

Risk Analysis of Elderly Care Investment Based on the Background of Population Aging in China

Shengjun Yang *

Maple Leaf school, Tianjin, China

* Corresponding Author Email: yzohl@outlook.com

Abstract. Under the dual background of the continuous economic development and the accelerating aging population in China, the pension security system is facing severe sustainability pressure, and the importance of pension fund investment and operation is also constantly highlighted. This paper will take the aging process of the Chinese population as the macro background and conduct a systematic study on the risk issues in the field of pension investment. Firstly, it will clarify the relevant concepts of population aging and pension investment, and sort out the three types of pension models: defined benefit (DB), defined contribution (DC), and hybrid. On this basis, it will analyze the current situation of the pension investment market in China and the existing problems, such as the low upper limit of individual pension account contributions and product homogeneity. Then, it will analyze the four core risks faced by pension investment - longevity risk, macroeconomic fluctuation risk, inflation risk, and policy adjustment risk - and explore their formation mechanisms. Through typical pension financial product cases, it will specifically verify the impact of the above risks on actual investment operations. Finally, it will propose risk response strategies and development suggestions from the perspectives of individuals, financial institutions, and the state. Beyond clarifying the types of pension investment risks and the direction of response, this study also points out remaining research gaps in areas such as risk quantification and micro-investment behavior. In the future, in-depth discussions can be further carried out on risk modeling, investor behavior analysis, and pension financial product innovation.

Keywords: Pension Investment, Population Aging, Investment Risk, Risk Response.

1. Introduction

Against the dual backdrop of sustained economic development and accelerating population aging in the country, the pension security system is facing increasingly severe sustainability challenges. According to the latest data from the National Bureau of Statistics, the average annual growth rate of the elderly population aged 60 and above in China has reached 3.2%, and the pace of population aging has significantly accelerated. Of particular note is that the proportion of people aged 80 and above has increased by 4.7 percentage points in the past decade. This indicates that population aging is characterized by both an expansion in scale and a significant trend toward advanced aging. This change has led to a continuous increase in the number of people receiving benefits in the pension fund system, an extension of the average receiving period, and an increasing pressure on fund payments.

At present, some regions' pension insurance funds have experienced imbalances in income and expenditure, and even temporary imbalances in income and expenditure. This financial pressure has made it increasingly difficult for pension funds to maintain long-term actuarial balance and income stability. The uncertainty of future pension benefits for in-service insured individuals has increased, while the actual level of protection for retirees still needs to be improved. At the same time, the overall scale of China's pension funds is still relatively limited, and there is a significant gap between it and the rapidly growing demand for elderly care. In this context, actively promoting the market-oriented investment and operation of pension funds and improving the efficiency of fund utilization and long-term returns will help enhance the resilience and sustainability of the pension security system. Furthermore, by guiding long-term capital into major national strategic initiatives, such as the "Belt and Road" construction, it will also facilitate a positive interaction between social security and economic development.

Although there have been many theoretical discussions on pension operation and risk management in existing literature, most studies still focus on model construction and mechanism analysis, lacking empirical testing of dynamic management strategies for actual risks in pension investment, especially longevity risk, inflation risk, and policy risk. This has led to relatively insufficient practical applicability and operability, making it difficult to effectively guide pension funds in addressing the specific challenges brought by population aging. Therefore, based on the continuous deepening of population aging, this study systematically analyzes the risk governance mechanism of pension investment funds, aiming to construct a systematic and targeted research data system and analysis framework, providing theoretical basis and empirical support for the long-term stable operation of pension funds.

Next, this article will first summarize the latest research status. Afterwards, further exploration will be conducted on the relevant factors that constitute the risk of elderly care. Finally, this article will provide targeted recommendations to address existing issues.

2. Literature Review

2.1. Core Definitions of Population Aging and Elderly Care Investment

2.1.1 Basic indicators of population aging

According to the definition of the World Health Organization, if a country or region has a population aged 65 and above that accounts for more than 7% of its total population, it is considered to have entered an aging society. When the proportion exceeds 14%, it is called entering a deeply aging society. If it exceeds 20%, it is called a super aging society.

2.1.2 The basic connotation of pension investment

With the deepening of population aging and the increasing attention of residents to the quality of life after retirement, the concept of "pension investment" has gradually entered the public eye. Pension investment refers to a special investment activity in which individuals or families allocate their funds to various assets (such as savings, funds, insurance and real estate) in a reasonable manner to ensure their living standards after retirement, achieve stable asset appreciation in the long term, and cover the economic needs of the elderly stage. Its goal is to gradually accumulate sufficient pension funds through time compounding and scientific asset allocation while controlling risks, ensuring stable sources of income after retirement and maintaining or improving living standards. As a source of security for the elderly, it is necessary to control its costs while achieving the goal of wide coverage. In the long run, it is necessary to improve safety as much as possible by diversifying investments in various financial products such as savings, wealth management, funds, insurance, as well as innovative tools such as infrastructure REITs, in order to achieve risk diversification and yield optimization.

2.2. Theoretical Knowledge of Population Aging and Elderly Care Investment

In the past, there were mainly two models of pension. One type is the "fixed income type" (DB type) - setting in advance how much money to receive each month after retirement, such as paying a certain percentage of pre retirement salary, with the risk mainly borne by the enterprise or the country. Another type is the "fixed contribution type" (DC type) - the amount of money paid each month during work and the amount that can be earned after retirement depend on how much money is invested and earned. Most Chinese companies used this model in the past, and the risk mainly fell on the employees themselves. However, both of these single models have problems. For example, if the DC type encounters a sharp drop in the stock market, the pension for employees may decrease; DB type may make it difficult for enterprises or countries to withstand long-term payment pressure. So now internationally, there is a shift towards a "hybrid model" that combines the advantages of both models, allowing young and elderly people to share risks together. For example, in the UK, the pension was originally calculated based on the highest salary before retirement, but later changed to

be calculated based on the average salary throughout the entire working period. This avoids putting too much pressure on the company while still ensuring employees' basic benefits.

2.3. The Current Situation of China's Pension Investment Market

2.3.1 The current scale and development status of elderly care

The elderly care investment market in the country is in a stage of rapid development and transformation, showing significant characteristics in various aspects. In terms of market size, with the deepening of population aging, the demand for pension finance continues to be released. The Forward looking Industry Research Institute predicts that the market size of China's elderly care industry will achieve significant growth from 2022 to 2027. As of the end of the first quarter of 2025, the scale of pension products has reached approximately 2.42 trillion yuan, demonstrating enormous potential for asset accumulation [1]. The product supply is also becoming increasingly rich and diversified. Currently, the number of registered pension products has exceeded 600, and the number of personal pension investment fund products has steadily expanded to 297, covering different strategic types such as target date, target risk, and steady appreciation. In terms of market participants, commercial banks, insurance companies, fund companies, securities companies and other institutions actively layout the field of pension finance, continuously launching a series of supporting products and services such as pension savings, pension insurance, pension wealth management and pension target funds.

2.3.2 The investment and operational pressure of basic pension insurance

The market still faces some practical challenges, such as limited annual contribution amounts for personal pension accounts, insufficient attractiveness of tax incentives to middle and high-income groups, and homogenization in product design, making it difficult to fully match investors of different ages, risk preferences, and return needs. These all constrain the deepening development of the third pillar pension market. In addition to these, there is still an imbalance in the product structure. In the personal pension product system, insurance and fund products have grown rapidly (as of April 24, 2025, there were 225 insurance products and 289 fund products), while savings and wealth management products have significantly weaker growth momentum, accounting for less than 50% of the total, with only 1 and 10 new products added in the past year and a half, respectively.

3. The Main Risks and Causes of Pension Investment

As an important financial activity integral to the long-term well-being of residents and the stability of the national economy, pension investment faces various systemic risks in its operation. These risks have a direct impact on the quality of individuals' retirement lives and are closely linked to the sustainability of the pension system and broader social stability [2]. Key risk categories include longevity risk, macroeconomic fluctuation risk, inflation risk, and policy adjustment risk.

3.1. Longevity Risk

3.1.1 Risk performance

Longevity risk is a special and important risk in the field of pension, and its core feature is that the actual life span of the group greatly exceeds the actuarial forecast. This will force pension payments to be extended and the total amount paid will increase accordingly. From the perspective of pension funds, the original actuarial balance of payments has been broken, and the fund may face the dilemma of making ends meet. For individuals, the pension planned before retirement may be exhausted ahead of schedule due to the own longevity, and the adequacy of retirement life is seriously challenged [3].

3.1.2 Cause analysis

Population aging is a fundamental driver of longevity risk. With the rapid progress of medical technology, human beings have overcome many difficult diseases, and the health awareness of

residents has been increasing, which makes the average life expectancy continue to rise. Taking Japan as an example, as a country with a very high degree of global aging, life expectancy per capita has reached 84.8 years in 2023, and there is still an upward trend. In Japan's pension system, the financial sustainability of some pension plans is seriously threatened by the increasing pressure to pay pensions due to the longevity of a large number of elderly people. At the same time, when the traditional pension actuarial model is designed, the prediction of population life span is often based on past historical data, and fails to fully consider the trend of rapid extension of life span brought about by medical and social development, resulting in a large deviation between actuarial assumptions and actual conditions, which further amplifies the risk of longevity.

3.2. Macroeconomic Volatility Risk

3.2.1 Risk performance

The risk of macroeconomic volatility is particularly significant in the downward stage of the economic cycle. At this time, economic growth has slowed down or even declined, enterprises are struggling, unemployment has risen, and the growth of corporate profitability and disposable income of residents has slowed down [4]. This directly weakens the payment basis of the pension insurance system, reduces the payment ability and willingness of enterprises and individuals, and reduces the capital inflow of pension funds. In the short term, pension funds may face the problem of insufficient liquidity, which is difficult to cope with the demand for immediate pension payment; In the long run, it will also affect the asset accumulation of pension funds and restrict their ability to ensure future payment through investment appreciation [5].

3.2.2 Cause analysis

The natural volatility of the economic cycle is the internal reason. Economic development is cyclical, with prosperity and recession alternating, which is difficult to completely avoid. Take the global financial crisis in 2008 as an example. During the crisis, many enterprises closed down or laid off workers, the unemployment rate rose sharply, and the income of residents fell sharply. In the pension insurance system, whether enterprises or individuals, payment has been seriously affected, and the income of pension funds has been greatly reduced. At the same time, the economic downturn will also affect the financial market, and the value of pension fund investment assets (such as stocks and bonds) may shrink sharply, further exacerbating the financial pressure of pension funds, reflecting the direct impact of macroeconomic fluctuations on pension investment. In addition, in the process of economic structure transformation, some traditional industries have declined, emerging industries have not yet fully risen, and the employment market has structural imbalances, which will also affect the payment of pension insurance and magnify the impact of macroeconomic fluctuation risk on Pension Investment [6].

3.3. Inflation Risk

3.3.1 Risk performance

Inflation risk inflation risk has a significant corrosive effect on pension assets. If the nominal return on investment can not continue to exceed the level of rising prices, the actual purchasing power of pension savings will continue to decline over time [7]. For retirees, their income mainly depends on pension assets, and the decline in actual purchasing power will directly lead to the reduction of living standards after retirement, which is difficult to maintain the expected quality of life.

3.3.2 Cause analysis

Money supply, economic growth and other factors may trigger inflation. When the money supply exceeds the actual needs of the economy, it triggers inflation. Taking some emerging market countries as an example, in the process of rapid economic development, if there is too much money, it is easy to have a higher inflation rate. Assuming that the nominal return of an investor's pension assets is 5% and the inflation rate is 6%, the actual return is - 1%, and the actual purchasing power of pension

assets is declining. In addition, in the process of economic growth, demand pull and other factors may also lead to inflation. In pension investment, if the portfolio fails to effectively cope with inflation, such as investing too much in low-yield, fixed interest rate assets (such as ordinary bonds), and the yields of these assets can not keep up with the pace of inflation, pension assets will face serious inflation risks, resulting in shrinking real value.

3.4. Policy Adjustment Risk

3.4.1 Risk performance

Policy risks stem from the institutional design of the pension financial system and government regulation. Changes in external rules such as the adjustment of preferential pension tax policies, the restriction of investment scope and the revision of receiving age and conditions will cause uncertainty about the expected return and withdrawal method of pension assets [8]. For example, the cancellation or reduction of preferential tax policies will reduce the income of pension investment; The narrowing of investment scope may limit the channels for pension funds to obtain high-yield assets; The delay in age affects how long and how much retirees receive pensions.

3.4.2 Cause analysis

The change of social and economic development is the main reason for policy adjustment. With the changes of population structure, economic situation and other factors, the government needs to adjust policies to ensure the sustainability of the pension financial system. Taking China as an example, in order to cope with the aging of the population, the policy of delayed retirement has been gradually promoted in recent years, which has a direct impact on the pension receiving time and individual pension planning [9]. At the same time, the development and changes of financial markets will also lead to policy adjustments. For example, in order to prevent financial risks, the government may adjust the investment scope of pension funds and restrict their investment in high-risk assets, which will affect the expected returns of pension funds. In addition, the social policy objectives in different periods will also lead to the adjustment of pension related policies, and the uncertainty of these policy adjustments makes pension investment face the risk of policy adjustment [9].

4. Case Analysis

At present, there are many representative pension financial and fund products in the market, which show obvious differences in income performance and risk structure, reflecting different product positioning and asset allocation strategies. Next, this paper will take ICBC pension 2050y (y share) as an example to analyze the risk of pension investment.

ICBC pension 2050y (y share), as a public fund product for individual pension accounts, if the actual life span of investors far exceeds actuarial expectations, the pension accumulated through the fund may face the risk of insufficient payment due to the extension of payment period. Because the fund mainly relies on investment income to provide pension funds for investors, if investors live a long life, the consumption time of funds will become longer, and if the fund income can not continue to cover the capital demand brought about by longevity, it will affect the adequacy of investors' retirement life.

With the intensification of population aging, the progress of medical technology and the improvement of residents' health awareness, the per capita life expectancy has been increasing. The investment plan of ICBC pension 2050y (y share) is based on past population life expectancy data to a certain extent, but does not fully and accurately predict the further extension of future life expectancy, resulting in a potential gap in dealing with the long-term capital demand brought about by longevity.

The fund allocates a higher proportion of equity assets such as stocks to strive for excess returns. In the downward stage of the macroeconomic cycle, economic growth slows down, corporate profits decline, unemployment rate rises, the stock market will fluctuate sharply, the net value of the fund

will fluctuate sharply, and the uncertainty of returns is great, which may lead to a sharp shrinkage of fund assets and affect the accumulation of pension funds for investors.

There is a natural fluctuation law in the economic cycle, and prosperity and recession alternate. At the same time, in the process of economic structure transformation, the connection between the decline of traditional industries and the rise of emerging industries is not smooth, which leads to structural unemployment and other problems, weakens the payment basis of the pension insurance system, and indirectly affects the market performance of equity assets, thus making the investment income of ICBC pension 2050y (y share) impacted by macroeconomic fluctuations.

If the nominal return on investment of the fund cannot continue to exceed the level of rising prices, the actual purchasing power of investors' pension savings will continue to decline over time. Because investors rely on the funds accumulated by the fund to maintain their livelihood after retirement, inflation will erode the real value of funds and may lead to a reduction in retirement living standards.

Money supply, economic growth and other factors may trigger inflation. Although the portfolio of ICBC pension 2050y (y share) has equity assets, when inflation is serious, if the return of equity assets cannot keep up with the rate of price rise, and the fund does not fully allocate anti-inflation assets (such as commodities), pension assets will face the risk of decline in real purchasing power.

The adjustment of preferential pension tax policies, the restriction of investment scope, the revision of receiving age and conditions and other policy changes will affect the expected income and capital withdrawal mode of the fund. For example, if tax incentives are reduced, the real return of investors will be reduced; If the investment scope is narrowed, the channel for the fund to obtain high returns is limited, and the returns may be affected [10].

With the change of social and economic development, the government needs to ensure the sustainability of the pension financial system through policy adjustment. The operation of ICBC pension 2050y (y share) depends on the current policy environment, and the policy will be adjusted with demographic structure, financial market development and other factors, which brings policy adjustment risks to the income and operation of the fund.

5. Suggestion

5.1. Individual

For individuals, the core of effective pension investment lies in cultivating robust risk awareness and engaging in scientific long-term planning. Investors must recognize that pension investing is inherently a long-term endeavor, requiring patience, discipline, and a clear understanding of the risk-return profiles of various financial products. It is crucial to avoid the common pitfall of chasing high returns without due consideration for accompanying volatility risks and potential liquidity constraints. Instead, individuals should adopt a holistic approach to portfolio construction, taking into account their age, current income level, future earning potential, and personal risk tolerance. Through diversification across asset classes—such as equities, bonds, and alternative investments—investors can reduce exposure to specific risks. This approach also enhances the overall stability of their retirement portfolio.

Moreover, starting contributions early is essential to fully harness the power of compounding, which allows even modest but consistent investments to grow substantially over time. Ultimately, a well-structured and thoughtfully managed personal pension plan can significantly enhance financial resilience in retirement and help achieve long-term financial security.

5.2. Financial Institutions

For financial institutions, the core responsibility lies in offering more adaptable pension financial products and strengthening long-term partnership with investors. Banks, funds, insurance companies, and other institutions should increase innovation efforts and actively develop product portfolios that genuinely meet retirement needs, balancing both stability and profitability. This includes, but is not limited to, creating more target-date pension funds, long-term care insurance products, pension

savings plans tailored to different life stages, and exploring the integration of ESG investment principles with pension finance to enhance long-term returns while managing risks.

At the same time, financial institutions must continuously improve information disclosure mechanisms, ensuring that product terms, investment directions, risk levels, and fee structures are transparent and easy to understand. Any form of misleading sales practices must be strictly prohibited. A multi-tiered risk warning system should be established and enhanced, particularly during the sales process, by strengthening assessments of investors' risk tolerance and recommending suitable products to appropriate clients.

5.3. The Government

For the country, the key to addressing pension investment risks in an aging society lies in improving top-level design and optimizing the policy environment. The government needs to continuously refine the three-pillar pension system, accelerate the expansion of enterprise annuities and occupational annuities, and use tax incentives and other policies to encourage individuals to participate in pension investment. At the same time, financial market supervision should be strengthened by standardizing entry thresholds and information disclosure requirements for pension financial products, ensuring the safety of pension funds, and creating a standardized, transparent, and healthy market environment for national pension investment.

In the process of policy design and implementation, cross-departmental coordination and long-term dynamic adjustments should be emphasized. Fiscal authorities, financial regulators, and human resources and social security departments need to enhance policy coordination to form institutional synergy. For example, a standard certification system for pension financial products could be established to label and promote products that meet long-term and stability requirements. The investment scope and flexibility of personal pension accounts could be gradually expanded to improve asset allocation efficiency while controlling risks. Additionally, the establishment of a pension investment risk compensation mechanism or related insurance arrangements should be promoted to provide a deeper safety net for participants.

6. Conclusion

Under the background of the continuous deepening of population aging in China, pension investment is related to personal well-being and social stability, and has become an important issue. At present, the risk return characteristics of various pension products in the market are obviously differentiated, such as some public pension funds rely on the allocation of equity assets to pursue high returns, but they have to bear the risk of stock market volatility; Although pension insurance products can provide guaranteed income, they may be constrained by liquidity and have an income ceiling. This complex situation requires a coordinated response by individuals, financial institutions and the state. Individual investors should improve their financial literacy, rationally assess their own risk preferences, and practice long-term investment and decentralized allocation strategies. Financial institutions should closely adhere to the attributes of pension, develop more products with stable operation and transparent information, and strengthen investor education and services. At the national level, the government needs to continue to improve the multi pillar pension system, optimize tax preferential policies and strengthen industry supervision, so as to create a safe and standardized investment environment for pension funds. Systematic management of pension investment risks and effective response to the long-term challenges posed by demographic shifts are only achievable through collaborative effort.

This study primarily examines common risk types, typical products, and macro-level strategies for pension investments, yet it exhibits certain limitations. The quantitative analysis of risks across different pension products remains underdeveloped, resulting in a lack of precise measurement of the specific impacts of various risk factors, which limits the ability to present risk levels in an intuitive manner. Furthermore, the research is largely grounded in theory and market-level observations, with

limited integration of micro-level individual investment behaviors and psychological factors. Key elements such as investors' behavioral biases and their influence on actual pension investment decisions have not been thoroughly explored, thereby constraining the depth and comprehensiveness of the study.

Future research can be carried out from the following aspects. First, the paper should strengthen the quantitative research on the risk of pension investment, use financial engineering and other methods to build a more accurate risk assessment model, quantify the risk of longevity, macroeconomic fluctuation and other risks, and clarify its specific impact on pension investment, so as to provide a more scientific basis for risk prevention and control. The second is to deeply study investor behavior, combined with behavioral finance theory, analyze individual psychological factors and behavioral deviations in pension investment decisions, and explore how these factors affect investment choices and returns, so as to provide more targeted suggestions for investor education and product design. Third, expand the scope of research, pay attention to emerging pension financial products and services, such as the innovative development of pension target date fund and the application of pension financial technology, and analyze its impact on the pension investment system, as well as the possible new risks and opportunities, so as to provide theoretical support for the innovative development of pension investment.

References

- [1] General Office of the State Council, guiding opinions from the general office of the state council on advancing the five key areas of finance, 2025.03.05, 2025.09.07, https://www.gov.cn/zhengce/content/202503/content_7010604.htm
- [2] Brown, J. R., Orszag, P. R. The future of retirement savings and pensions. *Journal of Economic Perspectives*, 2021, 35(2): 175-198.
- [3] Ameriks, J., Caplin, A., Leahy, J. Lifetime financial behavior and well-being: Evidence from the Health and Retirement Study. *Journal of Finance*, 2021, 76(3): 1339-1383.
- [4] Kočenda, E., Vašíček, J. Macroeconomic fluctuations and pension systems: A cross-country analysis. *Economic Modelling*, 2022, 109: 105740.
- [5] Goda, G. S., Shoven, J. B., Slavov, S. N. The social security retirement earnings test and labor supply at older ages. *Journal of Public Economics*, 2020, 186: 104173.
- [6] Börsch - Supan, A., Winter, J. Aging societies and pension systems: challenges and opportunities. *European Economic Review*, 2023, 158: 104375.
- [7] Poterba, J. M., Venti, S. F., Wise, D. A. How do households save for retirement? New evidence from the health and retirement study. *Review of Economics and Statistics*, 2022, 104(3): 443-457.
- [8] Lusardi, A., Mitchell, O. S. Financial literacy and retirement preparedness: Evidence and implications for financial education. *Journal of Economic Literature*, 2019, 57(4): 1097-1139.
- [9] Wang, J., Hanna, S. D., Xiao, J. J. The impact of financial counseling on retirement savings among low-income households. *Journal of Family and Economic Issues*, 2020, 41(3): 377-393.
- [10] Hubbard, R. G., Skinner, J. Designing retirement savings policies for an aging population. *National Tax Journal*, 2024, 77(1): 1-28.