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Risk Assessment of Enterprise Merger and Acquisition Based on Event Tree Method and Fuzzy Set Theory

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Abstract: This study aims at applying Event Tree Method and Fuzzy Set Theory on the research of the risk analyzing and evaluating in enterprise merger and acquisition. After analyzing the major risks during various stages of enterprise merger activity, the author builds the Event Tree Analysis model and then put forwards the event probabilistic estimation algorithm based on fuzzy set theory. Finally, an evaluation method on the risk of enterprise merger and acquisition comes up with on ascertaining the probability and the crisis consequences of the sequence of events. And in case analysis, well effect of the method above is certified.

Key words: Enterprise merger and acquisition, fuzzy set, event tree, risk analysis and assessment

INTRODUCTION

Merger and acquisition (M and A for short) is an important component part of capital operation activity and an effective way for the enterprises or government to adjust business structure to achieve optimal resources allocation. Afterwards, the enterprise or government can control the target company and obtain economic scale through market mechanisms. The statistical information shows that the success rate is less than 40% for corporate mergers and acquisitions and only 25% for global international M and A which indicates that enterprise M and A also has great risk and the risk exists in all stages of M and A activity. Therefore, it is important for enterprise to reduce or avoid of business loss that the risk is systematically identified and effectively measured.

ENTERPRISE M AND A RISK

Enterprise M and A process is complex with many dimensions influencing the final outcome, such as M and A strategy and target selection, investigation and M and A proposal, M and A negotiation implementation and integration etc. In terms of timeline, there are three phases of preparation, implementation and integration, of each with various risk factors to result in different risks (Zhu and Zhu, 2003).

Risks in M and A preparation: Preparation servers as a prerequisite to launch M and A and it consists of strategy basis, target selection and further investigation. The risk mainly exists in the aspects of strategy and target selection, Information asymmetry, etc.

Strategic risk of M and A is always from unclear merger strategic objective and approach which implied the potential adverse impact on the enterprise strategic target achievement. Whatever it is for enterprise strategic requirements or out of opportunism to implement M and A in what kind of methods, it determines the potential risk in different follow-up activities of M and A.

The risk of M and A target selection is easy to come into being in the process of mergers and acquisition. If goal enterprise information is not sufficient and there is no fully consideration of target enterprise uncertainty, it is particularly easy to cause improper target selection and then overestimate the merger gains and think poorly of M and A Cost to increase the risk of M and A.

The risk of asymmetric information mainly includes the risk of inflated asset, asset quality and unknown contingent liability. Therein inflating assets risk means that M and A target enterprise deliberately increases the owner's equity and creditor's rights, overstates assets and reduces the allowance for subjects in financial statements etc., after merger it will results in the risk of assets shrink; And the risk of asset quality mainly refers to the lower quality of assets caused by unclear ownership and discrepancy between true value and book value; The risk of unknown contingent liability means the concealment of contingent liabilities before M and A which may raise financial risk after M and A implementation.

Risks in M and A implementation: M and A implementation means that the parties get into negotiations of purchase plan, conclusion of contracts and trading process. Thus the relative risks mainly involve the risk from government intervention, M and A

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trading law, opposition to the deal, financing and potential liquidity, etc.

As far as known, some risk may result from government intervention. There is undeniable fact that the government plays a positive leading role in enterprise M and A activities in order to optimize regional industrial structure. However, what cannot be ignored is that there may be improper interference from the inconsistent goal between enterprise and government which leads to failure to achieve the desired result.

In M and A trading, some law risk may be engendered, too. The M and A procedure involves cumbersome legal provisions and restrictions, such as amount and price, the continuous acquisition time and proportion, offer specification, restrict of associated institution M and A behavior and announcement specification. It is very possible to cause illegal behavior if there is a bit carelessness. Illegal behavior will lead to punishment to enterprise from relevant organizations or departments, including compensation liability, criminal liability and even invalidation of M and A contract which will bring enterprise more loss and bad social influence.

Anti-merger may also bring some risks. In many cases, target enterprise with good operating performance holds hostile attitude to M and A, especially when it is be merged by competitors or hostile takeover party. It is easy to trigger anti-merger behavior, such as seeking other acquirer, leaking of high-quality assets, owing malicious debt and so on. It can lead the enterprise to an unexpected achievement and to form significant risk or hazard.

Besides, the risk of external financing is distinct, too. Generally, financing methods in M and A include equity financing, debt financing and mixed financing which follow different financing risk respectively. Equity financing is very efficient but easily leads to the risk of losing control. And excessive debt financing always leads to debt concentration risk. Convertible bond and convertible preferred stock in mixed financing brings about the risk of over dispersed ownership and uncertain debt structure and so on.

The last not the least, in M and A implementation process, liquidity risk is potential as well. If acquirer adopts cash payment in internal financing mergers and acquisitions, a large amount monetary capital must be occupied, to cause the lack of liquid assets. As a result, the liquidity risk of acquirer increases.

Risks in M and A integration: The M and A integration means that the enterprise enters into an operating adaption period after completing the M and A process, in which the enterprise will face various risk from the internal and external. Therein the internal risk mainly involves different conflicts of inner management or culture and so on. At the same time, the risk of the external of the enterprise after the M and A process includes the unknown tax or charge, changing of economic environment and policy or statute of government etc.

Regarding the internal risk in M and A integration, it is not only recombination of production factors but also the integration of management layer, management mechanism and enterprise culture. Executives in acquired enterprise may resist to the acquirer and also the struggle and internal friction may be generated among management layer which will influence enterprise operating activities directly and lead to the elapse of market, talents and technology resource. The disunited management mechanism and little integration of enterprise culture must result in conflicts in operating process, even shocks in a long period which can reduce the efficiency of enterprise operation and weaken the synergistic effect of enterprise M and A, restrict the acquirer fail to achieve expected objectives.

For external risk in M and A integration, some changes in economic environment, enterprise M and a local policy and statute are not conducive to mergers and acquisitions. Meanwhile, due to the replacement of management main body and lose of regional preferential policy, it is also likely to face a variety of the taxes and fees collection from administrative authorities. Besides, there may be arrearage of water, electricity, gas, communication and other aspects of Liability violation which will bring risks to the acquiring party, too.

ENTERPRISE M AND A RISK ASSESSMENT

Event tree analysis method: Event Tree Analysis (ETA for short) is a major component of nuclear reactor safety engineering, a kind of decision theory based on system engineering theory. ETA is a logical evaluative method which performs by tracing forward in time or forwards through all various forecasting possibilities to judge and predict the optimum decision. It does not require the premise of a known hazard and not simply rely on traditional decision methods and subjective judgment. In the past, it represented an important application value in the commercial nuclear power safety risk assessment of the United States of America and become a standard risk analysis method in many countries (Suresh *et al*., 1996).

An event tree may start from a specific initiator. First of all, it required to find out the initial inducement events to execute analysis stage by stage accordingly to event evolutionary development sequence. Each subsequent controllable result is classified to two completely opposite state, such as success and failure, normal and fault, loss and gain, or safety and risk, etc which must become one of developmental consequence. It may act off in direction

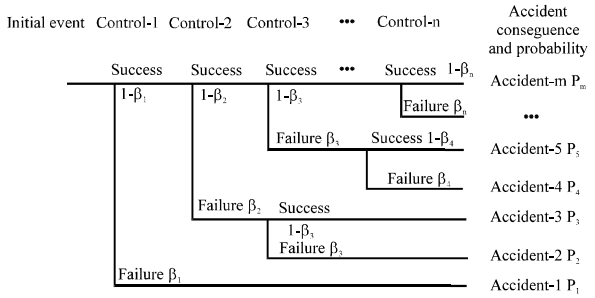

Fig. 1: Model structure of ETA

until the ultimate harm appears in the system. The whole process can be described by tree structure graph. So that, it can be called event tree, whose model structure as shown in Fig. 1. It qualitatively describes the dynamic changes of the whole event and also provides the basis for quantitative calculation of the probability of event result in different development stages. Through ETA, we can systematically control a variety of possible accidents in the development of the system, identify the inducement to accident in system evolution progress and provide the basis for control measures in advance to avoid the accident.

ETA model on M and A risk: The ETA method is deductive method based on logical analysis, starting from the initial event which may lead to subsequent analysis of control (events) and consequences, then to evaluate system reliability or risk comprehensively and reversely. From above analysis on M and A risk evolution, the enterprise M and A activities can be divided into a series of follow-up control of three phases. And event tree model can be constructed on the basis of ETA method.

Define the occurrence probability of branch event that may cause crisis in each section as βi and the opposite event as 1-βi. Define the occurrence probability of crisis caused by inducing crisis branches at all levels as Pi.

Motivation is the initial event of M and A and inappropriate or reasonable strategy is the subsequent events which forms the first order branch. It is likely to induce M and A crisis (probability is P1) with the improper strategy (probability is β1); while the strategy is reasonable and clear (probability is (1-β1)), it will not induce crisis in this stage. But afterwards, the selection of M and A target may become another risk inducement which forms the second order branch. It is easy to trigger business crisis (probability is P2) when the selection of the target is improper (probability is β1) and with the proper selection (probability is (1-β2)), crisis occurrence is decided by the subsequent event of the information sufficiency. It forms the third order branch and so on. As shown in Fig. 2. It builds a ten order enterprise M and A risk evolution analysis event tree model.

Each branch in the event tree shows the validity of system controls. It can calculate the event appearance probability of the final consequences through the probability multiplied by the occurrence probability of incentive events leading to ultimate harmful consequences in each branch. From Fig. 2, event probability of crisis Pi can be calculated at all levels:

$$P_1 = \beta_1$$

$$P_2 = (1-\beta_1)*\beta_2$$

$$P_3 = (1-\beta_1)\times(1-\beta_2)\times\beta_3$$

$$P_4 = (1-\beta_1)\times(1-\beta_2)\times(1-\beta_3)\times\beta_4$$

$$P_5 = (1-\beta_1)\times(1-\beta_2)\times(1-\beta_3)\times(1-\beta_4)\times\beta_5$$

$$P_6 = (1-\beta_1)\times(1-\beta_2)\times(1-\beta_3)\times(1-\beta_4)\times(1-\beta_5)\times\beta_6$$

$$P_7 = (1-\beta_1)\times(1-\beta_2)\times(1-\beta_3)\times(1-\beta_4)\times(1-\beta_5)\times(1-\beta_6)\times\beta_7$$

$$P_8 = (1-\beta_1)\times(1-\beta_2)\times(1-\beta_3)\times(1-\beta_4)\times(1-\beta_5)\times(1-\beta_6)\times(1-\beta_7)\times\beta_8$$

$$P_9 = (1-\beta_1)\times(1-\beta_2)\times(1-\beta_3)\times(1-\beta_4)\times(1-\beta_5)\times(1-\beta_6)\times(1-\beta_7)\times(1-\beta_8)\times\beta_9$$

$$P_{10} = (1-\beta_1)\times(1-\beta_2)\times(1-\beta_3)\times(1-\beta_4)\times(1-\beta_5)\times(1-\beta_6)\times(1-\beta_7)\times(1-\beta_8)\times(1-\beta_9)\times\beta_{10}$$

Ascertaining events probability based on fuzzy set theory: Aiming at specific M and A activities, it is difficult to obtain the probability statistic data in enterprise M and A risk tree shown in Fig. 2, so that, a quantitative method is required to determine the probability of event occurrence. The advantages of fuzzy set theory lie in recognition, evaluation and control of fuzziness and uncertainty. Therefore, in this study, it determines the probability of M and A risk at each node of event tree.

Fuzzy sets were introduced by Lotfi A. Zadeh and Dieter Klaua as an extension of the classical notion of set in order to solve and deal with fuzziness and uncertainty (Zadeh, 1965). The fuzzy set Ã means for all xÃ, there always be aμÃ (x)[0, 1] correspondingly. μÃ (x) is degree of membership x to Ã, μÃ is the membership function of Ã. The membership function of fuzzy set is called the fuzzy distribution if the fuzzy set is real number field R. The common fuzzy distribution includes rectangular, triangular, trapezoidal distribution, normal distribution and Cauchy distribution and k-times parabolic distribution, etc.

Triangular fuzzy function and trapezoidal fuzzy function: Triangular fuzzy number is expressed as A = (a, b, c) and its membership function is expressed as following:

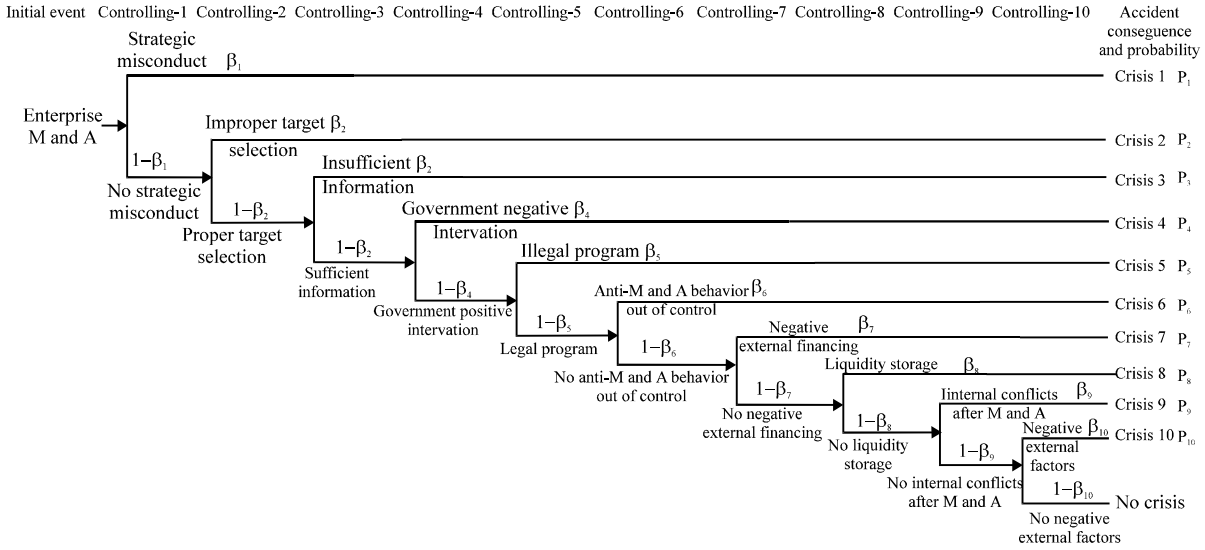

Fig. 2: ETA model for enterprise M and A risk evolution analyzing

$$\mu\tilde{A}(x)=\begin{cases}0 & x\le a\\ (a-a)/(b-a) & a<x\le b\\ (x-a)/(b-a) & b<c\le c\\ 0 & x>c\end{cases} \quad (1)$$

When x = b, the triangular fuzzy number is the most possible value, $\mu_{\tilde{A}}(b) = 1$; When x = a or x = c, the triangular fuzzy number is the most unlikely value, $\mu_{\tilde{A}}(a) = 0$, $\mu_{\tilde{A}}(c) = 0$.

Trapezoidal fuzzy number is expressed as A = (a, b, c, d) and the membership function is represented as following:

$$\mu\tilde{A}(x)=\begin{cases}0 & x\le a\\ (a-a)/(b-a) & a<x\le b\\ 1 & b<x\le c\\ (a-x)(d-c) & c<x\le d\\ 0 & x>d\end{cases} \quad (2)$$

When x∈[b,c], the trapezoidal fuzzy number is the most possible value, $\mu_{\tilde{A}}(x) = 1$; When x = a or x = d, the trapezoidal fuzzy number is the most unlikely value: $\mu_{\tilde{A}}(a) = 0$, $\mu_{\tilde{A}}(d) = 0$.

The cut sets of fuzzy number computation: For a given λ[0, 1], the cut set of λ for the fuzzy number Ã, Ẽ are represented as follows:

$$A_\lambda=\{x\in R\quad \mu\tilde{A}\ge\lambda\}=\left[a_1^\lambda b_1^\lambda\right]$$

$$E_\lambda=\{x\in R\quad \mu\tilde{E}\ge\lambda\}=\left[a_2^\lambda b_2^\lambda\right]$$

$$\tilde{A}(+)\tilde{E}=A_\lambda+E_\lambda=[a_1^\lambda+a_2^\lambda\quad b_1^\lambda+b_2^\lambda] \quad (3)$$

$$\tilde{A}(-)\tilde{E}=A_\lambda-E_\lambda=[a_1^\lambda-a_2^\lambda\quad b_1^\lambda-b_2^\lambda] \quad (4)$$

$$\tilde{A}(\times)\tilde{E}=A_\lambda\times E_\lambda=[a_1^\lambda\times a_2^\lambda\quad b_1^\lambda\times b_2^\lambda]$$

$$(a_1^\lambda\ge 0\quad a_2^\lambda\ge 0) \quad (5)$$

$$\tilde{A}(\div)\tilde{E}=A_\lambda\div E_\lambda=[a_1^\lambda\div a_2^\lambda\quad b_1^\lambda\div b_2^\lambda]$$

$$(a_1^\lambda\ge 0\quad a_2^\lambda>0) \quad (6)$$

Method of fuzzy integral value: The integral value method is a succinct processing way for fuzzy numbers (Liou and Wang, 1992). For triangular fuzzy numbers A = (a, b, c) and trapezoidal fuzzy numbers A = (a, b, c, d), the integral value respectively is represented as Eq. 7 and 8:

$$I^\alpha(A)=1/2[ac+b+(1-\alpha)a] \quad (7)$$

$$I^\alpha(A)=1/2[a(c+d)+(1-\alpha)(a+b)] \quad (8)$$

Therein, $I^\alpha(A)$ is the integral value of fuzzy number function; α is the optimistic coefficient of a policymaker, α∈[0, 1]; a, b, c, d are fuzzy Numbers. For a pessimistic policymaker, α = 0; for an optimistic policymaker, α = 1; and for a cautious policymaker, α = 0.5.

Evaluation language fuzzing process: For the majority of uncertainty or fuzzy evaluation such as probability evaluation in this study, the fuzzy expression always lists as "very litlle", "slightly litlle", "litlle""medium", "great","slightly great", "very great" (Lin *et al*., 1997), with the fuzzy number it can be expressed respectively as follows:

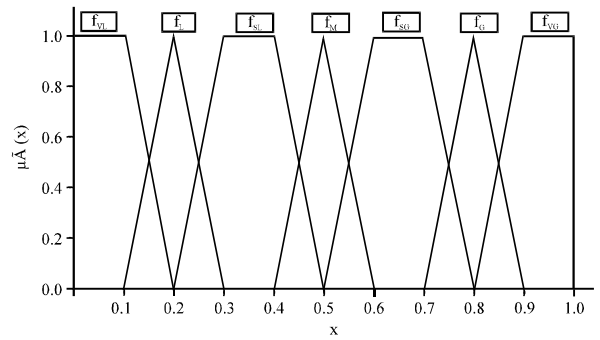

Fig. 3: Membership function of fuzzy language

$$f_{VL} = (0, 0, 0.1, 0.2),\ f_{L} = (0.1, 0.2, 0.3),$$
$$f_{SL} = (0.2, 0.3, 0.4, 0.5),\ f_{M} = (0.4, 0.5, 0.6),$$
$$f_{SG} = (0.5, 0.6, 0.7, 0.8),\ f_{G} = (0.7, 0.8, 0.9),$$
$$f_{VG} = (0.8, 0.9, 1.1)$$

Membership function is shown as Fig. 3.

The cut set of λ for the fuzzy numbers above are:

$$f_{VL}^{\lambda} = [0, -0.1\lambda + 0.2] \quad (9)$$

$$f_{V}^{\lambda} = [0.1\lambda, +0.1, -0.1\lambda + 0.3] \quad (10)$$

$$f_{FL}^{\lambda} = [0.1\lambda + 0.2, -0.1\lambda + 0.5] \quad (11)$$

$$f_{M}^{\lambda} = [0.1\lambda + 0.4, -0.1\lambda + 0.6] \quad (12)$$

$$f_{FH}^{\lambda} = [0.1\lambda + 0.5, -0.1\lambda + 0.8] \quad (13)$$

$$f_{H}^{\lambda} = [0.1\lambda + 0.7, -0.1\lambda + 0.9] \quad (14)$$

$$f_{VH}^{\lambda} = [0.1\lambda + 0.8, 1.0] \quad (15)$$

Events probability calculation: Considering different weighs assessed by different experts in risk judgment while applying Delphi method, the fuzzy evaluation is average of the experts' evaluations weighted (Ishikawa *et al.*, 1993):

$$B_i = \left(1/\sum_{j=1}^{n} \omega_j\right)(\times)[\omega_1(\times)v_{i1}(+)...(+)\omega_m(\times)v_{im}]$$

$$i = 1, 2,... m;\ j = 1, 2,... n \quad (16)$$

C_i means experts' comprehensive index to event i; ω_{jj} means the weight of expert j evaluating event i; v_{ij} means the evaluation of event i given by expert j.

Calculating the λ cut set of fuzzy number can arrive at the probability evaluation results of a certain event.

Enterprise M and A risk assessment: The definition of risk is the possibility of damage or loss (Haynes, 1895), it can be expressed by the arithmetic product of the occurrence probability of event risk and the seriousness of its consequence. Hence, the M and A event risk value can be defined as the arithmetic product of probability of inducing crisis and the extent of loss caused by the crisis. If describe the crisis loss by the ratio of crisis loss to total M and A investment, the risk of a branch in an M and A event tree can be expressed as:

$$R_i = P_i \times S_i \quad i = 1, 2, 3,..... \quad (17)$$

And the risk value of general M and A activities is as following:

$$R = \sum_{1}^{i} P_i \times S_i \quad i = 1, 2, 3..... \quad (18)$$

Therein, R is M and A risk value, P_i is the occurrence probability of the loss caused by event i, R_{li} is the crisis loss rate when event i caused the crisis.

CASE STUDY

Case overview: Taking Chinese company Z's takeover of company A and company B (both are Australian iron ore companies) in 2006 for example, according to the original plan, the total investment of iron ore mining project coming into production in July of 2009 after the merger was $4.2 billion. However during the construction, the project was forced to postpone three times and then the investment value increased to $7.8 billion. In March, 2012, company Z announced the first production line would be put into operation in August but soon the project was delayed again to December. Besides, simultaneously the project delay also caused more cost such as loan interests, labor wages and then the remaining project total spending budget increased sharply to $10 billion.

According to some certain analysis, M and A decision is based on "Iron ore price will continue to rise in the future under the constraint condition of limited resources" and it leads to M and A cost respectively high. What's more, the price of iron ore is in decline now. Thinking of the magnetite resource Z obtained after M and A, there are series of problems, for example, ore dressing is very difficult and there is insufficient consideration of logistics cost, desalination and environmental protection, etc. it will need more operating investment in the later stage. Additionally, the compensation will exceed budget due to high labor cost in Australia. But in current economic environment of Europe and the United States currency devaluated, Chinese currency pegged to the US dollar, Australian

Table 1: Evaluation for the possibility of events causing crisis

	Expert A	Expert B	Expert C	Experts D	Expert E	Expert F	Experts G
Strategic misconduct	Slightly great	Slightly great	Great	Very great	Slightly great	Great	Great
Improper target selection	Very great	Great	Great	Very great	Great	Very great	Very great
Insufficient information	Very great	Great	Slightly great	Very great	Great	Very great	Very great
Government intervention	Slightly great	Medium	Great	Slightly great	Slightly great	Medium	Great
Illegal program	Slightly little	Medium	Great	Slightly great	Slightly great	Medium	Medium
Anti-M and A behavior out of control	Very little	Slightly little	Little	Medium	Slightly little	Medium	Medium
Negative external financing	Very little	Very little	Little	Little	Little	Very little	Little
Liquidity shortage	Medium	Slightly little	Slightly little	Medium	Slightly little	Medium	Slightly little
Internal conflicts after M and A	Slightly little	Slightly little	Medium	Slightly little	Little	Little	Little
Negative external factors	Great	Slightly great	Slightly great	Very great	Great	Great	Great

dollar appreciated and so on, all these factors increase the exchange rate risk. There is lack of communication between the company undertaking contracted projects and the government causing construction spending increase in company Z.

Evaluation for the probability of an event causing the crisis in M and A: The seven specialists in this study are experts in strategic management (A), financial management (B), human resource management (C), economics (D), public relations (E), Geological exploration and design (F) and business management (G) area respectively. According to M and A project characters, the experts' weighted coefficients are w1 = 1.4, w2 = 1.2, w3 = 1.1, w4 = 1.4, w5 = 1.0, w6 = 1.2, w7 = 1.4.

By the method of Delphi Technique, evaluation values are presented in Table 1. According to the crisis probability caused by M and A risk event tree shown in picture 2.The cut set function and fuzzy numbers of the comment to every event can determined by Eq. 9:

$$C1 = 1/(1.4+1.2+1.1+1.4+1.0+1.2+1.4)\times\{1.4\times[0.1\lambda+0.5, -0.1\lambda+0.8]+1.2\times[0.1\lambda+0.5, -0.1\lambda+0.8]+1.1\times[0.1\lambda+0.7, -0.1\lambda+0.9]+1.4\times[0.1\lambda+0.8, 1]+1.0\times[0.1\lambda+0.5, -0.1\lambda+0.8]+1.2\times[0.1\lambda+0.7, -0.1\lambda+0.9]+1.4\times[0.1\lambda+0.7, -0.1\lambda+0.9]\} = [0.87\lambda+5.51, -0.73\lambda+7.61]$$

It is transformed into the fuzzy set numbers as following:

$$C1 = [0.63, 0.73, 0.79, 0.87]$$

By the same way, Ci(i = 1, 2……10) are gotten.

C2 = [0.87λ+6.63, -0.33λ+8.37], it is transformed into the fuzzy set numbers as following:

$$C2 = [0.10, 0.86, 0.92, 0.96]$$

C3 = [0.87λ+6.41, -0.33λ+8.26], it is transformed into the fuzzy set numbers as following:

$$C3 = [0.10, 0.84, 0.91, 0.95]$$

C4 = [0.87λ+6.41, -0.33λ+8.26], it is transformed into the fuzzy set numbers as following:

$$C4 = [0.10, 0.63, 0.67, 0.77]$$

C5 = [0.87λ+3.77, -0.87λ+5.89], it is transformed into the fuzzy set numbers as following:

$$C5 = [0.10, 0.53, 0.58, 0.68]$$

C6 = [0.73λ+2.15, -0.87λ+4.11], it is transformed into the fuzzy set numbers as following:

$$C6 = [0.08, 0.33, 0.37, 0.47]$$

C7 = [0.49λ+0.49, -0.87λ+2.23], it is transformed into the fuzzy set numbers as following:

$$C7 = [0.06, 0.11, 0.16, 0.26]$$

C8 = [0.87λ+2.54, -0.87λ+4.75], it is transformed into the fuzzy set numbers as following:

$$C8 = [0.10, 0.39, 0.45, 0.55]$$

C9 = [0.87λ+1.60, -0.87λ+3.74], it is transformed into the fuzzy set numbers as following:

$$C9 = [0.10, 0.28, 0.33, 0.43]$$

C10 = [0.87λ+5.77, -0.73λ+7.74], it is transformed into the fuzzy set numbers as following:

$$C10 = [0.10, 0.76, 0.81, 0.89]$$

According to the fuzzy number defuzzification integral method, whenα = 0.5 as the representative probability value, the calculation is shown in Table 2.

Each event probability (frequency) of M and A crisis can be calculated by event tree principle, as shown in Table 3.

The results and losses caused by the events: They are shown in Table 4.

Table 2: Event occurrence probability

Event probability	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
Probability value	0.76	0.71	0.70	0.54	0.47	0.31	0.15	0.37	0.29	0.64

Table 3: Probability value of event causing crisis

	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}
Probability value	0.7580	0.1723	0.0487	0.0114	0.0045	0.0016	0.0005	0.0011	0.0005	0.0008

Table 4: Crisis results and losses

Events	Crisis results description	Average loss	Total investment	Ratio of crisis loss (S_i)
Strategic misconduct	Strategic management defects cause improper decisions making, to cause enterprise to pay a huge price and lose of core competence a long time, even lead to bankruptcy	¥11.0 billion	¥10.0 billion	1.10
Improper target selection	M and A target value is not enough to reach the expected objective	¥6.0 billion		0.60
Insufficient information	Insufficient M and A information leads to overvaluation and non-ideal result, even fall in a dilemma	¥7.0 billion		0.70
Government intervention	Government intervention results in M and A period prolonged and raises the direct and operating cost. It can't reach the expected target and even may fall in a dilemma	¥2.0 billion		0.20
Illegal program	Illegal program or behavior will get the punishment; extend the M and A phase; increase the cost; fail to reach the expected target	¥2.0 billion		0.15
Anti-M and A behavior out of control	Intense anti-merger and anti-acquisition behavior causes the enterprise expected objectives cannot be achieved, even in trouble	¥3.5 billion		0.35
Negative external financing	Insufficient external financing ability extends the M and A phase, or even result in the M and A cost increase even directly lead to large losses	¥3.0 billion		0.30
Liquidity shortage	M and A will consume large amounts of cash which can cause liquidity shortage. Then the enterprise can't operate normally and fails the expected business objectives and even lead to bankruptcy	¥4.0 billion		0.40
Internal conflicts after M and A	it is hard to harmonize internal management so that the company is unable to realize merger synergies and normal operation after the acquisition and even losses	¥2.0 billion		0.20
Negative external factors	The irresistible external factors such as economic downward cycle, market control, banning closed will cause the enterprise to operate abnormally and even get a loss	¥3.0 billion		0.30

Risk value calculation: From Eq. 11, the expected risk loss value of M and A activity is: $R = R = \sum_{i}^{i} P_i \times S_i = 0.98$. It can be seen that the M and A risk is extremely high. On the actual situation, because of the downward cycle of Global and Chinese economy, low grade of ore resources in the acquired company, high mining cost, high human resource cost and the almost harsh environmental requirements of in the acquired enterprise country, operating activities after M and A delayed again and again and still have not yet entered into the normal operation state. The evaluation results are quite coincident with the actual situation. Therefore, M and A risk analysis and evaluation methods have excellent demonstration effect based on the fuzzy set theory and ETA method.

CONCLUSION

The author applies ETA method and Fuzzy Set Theory to analyze and evaluate the risk of enterprise M and A. Then the ETA model is built and the event probabilistic estimation algorithm based on fuzzy set theory is put forward after analyzing the major risks during various stages of enterprise merger activity. Finally, an evaluation method on the risk of enterprise M and A comes up with on ascertaining the probability and the crisis consequences of the sequence of events. And in the case analysis, it is certified that the method above achieves ideal conclusion.

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