are caused by the large cultural distance from the host country. The huge difference between the management model and cultural concept of overseas companies and Chinese companies makes it more difficult to integrate the company's culture. . Therefore, the success rate of cross-border mergers and acquisitions between Chinese companies and countries with similar humanities is higher.

m. Geographical climate:

In the overseas mergers and acquisitions of resource-based companies, if the geographical climate environment where the

acquired company is located is relatively harsh, on the one hand, it will increase the difficulty and cost of resource extraction; on the other hand, it will also affect the progress of the project. Certainly, it will not only extend the payback period but also reduce the income of M&A projects.

n.   Resource status:

Generally speaking, the richer the resource reserves of the target country, the more sufficient supply can be guaranteed; the higher the resource grade, the lower the processing cost and the lower the risk. Therefore, the resource status of a country has the most direct impact on the overseas mergers and acquisitions of resource-based companies.

C. Determine Index Weight

There are three main methods to determine the weight of risk assessment indicators: subjective weighting method, objective weighting method and subjective and objective weighting method. The subjective weighting method mainly includes Delphi method, analytic hierarchy process, etc., mainly through collecting opinions from experts and scholars in related fields, and using the experience of experts and scholars to weight indicators; objective weighting is the weight obtained through statistical induction, data processing and calculation by using actual data, which can avoid human interference, and the results are more objective; The subjective and objective weighting method combines the subjective and objective methods and comprehensively considers the advantages and disadvantages of the two methods to weight the evaluation indexes.

In order to make the evaluation results more scientific and reasonable, this paper uses the subjective and objective weighting method to establish the weight for the risk evaluation index.

a.   Subjective weighting method based on Delphi method

Delphi method was first put forward by O. helm and n. dalk in 1940s. According to the research contents, this method not only collects the views of experts in related fields, but also obtains consistent research conclusions. It is a scientific and practical method.

Because the risk evaluation of overseas M & A of resource-based enterprises is very comprehensive, Delphi method is used to determine the index. Considering the distribution of experts, working years, professional fields and the number of questionnaires, the author investigated 30 managers and experts in relevant professional fields. The author investigated 30 experts and scholars in related fields by questionnaire and interview. 30 questionnaires were issued and 27 questionnaires were collected. Through summarizing and sorting out the relevant information of the questionnaire, the author obtained the following conclusions The subjective weight of each risk assessment index is shown in TABLE II.

b.   Objective weighting method based on entropy weight method

Entropy weight method is a method to determine the objective weight by the variation degree of actual data according to the principle of information entropy. It is suitable for the comprehensive evaluation of multiple indexes and

objects. According to information theory, information is the order level of measurement system, while entropy is the disorder level of measurement system. Generally speaking, the smaller the information entropy of an index is, the greater the variation degree of the index value is, the more information is provided, the greater the role played in the objective evaluation and the greater the weight is. On the contrary, the greater the information entropy of an index is, the smaller the variation degree of the index is, the less information it provides, the smaller the role it plays in the objective evaluation and the smaller the weight.

TABLE II. Subjective weight of risk evaluation index

Primary indicators	weight	Secondary indicators	Local weight	Global weight
Political risk I_1	0.31	Political stability I_{11}	0.25	0.0775
		Degree of government corruption I_{12}	0.15	0.0465
		bilateral relations I_{13}	0.30	0.093
		environmental policy I_{14}	0.15	0.0465
		legal level I_{15}	0.15	0.0465
Economic risk I_2	0.29	Economic stability I_{21}	0.20	0.058
		Trade openness I_{22}	0.25	0.0725
		Investment openness I_{23}	0.25	0.0725
		CPI growth rate I_{24}	0.30	0.087
Social risk I_3	0.17	Education level I_{31}	0.25	0.0425
		Social security I_{32}	0.40	0.068
		Cultural distance I_{33}	0.35	0.0595
Natural resource risk I_4	0.23	Geographic climate I_{41}	0.45	0.1035
		Resource status I_{42}	0.55	0.1265

The calculation steps of entropy weight method are as follows:

Assuming that there are m research objects in the evaluation system, and each research object contains n evaluation indexes, the original evaluation matrix of each index is established according to the index system $R = (r_{ij})_{m \times n}$, Where r_{ij} is the value of the j（$j = 1,2,\cdots,m$）of the i（$i = 1,2,\cdots,n$）evaluation index,

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_1 \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}$$

Standardize the evaluation matrix R to obtain a matrix $R' = (r'_{ij})_{m \times n}$

$$r'_{ij} = \frac{r_{ij} - Min(r_{ij})}{Max(r_{ij}) - Min(r_{ij})} \quad (1)$$

The information entropy of the i-th evaluation index is calculated as:

$$e_i = -(1 / \ln m) \sum_{j=1}^{n} p_{ij} \ln p_{ij} \qquad (2)$$

$$p_{ij} = \gamma'_{ij} / \sum_{j=1}^{m} r'_{ij}$$

p_{ij} represents the proportion of the index value of the j-th research object under the i-th index.

According to the degree of variation of the evaluation index, the coefficient of difference is calculated as:

$$d_i = 1 - e_i$$

Then the information entropy weight of the evaluation index is:

$$w_i = d_i / \sum_{i=1}^{n} d_i = (1 - e_i) / \left(n - \sum_{j=1}^{m} e_i \right) \qquad (3)$$

This article sorts out 364 overseas M&A cases of Chinese resource-based companies from 2008 to 2018, and selects the top 10 host countries in the number of M&A projects as the evaluation objects: Australia, Russia, Kazakhstan, Canada, Malaysia, the United States, South Africa, In Saudi Arabia, Indonesia, and Zambia, each object uses 14 indicators to measure the external risks of Chinese resource-based companies' overseas mergers and acquisitions. Therefore, it is more reasonable and scientific to use the entropy method to determine the indicator weights. The objective weights of the risk evaluation indicators obtained are shown in Table III.

TABLE III. Objective weight of risk evaluation index.

Primary indicators	weight	Secondary indicators	Local weight	Global weight
Political risk I_1	0.159	Political stability I_{11}	0.031	0.005
		Degree of government corruption I_{12}	0.195	0.031
		bilateral relations I_{13}	0.006	0.001
		environmental policy I_{14}	0.535	0.085
		legal level I_{15}	0.233	0.037
Economic risk I_2	0.340	Economic stability I_{21}	0.276	0.094
		Trade openness I_{22}	0.303	0.103
		Investment openness I_{23}	0.168	0.057
		CPI growth rate I_{24}	0.253	0.086
Social risk I_3	0.435	Education level I_{31}	0.057	0.025
		Social security I_{32}	0.669	0.291
		Cultural distance I_{33}	0.274	0.119
Natural resource risk I_4	0.066	Geographic climate I_{41}	0.848	0.056
		Resource status I_{42}	0.152	0.010

c. Final weight

The key of the method is to balance the relative importance of objective weight and subjective weight. Generally speaking, the combination weight can be obtained by quantifying the subjective weighting result and the objective weighting result by introducing the adjustment coefficient,

$$\omega_i = \alpha \cdot \beta_i + (1 - \alpha) \cdot \lambda_i \qquad (4)$$

Where "λ_i" is the subjective weight, "β_i" is the objective weight, "α" is the adjustment coefficient, "ω_i" is the combination weight.

According to the formula (4), take the adjustment coefficient α = 0.5, that is, the importance of subjective weight and objective weight is equal. Combining the subjective and

objective weights of macro risk assessment indicators, the final combination weight of external risk indicators is calculated, as shown in Table IV.

TABLE IV. The final weight of risk evaluation index.

Primary indicators	Weight	Secondary indicators	Local weight	Global weight
Political risk I_1	0.235	Political stability I_{11}	0.174	0.041
		Degree of government corruption I_{12}	0.166	0.039
		bilateral relations I_{13}	0.200	0.047
		environmental policy I_{14}	0.281	0.066
		legal level I_{15}	0.179	0.042
Economic risk I_2	0.314	Economic stability I_{21}	0.242	0.076
		Trade openness I_{22}	0.274	0.086
		Investment openness I_{23}	0.207	0.065
		CPI growth rate I_{24}	0.277	0.087
Social risk I_3	0.303	Education level I_{31}	0.112	0.034
		Social security I_{32}	0.594	0.180
		Cultural distance I_{33}	0.294	0.089
Natural resource risk I_4	0.148	Geographic climate I_{41}	0.541	0.080
		Resource status I_{42}	0.459	0.068

IV. RISK EVALUATION MODEL

A. Constant Power Evaluation Model

The comprehensive evaluation value is V, and its calculation formula is:

$$V = \sum_{i=1}^{n} w_j x_j \qquad （5）$$

"w_j" is the constant weight of the evaluation index; "x_j" is the grading value of the evaluation index; "n" is the number of evaluation indexes.

B. Variable Weight Evaluation Model

In the constant weight evaluation model, the index weight remains unchanged, and it does not take into account that in the risk evaluation of resource-based enterprises' overseas investment environment, extreme risks may have a very bad impact on the results of mergers and acquisitions. In the variable weight evaluation model, the extreme value index changes, and the index weight also changes accordingly, and the "veto" effect of punishment or incentive variable weight model extreme indicators is implemented.

After Wang Peizhuang proposed the theory of weight change in 1985, some scholars further proposed incentive and penalty weight changes based on ecological suitability evaluation. The principle of variable weight is used in many industries and fields, such as bridge exploration, corporate decision-making and risk assessment.

Basic definition of variable weight:

Contingent weight $w_j(x_1, \cdots, x_m)(j = 1,2, \cdots m)$, which refers to m mappings, then $W_j: (0,1)^m \to (0,1) \to w_j(x_1, \cdots, x_m)(j = 1,2, \cdots m)$ satisfies the following three axioms:

1. Normalization: $\sum_{j=1}^{m} w_j(x_1, \cdots, x_m) = 1$,

2. Continuity: $w_j(x_1, \cdots, x_m)$ is continuous with respect to each argument X_k,

3. Punitive: $w_j(x_1, \cdots, x_m)$ decreases monotonically with respect to each argument X_k,

Then w_j is a penalty type variable weight.

If the mapping $B: (0,1)^m \rightarrow R$ is a balanced function, then

Let $B(x_1, \cdots, x_m) = \sum_{j=1}^{m} x_j^{\alpha} \ (\alpha > 0)$, get the variable weight formula:

$$w_j(x_1, \dots, x_m) = \frac{w_j x_j^{\alpha-1}}{\sum_{j=1}^{m} w_j x_j^{\alpha-1}} \qquad (6)$$

The variable weight comprehensive evaluation value V* calculation formula is:

$$V* = \sum_{i=1}^{n} w_i s_i \qquad (7)$$

"w_i" is the variable weight of the evaluation index; "s_i" is the score of the evaluation index; "n" is the number of evaluation indexes.

V. MODEL APPLICATION

This article selects the top 10 host countries for the number of overseas M&A projects of Chinese resource-based companies from 2008 to 2018 as the evaluation objects: Australia, Russia, Kazakhstan, Canada, Malaysia, the United States, South Africa, Saudi Arabia, Indonesia, and Zambia. These countries are the main target countries for overseas mergers and acquisitions of Chinese resource companies, and the number of mergers and acquisitions accounts for more than 60% of all mergers and acquisitions. Therefore, it is reasonable and necessary to conduct risk assessments on these countries.

A. Analysis of Risk Evaluation Grades and Indicators

a. Classification of evaluation levels

According to the evaluation objectives and grading rules, the risks are divided into five grades, namely very poor [1,3], poor [3,5], general [5,6], good [6,8] and very good [8, 10].

b. Classification of evaluation indicators

In order to eliminate the influence of the magnitude and dimension of the evaluation index on the evaluation result, the two secondary indexes are classified and quantified to [1, 10]. The classification rules are shown in Table V.

TABLE V. Risk Evaluation Model Classification Rules

Index	1	2	3	4	5
I_{11}	[0,1.2]	(1.2 , 2.4]	(2.4 , 3.6]	(3.6 , 4.8]	(4.8 , 6]
I_{12}	≤20	(20,30]	(30,40]	(40,50]	(50,60]
I_{13}	≤6.5	(6.5 , 6.7]	(6.7 , 6.9]	(6.9 , 7.1]	(7.1 , 7.3]
I_{14}	[0,1]	(1 , 2]	(2 , 3]	(3 , 4]	(4 , 5]
I_{15}	≤-1.5	(-1.5 , -1.3]	(-1.3 , -1]	(-1 , -0.5]	(-0.5 , 0]
I_{21}	> 4.5	(4,4.5]	(3.5 , 4]	(3 , 3.5]	(2.5 , 3]
I_{22}	≤20	(20,30]	(30,40]	(40,50]	(50,60]
I_{23}	[0,1]	(1 , 2]	(2 , 3]	(3 , 4]	(4 , 5]
I_{24}	> 40%	> 40%	[20%,40%]	[20%,40%]	[10%,20%]
I_{31}	≤4	(4,4.5]	(4.5,5]	(5,5.5]	(5.5,6]
I_{32}	> 9	(8 , 9]	(7 , 8]	(6 , 7]	(5 , 6]
I_{33}	> 4.5	(4,4.5]	(3.5 , 4]	(3 , 3.5]	(2.5 , 3]
I_{41}	> 100	(90,100]	(80,90]	(70,80]	(60,70]
I_{42}	favorable	favorable	Less favorable	Less favorable	general

Index	6	7	8	9	10
I_{11}	(6 , 7.2]	(7.2 , 8.4]	(8.4 , 9.6]	(9.6 , 10.8]	(10.8 , 12]
I_{12}	(60,70]	(70,80]	(80,90]	(90,100]	> 100
I_{13}	(7.3.7.5]	(7.5 , 7.7]	(7.7 , 7.9]	(7.9 , 8.1]	> 8.1
I_{14}	(5 , 6]	(6 , 7]	(7 , 8]	(8 , 9]	(9 , 10]
I_{15}	(0 , 0.5]	(0.5 , 1]	(1 , 1.3]	(1.3 , 1.5]	> 1.5
I_{21}	(2 , 2.5]	(1.5 , 2]	(1 , 1.5]	(0.5 , 1]	[0 , 0.5]
I_{22}	(60,70]	(70,80]	(80,90]	(90,100]	> 100
I_{23}	(5 , 6]	(6 , 7]	(7 , 8]	(8 , 9]	(9 , 10]
I_{24}	[10%,20%]	[6%,10%]	[4%,6%]	[2%,4%]	[0,2%]
I_{31}	(6 , 6.5]	(6.5,7]	(7 , 7.5]	(7.5,8]	> 8
I_{32}	(4 , 5]	(3 , 4]	(2 , 3]	(1 , 2]	[0,1]
I_{33}	(2 , 2.5]	(1.5 , 2]	(1 , 1.5]	(0.5 , 1]	[0 , 0.5]
I_{41}	(50,60]	(40,50]	(30,40]	(20,30]	≤20
I_{42}	general	More favorable	More favorable	favorable	favorable

According to the grading standard of each indicator, the specific grading value of each indicator in 10 countries can be obtained, as shown in Table VI.

TABLE VI. Classification value of risk indicators by country

Country	Political risk I_1					Economic risk I_2				Social risk I_3			Natural resource risk I_4	
	I_{11}	I_{12}	I_{13}	I_{14}	I_{15}	I_{21}	I_{22}	I_{23}	I_{24}	I_{31}	I_{32}	I_{33}	I_{41}	I_{42}
Australia	6	7	2	1	10	10	4	4	2	9	10	3	7	9
Russia	7	2	10	6	4	6	4	5	3	7	1	4	4	10
Kazakhstan	8	3	9	6	4	7	6	2	7	9	3	9	2	6
Canada	7	8	4	1	10	9	6	6	2	6	9	4	9	8
Malaysia	6	4	6	4	7	9	10	5	1	4	9	10	3	7
United States	7	7	2	1	10	10	2	3	2	5	6	3	9	9
South Africa	6	4	5	3	6	9	2	1	5	3	1	7	6	9
Saudi Arabia	6	4	4	6	6	7	5	2	2	6	4	7	3	9
Indonesia	5	5	5	6	4	10	5	1	3	3	10	10	5	5
Zambia	6	4	6	7	4	7	1	2	7	1	5	8	1	7

B. Constant right evaluation

According to the combined weight of each risk indicator and the grading value of each country indicator, the comprehensive evaluation value of the standing weight of Chinese resource-based enterprises' overseas M&A risks is obtained. The calculation results are shown in Table VII.

TABLE VII. Evaluation results of the comprehensive risk standing power of each country.

Country	Evaluation Value	Rank	Evaluation Results
Malaysia	7.343	1	Good
Canada	7.09	2	Good
Australia	6.878	3	Good
Indonesia	6.769	4	Good
United States	5.899	5	general
Saudi Arabia	5.512	6	general
Kazakhstan	5.434	7	general
Russia	5.081	8	general
Zambia	4.873	9	poor
South Africa	4.701	10	poor

C. Variable Weight Evaluation

According to the research of this paper, the value of α is 0.75, and the variable weight of punishment is used to evaluate the comprehensive risk of each country. The variable

weight of comprehensive risk of each country is shown in Table VIII.

TABLE VIIII. Variable Weights of M&A Risks in Various Countries.

Index	Australia	Russia	Kazakhstan	Canada	Malaysia
I11	0.040	0.035	0.036	0.040	0.042
I12	0.037	0.046	0.043	0.036	0.044
I13	0.060	0.037	0.040	0.052	0.048
I14	0.101	0.059	0.062	0.104	0.075
I15	0.036	0.041	0.044	0.037	0.042
I21	0.065	0.068	0.069	0.069	0.071
I22	0.093	0.085	0.081	0.086	0.078
I23	0.070	0.061	0.080	0.065	0.070
I24	0.075	0.070	0.079	0.079	0.079
I31	0.030	0.029	0.029	0.034	0.039
I32	0.155	0.251	0.201	0.163	0.167
I33	0.103	0.088	0.075	0.099	0.081
I41	0.075	0.079	0.099	0.073	0.098
I42	0.060	0.053	0.064	0.063	0.067

Index	United States	South Africa	Saudi Arabia	Indonesia	Zambia
I11	0.037	0.035	0.039	0.042	0.036
I12	0.035	0.037	0.041	0.040	0.038
I13	0.058	0.042	0.050	0.048	0.041
I14	0.097	0.067	0.063	0.065	0.056
I15	0.035	0.036	0.040	0.046	0.041
I21	0.062	0.059	0.070	0.066	0.065
I22	0.106	0.097	0.086	0.089	0.119
I23	0.072	0.087	0.082	0.100	0.075
I24	0.073	0.069	0.075	0.077	0.074
I31	0.033	0.035	0.032	0.040	0.047
I32	0.168	0.241	0.190	0.156	0.166
I33	0.099	0.073	0.082	0.077	0.073
I41	0.068	0.069	0.091	0.083	0.110
I42	0.057	0.053	0.059	0.070	0.058

Using the variable weight in table 4.4, the comprehensive risk variable weight evaluation results of various countries are calculated, and compared with the results of constant weight evaluation, the results are shown in Table IX.

TABLE IX. Comparison of evaluation results of constant weight and variable weight.

Country	Evaluation value		Rank		Degree of risk	
	constant weight	variable weight	constant weight	variable weight	constant weight	variable weight
Malaysia	7.343	7.091	1	1	Good	Good
Canada	7.090	6.718	2	2	Good	Good
Indonesia	6.769	6.345	4	3	Good	Good
Australia	6.878	6.323	3	4	Good	Good
United States	5.899	5.372	5	5	general	general
Saudi Arabia	5.512	5.305	6	6	general	general
Kazakhstan	5.434	5.115	7	7	general	general
Russia	5.081	4.553	8	8	general	Poor
Zambia	4.873	4.391	9	9	Poor	Poor
South Africa	4.701	4.095	10	10	Poor	Poor

After punitive change of weight, Russia's overall risk level has changed from general to poorer under the influence of extreme indicators.

The results of the variable weight evaluation of the comprehensive risks of various countries show that the countries whose evaluation results are "good" are Malaysia, Canada, Indonesia and Australia. Among them, Canada and Australia have large reserves of resources, a large proportion of exports, relatively stable economic growth, better education and social security, so their economic risk, social risk and resource risk evaluation results are all good. Although their environmental protection policies and bilateral relations with China are not good for overseas mergers and acquisitions, a comprehensive analysis of Canada and Australia as the target countries of resource-based companies' overseas mergers and acquisitions has a relatively low level of risk. Although both Malaysia and Indonesia contain some extreme indicators, other indicators are less risky. The economic stability and trade openness of the two countries are relatively high. At the same time, the bilateral relations and cultural distance with China are better, so they are also resource-based companies' overseas mergers and acquisitions. Good choice for the target country.

Countries with "general" comprehensive risks are the United States, Saudi Arabia, and Kazakhstan. Although the United States has relatively high reserves of resources and a stable economy, the political risk of overseas mergers and acquisitions in the United States is relatively high, so the evaluation result is general.

The countries with a "poor" overall risk result are Russia, Zambia and South Africa. Although Russia and South Africa are rich in resources and high-quality, they have relatively high levels of corruption and their social risk performance is "poor." Zambia's trade openness, investment openness, and education level are low. At the same time, its geographic climate is also vulnerable to extreme weather, its resource reserves are general, and the overall risk result is "poor".

VI. CONCLUSION AND SUGGESTION

A. Conclusion

This paper analyzes and identifies the risk factors of overseas M & A of Chinese resource-based enterprises, and constructs a set of evaluation index system with the target layer as the risk of overseas M & A of China's resource-based enterprises, four first-class risks in the standard level and 14 second-class risks in the factor level. After the application of the index system, the evaluation results are in good agreement with the actual situation, which provides a set of more scientific and reasonable evaluation criteria for the risk evaluation of overseas M & A of Chinese resource-based enterprises. From the evaluation process and conclusion: in the construction of the risk evaluation index system of overseas M & A of Chinese resource-based enterprises, the identification of risk factors is the key, and the quantification and classification of evaluation indicators are the basis. The classification should be conducted according to the recognized grading rules and evaluation objectives, and quantitative indicators should be used as far as possible to make the evaluation results more objective.

Delphi method is used to determine the weight of indicators, and the experience of experts is absorbed as much as possible. In the first level of risk indicators, economic risk and social risk accounted for a large proportion of 31.4% and 30.3% respectively. Therefore, in the process of overseas M & A, we should pay attention to these two aspects of risk evaluation and control strategy formulation; in the secondary index risk, social security, trade openness and cultural distance

three indicators account for the largest overall weight, which are the risk indicators that resource-based enterprises should focus on in their overseas M & a country selection. This paper introduces the incentive variable weight in the principle of variable weight, establishes the evaluation model of constant weight and variable weight, effectively solves the impact of extreme indicators on the evaluation results, and highlights the veto effect of extreme indicators.

The constant weight model and the variable weight model were compared. The results of variable weight evaluation show that the countries with low risk are Malaysia, Canada, Indonesia and Australia; the countries with general risk are the United States, Saudi Arabia and Kazakhstan; the countries with higher risk are Zambia, South Africa and Russia, and the evaluation results are more scientific and reasonable.

B. Suggest

a. Deepen investment relations with countries with lower risks

According to the evaluation of the external risks of Chinese resource-based companies' overseas mergers and acquisitions, countries with lower risks are Malaysia, Canada, Indonesia and Australia. Malaysia and Indonesia have relatively low risks of overseas mergers and acquisitions, but they must pay attention to avoiding extreme risks that may arise during overseas mergers and acquisitions. The two indicators of trade openness and geo-climate performance of the two countries are relatively poor. Before M&A transactions, it is necessary to conduct research and make adjustments according to their domestic economic environment and the geographic environment of the project.

The main reason for the low level of risk of Chinese resource-based companies' overseas mergers and acquisitions in Australia and Canada is that these two countries not only have abundant resources to meet China's resource needs; at the same time, the two countries have relatively stable domestic politics, investment openness and economic development. The stability is good, and the country's credit is high, so its economic risk, social risk and resource risk evaluation results are all good. Although Canada and Australia are the countries with the largest number of overseas M&A projects by Chinese resource-based companies in recent years, the bilateral relations between Canada, Australia and China have declined year by year in recent years. In the future, resources will become increasingly tight and the international environment will become increasingly complex. To prevent them from imposing stricter sanctions on Chinese resource-based enterprises, China should optimize its investment structure while using the resources of these two countries, and pay attention to the risk of excessive investment in important resource projects.

b. Expand investment cooperation with countries with ordinary risks

Countries with "general" risk levels are the United States, Saudi Arabia, and Kazakhstan. Although the United States is rich in resources and the climatic conditions are suitable for resource extraction, Chinese resource-based companies should also pay attention to the political risk factors of their

transactions when conducting mergers and acquisitions in the United States. They need to strengthen their prevention against political review and cultural integration risks. The risk indicators of Saudi Arabia and Kazakhstan are at general levels, and the scale of mergers and acquisitions can be appropriately expanded for their domestic high-quality resource-based enterprises.

c. Weigh the investment cooperation of countries with higher risks

The analysis results show that the countries with higher risk of overseas M&A of Chinese resource-based companies are Russia, Zambia and South Africa. Although Russia and South Africa are rich and high-quality resources, China has also carried out many mergers and acquisitions projects in these countries. At the same time, Russia and South Africa have high levels of corruption and poor social security. Therefore, Chinese resource-based companies conduct overseas mergers and acquisitions in these two countries. Always do political and social environmental research. There are many extreme indicators in Zambia's risk indicator system, and overseas mergers and acquisitions by resource-based companies in this country are not conducive to ensuring the profits and safety of Chinese companies. However, it is not impossible to conduct overseas mergers and acquisitions in Zambia. Related companies should accurately identify risk factors, reasonably evaluate merger risks, and selectively invest and cooperate in accordance with national policies and the company's own conditions.

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