



Evaluating the investment benefit of multinational enterprises' international projects based on risk adjustment: Evidence from China

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This study examines the international risks faced by multinational enterprises to understand their impact on the evaluation of investment projects. Moreover, it establishes a 'three-dimensional' theoretical framework of risk identification to analyse the composition of international risk indicators of multinational enterprises based on the theory of an enterprise's international development path and stages as well as risk management. Using entropy weights and net present value (NPV), this study employs survey data to empirically analyse the international risk entropy evaluation model and then test the NPV evaluation model based on risk adjustment. A significant difference is found between the evaluation process of multinationals' international investment benefits with and without considering the risk factors. This study concludes that the results of the risk-adjusted NPV model are more scientific and effective than that of the traditional NPV model as the basis of decision-making. It contributes to the theoretical literature by proposing the international risk entropy model and constructing the risk-adjusted NPV model to test the impact of international risk factors on the evaluation of international investment projects. This provides a reference to multinationals in their choice of investment projects as well as to researchers in this field.

Keywords: risk identification, interdisciplinary science, risk assessment, entropy, multinational project, project-based, evaluation

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INTRODUCTION

Countries must promote domestic openness in addition to openness to the outside world to adapt to this increasing economic globalisation (Zheng, 2013; Sjøberg, 2015). As global economic integration intensifies, an increasing number of Chinese enterprises are becoming part of the global market competition. They have to effectively integrate the 'bring in' and 'go global' strategies and facilitate the orderly and free flow of international and domestic factors of production, efficient allocation of resources and in-depth market integration (Zheng, 2013). They should also foster new advantages in participating in and leading international economic cooperation and competition at a faster pace to promote reform through opening up, constantly improving their own competitiveness in the international market (Fang, & Yu, 2016). However, multinational companies are inevitably impacted by the international environment in this process of international development, which is a complex and lengthy process where companies find themselves at different levels of development at different stages (Gabrielsson, Gabrielsson, & Dimitratos, 2014).

Sometimes, these impacts may even threaten the normal operations of the enterprises, so the decision to choose an investment project becomes critical for multinational companies. They are often faced with a series of issues that they have to resolve, such as the decision to choose a good investment project and the criteria to be used for evaluating projects. They may have to consider environmental uncertainty (or risk) and include the effect of risk factors in their evaluation. Existing studies show that investment projects are judged on basis of the risk profile and earnings of the investment (Rubino, & Cuomo, 2015; Sjøberg, 2015). With the intensification of global economic integration and the rapid growth of multinational companies, the problem of international risk highlights an important aspect of the growth of the global economy. The question posed is regarding identifying and assessing international risks and the impact of these risk factors on the choice of investment projects. In recent years, strategic decision-making and the daily management of a multinational enterprise's international development has become the focus of the management and business community (Asif, Searcy, Santos, & Kensah, 2013).

This study employs the related theory to identify and assess the business risk associated with a company's internationalisation and then evaluates the benefits of a company's international projects. First, this study establishes a 'three-dimensional' theoretical framework of multinational enterprises' international risk identification to identify the business risks and understand the risks faced by these multinational companies during international development based on the theory of international path and international development stage as well as risk management. Second, it employs the entropy weight method to establish an entropy evaluation model of international risks to assess the enterprise's risk during international development. Finally, this study employs the net present value (NPV) method to establish the

State of the literature

- Previous studies have focused on the partial research about one or several risks rather than the systemic research about enterprise's international risk system.
- Entropy weight method is a quantitative method of enterprise's international risk assessment to make up for the inadequacy existing in the quantitative research.
- The NPV evaluation model based on risk-adjusted can provide accurate results to ensure the scientific and effectiveness of the evaluation.

Contribution of this paper to the literature

- Establishes a 'three-dimensional' theoretical framework of multinational enterprises' international risk identification to identify and understand the risks.
- Builds up an entropy evaluation model of international risks based on the entropy weight method to assess the enterprise's risk during international development.
- Employs the NPV method to establish the model of investment benefits on an enterprise's international projects based on risk adjustment, the traditional NPV evaluation model to be further amended and improved.

investment benefits of an enterprise's internationalisation projects based on risk adjustment. Based on the results of these risk assessments, this study empirically analyses the investment benefits of a multinational enterprise's international project. This study hopes to provide a reference point for Chinese multinational enterprises in selecting their international investment projects besides providing useful insights for researchers in this field.

INTERNATIONAL RISK IDENTIFICATION

Enterprises should be able to identify risks so that they can take appropriate measures to control risk aversion (Kim & Hwang, 1992). With regard to managers' perceptions, Miller (1996) divided the uncertainty of an enterprise's internationalisation into three aspects—general environmental uncertainty, industry-wide uncertainty and uncertainty of the enterprise—and then integrated these uncertainties into the risk management framework. Brouthers, Brouthers & Werner (2002) analysed and verified Miller's integrated risk management model. He believed that with the different levels of enterprises entering the international market, they will face different risks. Furthermore, he analysed the environmental uncertainty through the classification of risk. Kulkarni (2001) indicated that owing to the continuous refinement of risk categories as well as different individual experiences, the characteristics of internationalisation and the change of enterprise strategy, managers may have different risk perceptions of the key risks affecting the enterprise's international operations. In addition, some scholars have also raised concerns about the specific risks that may impact an enterprise's production and business activities, including political, economic and foreign exchange risks (Jinjarak, 2007; Schmidt, & Broll, 2008).

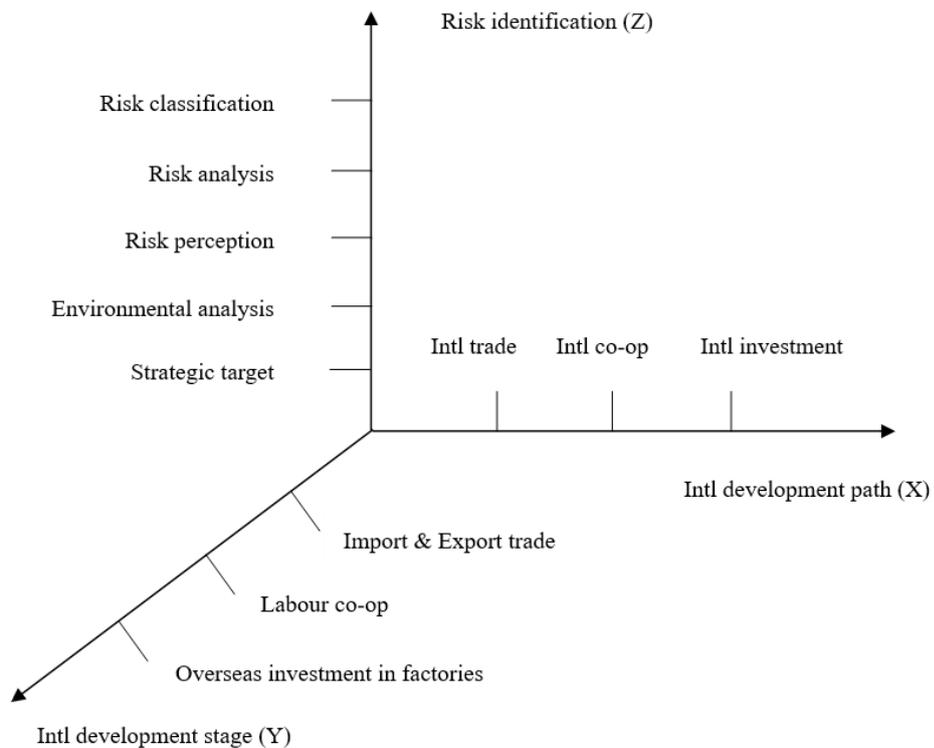


Figure 1: The 'three-dimensional' theoretical framework of multinational enterprise's international risk identification

Chinese scholars have analysed and discussed risk identification from different perspectives. Haines (2015) considered risk identification as a process and noted that the dynamic nature of risk identification itself is the entire process of risk identification. Hui, & Juan, (2007) observed the sources of risks and the possibility of occurrence of risks and systematically analysed the investment risk of an enterprise, delineating five aspects of risks. Some studies have categorised an enterprise's internationalisation risks into four types, namely, government risk, market risk, technical risk and management risk (Hui, & Juan, 2007).

David, Pan, & Au (1997) focused on how companies entered overseas markets by examining factors influencing their choice of the entry route, such as the size of the market, the pattern of competition, production costs and economic policy. Meanwhile, Pan & David (2000) examined this issue from the perspective of the home country's cultural characteristics. They isolated three types of entry routes— trade, contracts and investment. Based on how much enterprises invest in the various entry routes and the complexity of the external environment, Ray (2010) proposed four main

Table 1. The composition of international risk indicators of multinational enterprises

	First-class indicators	Second-class indicators
The composition of international risk indicators of multinational enterprises	Political risks	War, system, state intervention, nationalisation, government defaults, deferred payment
	Policy risks	Environmental policies, laws, trade barriers, foreign exchange, taxes, price controls, fiscal and monetary policy
	Economic risks	Exchange rates, interest rates, inflation, fluctuations in the economic cycle
	Cultural risks	Values, communication, ethnic differences
	Management risks	Decision making, organisational management, social responsibility, project management, human resource management
	Financial risks	Financing, investment, financial operations, profit distribution
	Technical risks	Exploration, mining technology, production safety
	Market risks	Market structure, market competition, market price

entry routes—export, license/franchise, joint venture and individual proprietorship. From the above literature review, we can see that enterprises have to face different risks in their international operations defined by multiple development paths and development stages, and there are different perspectives on identifying the risks in this process. This study analyses the risk identification of an enterprise's international development process from the two dimensions of international path and international development stage, selecting three paths and three stages for analysis. In addition, it establishes a 'three-dimensional' theoretical framework of multinational enterprises' international risk identification based on the theory of enterprise's international development paths and stages as well as risk management as noted in Figure 1.

As noted in Figure 1, we can see:

(1) The X-axis represents three international development paths — international trade, international co-operation and international investment.

(2) The Y-axis has three international development stages — import & export trade, labour co-operative and overseas investment in factories.

(3) The Z-axis shows five factors — strategic target, environmental analysis, risk perception, risk analysis and risk classification.

Using this 'three-dimensional' theoretical framework of a multinational enterprise's international risk identification and combining it with the actual situation of multinational enterprise's international development, this study offers an in-depth analysis of the different risks faced by enterprises during the different stages and paths of their international development through field research, expert discussions, questionnaires and other methods. By analysing the external environment and combining that with the strategic objective of a company's overseas expansion, we classify the risks faced at every stage of the company's operations. Based on the perception of risk faced in the process of analysis of enterprise's international risk and on the principles of comprehensiveness and independence, we isolate 35 risk indicators grouped under eight risk classifications as noted in Table 1.

INTERNATIONAL RISK ASSESSMENT

Although there are many studies on risk assessment, each adopts a different approach to the task. We have chosen the entropy theory to evaluate an enterprise's international risk. The next step is to briefly introduce the entropy theory and then analyse the existing theoretical research. The term entropy was coined by the German physicist Clausius (1868). Einstein (1901) termed the law of entropy 'the highest law of all laws in nature'. Over a century, entropy has emerged as the best measure of 'uncertainty'. American scholar Shannon (1948) introduced entropy into information theory and proposed the concept of the 'entropy of information'. According to the basic principle of information theory, information is a measure of the degree of system order while entropy is a measure of the degree of system disorder. Thus, entropy of information can measure the amount of valid information provided by a set of data. Its application in the field of enterprise management created the concept of 'entropy of management', unifying the natural and social sciences and moving from the qualitative to the quantitative that may be called the comprehensive integrated discussion system (Amin, Jeppsson, Haglund, & Strömdahl, 2012; Levada, 2014; Haglund, Jeppsson, & Andersson, 2014; Haglund, Andersson, & Elmgren, 2015; Chang, & Wang, 2016).

Risk is, thus, loss caused by uncertainty. Many scholars introduced the concept of entropy into studies of risk. Zhang and Wang (2010) detailed a model of the entropy evaluation of the management of Chinese university presses, providing an effective method of analysis of the assessment of management risk. Wu and Zhang (2011) proposed the concept of risk entropy. They analysed the basic framework of security systems and components to find the corresponding evaluation model and utilised risk entropy to examine the effectiveness of security systems and risks. Xuebing (2010) applies the entropy theory to public management to study disorder, poor information and poor operating conditions in public management that results in low effectiveness, high management costs, derailing of management objectives, interpersonal friction and conflict and decline across an enterprise. They use information entropy theory to examine correlations globally, which they then use to show the complex correlations between different nations' country risk to propose a 'multi-phase & multi-elements' frame that allows an analysis of the correlations before and after the financial crisis in 2007 for political/economic/financial risks. Thus, few studies have used entropy theory to assess a company's international risk.

The assessment matrix

To evaluate a risk problem that involves multiple risk indicators, we must first build a risk index matrix. For example, for a risk assessment programme with m evaluation index and n evaluation experts (called (m, n) assessment), set a_{ij} is the j th expert assignment on i th indicators, including n experts' assignment on m indicators, to form the evaluation matrix $A = (a_{ij})_{m \times n}$, $(i = 1, 2, \dots, m; j = 1, 2, \dots, n)$. Through standardisation, it gets a new matrix $A' = (a'_{ij})_{m \times n}$, $0 \leq a'_{ij} \leq 1$.

Calculation of entropy values and entropy weights

For the evaluation indicator, the entropy value is calculated as

$$H_i = -K \left(\sum_{j=1}^n P_{ij} \ln P_{ij} \right) \quad (i = 1, 2, \dots, m; j = 1, 2, \dots, n) \quad (3.1)$$

For the evaluation indicator, the entropy weights are calculated as

$$w_i = \frac{1 - H_i + \frac{1}{10} \sum_{i=1}^m (1 - H_i)}{\sum_{i=1}^m \left\{ 1 - H_i + \frac{1}{10} \sum_{i=1}^m (1 - H_i) \right\}} = \frac{1 - H_i + \frac{1}{10} \sum_{i=1}^m (1 - H_i)}{m - \sum_{i=1}^m \left\{ H_i + \frac{1}{10} \sum_{i=1}^m (1 - H_i) \right\}} \quad (3.2)$$

Entropy weights indicate the role of indicators in the evaluation. The equation shows an inverse relation between entropy weight and entropy value. The larger the indicator's entropy value, the smaller its entropy weight becomes and the lower is its importance. In contrast, the smaller the indicator's entropy value, the larger its entropy weight becomes and the higher is its importance.

Calculation of risk value

If λ_i is the i th expert weight of the evaluation indicator, then the risk value of the first-level risk indicators is

$$R_k = \sum_{i=1}^m \lambda_i H_i = \sum_{i=1}^m w_i H_i \quad (3.3)$$

The risk vector of the first-level indicator is obtained as $R' = (R_1, R_2, \dots, R_k, \dots, R_b)$. Correspondingly, the first-level indicator's entropy weight vector is $w = (w'_1, w'_2, \dots, w'_k, \dots, w'_b)$,

The calculation equation for total risk value is

$$R_{\text{总}} = \sum_{k=1}^b \lambda_k R_k = \sum_{k=1}^b w'_k R_k \quad (3.4)$$

INTERNATIONAL PROJECT'S BENEFIT EVALUATION

The NPV method is a relatively simple scientific method for evaluating the investment projects. This method calculates the NPV of the total present value of net cash benefit and net cash investment and then evaluates the investment project according to the NPV. If the NPV is positive, then the investment project is acceptable; if the NPV is negative, then the investment project is unacceptable. The greater the

NPV, the better the investment plan becomes. To a certain extent, the NPV method is significantly adjusted and improved in the application process (Brown, & Goetzmann 1995).

Traditional NPV evaluation model

The traditional NPV evaluation model is

$$NPV(i) = \sum_{t=0}^n (CI - CO)_t (1+i)^{-t} \quad (4.1)$$

where $NPV(i)$ is the project's NPV, CI is cash inflow, CO is cash outflow, $(CI - CO)_t$ is the net cash flow of the t th year and i is the discount rate.

NPV evaluation model based on risk adjustment

Looking at existing studies, we find that the NPV calculation in the traditional evaluation model does not consider project risks arising from factors that are likely to play a role in future. However, some scholars have suggested improvements. They point to the limitations of the current investment project's financial evaluation to propose a blind number analysis method for the financial evaluation of an investment project. Tow(2001) suggests using the reliability design theory to reckon with the risk factors associated with the investment process. These scholars look at a range of NPV calculations, which is more appropriate.

In this study, given the risks associated with Chinese multinational enterprise's international operations, the NPV can be calculated as

$$NPV(i) = \sum_{t=0}^n (CI - CO)_t (1+i+r)^{-t} \quad (4.2)$$

In this equation, r denotes the risk coefficient of the enterprise's international investment.

Consequently, the risk factors of different international projects can be incorporated into the investment project's evaluation by the introduction of an investment risk coefficient in the traditional NPV evaluation model. The impact of international investment risk on the investment rate of return can be derived from the value of r . The size of the r value reflects the influence of investment risks on project management.

EMPIRICAL ANALYSIS

Based on the foregoing analysis of the composition of risk indicators of Chinese multinational enterprise's international development, we designed the questionnaire, 'An analysis of the international risk assessment of Chinese multinational enterprises in Australian investment projects'. The survey targets were international management staff and scientific experts from large multinational enterprises, industry associations and research institutions in China. Of the 182 questionnaires distributed, 158 received a response; the recovery rate was 86.8%, which met the requirements of the statistical sample. Based on the risk acceptance criteria such as 'as low as reasonably practicable' and relevant literature, we set the risk levels and decision-making criteria of the multinational enterprise's international development in Table 2.

Table 2. Risk levels and decision-making criteria of multinational enterprise’s international development

Risk level	Risk value	Standard value	Rank of risk	Content
1	1~4	0~0.16	Very Low	Risk does not impact the company's international development, and the company's development goals can be fully realised.
2	5~8	1.16~0.32	Low	Risk does not significantly impact the company's international development, and the company's development goals can still be realised.
3	9~12	0.32~0.48	Middle	Risk impacts the company's international development, but the company's development goals can be partially realised.
4	13~16	0.48~0.64	High	Risk significantly impacts the company's international development, and the company's development goals can be seriously undermined.
5	16~25	0.64~1.00	Very High	Risk will fail the company's international development and may even threaten the company's survival.

According to the survey results and the composition of the risk indicator system of the Chinese multinational enterprise’s internationalisation, the assessment matrix of the eight first-level indicators is

$$A_x = (a_{ij})_{m \times n}$$

In the equation, $x=1,2,\dots,8$; A_1, A_2, \dots, A_8 represent the first-level risk indicators, namely political risk, policy risk, economic risk, cultural risk, management risk, financial risk, technology risk and market risk.

Calculation of value of risk

Political risk

A standardised matrix can be derived from $A_x' = (a_{ij}')_{m \times n}$ as

$$A_1' = \begin{pmatrix} 1 & 0 & L & 0.75 & 0.75 \\ 1 & 0.75 & & 0.75 & 0.75 \\ 0.75 & 0.75 & O & 0.75 & 0.75 \\ 0.666667 & 0.666667 & & 0.75 & 0.5 \\ 0 & 0.75 & & 0.75 & 0.75 \\ 1 & 0 & L & 0.5 & 0.5 \end{pmatrix}_{6 \times 5}$$

From the above, the probability matrix, entropy values and entropy weights can be derived. Finally, value of risk $R_1=0.674661$ can be derived.

Similarly, the entropy values (H), entropy weights (W) and value of risk (R) of policy risk, economic risk, cultural risk, management risk, financial risk, technology risk and market risk can be derived.

Calculation of total value of risk

The risk vector R' , entropy weight vector w' , and total value of risk R_{total} can be derived from the above equation as

$$R'=(R_1,R_2,R_3,R_4,R_5,R_6,R_7,R_8)=(0.674661,0.659389,0.657872,0.530210,$$

$$0.622219,0.634034,0.590125,0.539973)$$

$$w'=(0.105236,0.110176,0.110666,0.151964,0.122199,0.118377,0.132580,0.148803)$$

$$R_{total}=0.606700$$

From the result, we find that the total value of risk $R_{total} = 0.606700$ is between 0.48 and 0.64, indicating that the international development goals can be seriously undermined once the risk occurs.

Calculation of project investment benefit

Investment risk coefficient

As the value of the investment risk coefficient (r) reflects the degree to which the enterprise is affected by risks in project investment, the greater the risk of the investment projects, the lower the rate of return of the project will be. The rate of return is mainly determined by the size of the risk and the price of the risk, and the price of the risk is determined by the degree of the investors' preference in the risk market. Based on the foregoing analysis, the investment risk coefficient r can be derived from equation (5.1) by the value of risk of the investment project.

$$r = R_{total} / 100 \tag{5.1}$$

where r is the investment risk coefficient and R_{total} is the value of risk of the investment project.

Evaluation of the investment benefit of enterprise's international project

The NPV of cash flow is calculated as $NPV(i)=\sum_{t=0}^n (CI - CO)_t(1+i+r)^{-t}$ based on the project's cash flow in the calculation period to determine the choice of project or programme as well as to evaluate the investment benefit of international projects. In the financial evaluation of the project, $i=i_c$, i_c is the financial benchmark rate of return, usually determined according to the industry norm or as decided by the investors. When $NPV(i_c) > 0$, it means that the project's rate of return is greater than i_c , implying excess returns on the project; thus, the project is financially feasible. However, when $NPV(i_c) < 0$, it means that even the financial benchmark rate of return cannot be realised from the project, not to mention the excess returns; thus, the project is financially unfeasible.

Table 3. Cumulative net cash flow and net present value

Order of Year	1	2	3	4	5	6	7	8	9	10	11	12
net cash flow	-9100	-1000	500	2500	2500	2500	2500	2500	2500	2500	2500	3500
cumulative net cash flow	-9100	-10100	-9600	-7100	-4600	-2100	400	2900	5400	7900	10400	13900
discount factor	0.90909	0.82645	0.75131	0.68301	0.62092	0.56447	0.51316	0.46651	0.42410	0.38554	0.35048	0.31862
NPV_t	-8270	-830	380	1710	1550	1410	1280	1170	1060	930	880	1120
$\sum_{t=1}^n NPV_t$	-8270	-9100	-8720	-7010	-5460	-4050	-2770	-1600	-540	390	1270	2390

An example

A Chinese enterprise looking to invest in a construction project in Australia needs to perform a feasibility analysis. The net cash flow in the calculation period is noted in Table 3. Assuming that the project's financial benchmark rate of return $i_c = 10\%$, we analyse if the investment is economically feasible. (Unit: RMB ten thousand)

Based on the data in Table 4 and using the traditional NPV equation, we find that the $NPV(10\%) = 2412.29$ (ten thousand yuan) > 0 , which shows that 24,122,900 excess returns can be obtained from this investment project in addition to the financial benchmark rate of return. The NPV varies when the discount rate is changed, and the nonlinear function can be obtained as $NPV(i) = f(i)$. In this case, the values of the discount rate are as noted in Table 4, and the contrast between the NPV and the discount rate is shown as the 'traditional NPV' line in Figure 2.

From the 'traditional NPV' line in Figure 2, 0~14.22% of the of the project is positive, which means that the present value of the project benefit is greater than that of the project consumption. When a greater rate of return (above 14.22%) is sought, the NPV of the project becomes negative, and the present value of the project consumption is greater than that of the project benefit, rendering the project unfeasible.

Similarly, as $R_{total} = 0.6067$, the investment risk coefficient $r = 0.006067$ can be derived from equation (5.1) and $NPV(10\%) = 2011.28$ (ten thousand yuan) > 0 can be derived from equation (4.2).

The result reveals that the investment project can bring in 20,112,800 yuan of excess returns in addition to the financial benchmark rate of return for the industry. In this case, the values of the discount rate are as noted in Table 5, and the contrast between NPV and the discount rate is shown as the 'adjusted NPV' line in Figure 3. From the 'adjusted NPV' line in Figure 3, 0~13.69% of the of the project is positive, which means that the present value of the project benefit is greater than that of the project consumption. When a greater rate of return (above 13.69%) is sought, the NPV of the project becomes negative, and the present value of the project consumption is greater than that of the project benefit, rendering the project unfeasible.

Table 4. The discount rate

Discount Rate i , %	0	2	4	6	8	10	12	14	14.22	16	18
NPV (i), ten thousand yuan	14000	10680	7980	5760	3930	2410	1150	105	0	-773	-1510

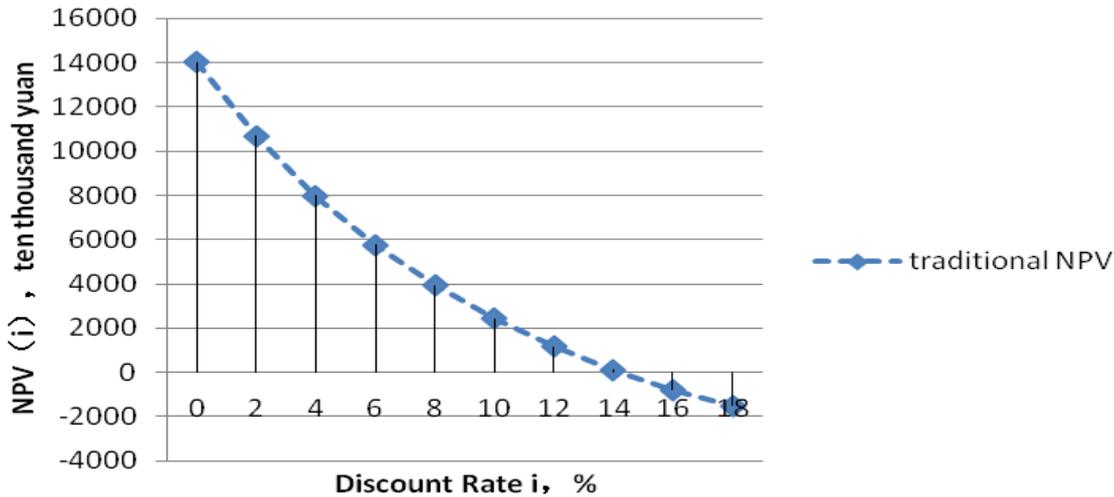


Figure 2. The NPV discount rate

Table 5. The discount rate

Discount Rate i , %	0	2	4	6	8	10	12	13.69	14	16	18
NPV (i), ten thousand yuan	14000	9733	7206	5132	3424	2011	839	0	-138	-953	-1635

From Figures 2 and 3, we derive the contrast between the 'traditional NPV' discount rate and 'adjusted NPV' discount rate as shown by the NPV line in Figure 4.

The results reveal that for the same investment project, the highest rate of return calculated by the traditional NPV equation is 14.22%, and the highest rate of return by the adjusted NPV equation is 0.53%. There is a difference of 0.53% between the two methods of calculation, indicating the possible loss that the investment project might bring to the enterprise. From the equation above, we see that different risk values produce different degrees of impact on the discount rate of the NPV. The higher the investment risk coefficient, the lower the investment rate of return is. In contrast, the lower the investment risk coefficient, the higher the investment rate of return is. From the above analysis, we can see that the results will be the basis of decision-making in the choice of enterprises' international projects.

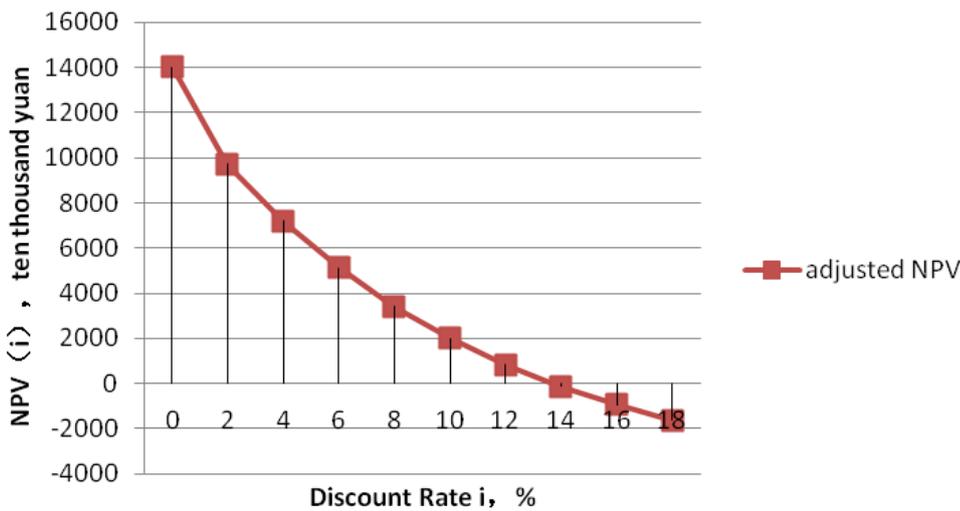


Figure 3. The NPV discount rate

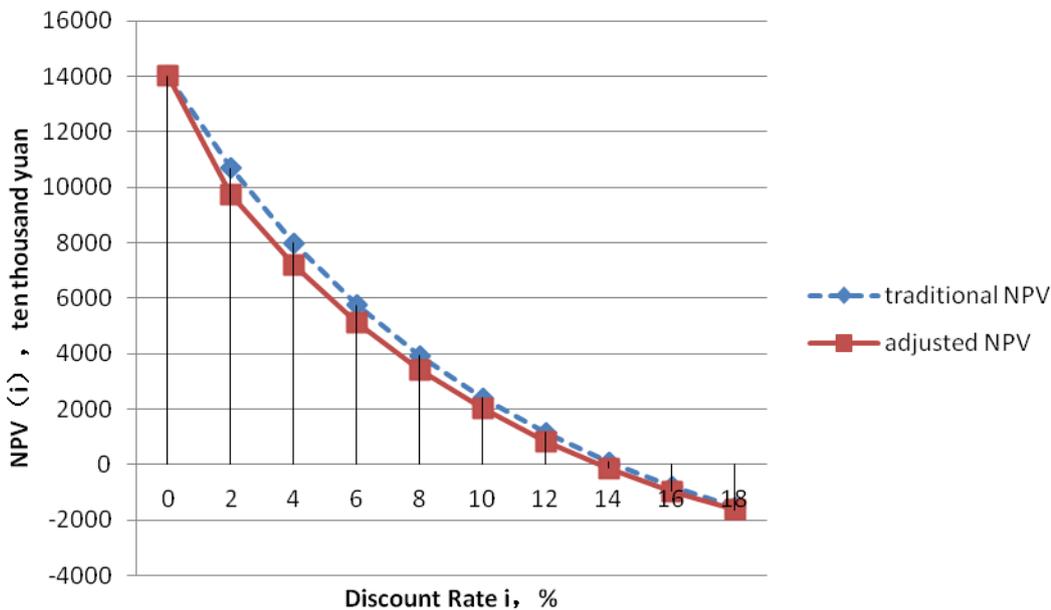


Figure 4. The NPV discount rates contrasted

CONCLUSION

In the study, we can see that, in the process of international development, the most important thing for multinational companies is to choose international investment projects. Therefore, multinational companies must evaluate these projects before making the investment decision. Owing to rapidly changing global situation, enterprises must essentially consider international risk in the choice of investment projects in addition to the project’s profitability, prospects for growth in the industry and other factors. The evaluation of international investments by multinationals will vary depending on whether these risk factors have been considered. From previous studies, we know that an enterprise will face different international risks at different growth paths and development stages. Thus, this study proposes a ‘three-dimensional’ theoretical framework of multinational enterprises’ international risk identification to ensure scientific risk identification and a comprehensive risk

analysis. The next step in risk assessment is to introduce the entropy weight method to analyse the problem of 'uncertainty'. Looking at the risk entropy of an enterprise's internationalization gives a more accurate picture of the risks it faces. We used the composition of international risk indicators of multinational enterprises to design the questionnaire for 'An analysis of the international risk assessment of Chinese multinational enterprises in Australian investment projects'. Combined with the scientific choice of investigation object, considering their knowledge structure and experience, it will ensure the accuracy of risk assessment in enterprise's internationalization. Risk assessment will yield the risk factors that can be included in the evaluation of an investment project as an investment risk coefficient in the traditional NPV evaluation model, further improving the accuracy of the project's evaluation. Thus, this study concludes that the results of the risk-adjusted NPV model are more scientific than that of the traditional NPV model. Considering the international risk factors when evaluating investment projects will not only reflect the impact of investment risk on the international development of Chinese multinational enterprises but also make the evaluation of investment projects more scientific and comprehensive. This will provide more scientific and effective information in the process of business decisions.

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REFERENCES

- Amin, T. G., Jeppsson, F., Haglund, J., & Strömdahl, H. (2012). Arrow of time: Metaphorical construals of entropy and the second law of thermodynamics. *Science Education*, 96(5), 818-848.
- Asif, M., Searcy, C., Santos, P. D., & Kensah, D. (2013). A review of Dutch corporate sustainable development reports. *Corporate social responsibility and environmental management*, 20(6), 321-339.
- Brouthers K. D., Brouthers L. E., Werner S. (2002). Industrial sector perceived environmental uncertainty and entry mode strategy. *Journal of Business Research* (55): 498-499.
- Brown, S. J., & Goetzmann, W. N. (1995). Performance persistence. *The Journal of finance*, 50(2), 679-698.
- Chang, T. C., & Wang, H. (2016). A Multi Criteria Group Decision-making Model for Teacher Evaluation in Higher Education Based on Cloud Model and Decision Tree. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(5), 1243-1262.
- Clausius, R. (1868). XLVII. On the second fundamental theorem of the mechanical theory of heat; a lecture delivered before the forty-first meeting of the German Scientific Association, at Frankfort on the Maine, September 23, 1867. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 35(239), 405-419.
- David, K. T., Pan, Y., & Au, K. Y. (1997). How MNCs choose entry modes and form alliances: The China experience. *Journal of International Business Studies*, 28(4), 779-805.
- Einstein, A. (1901). Folgerungen aus den Capillaritätserscheinungen. *Annalen der Physik*, 309(3), 513-523.
- Fang, C., & Yu, D. (2016). Basic Modes for China's New Urbanization Development. In *China's New Urbanization* (pp. 111-178). Springer Berlin Heidelberg.
- Gabrielsson, M., Gabrielsson, P., & Dimitratos, P. (2014). International entrepreneurial culture and growth of international new ventures. *Management International Review*, 54(4), 445-471.
- Haglund, J., Andersson, S., & Elmgren, M. (2015). Chemical engineering students' ideas of entropy. *Chemistry Education Research and Practice*, 16(3), 537-551.
- Haglund, J., Jeppsson, F., & Andersson, J. (2014). Primary school children's ideas of mixing and of heat as expressed in a classroom setting. *Journal of Baltic Science Education*, 13(5), 726-739.

- Haimes, Y. Y. (2015). *Risk modeling, assessment, and management*. John Wiley & Sons.
- Hui, X., & Juan, Y. (2007). A Study on the Key Risk Identification of the Enterprises' International Operation Xu Hui, Yu Juan. (2007). A Study on the Key Risk Identification of the Enterprises' International Operation. *Nankai Business Review* (4):92-97.
- Jinjarak, Y. (2007). Foreign direct investment and macroeconomic risk. *Journal of Comparative Economics*, 35(3), 509-519.
- Kim W C, Hwang P. (1992). Global Strategy and Multinationals' Entry Mode Choice. *Journal of International Business Studies* 23(1):29-53.
- Kulkarni, S. P. (2001). The influence of the type of uncertainty on the mode of international entry. *American Business Review*, 19(1) Subodh P. Kulkarni. (2001). The Influence of the Type of Uncertainty on the Mode of International Entry. *American Business Interview January*:946-108.
- Kwok, Chuck C.Y, Reeb, David M. (2000). Internationalization and Firm Risk: An Upstream-downstream Hypothesis. *Journal of International Business Studies* (4):611-629.
- Levada, A. (2014). Learning from complex systems: On the roles of entropy and Fisher Information in pairwise isotropic Gaussian Markov random fields. *Entropy*, 16(2), 1002-1036.
- Miller, K. D. (1996). A Framework for Integrated Risk Management In the International Business. *Journal of International Business Studies* (2): 311-331.
- Pan, Y., & David, K. T. (2000). The hierarchical model of market entry modes. *Journal of international business studies*, 31(4), 535-554.
- Pan, Yigang, and David K. Tse. (2000). The Hierarchical Model of Market Entry Modes. *Journal of International Business Studies* (4):31.
- Ray, K. G. (2010). *Mergers and acquisitions: Strategy, valuation and integration*. PHI Learning Pvt. Ltd..
- Root, F. R. (1994). *Entry Strategies for International Markets*, Lexington: New York.
- Rubino, A., & Cuomo, M. (2015). A regulatory assessment of the Electricity Merchant Transmission Investment in EU. *Energy Policy*, 85, 464-474.
- Schmidt, C. W., & Broll, U. (2008). The effect of exchange rate risk on US foreign direct investment: An empirical analysis. Christian W. Schmidt, (2008). The Effect of Exchange Rate Risk on U.S. Foreign Direct Investment: An Empirical Analysis. *Dresden Discussion Paper in Economics* (9):125-154.
- Shannon, C. E. (1948). A note on the concept of entropy. *Bell System Tech. J*, 27, 379-423.
- Sjøberg, S. (2015). PISA and global educational governance—A critique of the project, its uses and implications. *Eurasia Journal of Mathematics, Science & Technology Education*, 11(1), 111-127.
- Tow, W. T. (2001). *Asia-Pacific strategic relations: Seeking convergent security*. Cambridge University Press.
- Wang, Runxiao R. & Zhang, J. Jinle. (2010). Entropy Value Method in Operational Risk Evaluation of University Press. *Journal of Lanzhou University (Social Sciences)* (1):20-24.
- Wu, J. Z., & Zhang, Q. (2011). Multicriteria decision making method based on intuitionistic fuzzy weighted entropy. *Expert Systems with Applications*, 38(1), 916-922.
- Xu Hui, Zou Huimin. (2009). Key Risk Identification, Measurement and Governance Mechanism in Multinational Operation——Based on the Shareholding Structure. *Chineses Journal of Management* (5):684-692.
- Xue-bing, X. I. O. N. G. (2010). Research on the Performance Evaluation of Public Management Based on Entropy in Complexity Science. *Finance and Trade Research*, 2, 012.
- Zheng, T. (2013). Increasing the Openness of Education through Innovating University Training Model-Based on the Perspective of Mutual Recognition of Credits and Mutual/Joint Granting of Degrees. *Quarterly Journal of Chinese Studies*, 1(3), 1.

