

Research on the Asset Allocation Scheme of Intelligent Investment Advisor based on the Third Pillar of Pension

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Abstract: This paper uses big data technology and machine learning to empower finance, and independently designs intelligent investment consultants for the third pillar pension to solve the economic problems that may be brought about by the accelerating process of population aging. In order to accelerate the implementation of the third pillar of old-age care faster and better, this paper explores the development trend of the third pillar of old-age care and the methods that can be popularized, and tries to design an intelligent investment advisory asset allocation scheme. This paper takes the factor analysis method as the core of the quantitative investment of the intelligent investment consultant, and designs four types of asset allocation schemes for the third pillar of the old-age pension. According to the factor score, the asset allocation scheme that meets the needs of different customers is constructed, and the actual back test and comparison with the CSI 300 ETF and other indexes are carried out to explore its feasibility, scientificity and superiority.

Keywords: Intelligent Investment Advisor, Asset Allocation Scheme, Factor Analysis Method, The Third Pillars of Pension

1 Introduction

Population aging is an important trend in China's current population development, and it is also a major issue to be considered in China's future economic construction and long-term sustainable and stable development of society. The 'China Pension Actuarial Report 2019-2050' issued by the World Social Security Research Center of the Chinese Academy of Social Sciences pointed out that the current balance of China's basic pension insurance fund was expected to show a gap in 2028 and run out by 2035. With the accelerating process of population aging, China's pension gap is widening, and the contradiction between supply and demand of pension is intensifying, which needs to be solved urgently^[1]

The application of the three pillars in China's social old-age security system is unbalanced and inadequate.^[2] Scholars' research shows that the high level of the first pillar contribution rate will restrict the level of economic development, and the increase of the third pillar individual pension contribution rate will improve the level of economic development. The third pillar of old-age care has broad prospects for development in the future^[3].

There is little research on the third pillar of the pension in the academic community. At present, the theory and practice of the third pillar of the pension in China are still in the initial stage of exploration. This paper enriches the existing research in the field of intelligent investment advisory system and the third pension pillar, and provides new ideas and new methods for the future development of pension.

2 Literature review

2.1 Research on the third pillar of old-age care

After years of continuous development, China has established a three-pillar pension system, but it also faces some problems, such as inadequate and unbalanced development of the three pillars, prominent structural contradictions, and excessive pressure on the first pillar of basic old-age insurance^[4].

At present, the development of the third pillar of pension in China is relatively late^[5]. Compared with developed countries, the third pillar of pension in China accounts for a relatively small proportion. In developed countries, multi-level pension system has long been regarded as an important part of social infrastructure^[6]. In 2018, for example, the first, second and third pillars of the United States accounted for 10.15%, 58.14% and 31.71 % respectively. The first, second and third pillars of China accounted for 77.47%, 22.53% and 0.0001 % respectively (ICI, Social Security; ministry of Human Resources and Social Security).

2.2 Intelligent investment advisor in the third pillar of old-age care

Compared with group and enterprise property insurance, personal commercial pension insurance products have the characteristics of diversified demand, decentralization and less share^[7].

As a product of the integration of financial technology and traditional business, intelligent investment advisors make investment advisory services get rid of the dependence on high labor costs through digital and intelligent asset allocation and asset management, which realizes the establishment of a low-cost comprehensive pension public management platform on the supply side^[8]. The market share of other countries such as Canada, Japan and Singapore is much worse than that of the United States.^[9] The United States is in an absolute dominant position in the development trend of the global intelligent investment advisory industry and is the leader in the global intelligent investment advisory industry.^[10] There are many experiences for reference. 4 In particular, Betterment has the reputation of "the Apple of the financial industry" and can be used as a reference object.^[11] The average annual consulting fee rate of smart investment advisors in the United States is about 0.3 % of the management assets, which is about 60-70 % of the traditional investment advisors.^[12] By adhering to the market and financial attributes of the third pillar, we will establish and improve a multi-level old-age insurance system, improve a multi-level social security system, and modernize the national governance system and governance capacity^[13]

3 Research methodology and innovation

3.1 Research ideas

We have designed a complete smart investment system based on rigorous research ideas, as shown in Figure 1.

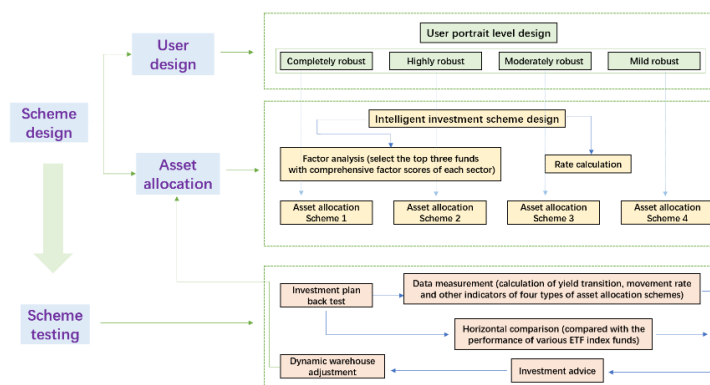


Fig. 1: Research ideas.

3.2 Design of intelligent investment advisory system for the third pillar of old-age care

1. Source and collation of data

This paper collects the relevant data of 8317 funds such as bond funds, stock funds, hybrid funds, money market funds and commodity funds. The indicators include 20 indicators such as management fee rate, return, return ranking, Alpha, Beta, annualized volatility and maximum withdrawal. The consistency check of the data was carried out, in which the return ranking was taken as the reciprocal, and two types of tests were carried out.

2. The asset allocation of four kinds of smart investment advisory schemes

The system sets up 4 different types of investment schemes, which are completely robust, highly robust, moderately robust, and mildly robust, respectively, to meet the needs of users at different levels which are shown in Figure 2.

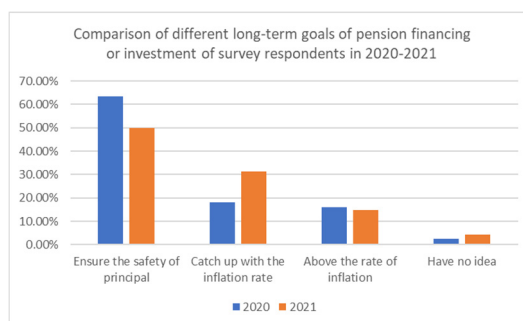


Fig. 2. Comparison of different long-term goals of pension financing or investment of survey respondents in 2020-2021

3. Real asset allocation of intelligent investment advisor system

This paper independently designs an asset allocation scheme for the third pillar of the pension, and configures four types of asset allocation schemes that meet different groups and deadlines.

Based on the scarcity and immaturity of the number of domestic products, as well as the constraints of policies and laws^[14], most of the targets selected in this paper are mainly funds.

Factor analysis (FA) was used as the core, KMO test and Bartlett spherical test were used to test the data, and the principal component method was used to determine the factor load. The maximum variance rotation method (Varimax) was used for factor rotation, and the least square method was used to calculate the factor score.

This system uses Python and Wind database, and automatically crawls data from the Wind database for different categories of targets and imports them into Python every day. Dynamic factor integration and sorting are performed to find efficient factors, and the factor scores of each specific product under each category are obtained. According to the score results, the specific financial products or funds purchased or sold are finally formed into four types of portfolios.

According to the four customer portraits set in advance, the portfolio allocation is carried out in real time, and the weights of each major category and its specific products are obtained, forming four robust but increasing risk intelligent portfolio schemes, which correspond to four different types of investors depicted by user portraits.

4. Four asset allocation schemes are shown in Table 1.

Table 1. Four asset allocation schemes

Asset allocation scheme	expected yield	Expected maximum retracement rate	Category of subject matter	The weight of the subject category
Asset allocation scheme I	2.86% (2.86%-3%)	Not more than 0.2%, expected to be below 0.1%	Cash (current deposits)	5%
			Non-bank current financial products (T+0)	5%
			Bank financial products and deposits	80%
			money market fund	10%
Asset allocation scheme II	5.4% (4.5%-5.5%)	Not more than 0.25%, expected to be around 0.15%	Non-bank current period financial products	5%
			Bank financial products and deposits	45%
			money market fund	15%

			bond funds	35%
			money market fund	35%
Asset Allocation Scheme III	5.8% (5%-6%)	2.47%, expected to be below 3%	bond funds	50%
			hybrid fund	5%
			Index fund (stock fund)	10%
			money market fund	30%
Asset allocation scheme IV	8.2% (8%-8.2%)	3.63%, expected to be less than 5%.	alternative investment	5%
			bond funds	45%
			Index fund (stock fund)	20%

3.3 Measured results and analysis of intelligent investment advisor asset allocation scheme

Based on the previous data and the four types of asset allocation schemes contained in the design, this paper applies the designed intelligent investment advisor to asset allocation. Therefore, this paper grabs data from the Wind database for simulated quantitative investment, and compares the results of each asset allocation scheme with the CSI 300 ETF and CSI 500 ETF. Finally, the measured results are shown in Figure 3 and Figure 4:

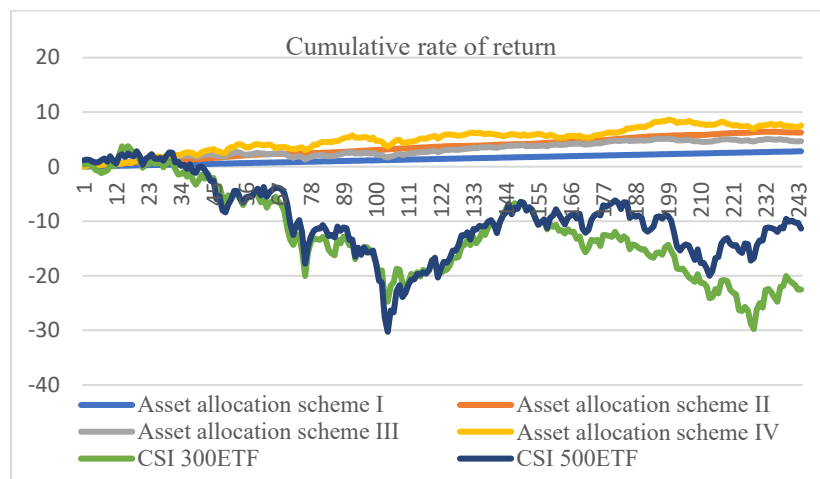


Fig. 3. Comparison of the cumulative annualized rate of return of the four asset allocation schemes with the CSI 300 ETF and the CSI 500 ETF in the past year

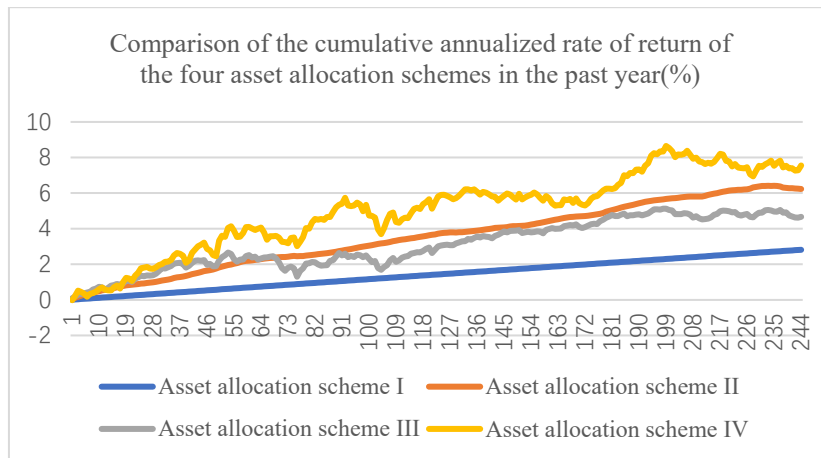


Fig. 4. Comparison of the cumulative annualized rate of return of the four asset allocation schemes in the past year

As shown in Figure 5, the one-year annual volatility of the asset allocation scheme IV with the largest volatility is only 3.36 %. The one-year annual volatility of the four asset allocation schemes is significantly lower than that of the CSI 300 ETF and the CSI 500 ETF.

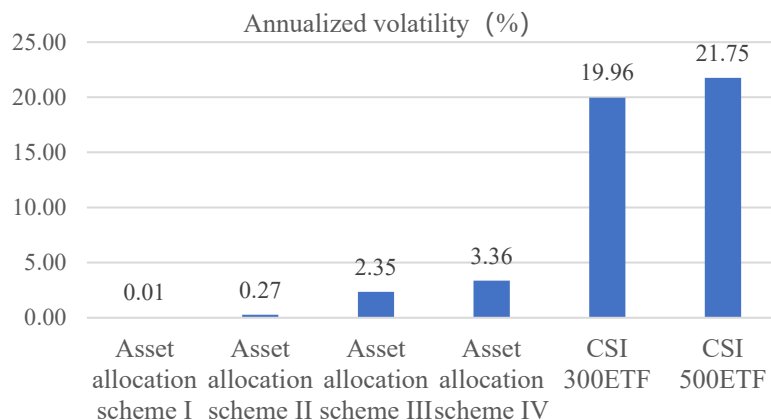


Fig. 5. Comparison of the annual volatility of the four asset allocation schemes with the CSI 300 ETF and the CSI 500 ETF in the past year.

As shown in Figure 6, compared the maximum withdrawal performance of the four asset allocation schemes and the CSI 300 ETF and the CSI 500 ETF, the maximum withdrawal of the CSI 300 ETF and the CSI 500 ETF in the past year reached -33.54% and -33.04% , respectively. The maximum withdrawal of the four asset allocation schemes is significantly lower than that of the CSI 300 ETF and the CSI 500 ETF, and the performance is excellent.

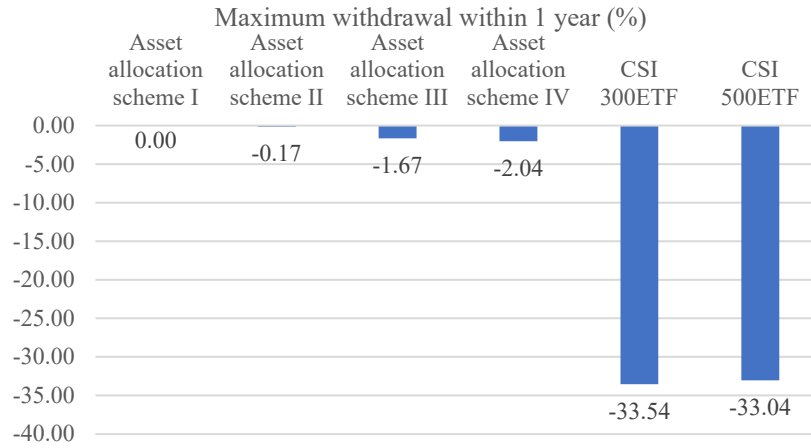


Fig. 6. Comparison of the four asset allocation schemes with the maximum withdrawal of CSI 300 ETF and CSI 500 ETF in the past year

4 Conclusions

This paper designs a set of intelligent investment advisory system, including user portrait rating, product rate design, data-based asset allocation scheme, etc. According to the personal information entered by the user, the system recommends suitable investment schemes for the user, and allocates the asset portfolio according to the factor analysis method to form four robust but risk-increasing intelligent portfolio schemes, which correspond to four different types of investors under the user's portrait. The system is designed to control risks within a certain range and ensure the safety of pensions.

In addition, the system uses big data and intelligent computing technology to automatically update the optimal configuration scheme according to real-time changes in market conditions. This system uses Python and Wind database, and automatically crawls data from the Wind database for different categories of targets and imports them into Python every day. Dynamic factor integration and sorting are performed to find efficient factors, and the factor scores of each specific product under each category are obtained. According to the score results, the specific financial products or funds purchased or sold are finally formed into four types of portfolios.

Using the real market data for measurement, the measured results show that the maximum withdrawal of the four asset allocation schemes proposed in this paper is significantly lower than that of the CSI 300 ETF and the CSI 500 ETF, and the performance is excellent. In addition, this paper uses factor analysis, quantitative adjustment, intelligent asset allocation and other methods, which is innovative, and draws on the QDIA system to establish a strict product filing system to protect the rights and interests of users.

This paper enriches the existing research in the field of intelligent investment advisory system and the third pension pillar, and provides new ideas and new methods for the future development of pension.

References

- [1]Cao Dongmei, Gu Shengzu, Fang Lang. Research on the countermeasures of China's pension gap under the background of aging [J]. Statistics & Decision, 2015(10):63-65.
DOI:10.13546/j.cnki.tjyj.2015.10.017.
- [2]Sun Jie. Research on China's third-pillar individual pension account [J]. Price: Theory & Practice, 2020(10):9-15. DOI:10.19851/j.cnki.cn11-1010/f.2020.10.427.
- [3]Luo Hao, Zhou Yan. Study on the impact of the third-pillar personal pension on the replacement rate of pensions [J]. Journal of Central University of Finance & Economics, 2022(11):77-88. DOI:10.19681/j.cnki.jcufe.2022.11.001.
- [4]Dong Keyong, Shi Wenkai. Speeding up the Construction of the Third Pillar of Individual Pension with Chinese Characteristics: Theoretical Discussion and Policy Choice [J]. Social Security Studies, 2020(02):3-12
- [5]Wang Bo, Zheng Liansheng, Guo An. Aging Finance: China's Practice, International Experience and Development Countermeasures[J]. Southwest Finance,2022(08):3-14.
- [6]Gordon L.Clark.Pension Fund Capitalism.Oxford:Oxford University Press,2000.
- [7]SPFC Bidding Project Research Group on Fiscal Policy to Deal with Population Aging. Research and Analysis of China's Commercial Endowment Insurance Market in 2021 [J]. Fiscal Science,2021(08):78-85.DOI:10.19477/j.cnki.10-1368/f.2021.08.002.
- [8]Sun Shouji, Wang Guojun. High-quality Development of the Third Pillar of Personal Pension under Common Prosperity and New Employment Forms [J]. Studies on Socialism with Chinese Characteristics, 2022(03):39-49.
- [9] Welsch A, Jone E. Steers Clear of Robo-Adviser Herd [R] . The Wall Street Journal, 2017.
- [10] Baker T, DeLaet B G C. Regulating Robo Advice Across the Financial Services Industry [J] . Iowa Law Review, 2018, 103 (2) : 713.
- [11] Liberti J M, Petersen M A. Information: Hard and Soft [R] . NBER Working Paper, 2018
- [12] Jiang Haiyan, Wu Chang Feng. The Development and Supervision Suggestions on Robo-advisor[J]. Securities Market Herald,2016(12):4-10.
- [13] Sun Jie. Develop the Third Pillar of Old Age Security System[J]. Studies on Socialism with Chinese Characteristics,2020(Z1):43-52.
- [14]Li Jingwei. Constructing the Leading Model of the Intelligent Investment: Based on Market Demands and the Global Practice[J]. Journal of Central University of Finance & Economics,2020(06): 20-28.DOI:10.19681/j.cnki.jcufe.2020.06.003.