



Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Study on taxation risk assessment of chemical enterprise based on analytic hierarchy process

Weng Jiachen

Chuzhou Vocational and Technical College, Chuzhou City, China

ABSTRACT

Taxation risk is an important factor for the development of the chemical enterprise, which can affect the operation of the chemical enterprise, and therefore the application of the analytic hierarchy process on it is studied in depth. Firstly, the importance of strengthening taxation risk management of chemical enterprise is summarized. Secondly, the basic theory of analytic hierarchy process is studied in depth, the analyzing procedure is discussed, and the improved algorithm is put forward. Finally, a case study is carried out, and the taxation risk situation of a chemical enterprise is assessed based on the analytic hierarchy process, and results show that this method can offer the effective theory basis for the taxation risk management of the chemical enterprise.

Key words: taxation risk assessment; analytic hierarchy process; chemical enterprise

INTRODUCTION

Taxation risk refers to the probability of legal remedy, luggage loss, and reputation damage suffered from not complying with provisions of the tax law effectively and correctly. Taxation risk of chemical enterprise is sparked by tax behavior, which concludes two aspects. One hand the tax behavior of chemical enterprise does not meet the regulations of tax regulations. The chemical enterprise should pay taxes, and does not pay taxes, and pay fewer taxes, and then the chemical enterprise faces with the risk of paying an overdue tax, penalty, additional fines, legal penalties and reputational damage, on the other hand, the applicable tax of chemical enterprise operation is not correct, the relating tax policies are not used flexibly and sufficiently, the chemical enterprise undertakes unnecessary burden [1]. Therefore it is necessary to carry out taxation risk assessment of chemical enterprise, and the chemical enterprise can take effective measurements to avoid the tax evasion behavior. Currently, there are many evaluation methods, but the taxation risk can be affected by many affecting factors, the affecting factors is complex and uncertain, and there are contradictories between two affecting factors, the qualitative information and quantitative information can coexist, then the taxation risk evaluation is dynamic and complex. In recent years, there are many evaluation methods, such as fuzzy mathematics, grey relational analysis method, and artificial neural network. These evaluating methods can evaluate the taxation risk of chemical enterprise qualitatively and quantitatively, but the taxation environment of chemical enterprise changes unstably, although a certain effect is obtained, but there are still defects and limitations, therefore another effective evaluation method should be found out, the analytic hierarchy process can carry out quantitative analysis for non quantitative event, which is a decision method with multi-schemes and objects making objective analysis for subjective judgment. Then it is feasible to evaluate the taxation risk of chemical enterprise based on analytic hierarchy process [2].

Importance of strengthening taxation risk management of chemical enterprise

The taxation risk is an important risk during the procession of business of chemical enterprise, strengthening the taxation risk management is an important part of controlling risk, establishing scientific and effective taxation risk management system has a significant realistic meaning. It is necessary to evaluate the taxation risk management level of chemical enterprise. Then the chemical enterprise can establish a good self-image, the safety of production

and business operation environment can be ensured, the scientification and rationalization of chemical enterprise decision can be promoted, the strategic development goals of chemical enterprise can be achieved smoothly, the internal controls of chemical enterprise can be controlled effectively, the management system of chemical enterprise can be improved [3].

The connotation of chemical enterprise taxation risk is uncertain. Uncertainty exists objectively during the procession of taxation management. As long as the uncertainty exists in the procession of the taxation management, the taxation risk exists. But the understanding ability of chemical enterprise taxation manager is limited, and then the understanding degree for the uncertainty of event during the procession of taxation management has difference with uncertainty existing objectively.

The taxation risk refers to the possible profit and loss of chemical enterprise in the whole process of taxation strategic management, operation control, normal management and information management. As for a taxation risk event can bring taxation profit or taxation loss, which can be decided by the reorganization and management for the risk event of taxation manager. If the positive taxation risk is in line with objective taxation risk, and can process the taxation risk event, the taxation profit of chemical enterprise can improve, and unnecessary taxation loss and taxation risk management charge reduces accordingly. The taxation risk management of chemical enterprise concludes the following factors:

(a) Internal environments

The internal environment refers to personal character of manager of chemical enterprise and tax environment of operating activities. The internal environment is the basis of controlling taxation risk by the chemical enterprise taxation risk manager.

(b) Goal setting.

The goal setting refers to taxation risk managing objective set through means and procedure taken by chemical taxation risk management. At the same time taxation risk managing object and total business objective can be ensured, and can suit for the taxation risk capacity of chemical enterprise [4].

(c) Event identification

The event identification refers to potential tax event identified from internal and outer reasons affecting taxation risk manage objective, which concludes event of risk loss and event of risk profit. The risk profit can be feed back to establishing procession of chemical enterprise strategy.

(d) Risk assessment

The risk assessment refers to management basis of confirming taxation risk management through analyzing taxation risk identified by the chemical enterprise. The taxation risk may affect the strategy objective of chemical enterprise, therefore the probability and effect of natural taxation risk are evaluated, and the probability and effect of other taxation risks are also evaluated.

(e) Risk response

The risk response refers to countermeasures taken after the taxation risk manager of chemical enterprise evaluates the possible taxation risk. The taxation manager can choose a series of measures such as risk reversion, risk taking, risk reduction, and risk sharing can make the taxation risk faced by chemical enterprise match the taxation risk capacity.

(f) Control activity

The control activity refers that the chemical enterprise taxation manger can establish the taxation controlling policies and procedures to ensure effective implementation of countermeasures,

(g) Information and communication

The every level of taxation risk manager of chemical enterprise should be identified, evaluated and coped with taxation risk based on information, which concludes vertical and horizontal mobility among the strategic management, operational control daily management, Information management of taxation risk management.

(h) Monitor

The chemical enterprise should dynamically reflect the status of taxation risk manage, and make it change with the changes of environment, and the whole taxation risk management should be controlled, and amend it in time.

Basic theory of analytic hierarchy process

The analytic hierarchy process is a practical decision method with multi-scheme and multi-objective that can make quantitative analysis for non quantitative event, and make objective analysis for subjective judgment. The analytic hierarchy process can decompose the component relating to decision into target layer, criteria layer and project layer, then carry out qualitative analysis and quantitative analysis [5].

The analytic hierarchy process can decompose the complex problem based on establishing the clear architecture, then the measure theory is introduced, the relative scale can achieve scalarization subjective judgment through multiple comparisons, then the judgment matrix can be constructed layer by layer. Then the weight of judgment matrix is solved. Finally the comprehensive weight of computing project is calculated. The clear hierarchy structure is the key to solve the complex problem, the attribute weight on this basis obtained can reflect the important degree between the indicators in the same layer.

The basic process of the analytic hierarchy process is listed as follows:

(1) Establish the hierarchical structure model

According to situation of the taxation risk assessment, the complex problem can be divided into every part, these parts can form several groups according to the attribute, and different layers can be formed, then the block diagram is used to show the hierarchical structure of layers and owner-member relationship of factors.

(2) Construct judgment matrix of every layer

For the affecting factors of principle and index layers, the judgment matrix is given according to the relative important through multiple comparisons based on experience knowledge. The relative important degree is expressed by 1 (same), 3 (relatively important), 5 (obviously important), 7 (strong important), 9 (extremely importance). The judgment matrix of principle and index layers is expressed by $A = (a_{ij})_{n \times n}$, which has the following characteristics [6]:

$$a_{ij} > 0 \quad (1)$$

$$a_{ii} = 1 \quad (2)$$

$$a_{ij} = \frac{1}{a_{ji}} \quad (3)$$

where $i, j = 1, 2, 3, \dots, n$.

(3) Single sequencing and consistency check

Firstly the approximate eigenvector and maximum eigenvalue of judgment matrix are calculated. Elements in each column are deal with through normalization, the every element processed is expressed as follows:

$$a_{ij} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad (4)$$

Every column adds up after normalization by the following expression [7]:

$$\omega_i = \sum_{i=1}^n a_{ij} \quad (5)$$

The normalization is carried out for the vector $\{\omega_1, \omega_1, \dots, \omega_n\}^T$ by the following expression:

$$\bar{\omega}_i = \frac{\omega_i}{\sum_{j=1}^n \omega_j} \quad (6)$$

Then the vector $\{\bar{\omega}_1, \bar{\omega}_2, \dots, \bar{\omega}_n\}^T$ can be obtained, which is the approximation of the eigenvector.

The maximum eigenvalue can be expressed as follows:

$$\lambda_{\max} = \sum_{i=1}^n \frac{(AW)_i}{n\omega_i} \quad (7)$$

The consistency check can be carried out based on the following expressions [8]:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad (8)$$

$$CR = \frac{CI}{RI} \quad (9)$$

Where CI is the sample mean value, CR is the index of the consistency check, RI is the same order average random index of the consistency check, when $CR < 0.1$, the consistency can be accepted, otherwise, the matrix should be adjusted. The value of RI is shown in table 1.

Table 1 Value of average random consistency RI

Order	Value of RI	Number of order	Value of RI
1	0	8	1.41
2	0	9	1.46
3	0.58	10	1.49
4	0.90	11	1.52
5	1.12	12	1.54
6	1.26	13	1.56
7	1.36	14	1.58

(4) Level ordering and consistency check

The final weight of every affecting factor for taxation risk assessment can be obtained through the inner product of weight vector of index layer to principle layer and weight vector of principle layer to objective layer.

For taxation risk evaluation there are many affecting factors, the correct situation is not reflected correctly, then the method of confirming weight should be amended, the Delphi method can be used to deal with the disadvantages of traditional analytic hierarchy process.

For the judgment matrix formed in the same layer, there are m experts participating in decision making, and the judgment matrix is formed finally, the weight vector of judgment matrix made by k th expert is expressed as follows [9]:

$$\omega^{(k)} = \{\omega_1^{(k)}, \omega_2^{(k)}, \dots, \omega_n^{(k)}\} \quad (10)$$

Define the following expression:

$$S_{ij} = \cos(\theta_{ij}) = \frac{\omega^{(i)} \cdot \omega^{(j)}}{|\omega^{(i)}| |\omega^{(j)}|} \quad (11)$$

where θ_{ij} is the intersection angle of the two vectors $\omega^{(i)}$ and $\omega^{(j)}$, S_{ij} is the consistency of the two judging matrixes $A^{(i)}$ and $A^{(j)}$. The bigger S_{ij} is, the higher the consistency between the two judging matrixes is.

$$S_i = \frac{1}{m-1} \sum_{j=1, j \neq i}^m S_{ij} \quad (12)$$

where S_i denotes the mean consistency of judging matrix of i th expert.

Then the normalization procession is carried out for the mean consistencies of all experts to obtain the relative consistency of judging matrix of experts, the relative consistency of judging matrix for i th expert is expressed as follows:

Resource allocation state (I2)

$$\bar{S}_i = \frac{S_i}{\sum_{i=1}^m S_i} \quad (13)$$

Then the improved weight vector can be expressed as follows:

$$W = \sum_{i=1}^m S_i W^{(i)} \quad (14)$$

The improved algorithm can treat the weight value of different expert differently, the effect of different judging matrix formed by expert is considered, then the better assessing effect can be obtained.

RESULTS AND DISCUSSION

A chemical enterprise is chosen as researching object, the taxation risk assessment is carried out for it based on analytic hierarchy process. This chemical enterprise is founded in 1979, the annual production scale of it is 3.5 million tons, the main products are refined cotton products and carboxymethylcellulose sodium, at present this chemical enterprise has 20 kinds of products. The sales of this chemical enterprise are 1.4 billion yuan in 2013, the payable value-added tax is 4.3 million yuan, the tax bearing rate is 6.32%, which is abnormal. Therefore it is necessary to carry out taxation risk evaluation for this chemical enterprise.

According to the situation of the chemical enterprise, the hierarchy structural diagram of it is constructed, which is shown in figure 1.

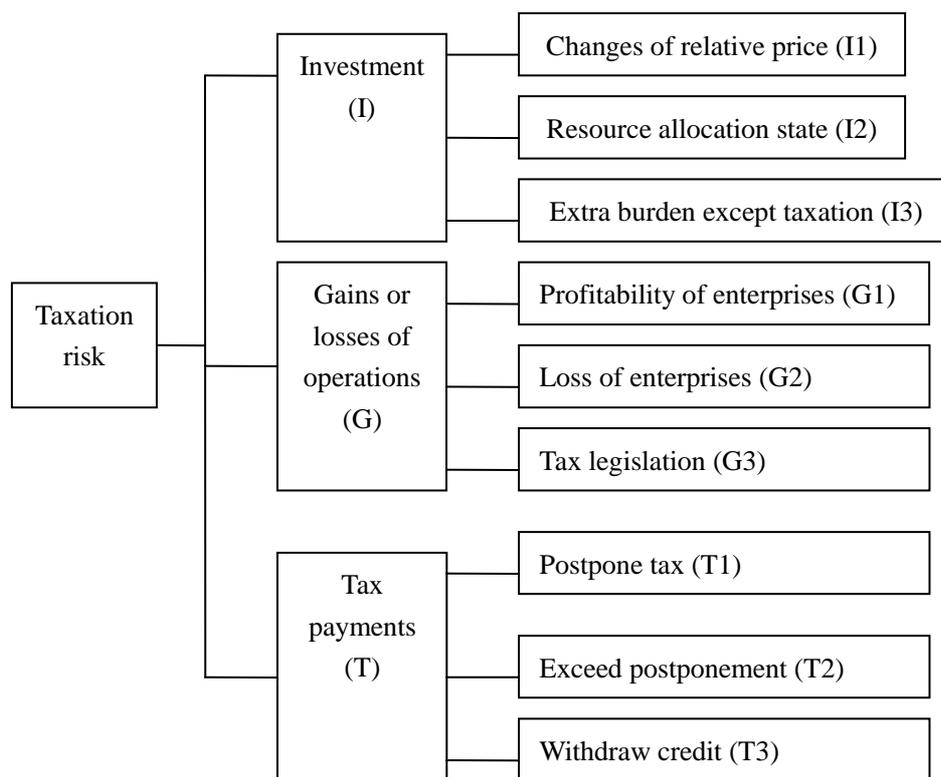


Figure 1 Hierarchy structural diagram of taxation risk of the chemical enterprise

There are experts are invited to evaluate the taxation risk situation of this chemical enterprise. The judging matrix of taxation risk of the chemical enterprise is constructed according to the suggestions of experts, which is shown as follows:

$$A = \begin{bmatrix} & I & G & T \\ I & 1 & 3 & 5 \\ G & 1/3 & 1 & 1/7 \\ T & 1/5 & 7 & 1 \end{bmatrix}$$

The weight vector of first expert is obtained through consistency check, which is shown as follows:

$$\omega^{(1)} = \{\omega_1^{(1)}, \omega_2^{(2)}, \omega_n^{(3)}\} = (0.214, 0.432, 0.354)$$

The weight vector other experts can be obtained based on the same procedure, the final weight of taxation risk can be obtained based on formula (14), which is listed as follows:

$$W = \{\omega_1, \omega_2, \omega_3\} = (0.236, 0.481, 0.283)$$

Then the weight of every affecting factor for taxation risk of chemical enterprise can be obtained, which is shown in table 2.

Table 2 Weight of taxation risk of chemical enterprise

First grade index	Weight	Second grade index	Weight
I	0.236	I1	0.452
		I2	0.338
		I3	0.210
G	0.481	G1	0.396
		G2	0.424
		G3	0.180
T	0.283	T1	0.227
		T2	0.375
		T3	0.398

According to the analysis results, gains or losses of operations are most important affecting factors for the taxation risk of the chemical enterprise, the effect of investment on the taxation is similar with the effect of tax payments on the taxation risk of the chemical enterprise. Therefore the assessment results offer the effective theory basis for coping with the taxation for the chemical enterprise.

CONCLUSION

The chemical enterprise should recognize the importance of taxation risk management, and they should avoid the taxation risk during the whole operation. The effective assessment method can offer theory basis for the taxation risk management of the chemical enterprise. Analytic hierarchy process is an effective method for assessing the taxation risk of the chemical enterprise, and can obtain the correct assessing results, which can be applied widely in the taxation risk assessment of chemical enterprise.

REFERENCES

- [1] T Kenc. *Journal of Economic Dynamics and Control*, **2004**, 28(8), 1511-39.
- [2] HX Xie, LP Shi, H Xu. *Journal of Computers*, **2013**, 8(5), 1343-1350.
- [3] M Song, Z Qin, L Chen, et al. *Application Research of Computers*, **2008**, 25(2), 521-523.
- [4] M Fochmann, D Kiesewetter, A Sadrieh. *Journal of Economic Behavior and Organization*, **2012**, 81(1), 230-242.
- [5] YC Dong, WC Hong, YF Xu, et al. *European Journal of Operational Research*, **2013**, 229(3), 654-662.
- [6] YP Zhang. *Journal of Chemical and Pharmaceutical Research*, **2014**, 6(3), 1320-1325.
- [7] J Zhou. *Journal of Chemical and Pharmaceutical Research*, **2014**, 5(12), 654-661.
- [8] YF Sun. *Journal of Chemical and Pharmaceutical Research*, **2013**, 5(11), 22-31.
- [9] H Yue. *Journal of Chemical and Pharmaceutical Research*, **2014**, 6(3), 356-360.