Based on the ISM-MICMAC model, the risk path identification and factor analysis of the capital operation of small and medium-sized real estate enterprises

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Abstract. In small and medium-sized real estate enterprises, the accurate identification of the main factors affecting the operation of enterprise project funds and the analysis of their influencing process significantly impact the survival and development of small and medium-sized enterprises. Analyze the influence of financing, investment and construction activities on the operation of project funds and identify 16 major risk factors. Based on the calculation of the adjacency matrix and reachable matrix, the interpretive structure model and hierarchical structure diagram (ISM) were constructed, and divide the influencing factors into four categories, namely independent cluster, dependent cluster, linkage cluster, spontaneous cluster, combined with cross influence matrix multiplication (MICMAC). The results show that the driving force of quality management is low, but the dependence is vital. The macro background of financing, investment management, investment policy, and organizational coordination have low driving force and strong dependence. Quality management is an essential factor affecting the regular operation of enterprise project funds. The macro background of financing, investment management, investment policy, and organizational coordination are the direct reasons to keep the project fund risk stable. The research of this paper will contribute to the healthy development of SMEs and play a positive role in China's social and economic life.

Keywords: ISM, MICMAC, Small and medium-sized real estate enterprises, Risk factors.

1. Introduction

SMEs are vital in maintaining China's economy and coordinating social development. As labor-intensive enterprises, small and medium-sized enterprises have significantly contributed to transferring rural labor to urban areas, narrowing the gap between the rich and the poor in urban and rural areas, and improving the happiness index of residents. Due to their relatively small scale, small and medium-sized enterprises are easily affected by various factors in the operation process.

At present, there is much research in this area. In recent years, with the national macro-control, small and medium-sized real estate enterprises to the financial industry tilted, as well as most of the technological innovation across the country, the transformation of achievements by small and medium-sized enterprises. As the main force of technological innovation in the main body of the market, small and medium-sized enterprises promote their sustained and healthy development, which is the proposition of the times in the construction of socialist modernization with Chinese characteristics. While China's real estate enterprises are booming, it restricts the space for small and medium-sized real estate enterprises to survive and develop, resulting in unbalanced development of social resources. In 2021, Qian Yanli[1] researched small and medium-sized real estate construction projects. Taking the whole process of fund operation as the starting point in real estate construction project, the possible capital risk factors of real estate construction projects are analyzed, and based on the life cycle theory of engineering projects, different suggestions for capital risk control are put forward from different stages of the project. And for the financing of small and medium-sized enterprises, Tian Shuanglong[2] recognized the financing difficulties of small and medium-sized
enterprises on the basis of market research, and put forward suggestions to solve this problem from the three levels of the enterprise itself, the government and the bank; In terms of enterprise investment, Liu Pengbin[3] from the perspective of SME market management, believes that the analysis of enterprise management problems is of great significance for the operation and management of SMEs, and gives effective measures; In 2020, Li Qianyu[4] on the basis of constructing a measurement index of China's economic policy uncertainty, using data from 285 prefecture-level cities in China, conducted an empirical analysis of how uncertainty affects real estate investment behavior and investment efficiency, and the results show that there is a significant positive relationship between economic policy uncertainty and real estate investment, especially the improvement of economic policy uncertainty will promote the improvement of investment efficiency of real estate enterprises. The positive impact of uncertainty in the central and western regions on real estate investment and investment efficiency is more significant than that in the eastern region. According to the empirical results, further suggestions for flexible use of real estate policies and accelerating the improvement of the technical level of the real estate industry are further proposed, Liu Linchuan[5] through the study and analysis of small and medium-sized real estate construction project management engineering cases, because of the five aspects of the existing problems in small and medium-sized construction projects, put forward the enterprise construction project innovation management methods.

Although the research mentioned above uses different methods to study the capital operation risks of small and medium-sized real estate enterprises from different angles and in various aspects, most are subjective and objective, and there are still fewer studies on visualization and hierarchization. The article obtains a hierarchy diagram by constructing ISM; At the same time, combined with the MICMAC method, the dependence and driving force of the risk factors of the capital operation of small and medium-sized real estate enterprises are classified at a deeper level to facilitate the more effective and reasonable research countermeasures for the risk factors of different natures. The marginal contribution of this paper is to take the conclusions obtained from the mathematical model as the main logical line and use the theoretical knowledge related to real estate project funds to conduct a panoramic perspective on real estate project management measures.

2. Construction of risk index system

2.1 Financing stage

At the financing stage, the risk of capital operation is mainly affected by three factors such as financing management, financing channels, and financing macro background. In terms of financing management, due to the lack of a comprehensive understanding of the management's financing policy and loan business, the enterprise will not be able to achieve the financing purpose and cause certain economic losses in the later stage. However, neglecting the enterprise's emphasis on its credit status in management will lead to a poor corporate reputation and financing difficulties. In the macro background of financing, because real estate has a dual nature, it has attracted the attention of real estate entrepreneurs to macro-control "hot real estate," so the policy intensity is inclined to small and medium-sized enterprises. However, some enterprises have carried out illegal operations after obtaining undetectable economic resources and thus increased potential hidden dangers.

2.2 Investment stage

At the investment stage, the influencing factors mainly include the investment market, investment policy, and investment management. In terms of investment management, inappropriate investment strategic management methods and inadequate investment supervision measures will threaten the regular operation of enterprises. The business model of small and medium-sized enterprises is generally based on discounted cash flow, and the lease-supplemented model is adopted as a strategic management method. However, the financing of small and medium-sized enterprises is highly dependent on banks, which leads to a single channel, and the financing cost of small and medium-
sized enterprises is high, resulting in the aggravation of corporate risks. Before investing, enterprises will generally conduct market research on the investment market and conduct a series of influencing factors, of which any factor analysis error will cause sunk costs and economic losses for enterprises.

### 2.3 Construction phase

The factors affecting the construction stage of the enterprise mainly include organizational coordination, cost control, quality management, etc. In organizational coordination, the management authorizes the allocation of construction project funds to be squeezed and deducted layer by layer, resulting in unfair distribution of benefits and a decline in employee enthusiasm and the overall quality of construction projects. Usually, to complete the project plan of the enterprise, the management department generally uses the balance to recruit employees with low comprehensive quality, resulting in a series of chain reactions: first of all, the construction quality of the enterprise project will be directly affected, which will lead to the decline of the reputation of the enterprise and damage the image of the enterprise itself, and secondly, because the enterprise does not have management skills and other professional talents to lead and there is no standardization system to manage employees, which will lead to the gradual decline of the enterprise.

In summary, the indicator system constructed in this paper is shown in Table 1:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Primary factors</th>
<th>Secondary factors</th>
<th>Description of the influencing factors</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing stage</td>
<td>Financing management</td>
<td>Neglect of financing management (S1)</td>
<td>Management does not have a comprehensive understanding of financing policies and lending operations</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lack of risk management awareness (S2)</td>
<td>Enterprises need to timely analyze the opportunities and risks they are facing. The enterprise internal management is not good, and attaches insufficient importance to their own credit.</td>
<td>[12]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bad credit status (S3)</td>
<td>Many small and medium-sized real estate companies do not have capital advantage, overly rely on bank financing. In the new situation, the rapid appreciation of land and no longer obtain windfall profits, enterprises are facing a huge pressure of transformation and innovation.</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>Financing channels</td>
<td>Single financing channel (S4)</td>
<td>Real estate enterprises are highly leveraged, long-term operation mode, blind expansion of scale, will lead to potential dangers. Because of policy factors, some enterprises use funds to conduct illegal operations, increasing the risk of hidden trouble.</td>
<td>[7]</td>
</tr>
<tr>
<td></td>
<td>Macro background of financing</td>
<td>The financing chain is imperfect (S5)</td>
<td></td>
<td>[7]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Much leverage (S6)</td>
<td></td>
<td>[7]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More arbitrage in the mortgage market (S7)</td>
<td></td>
<td>[7]</td>
</tr>
</tbody>
</table>
Investment management

Competitiveness of enterprises (S8)

The more competitive an enterprise is, the more it is able to provide more business value for upstream and downstream enterprises.

Incomplete investment strategy (S9)

Enterprise investment strategy formulation is not perfect, easy to lead to investment error and capital loss.

Investment supervision is not in place (S10)

The management did not supervise the enterprise project, and the risks accumulated one by one in the actual project operation.

Investment market

Weak awareness of market research (S11)

Small and medium-sized enterprises lack of research awareness, research methods are not scientific, will directly lead to decision-making mistakes.

Investment policy

Policies affect investment decisions (S12)

Macro-control policies affect the development direction and speed of enterprises and even the whole industry.

Unfair distribution of benefits and low quality of staff (S13)

Investment funds in the construction of the phenomenon of ring - ring deduction, reduce the actual utilization efficiency.

Organizational and coordination

Lack of perfect engineering management mode (S14)

Because the enterprise management personnel professional ability is poor, the operation system is backward, leading to the enterprise losses.

Construction phase

Lack of standardization in cost control (S15)

Enterprise cost management ability is insufficient, resulting in the waste of funds.

Cost control

The problem of unqualified quality exists (S16)

In order to catch up with the schedule, the construction is not strictly in accordance with the standard, so that the quality of the project is not guaranteed.

Quality management

ISM model

The Interpretative Structural Modeling Method (ISM), first proposed by Warfield in the USA in 1973 for the analysis of complex socio-economic system problems, is a method for static analysis of the hierarchical structure of complex technologically social systems. This method uses the principle of graph theory association matrix, qualitatively analyzes the overall structure of complex systems, and uses graphics to show the relationship between each element in the system. The characteristic of the ISM model is to decompose complex systems into multiple subsystems and combine people's
practical experience to construct a model of multi-level hierarchical structure, to clarify the connection and location of various elements in the system[10]. The ISM modeling steps are as follows:

STEP1: Creation of adjacency matrix.
STEP2: Summing the adjacency matrix with the unit matrix.
STEP3: Building reachable matrices.
STEP4: Hierarchical decomposition of reachable matrices.
STEP5: Drawing structural model diagram.

4. MICMAC model

Matrices impacts cruises-multiplication appliance classement (MICMAC) is a method proposed by Duperrin and Godet in 1973 to analyze the position and magnitude of various influencing factors in the system. It uses to identify dynamic and dependent variables in the system. The MICMAC model uses the matrix multiplication principle to obtain the driving force and dependency of each factor in ISM in the reachability matrix. Among them, the greater the driving force, the greater the influence of this factor on other factors; The better the dependence, the greater the influence of other factors on this factor[11]. Therefore, the MICMAC steps are as follows:

Step1: Calculate the sum of the rows and columns of the reachable matrix to respectively obtain the values of the driving force and the dependency;
Step2: Takes the average value of dependence and driving force as the vertical error line and horizontal error line to divide the influencing factors into four categories: Autonomous (quadrant I), dependent (quadrant II), linkage (quadrant III), and Independent (quadrant IV);
Step3: Draw a quadrant diagram, as shown in Figure 1:

Figure 1 Analysis schematic of MICMAC

5. Actual situation analysis

5.1 ISM Model Construction

There may be a direct correlation between the influencing factors in the capital operation of small and medium-sized real estate enterprises. In this paper, Delphi method is used to generate the adjacency matrix by comparing the risk influencing factors of fund operation with relevant domain experts. Since the effects of each factor are likely to be reciprocal, only direct effects and not indirect effects are considered, and the direct effects of each factor can be expressed by establishing an adjacency matrix A, or zero if the influence factor Si directly affects Sj. To establish an adjacency matrix is shown in Matrix A:
5.2 Computation of Accessibility Matrix

According to the adjacency matrix $A$ of Formula 2, the reachable matrix $R$ is obtained by introducing unit matrix $I$ based on the adjacency matrix, and Boolean operation of matrix $A+I$ is carried out by software until Formula 1 is established.

Formula 1: $(A+I)^{n+1} = (A+I)^n ≠ (A+I)^{n-1}$

In the reachable matrix, when element $S_{ij}$ is 1, it means that there is a reachable path between factor $S_i$ and factor $S_j$. If element $S_{ij}$ is 0, there is no reachable path between factor $S_i$ and factor $S_j$.

The function of generating reachability matrix is to express the direct or indirect influence relationship between various factors. The reachable matrix obtained by operation is shown in Matrix $R$:

\[
\begin{pmatrix}
S_1 & S_2 & S_3 & S_4 & S_5 & S_6 & S_7 & S_8 & S_9 & S_{10} & S_{11} & S_{12} & S_{13} & S_{14} & S_{15} & S_{16} \\
S_1 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_2 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_3 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_4 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_5 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_6 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_7 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_8 & 1 & 1 & 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_9 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_{10} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_{11} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_{13} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_{14} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_{15} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
S_{16} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
\end{pmatrix}
\]

5.3 Hierarchical decomposition of reachable matrices

To divide the system factor level means to part the influencing factors that affect the capital operation in the system into different levels. In this process, the reachable set $R(S_j)$, antecedent set
A(Si), and intersection R(Sj) \cap A(Si) = R(Sj) of all factors should be determined first. The results are shown in Table 2:

<table>
<thead>
<tr>
<th>Factors</th>
<th>Reachable set R (Sj)</th>
<th>Antecedent set A (Si)</th>
<th>R (Sj) \cap A (Si)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>S1, S2, S3, S4, S5, S8</td>
<td>S1, S2, S3, S4, S5, S8, S10</td>
<td>S1, S2, S3, S4, S5, S8</td>
</tr>
<tr>
<td>S2</td>
<td>S1, S2, S3, S4, S5, S8</td>
<td>S1, S2, S3, S4, S5, S8, S10</td>
<td>S1, S2, S3, S4, S5, S8</td>
</tr>
<tr>
<td>S3</td>
<td>S1, S2, S3, S4, S5, S8</td>
<td>S1, S2, S3, S4, S5, S8, S10</td>
<td>S1, S2, S3, S4, S5, S8</td>
</tr>
<tr>
<td>S4</td>
<td>S1, S2, S3, S4, S5, S8</td>
<td>S1, S2, S3, S4, S5, S8, S10</td>
<td>S1, S2, S3, S4, S5, S8</td>
</tr>
<tr>
<td>S5</td>
<td>S1, S2, S3, S4, S5, S8</td>
<td>S1, S2, S3, S4, S5, S8, S10</td>
<td>S1, S2, S3, S4, S5, S8</td>
</tr>
<tr>
<td>S6</td>
<td>S6</td>
<td>S6</td>
<td>S6</td>
</tr>
<tr>
<td>S7</td>
<td>S7</td>
<td>S7</td>
<td>S7</td>
</tr>
<tr>
<td>S8</td>
<td>S1, S2, S3, S4, S5, S8</td>
<td>S1, S2, S3, S4, S5, S8, S10</td>
<td>S1, S2, S3, S4, S5, S8</td>
</tr>
<tr>
<td>S9</td>
<td>S9</td>
<td>S9, S11, S15, S16</td>
<td>S9</td>
</tr>
<tr>
<td>S10</td>
<td>S1, S2, S3, S4, S5, S8, S10</td>
<td>S10</td>
<td>S10</td>
</tr>
<tr>
<td>S11</td>
<td>S9, S11</td>
<td>S11, S15, S16</td>
<td>S11</td>
</tr>
<tr>
<td>S12</td>
<td>S12</td>
<td>S12</td>
<td>S12</td>
</tr>
<tr>
<td>S13</td>
<td>S13</td>
<td>S13, S15, S16</td>
<td>S13</td>
</tr>
<tr>
<td>S14</td>
<td>S14</td>
<td>S14, S16</td>
<td>S14</td>
</tr>
<tr>
<td>S15</td>
<td>S9, S11, S13, S15</td>
<td>S15, S16</td>
<td>S15</td>
</tr>
<tr>
<td>S16</td>
<td>S9, S11, S13, S14, S15, S16</td>
<td>S16</td>
<td>S16</td>
</tr>
</tbody>
</table>

According to Table 2, the levels of each element are determined. According to the above results, through analysis, it is concluded that S16 is in the fourth level, S15 is in the fourth level, S10 and S11 are in the second level, and other factors are in the first level. As shown in Table 3:

<table>
<thead>
<tr>
<th>Level</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S1, S2, S3, S4, S5, S6, S7, S8, S9, S12, S13, S14</td>
</tr>
<tr>
<td>2</td>
<td>S10, S11</td>
</tr>
<tr>
<td>3</td>
<td>S15</td>
</tr>
<tr>
<td>4</td>
<td>S16</td>
</tr>
</tbody>
</table>

5.4 The ISM analysis

According to the results in Table 3, the influencing factors at the same level are placed at the same level, and all levels are connected with arrows according to the directed path to form an explanatory structure model of risk path identification and factor analysis, as shown in Figure 2:
As a typical capital-intensive industry, real estate enterprises adopt the development mode of high leverage and turnover, accumulating excessive risks in the whole cycle[12]. As shown in figure 2, each arc represents a hierarchy. The outer layer directly impacts the real estate enterprise capital operation. In the initial stage of financing, corporate finance management and the market environment, policy, and other factors determine whether the enterprise can efficiently use the diversified financing ways to help real estate enterprises after obtaining land resources for the development and construction[13]. Policy background and management also play a similar role in the investment stage. The second is the indirect factor; investment supervision measures are not in place (S10) easy to blindly pursue economic benefits, do not blindly expand the scale according to the actual situation. Once the risk appears, it may cause a destructive credit impact and lead to enterprises' lack of resistance ability and collapse. The real estate industry plays a pivotal role in the development and construction of the country. It is necessary to improve the investment supervision system and fully consider national policies, enterprise linkage, and other factors to promote the healthy and stable development of the industry.

The market is objective and changeable. If enterprises lack the awareness of market research (S11), they will not fully prepare for market research in the investment stage, and they will view the market too optimistic without understanding the market, which will lead to the error of investment judgment, which will have made an impact on the return of funds. For example, some commercial projects invested by enterprises have high requirements for geographical location and long-term business development. A good operation can obtain continuous cash flow. However, when the regional human flow is small, or the operation is not good, various capital risks are easy to occur, and it is often difficult to sell in time or suffer depreciation loss when the enterprise needs to realize it[14]. As a profound factor, quality control (S16) is the cornerstone of the survival of small and medium-sized real estate enterprises. The projects built within a cycle are the final carrier of real estate enterprises' whole capital operation process. The quality of the projects will directly affect the profit, reputation, and reputation of enterprises and even the safety of people's lives and property. One mistake may cause the enterprise to go bankrupt. Therefore, it is at the bottom of the chain of capital operation, with decisive significance.
5.5 Calculation and analysis of MICMAC

According to the calculation results of the reachability matrix, the average driving force and dependence values are both 4, which is regarded as the dividing line of the four quadrants. Then, according to the driving force and dependence results of each influencing factor, the MICMAC analysis diagram of influencing risk can be obtained, as shown in Figure 3:

Figure. 3. MICMAC analysis for the risk of capital operations

Elements S6, S7, S11, S12, S13, and S14 belong to the spontaneous cluster (quadrant I) with low driving force, low dependence, and relative independence. S6, S7, and S12 are in the lower left corner and are not affected by other factors or affect others. Controlling factors in spontaneous clusters is simpler and more manageable than other factors, so controlling factors in spontaneous clusters should be considered first. Elements S16 and S10 belong to the (quadrant II), with high dependence and low driving force. These factors are highly dependent and are easily affected by other factors, such as quality issues, which will affect the final quality of delivery at each stage. As for the influencing factors in this quadrant, we can strengthen the control of other influencing factors to make the factors in this quadrant in a peaceful state to promote the development of real estate enterprises. Elements S1, S2, S3, S4, S5, and S8 are critical factors with high driving force and high dependence. In other words, other factors in the system have a significant influence on it, and other factors also have a great influence on it. In the process of asset operation, the above factors play a vital role in the risk.

6. Conclusions

In order to explore the path of small and medium-sized real estate enterprises in the process of capital operation risk factors, according to the characteristics of small and medium real estate enterprise capital operation, from the financing stage, investment and construction phase out 16 critical influencing factors, combining ISM model and MICMAC model, determine the relationship between influencing factors and analysis of factors, build the grade four layers of structure. The analysis draws the following conclusions:

The ISM model analyzes the progressive relationship between the influencing factors. The results show that S16 quality management is at the bottom of the structure layer and is a profound factor in the project capital operation risk of small and medium-sized real estate enterprises. Therefore, when
enterprises carry out construction, they should carry out construction strictly according to the corresponding standards to ensure the quality of the project.

MICMAC analysis shows that S16 quality management has strong dependence and weak driving force, which can be solved through direct or indirect factors, such as S13 reasonable profit distribution and improving the quality of employees, to reduce the capital risk in the process of enterprise operation.

There are many risks in the operation of project capital of small and medium-sized real estate enterprises in China. However, the risk paths are different due to the different operation modes of the capital of different enterprises. The article carries on the corresponding analysis and concludes that the quality of the project is the profound factor that affects the capital operation of small and medium-sized real estate enterprises.

References