Critical Factors and Risk Hierarchy of Finance Risk in Cross-Border E-Commence

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ABSTRACT. *In recent years, with the mature of information technology and the diversification of trade way, the new rise of cross-border e-commerce transaction amount rising, has become the important force to promote the development of China's foreign trade. But since cross-border e-commerce is gradually mature at the same time with the increase of capital market admittance threshold, financing risk become an important problem in the process of the industry financing. This study use ISM and MICMAC to carry out hierarchical analysis of the relationship between the financing risk factors of cross-border e-commerce, and then get the most important critical factors which should be focused on and carry out targeted adjustment, thus managers can clearly understand the core of the financing risk predicting issues, so as to provide a clear guidance for cross-border e-commence operations, and enhance the core competitiveness of enterprises.*

KEYWORDS: *ISM, MICMAC, Financing risk.*

1. Introduction

Along with the network popularization and people's consumption patterns changing, the E-commerce has promptly been into one popular emerging industry. The Cross-border e-commerce mainly refers to a new kind of international business activity in which the buyers and sellers in different countries or areas, communicate and negotiate a deal through the electronic commerce platform relying on the internet technology, and then complete the payment and settlement. At last, the sellers send the goods to foreign buyers through cross-border logistics service provider. The cross-border e-commerce, as an emerging industry, has been the new engine for upgrading our open economy development relying on its new concept and new modal. However, there are many problems in the cross-border e-commerce industry. Financing difficulty is one of the main reasons to hinder the development of cross-border e-commerce.

The financial situation of enterprises has become a hot point that being common concerned by the community, while the control of financing risk is the most important key point for the survival of the enterprises. In the process of enterprise production and operation, there will be some signs, which show that enterprises have already had poor management or liquidity deterioration etc. in financing. Most of the previous studies focused on the study of financial variables on the financial crisis and financing risk, such as Feng (2009) [1] and Qi (2017) [2]. In recent years, many scholars have paid attention to researches enterprises financing model and risk, such as Xia (2017) [3] and Ding (2017) [4], they all have got good results by using different methods. However, there is little analysis on cross border e-commerce, studies on the selection of indexes from the perspective of risk hierarchy and strategy are even more less.

In recent years, according to the risk analysis of complicated factors, many scholars have managed to put forward the interpretative structure model (Interpretative Structural Modeling Method; ISM) as well as classification method based on impact matrix cross-reference multiplication (Impact Matrix Cross-Reference Multiplication Applied to a Classification; MICMAC) to make deep analyses. The advantages of these two methods are that they can not only form a ladder hierarchy, at the same time, it can identify the most influential and dependent factors. For example, Wen and Dong (2013) [5]; Kumar, Gorane and Kant (2015) [6]; Zhao, Jiang and Guo (2015) [7].

By using ISM and MICMAC, this paper can carry out hierarchical analysis of the relationship between the financing risk factors of cross-border e-commerce, and then get the risk structure. And we can know the influence degree and the dependence degree of each critical factors according to the influence - dependence chart, what's more, we can find the most important critical factors which should be focused on and carry out targeted adjustment of the leading indexes, thus managers can clearly understand the core of the financing risk issues, so as to provide a clear guidance for cross-border e-commence operations, and enhance the core competitiveness of enterprises.

2. Introduction of ISM and MICMAC

2.1 ISM method

ISM was introduced by American professor Warfield in 1973[8], and it is mainly used to decompose the complex system into several subsystems, so as to clarify complex relationships, provide decision support for managers by multi-level hierarchical structure model. Methods and procedures of ISM technology are:

2.1.1. Identify the components of the target problem

If the target problem is a set composed of n elements, which is expressed by S, then

(1) $S = \{ s_1, s_2 \ldots s_n \}$,(s_i, s_j) is ordered pair of S_i and S_j;

(2)   Cartesian product is: $S \times S = \{ (s_i, s_j) | s_i, s_j \in S; \forall i, j \}$

(3)   The relationship between the elements in the set S is defined as binary relation.

2.1.2. The establishment of adjacency matrix

By determining whether there is any direct relationship between Si and Sj, we can determine the adjacency matrix A, if Si has a direct effect on Sj, then Sij in the matrix is 1, otherwise, Sij in the matrix is 0.

2.1.3. Computation of reachability matrix.

Reachability matrix refers to that the matrix form is used to describe the degree to which the nodes of a connected graph can be reached after a certain length of access. The steps is that add the adjacency matrix A and the unit matrix I to get a new matrix. After getting the matrix N which contains its own causal relationship, then the matrix N is repeated with Boolean algebraic operation, calculate it until it has met the conditions, $(A+I) \neq (A+I)^2 \neq \ldots \neq (A+I)^n = (A+I)^{n+1} = M$, the matrix M is the reachability matrix.

2.1.4. Construction of hierarchical structure

By using the reachability matrix M, we can find the reachable set R and the antecedent set Q for each factor, among which: The reachable set R refers to the collection of column elements corresponding to matrix elements which contain 1 in the row of elements Si in reachability matrix. It represents the arrival elements of Si. The antecedent set Q refers to the collection of row elements corresponding to matrix elements which contain 1 in the column of factors Si in reachability matrix.

When satisfied, these elements are in the same layer, then cut them off from the reachability matrix, and repeat the above steps, then we can divide the influencing factors into different layers, and finally, we can establish a hierarchical structure model, and what's more, we can use the multilevel ladder structured digraph to represent the whole structure of factors.

2.2 MICMAC method

MICMAC approach is a structural classification method concluded by Duperrin and Godet (1973) [9], which is used for analyzing and identifying the relationship between factors. Its method of calculation is similar to that of ISM, but according to the degree of driving force and dependence, its aim is to divide all the system elements into four categories, including influencing factors, independent factors,

dependent factors and transfer factors.

2.2.1. The analytical steps of MICMAC

The influence degree (D value) and the degree of dependence (R value) are calculated according to the reachability matrix.

(1)   The influence degree (D value): add Di to the value of each row in the array to represent the sum of other elements affected by element i, and this includes direct and indirect effects.

(2)   The degree of dependence (R value): add Rj to the value of each column in the array to represent the sum of the elements affected by other elements with the element j as the result.

2.2.2. Draw influence - dependence chart

Put the influence degree of each element (D value) and dependence (R value) into the influence - dependence chart, and the mean value of D and R is divided into four quadrants, thus factors in different locations represent different meanings as Figure 1.
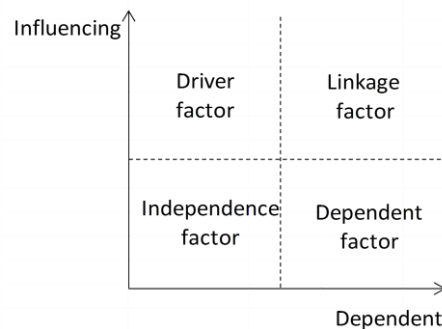

Figure 1. Influence–dependence chart

3. Case Study

3.1 Determine the critical factors of financing risk and compile the adjacency matrix

Grounded on the 15 critical factors of financing risk selected by three papers (i.e., Geng (2015) [10]; Qi (2017) [2]; Ding (2017) [4]), with a cross-border e-commerce company as the study object, this study has visited two senior executives and financial executives in cross border e-commerce industry, as well as

three financial management and e-commerce of college teachers, then this study makes an analysis of the relationship between the 15 key factors, and then compile the adjacency matrix.

Table 1. Critical factors of financing risk

Code	Factors
S1	Quick ratio
S2	Current ratio
S3	Asset-liability ratio
S4	Cash ratio
S5	Debt guarantee rate
S6	Turnover of current assets
S7	Total assets turnover
S8	The turnover rate of intangible assets
S9	Return on equity
S10	Main business profit margin
S11	Total return on assets
S12	Net profit growth rate
S13	Main business income growth rate
S14	Growth rate of total assets
S15	Chang rate of net cash flow under the influence of exchange rate

3.2 Computation of the reachability matrix

Add the summary of the adjacency matrix A and unit matrix I to get the adjacency matrix $(A + I)$, stop the operation until collecting all the matrix by using the Boolean algebra, then we can get the reachability matrix.

3.3 Risk hierarchy analysis

When satisfied, these factors are in the same layer, then cut them off from the reachability matrix, and repeat the above steps, then we can divide the influencing factors into different layers. The first layer financing risk factors are as Table 2.

Table 2. The first layer financing risk factors

s	R(Si)	A(Sj)	R(Si)∩A(Sj)
s1	1,5,9,12	1,4,6,7,11,13,14,15	1
s2	2,3,5	2	2
s3	3,5	2,3	3
s4	1,4,5,7,9,12	4	4
s5	5	1,2,3,4,5,6,7,9,11,12,13,14,15	5
s6	1,5,6,7,9,10,11,12,13,14	6,14	6,14
s7	1,5,7,9,12	4,6,7,11,14	7
s8	8	8	8
s9	5,9,12	1,4,6,7,9,11,13,14,15	9
s10	10	6,10,11,14	10
s11	1,5,7,9,10,11,12	6,11,14	11
s12	5,12	1,4,6,7,9,11,12,13,14,15	12
s13	1,5,9,12,13	6,13,14	13
s14	1,5,6,7,9,10,11,12,13,14	6,14	6,14
s15	1,5,9,12,15	15	15

According to Table 2, we can see that the first layer risk factors are S5, S8 and S10, we can get a new matrix after we remove these three factors, then we continue layer the new matrix. Repeat the above steps, the final financing risk hierarchy can be obtained as shown in Figure 2 below:

The seven-layer relationship has a certain influence on each other, and different decisions can be made according to the influence of different levels. The results show that the first layer is the direct cause of the risk of cross-border e-commerce financing, S5 (Debt guarantee rate), S8 (The turnover rate of intangible assets) and S10 (Main business profit margin) respectively. The seventh layer is the deepest cause, S6 (Turnover of current assets) and S4 (Cash ratio) respectively. However, the relationship between the sixth layer and the fifth layer is not significant, and the third, fourth and fifth layers have a great influence on each other. Therefore, it is possible to make management decisions only from the risk level, which may result in inadequacy. After the interaction between factors, the decision can be made more accurately. Therefore, this study further analyzes the depth of the MICMAC method.
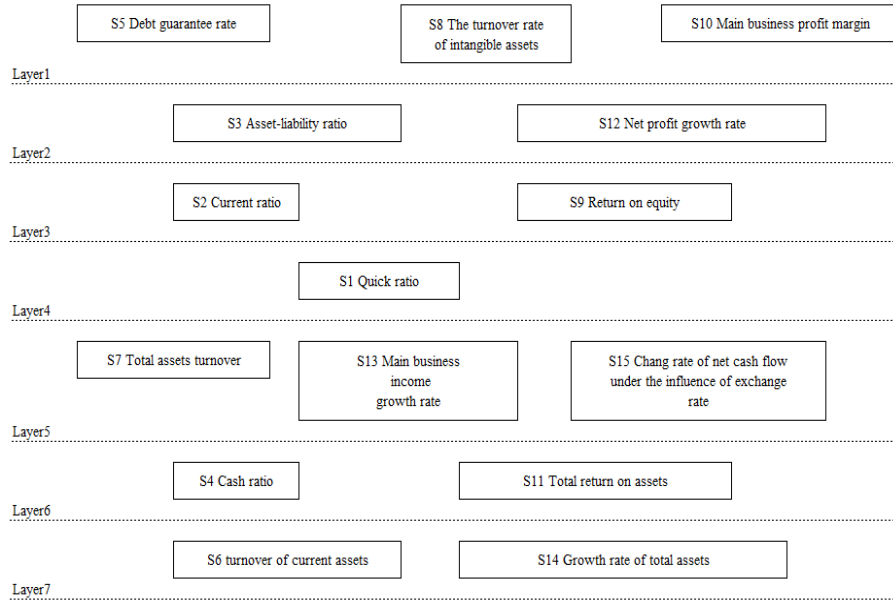
Figure 2. Risk hierarchy of the critical factors

3.4 Construction of influence - dependence chart

The influence degree (D value) and dependence (R value) of each factor are calculated and then draw the influence - dependence chart according to the results, and the mean value of D and R is divided into four quadrants, as shown in Figure 3.
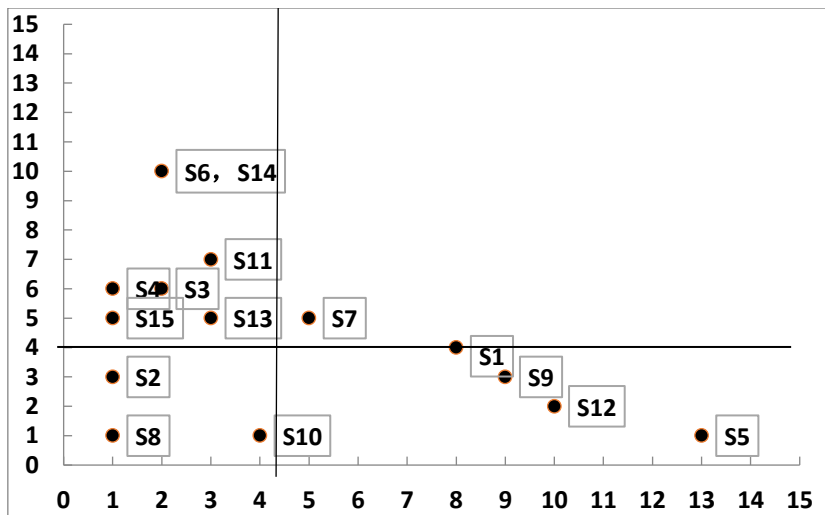
Figure 3. Result of influence - dependence chart

3.5 Discussion

It can be seen from Figure 4, S7: Total assets turnover, this factor has the characteristics of high influence and high dependence, indicates that this factor is unstable in the system, belongs to the risk factor. S7(Total assets turnover)is located in the first quadrant, but very close to the center, and in the fifth layer of the ISM risk hierarchy. Enterprises should pay attention to its influence and dependence, strengthen internal management, increase capital turnover, and improve asset utilization. Increase the cross-border financing efficiency.

S3: asset-liability ratio, S4: cash ratio, S6: turnover of current assets, S11: total return on assets,S13: main business income growth rate, S14: growth rate of total assets, S15: change rate of net cash flow under the influence of exchange rate, these seven factors have the characteristics of high influence and low dependence, thus they are influencing factors, what's more, they are input factors of the model, thus, these factors are the components of the whole system. At the same time, according to the risk hierarchy of the financing factors, S3 (asset-liability ratio) is in the second layer and is easily affected by factors such as S2 (current ratio). S4(Cash ratio), S11 (total return on assets), S6 (turnover of current assets), S14 (growth rate of total assets) is located in the bottom layer, belongs to the potential factors, we can affect the control such factors to influence the whole cross-border e-commerce financing system ; S13 (main business income growth rate), S15 (change rate of net cash flow under the influence of exchange rate) is located in the third layer, belong to the unstable factors,   by controlling this factor can influence financing risk.

S2: current ratio, S8: the turnover rate of intangible assets, S10: main business profit margins, these three factors have the characteristics of low influence and low dependence, thus they are independent factors, and the change of the whole system will not be affected too much by these factors.

S1: quick ratio, S5: debt guarantee rate, S9: return on equity, S12: net profit growth rate, these four factors have the characteristics of low influence and high dependence, thus they are more likely to be affected by other factors than other factors, belongs to the output factor for the whole system. What's more, these factors are very sensitive, and they can reflect the impact of dependent factors, so these four factors can be used to examine the effectiveness of the entire cross-border e-commerce financing risk system indicators, and provide reference for the decision making of the whole strategy. Compared to other three factors, S5 (debt guarantee rate) has high dependency, and on the first layer of ISM risk level, in the whole system belongs to the most sensitive factors, cross-border e-commerce industry should pay attention to debt situation, through the index to adjust or strategies to reduce the risk of financing.

By our analysis shows that the turnover of current assets, total return on assets, growth rate of total assets, these three factors have the highest influence. In the process of the strategic decision, we can through improve profitability and increase

capital accumulation to adjust the dependence of these factors, thus reducing cross-border e-commerce financing risk and financing difficulty, puts forward management strategies, and make the enterprise in the violent competition market environment can be sustained and stable development. And we can adjust the asset-liability ratio, cash ratio, main business income growth rate, change rate of net cash flow under the influence of exchange rate, because these factors are also affect cross-border e-commerce industry financing risk, in developing strategy and strategy implementation process, has the high reference value. Quick ratio, debt guarantee rate, return on equity, net profit growth rate are dependency factors, but because of this factors belong to sensitive factors, does not have special scientific reference value.

4. Conclusion

By using ISM and MICMAC methods, this study accurately gets critical factors and risk hierarchy of financing risk in Control of Cross-Border E-Commence, and provides clear direction for managers. But there are few limit in this study, thus the representative may not quite enough. In addition, by collecting the opinions of several experts, fuzzy theory is one of the future research directions.

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