Build the Structural Model of Risk Assessment on the AHP Method by Yaahp Software:
a Case Study on Housing Fund

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Abstract*:* In order to study the risk such a complex and relatively obscure issue of housing fund, we build the structural model of risk assessment with AHP method, Yaahp is a software development company specialized software to achieve a complete AHP, determine each specific evaluation of the criteria layer and programs layers to establish the structure of the housing fund risk management model. Finally get housing fund risk judgment matrix. Determined by the characteristics the housing fund in the course of execution it will be various unforeseen factors of inevitability, as long as careful analysis of the potential risk factors themselves, and actively respond to prevention, must be able to control the risk of loss to a minimum.

Keywords: AHP; Yaahp; Structural Model; Housing Fund

INTRODUCTION

Analytic Hierarchy Process (i.e. AHP) is proposed by a famous American professor T L Saaty, university of Pittsburgh Satie, which in the 1970s a combination of qualitative and quantitative, systematic, hierarchical analysis methods. Because of its practicability and effectiveness in dealing with complex decision problems, AHP soon get worldwide attention. Currently, its application has been all over the field of economic planning and management, energy policy and distribution, transportation, education, health and the environment. The basic idea of the Analytic Hierarchy Process AHP is a problem if the target is determined by several factors, these factors in the proportion of the target (or contribution) is to be determined first. The basic idea of the AHP is: the target problem is determined by several factors, these factors in the proportion of the target (or contribution) is to be determined first. The proportion to be integrated on the basis of these factors, resulting in a total contribution, to the total contribution of the largest proposal is the optimal solution.

The specific steps of AHP can be summarized as follows:

1) Establish a hierarchical model. Accordance with the nature and requirements of the problem, according to the various factors relating to different attributes from the top down into several levels. Generally divided into three layers, the top layer is the target, the bottom layer is the program, the middle layer is the criteria or index level.

2) Construct pairwise comparison matrix. From the second layer, using pairwise comparison and comparative scale of 1 to 9 pairwise comparison matrix structure (judgment matrix). In this step, the establishment of pairwise comparison matrix is mainly based on personal or expert subjective judgment.

3) Single-level sorting and consistency check. Use the judgment matrix to determine the impact of a layer to get impact of each factor in the total proportion, that the weight. We require the judgment meet the matrix consistency conditions. If the consistency test is not passed, need to re-construct the appropriate judgment matrix.

4) Total level sorting. Calculate weight vector of the lowest level to the uppermost objection, and doing the sort of total consistency test. If the test is passed, the weight vector is used to rank the final decision.

Pay attention to the step in AHP, as long as the pairwise comparison matrices (judgment matrix) is given by decision makers, calculation and analysis are carried by out the computer, so it can be relevant to the development of AHP software, convenient application for decision makers. For example, you can use MATLAB software - the known powerful numerical calculation function development package, in addition to easy to use analysis AHP software: Yaahp. Yaahp (Yet another AHP) is a software development company specialized software to achieve a complete AHP, provides a convenient a hierarchical model construction, judgment matrix data entry, sorting weight calculation and computational data export functions. The software is flexible and easy to use, favored by many educational and research institutions and commercial organizations.

HOUSING FUND

China - Housing Accumulation Fund

For the risk such a complex and relatively obscure issue of housing fund, combined with the characteristics of China's Housing Accumulation Fund, the risk can be divided into the Housing Accumulation Fund faces systemic risk and non-systematic risk. Systemic risk is the possibility that by macroeconomic factors due to changes such as political, economic and social environment cause the Housing Accumulation Fund losses, the overall risk of the Housing Accumulation Fund, including the risk of fluctuations in the economic cycle, policy risk, inflation risk, interest rate risk; Unsystematic risk is the possibility of a variety of factors caused by its own fund management institutions Housing Accumulation Fund losses, the risk of individual Housing Accumulation Fund management center, including liquidity risk, credit risk, operational risk, decision-making risks. By identifying risks to the Housing Accumulation Fund, according to business lines to define and identify various risks, establish risk identification catalog items.

Worthy of note is that the Housing Accumulation Fund management center operates housing finance business, so the risk of their business comes from financial risks. Of course, more precise sources of risk and issues often interact with each other, and may even reinforce each relationship; it is not necessarily divide all risk categories very clear. Then, various quantitative analysis tools provided by means of fund risk management, select a specific risk assessment methods, such as the risk index system monitoring, data mining models.

Singapore - Central Provident Fund

Singapore is more successful in the use of housing provident fund system to solve the housing problems of a country. Singapore began to create in 1955 the central housing provident fund system, is a membership organization to 2005, and has a membership of 3,049,000. Singapore's Central Provident Fund is a social security system with a mandatory, through savings and restrictions on the use ways to implement, with the purchase, pension, health care and many other functions, with particular emphasis on the prominent role of housing security aspects. The Government until 1968, under the original premise of relatively perfect guarantee fund, defined the national housing policy objectives of "Home Ownership". Singapore's Central Provident Fund is for all the people of the public, the individual fund, with interest are paid for as members name monthly, unified management by the Central Provident Fund Board. 80% of Central Provident Fund are spend on daily living expenses, mainly referring to the purchase of housing and pay various types of insurance, 12% for health care, while 8 % for retirement and other special purposes.

Fund deposit rate determine by the Central Provident Fund Board, according to improve the living standards, the amplitude of economic prosperity, labor costs of businesses, public evaluation and other factors, change once a year. Central Provident Fund Board also made different rules for different income, different age groups members, depending on income, age of fund member's demand, developed a different pay rates. So that, whether high or low-income earners, they are able to pay the fund based on their pay standards; there are, the older paid the less.

Brazil - Unemployment and Guarantee Fund

Brazilian Unemployment and Provident Fund was established in 1966, which has unemployment insurance and housing support two functions into a comprehensive social security funds. In this system provides, in this system provides, the Brazilian deducted salary by a certain percentage deposit into personal accounts of funds monthly, this accounts for extraction of medical care, unemployment and pension security funds, can be used for at least five years after the purchase of housing.

Brazilian National Housing Bank is mainly responsible for funds management, and provides housing loans. In 1967, Brazil has also established a Brazilian System of Savings and Loans, which is a system of tax exemptions and preferential policies for selective deposit system requires all participating banks must carry out housing loans.

Currently, the Unemployment and Provident Fund and System of Savings and Loans has become the two major sources of funds for housing loans in Brazil, the Brazilian National Housing Bank is responsible for the operation. The design of the system effective integrates the social security schemes and accumulation of Housing Development Fund, is an innovations. Under this system, the Brazilian National Housing Bank only grant loans to low-income families through commercial banks, and the amount of revenue based on the preferential interest rate, the less income, more concessions.

Korea - National Housing Fund

In 1981, the South Korean government established Korean National Housing Fund in the revised "Residential Development Law"; it belongs to housing finance policy institution established by the State. The main function is to finance the housing needs of low-income families of policy loans and subsidies, focus on providing preferential home loans for low-income and first-time buyers, its public welfare, policy nature and service objects are very clear.

QUANTITATIVE ANALYSIS MODEL

Determine each specific evaluation of the criteria layer and programs layers to establish the structure of the housing fund risk management model.

Consistency Check

After establish housing fund hierarchical model, apply Yaahp6.0 assessment risk of the housing fund. In the software, enter a value around 1-9 scale in the judgment matrix option, by input analog data, build judgment matrix respectively to each simulated data, and analyzes all the results of by perform geometric mean, and finally get housing fund risk judgment matrix. Figure.1. for the housing fund matrix analog states. Figure.2. for judging matrix of systemic risk, Figure.3. shows judgment matrix of non-systemic risk.

Known in judgment matrix of order n positive reciprocal matrix, λ_{max} characteristic of its maximum value, said $CI = (\lambda_{max} - n)/(n-1)$ to determine the matrix consistency index. When $CI = 0$, judgment matrix is consistent matrix, the smaller the CI value, the higher the degree of consistency of judgment matrix. Clearly, judgment matrix M is consistent matrix.

Under normal circumstances, judgment matrix is not consistent matrix, but in order to use it to calculate the comparative factor of the weight vector, asking them inconsistent level should be within the allowable range. Set $CR = CI/RI$, said CR is the random consistency ratio of judge matrix, when $CR < 0.1$, considered judgment matrix has satisfactory consistency, At this point, we determine the maximum eigenvalue λ_{max} of matrix corresponding normalized eigenvectors as weight vector of judgment matrix. When $CR \geqslant 0.1$, you will need to amended the scale of the matrix further until it matches up.

$$M = \begin{bmatrix} 1.0000 & 1.2721 \\ 0.7861 & 1.0000 \end{bmatrix}$$

Figure 1. Housing fund matrix analog states

$$N1 = \begin{bmatrix} 1.0000 & 0.5880 & 1.3238 & 1.3306 \\ 1.7008 & 1.0000 & 1.5027 & 1.4543 \\ 0.7554 & 0.6655 & 1.0000 & 1.0560 \\ 0.7515 & 0.6876 & 0.9496 & 1.0000 \end{bmatrix}$$

Figure 2.The judging matrix of systemic risk

$$N2 = \begin{bmatrix} 1.0000 & 2.1193 & 1.5388 & 0.6109 \\ 0.4718 & 1.0000 & 0.7296 & 0.4294 \\ 0.6499 & 1.3706 & 1.0000 & 0.5548 \\ 1.6370 & 2.3286 & 1.8025 & 1.0000 \end{bmatrix}$$

Figure 3.The judging matrix of non-systemic risk

Risk Assessment Analysis

Since the judgment matrix pass the consistency test, each item of feature vector corresponding to the maximum eigenvalue is the average weight of each factor we weights.

Housing fund risk accounted for 59.99% of systemic risk, accounting for 44.01% of non-systemic risk, systemic risk higher than non-systemic risk. Because of the housing fund business model mainly as "mandatory savings, low loan-to-deposit low, closed operation, a conservative investment" stable source of funding. Because of the housing fund business model mainly as "mandatory savings, low loan- low-deposit, closed operation, a conservative investment", the source of funding are stable, Housing Fund Management Center is a non-profit independent institution, and therefore non-systematic risk of housing fund is relatively low, And because the housing fund focused on the use of personal housing mortgage loans, funds and increasing the value of the real estate market fluctuations, inflation and other macro-economic factors are closely related, and because the application of housing fund focused on the use of personal housing mortgage loans, increasing funds are closely related to the value of the real estate market fluctuations, inflation and other macro-economic factors.

Under the current institutional arrangements, fund management center has no principal, extract the risk reserves required neither scientific basis, extraction of risk reserves accordance with neither scientific basis, it is not sufficient to cope with various risk scenarios, once the macroeconomic environment changes, it lead to large-scale breach of contract, insolvency problem will arise, resulting in a disastrous impact on the housing fund system. Therefore, it should improve the housing fund systemic risk of attention and vigilance.

Among systemic risk the most prominent is policy risk (33.97%) and the risk of fluctuations in the economic cycle (24.68%). In recent complex international economic and financial situation conditions, further expansion of real estate bubble will bring huge economic risk, so since 2010 the central implemented a series of severe real estate control policies. The impact of policies combined effect of purchase restrictions, credit control, raising interest rates, increasing the supply of affordable housing and so on, the momentum of rapidly rising house prices has been initially curbed. Starting early in 2011, the nation has a sustained economic downturn, in 2012 the rapid growth in real estate investment fell 13.2 % in the second quarter from 23.5% in the first quarter, the bubble has been a rapid decline in housing prices once, not only economic volatility, and there will be a large number of loan breach of contracts, especially loan risk in low-income populations will become increasingly prominent.

Thus, a game among the policy and market is depend on real estate market can successful landing soft, to avoid volatility in the economy, remains the most critical issue.

Among non-systematic risk the highest proportion is the risk of decision-making (37.96%) and liquidity risk (27.85%) showed housing fund micro-level risk

primarily from its management and operation mode, in which the most prominent is the decision-making housing provident fund management committee institutional issues. During practical work, housing provident fund management committee organizations are loose and large, representation and professionalism of each committee are lack of independence, and each participant in decision-making did not have the actual responsibility. Do not take risks, resulting in the pre-existing management decision-making and management separated from one another. The mechanisms of decision-making body check and balance management of main body for unable to play the role. These groups institution are often nothingness, but as a decision-making body on the trillion housing fund management of national, the risk cannot be ignored. Furthermore, since the operation of funds are closed, housing fund are lack of means of regulating, resulting imbalance of utilization between regions, it is the main cause of liquidity risk.

Although the National Housing Fund system is in excess liquidity (funds precipitation) state as a whole, but significant differences in the country. In some areas, a lot of fund precipitates in the bank, at the same time, other higher prices, demand for larger of provident fund loans areas, fund utilization rate even exceeded 100%. Liquidity risk is very prominent, part of the management center had to high-interest loans from the bank and then loans with low-interest, And by limiting the average loan amount or loan workers "waiting" system and other methods to slow down the shortage of funds contradictions balance, it is the leading cause of liquidity risk.

The index of individual risk projects layer depending on its proportion, the order is: risk policy, decision-making risks, and fluctuations in the economic cycle, inflation risk, interest rate risk, liquidity risk, operational risk and credit risk. As can be seen, the current risk of housing accumulation mainly from the macro-economic situation and the policy level, as well as housing provident fund management system and operational mode regimes, and because the housing provident fund loans mainly targeted "quality customers" have a fixed salary and the ability to buy a house, credit risk is not prominent. This is an important difference between commercial housing finance. Thus, the housing provident fund should be established a targeted risk management system.

CONCLUSION

Through the above analysis we can see, as the housing fund managers, but also to focus on fund risks, technical risks and economic risks and take the

necessary measures to take appropriate countermeasures based on the actual situation of risk, such as risk avoidance, loss control, risk retention, risk transfer, or a combination of various measures.

Determined by the characteristics the housing fund in the course of execution it will be various unforeseen factors of inevitability, as long as careful analysis of the potential risk factors themselves, and actively respond to prevention, must be able to control the risk of loss to a minimum.

AHP in the relative lack of historical data and real information, using qualitative comparison of the results of the expert survey gives quantitative analysis, given number of the importance about risk factors compared in terms between the relationship though mathematical analysis, Yaahp software applications improve the efficiency of risk analysts, so this approach to be more widely used.

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