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Fuzzy Comprehensive Evaluation Method Applied in the Real Estate Investment Risks Research

Zhang ML(Zhang Minli)[1],Yang Wp(Yang Wenpo)[2]

[1]*School of Civil Engineering and science Yangzhou University*
Yangzhou, China
[2]*Information Science and Engineering College Yangzhou University*
Yangzhou, China

Abstract

Real estate investment is a high-risk and high returned of economic activity, the key of real estate analysis is the identification of their types of investment risk and the risk of different types of effective prevention. But, as the financial crisis sweeping the world, the real estate industry also faces enormous risks, how effective and correct evaluation of real estate investment risks becomes the multitudinous scholar concern[1]. In this paper, real estate investment risks were summarized and analyzed, and comparative analysis method is discussed and finally presented fuzzy comprehensive evaluation method, not only in theory has the advantages of science, in the application also has the reliability, for real estate investment risk assessment provides an effective means for investors in real estate investing guidance on risk factors and forecasts.

Keywords:Fuzzy comprehensive evaluation method; The investment risk; Real estate investment; Risk analysis.

1. Introduction

The real estate industry is playing an important stimulating role in China's national economy which has been the main pillar industry of national economy, but it also has been considered a high-yield investment. Therefore, the real estate investment is still within the next few years, a sustainable social investment hot spot. But the real estate investment process is the coexistence of risks and benefits, also is a high-risk high-yield economic activities. Therefore, research of real estate investment risk and risk aversion measures is of great practical significance. Among the many investment risk analysis method based on, to find an effective solution to reduce the investment risk has always been the focus of attention. In this paper, fuzzy comprehensive evaluation method, with a view to real estate investment risks make a more objective scientific evaluation.

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2. Real estate investment overview

The so-called investment in economics is defined as "the consumer will now move through some sort of media consumption behavior for the future is carried out for profit capital investment." Real estate investment is the investor capital into real estate, with a view to obtain an uncertain future gains[2], that is, their money to invest in real estate development and management and intermediary services in the behavior. Real estate investment is an activity which costs one-time funds for the massive accumulation of capital, and longer time period than any other investment resulting in more uncertainty.

Real estate commodities are special commodities differentiated to other commodities. Uncertainties are always associating with them, which plays a decisive role in the success or failure.

- Real estate investments in fixed and non-mobility.
- Real estate investment and cost of high input
- Real estate investment has long payback period and longer cyclical.
- High-risk real estate investment.
- Rreal estate investment environment strong constraints
- Real estate investment in low liquidity

3. Real estate investment risks overview

3.1 The concept of real estate investment risk and risk types

Real estate investment risk is engaged in the real estate investment losses caused by the possibility of loss, which includes the loss of capital invested and the expected return not meeting the losses. Risk and real estate development, always accompanied, always hand in hand, which is different from other industries by the real estate industry itself, the characteristics of decision.

Real estate investment risks are mainly divided into systematic risk investment and Investment unsystematic risk. The former can influence the real estate market, the latter only for the individual changes in real estate prices[3].

1) Investment systemic risk

(a) The policy risk. In China's market economy has not been perfected yet,the state made the development of real estate is strictly controlled, such as government limited foreign policy, the second set of housing down payment mortgages and restrictions on the villa building etc and other related macro-control policies have given the real estate investor risks.

(b) The interest rate risk. Interest rate risk refers to the possibility of loss due to the interest rate changes. The larger amounts of real estate investment, the longer investment recovery period, especially bank loans are quite big on external finance. Therefore, there are inevitable risks arising from changes in interest rates.

(c) The inflation risk. Inflation refers to the note issuance exceeds the actual requirements of the notes of the market circulation arising from the devaluation, rising prices, the actual decline in purchasing power.

(d) The cycle of risk. Cycle of risk refers to the volatility of the real estate market cycle brings the risks to investors. Just as the existence of the economic cycle, there are periodic fluctuations in the real estate market or the business cycle phenomena. Fluctuations in the real estate market cycle can be divided into four stages —recovery and development, prosperity, crisis and recession, depression.

(e) natural risks. Natural hazard is due to natural factors (such as earthquakes, fires, floods, storms, snow, etc.) of uncertainty and irresistible to real estate investment projects of produce risk.

2) Investment unsystematic risk

(a) The credit risk. Refers to the counterparty fails to fulfill the obligation prescribed contract caused economic losses, That is fiduciary cannot fulfill the responsibility and make the credit people expected return and actual returns deviate from the possibility of occurrence, which is the main types of financial risks.
(b) Business competition risk. The emergence of business competition, mainly from investors in the risk of subjective factors, it includes an investment location selection mistakes and a misunderstanding of the law, etc.
(c) Financial risk. Financial risk is due to leveraged investors unable to meet liabilities arising from obligations or can not be timely loan proceeds arising from the possibility of loss.
(d) Quality risk. In the same area with the price of real estate in the project construction quality investors, quality risk has become the primary consideration. Real estate project construction quality not up to standard may lead to rework, reinforcement, design changes, construction and delay processing, enlargement of investment capital.

3.2 Characteristics of real estate investment risk

Real estate investment risk except with the general characteristics of risk, obviously presents following features:

- The risk of occurrence of a particular contingency, and the inevitable occurrence of a large number of risk[4].
- Cash poor: As a real estate investment fund is invested in a large amount and of a long cycle, and the real estate market is an incomplete market, hence it endures higher realized risk.
- Compensatory. As the real estate investment risks, which investors generally bear the risk of economic demand compensation, the compensation is also called the risk premium or risk-reward.
- Real estate investment risk factors of grey. Since the formation of risk factors in people's subjective understanding of the relationship between these factors, as well as the impact of these factors on the risk of not fully understanding, therefore, investment in real estate between the various risk factors of typical gray.

4. Principle of fuzzy comprehensive evaluation

Fuzzy comprehensive evaluation is a fuzzy transformation theory and the maximum membership degree principle, considering the evaluation of things and being related to various factors, it is the comprehensive evaluation[6]. Fuzzy comprehensive evaluation method by combining a variety of factors to consider, for something to make comprehensive judgments on a particular purpose or decision-making, and deal with other methods can not deal with fuzzy information, is a combination of qualitative and quantitative decision-making process[7].

Fuzzy comprehensive evaluation method of the basic principles and steps in:

4.1 Identification of indicators set and reviews sets

The things being evaluated the impact factor of $U_1 U_2 \cdots U_m$ Constitutes a factor set $U : U = \{U_1 U_2 \cdots, U_i \quad U_m\}$ Where U_i is an indicator of factor concentrate. $U_i = \{U_{i1} U_{i2} \cdots, U_{ij} \quad U_{is}\}$ is the U_i in the first indicators of the index set j, U_{ij} is the

U_{i} in the first indicators of the indicator j concentration of an indicator, based on this idea, you can create multi-target architecture.

Reviews collection objects is a judge who may make to the judge the overall evaluation results are a collection of elements.Evaluation of high to low levels for the reviews set of $V:V=\{V_1V_2\cdots V_{\mathrm{n}}\}$ .Reviews set identification, get a fuzzy evaluation vector of the object being evaluated degree of membership of various reviews grade level of information through out the fuzzy vector that reflects the evaluation of fuzzy feature.

4.2 Determine the levels of weight

The importance of each factor is usually not the same, in order to reflect the importance of each factor for each factor R should be given appropriate weight. $A_{\mathrm{i}}=\{A_1A_2\cdots A_{\mathrm{m}}\}$ represents the primary weight, $B_{\mathrm{i}}=\{B_{i1}B_{i2}\cdots, B_{\mathrm{ij}}\quad B_{\mathrm{is}}\}$ represents the secondly weight, B_{ij} represents i elements j index weights. Delphi method can be adopted by weight or expert survey method to obtain, but also through the Analytic Hierarchy Process (AHP) to obtain.

4.3 Fuzzy comprehensive judge

The first step: write the factors of the secondly factor set on the reviews of each set of membership may be the primary factor in the fuzzy evaluation matrix.

$$R_{\mathrm{i}}=\begin{pmatrix} r_{11} & r_{12} & \cdots\cdots & r_{1s} \\ r_{21} & r_{22} & \cdots\cdots & r_{2s} \\ \cdots\cdots & \cdots\cdots & \cdots\cdots & \cdots\cdots \\ r_{n1} & r_{n2} & \cdots\cdots & r_{ns} \end{pmatrix}^{T}$$

The second step: write the weight vector of the secondly factor $B_{\mathrm{i}}=\{B_{i1}B_{i2}\cdots B_{\mathrm{is}}\}$, usually require $\sum_{j=1}^{s}B_i=1$ and $B_{\mathrm{ij}}\geq 0$.

The third step: Start Fuzzy Comprehensive Evaluation $E_i=B\bullet R_i$ Where "$\bullet$" that according to selected practical problems in computing the product of a certain ambiguity. Where E_i is called evaluation index, that means useing $U_{\mathrm{i}}=\{U_{i1}U_{i2}\cdots, U_{\mathrm{ij}}\quad U_{\mathrm{is}}\}$ S evaluation indexes, according to experts, the investigation determined the weight and the target set degree of membership of the reviews,find a leader in the evaluation of the object to the alternative element of cohesion that reviews focus on the various reviews of the membership.

The fourth step: similarly find the primary factor $U_{\mathrm{1}}U_2\cdots, U_{\mathrm{i}}\quad U_{\mathrm{m}}$, the Comprehensive Evaluation results of $E_1E_2\cdots, E_{\mathrm{i}}\quad E_{\mathrm{m}}$.

The fifth step: The composition of the five Comprehensive Evaluation of the results from the primary relationship matrix $E=\left[E_1E_2\cdots E_{\mathrm{m}}\right]^T$.

The sixth step: U will be judged as a collection of E, and with each weight set of the primary factor consisting of the weight vector A. Find the real estate enterprise's core competitiveness of the reviews set of all elements attached to the $E_0=E\bullet A$ 。

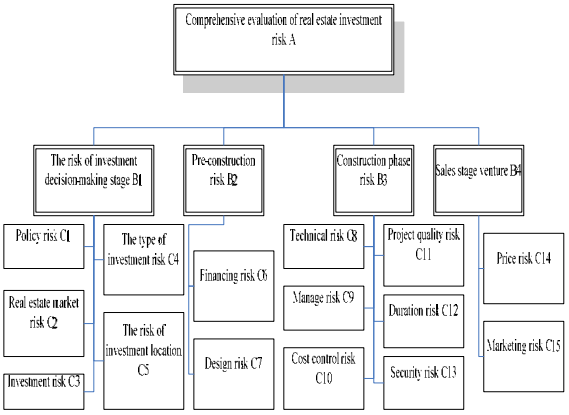
Finally: E_0 need to be normalized, so maximum membership degree method can be used in real estate and make assessment of investment risk. Can also fill in the various reviews reviews set the standards set points. finally the real estate investment risks obtained the final fuzzy evaluation score, and then concludes evaluation results.

5. Case study of fuzzy comprehensive evaluation method

There is now a Shanghai real estate development companies need to conduct a risk two comprehensive evaluation of investment projects, two projects are located in Jinshan District and Zhabei District, the investment project data and statistics in 2007. we use these data on the two projects are evaluated on the evaluation results as investors in the basis for investment decisions.We use fuzzy comprehensive evaluation method, specific steps are as follows:

1) Construction of a comprehensive evaluation index system of the real estate risk, investment risk assessment index hierarchy system, including the target level A, level B criteria and indicators for level C, as shown in Table 1.

Table 1. Real Estate Investment Risk comprehensive evaluation index system



2) Analytic Hierarchy Process to determine the weight of each index.

Firstly: determine the weight of layer guidelines, using 1 to 9 scale, the establishment of comparison matrix:

A–B	B1	B2	B3	B4	α
B1	1	4	5	4	0.58
B2	1/4	1	2	1	0.16
B3	1/5	1/2	1	1/2	0.10
B4	1/4	1	2	1	0.16

Figure 1. The establishment of comparison matrix

Calculate the available weight vector α={0.58,0.16,0.10,0.16},to determine the largest eigenvalue matrix $\lambda_{\max} = 4.03$, average random consistency index RI=0.89,consistency index CI=0.01, Because CR <0.1, so comparison matrix is acceptable.

Secondly: the identification of the targets on the target layer of synthetic weights. Indicators on the target layer of synthetic weight

ω={0.162,0.162,0.103,0.058,0.162,0.144,0.016,0.005,0.005,0.028,0.028,0.028,0.005,0.128,0.032}

Indicators of the consistency of the target layer to meet the requirements of the overall consistency of

3) Determine the risk assessment set E = (big, large, medium, small, small), based on the evaluation scale, using expert evaluation method of scoring the various investment and development projects, to be evaluation index set membership matrix as follows:

$$R_1=\begin{Bmatrix}0.0&0.0&0.1&0.8&0.1\\0.0&0.2&0.6&0.2&0.0\\0.0&0.0&0.3&0.5&0.2\\0.0&0.0&0.4&0.6&0.1\\0.0&0.0&0.2&0.5&0.3\\0.0&0.0&0.2&0.7&0.1\\0.0&0.0&0.3&0.6&0.1\\0.0&0.0&0.1&0.5&0.4\\0.0&0.0&0.2&0.6&0.2\\0.0&0.0&0.3&0.5&0.2\\0.0&0.0&0.2&0.5&0.3\\0.0&0.0&0.3&0.7&0.0\\0.0&0.0&0.2&0.5&0.3\\0.0&0.0&0.2&0.6&0.2\\0.0&0.0&0.2&0.7&0.1\end{Bmatrix}\quad R_2=\begin{Bmatrix}0.0&0.0&0.1&0.8&0.1\\0.0&0.2&0.6&0.2&0.0\\0.0&0.3&0.5&0.2&0.0\\0.0&0.2&0.6&0.2&0.0\\0.0&0.2&0.7&0.1&0.0\\0.0&0.4&0.5&0.1&0.0\\0.0&0.0&0.2&0.6&0.2\\0.0&0.0&0.5&0.3&0.2\\0.0&0.0&0.3&0.5&0.2\\0.0&0.2&0.5&0.3&0.0\\0.0&0.0&0.5&0.5&0.0\\0.0&0.3&0.6&0.1&0.0\\0.0&0.0&0.2&0.5&0.3\\0.0&0.3&0.5&0.2&0.0\\0.0&0.0&0.4&0.6&0.0\end{Bmatrix}$$

4) Calculate investment and development projects of the two comprehensive evaluation results, respectively,

$$S_1=\omega R_1=(0.00,0.03,0.29,0.56,0.12)$$

$$S_2=\omega R_2=(0.00,0.20,0.48,0.30,0.02)$$

Were given five risk rating in order to weight 5,4,3,2,1, the results of the evaluation of single-valued vector obtained two investment projects in a consolidated evaluation of point values:

S_1 =0.03×4+0.29×3+0.56×2+0.12×10.03+0.29+0.56+0.12=2.23

S_2 =0.20×4+0.48×3+0.30×2+0.02×10.20+0.48+0.30+0.02=2.86

From the evaluation results can be seen that the risk of investment projects, the first investment project is less than the second risks. Therefore, investors should choose the first investment.

5) Conclusion

Illustrate by example, fuzzy comprehensive evaluation method is a very effective real estate investment risk evaluation method, it can obtain the investment process in the comprehensive performance project quantitative indicators to quantify the results obtained for the investors to invest and to provide reference for decision-making, has a large application space and the application value.

6. Summary

Real estate economy is a risky economy, inevitably accompanied by investment in real estate investment risks. Real estate economy is a risky economy, inevitably accompanied by investment in real estate investment risks. In this paper, fully aware of the real estate investment risk analysis, under the premise of the importance of access to a lot of literature, in the real estate investment risk evaluation methods in-depth study on the basis of comparison, the integrated use of AHP and fuzzy evaluation method to assess with " ambiguity "of things analysis method. Fuzzy evaluation method to deals with

hierarchical analysis of the various programs pros and cons of the various evaluation factors scoring problems; level of analysis rules for the fuzzy comprehensive evaluation to provide a more scientific evaluation index system and the weight of each factor.Through the establishment of fuzzy mathematical model, using fuzzy pattern recognition method, we can better solve the fuzzy risk assessment of real estate investment issues. However, this method also has application to determine subjective, therefore, in the real estate investment risk analysis and evaluation, you need to combine several methods applied in order to improve the accuracy of analysis of the conclusions.

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