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Research on the Problems of Pension Finance in China

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Abstract: With the obvious development trend of global aging, the "three-pillar" model is becoming the mainstream choice for the reform of pension systems in various countries. The Central Economic Work Conference proposed to standardize the development of the third pillar of pension insurance. China's multi-level pension insurance system consists of three pillars, of which the first pillar is basic pension insurance, the second pillar is corporate and occupational pensions, and the third pillar includes individual savings-type pension insurance and commercial pension insurance. Although the three pillars indeed bring a certain level of protection, they still face some objective problems. For example, China is facing the challenge of an aging population, with the proportion of elderly people aged 65 and above continuing to rise. In order to deal with the challenges posed by aging, the Chinese government has introduced a series of policies and measures, including the Guidelines for Pension Targeted Securities Investment Funds (for Trial Implementation) in 2018 and the 2019 Opinions on Promoting the Development of Pension Services issued by the General Office of the State Council. But pension funds still face many problems, like risk management, hedging and so on. This paper will use the risk management method, asset portfolio, personalization and so on to solve the problem of pension finance, and ultimately using these financial instruments and the corresponding means, can indeed play a role in preventing risks.

Keywords: Pension insurance, Pension funds, Population ageing, Portfolio, Value at Risk.

1. Introduction

Pension this problem touches the heartstrings of every Chinese, the country is currently practicing a partial fund system, but in fact, due to the immaturity of the management of the pension insurance, most of them are still pay-as-you-go system. In this case, for the future safety and security of the insurance fund, there is a greater potential danger. At present, Chinese scholars are also very concerned about the operation of pension insurance, but also made a lot of research, can learn some of the pension fund management in Western countries. For example, learning from the Nordic pension fund allocation: liability-driven investment, actively carrying out foreign investment, exploring the Swedish "horse racing" mechanism [1], and other ways to learn from learning. This paper focuses on the current problems faced by the pension fund in the management, investment, and a series of financial and mathematical means to optimize the pension fund to achieve the optimal combination of asset appreciation and risk reduction. Let people no longer worry about the

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pension insurance in the account that is empty and the distribution of benefits as a as a downward adjustment of the problem.

2. Historical background of the policy

The establishment of China's pension system was relatively slow compared to that of other countries. Between 1951 and 1965, when China's pension insurance system was initially established, the Party and the State paid great attention to it, and the promulgation and implementation of the Regulations of the People's Republic of China on Labor Insurance marked the initial establishment of China's pension insurance system, which went through many hardships and bumps in the road, and step by step, problems were identified and improvements and revisions were made. Since the founding of New China, population development has first undergone a period of rejuvenation, with the proportion of older persons declining from the first national census in 1953 to the second national census in 1964.Beginning in 1964, the proportion of older persons rose, and by 2000, the population had entered an aging society. In the two decades that followed, the growth rate of the proportion of older persons accelerated markedly, and the degree of population aging continued to deepen. The development of an aging population in China is characterized by a large population size, rapid development, unbalanced development, and aging before wealth. The pension insurance fund is the most central asset of the pension insurance system, and is the main economic source for retirees and elderly residents to maintain a basic livelihood. The improvement of the pension insurance system and the effective investment and operation of pension insurance funds not only help to realize China's social policy objectives, but also play a very important role in improving the Pareto of social welfare, narrowing the income gap and stabilizing the social order. In the early days, pension funds were mainly invested in low-yield financial assets such as banks and treasury bonds.

Low-yield financial assets, although their safety is fully guaranteed, have a low investment return rate, even lower than the inflation rate in the same period[2]. It is urgent to improve the pension finance. By 2022, the proportion of 0-14 years old will be 16.9%, and the proportion of 15-64 years old will be 68.2% 65 accounting for more than 14.9% [3]. China's multi-level pension insurance system consists of three pillars, of which the first pillar, basic pension insurance, includes urban workers' basic pension insurance and urban and rural residents' basic pension insurance, which is dominated by the government; the second pillar, i.e., enterprise annuity and occupational annuity, is a supplemental pension insurance related to occupations, guided by state policies, with the participation of units and employees, operated and managed by the market, and administratively supervised by the government; and the third pillar includes individual savings pension insurance and commercial pension insurance, which is a supplementary pension insurance related to occupations. The third pillar includes individual savings pension insurance and commercial pension insurance, which is an effective form for individuals to utilize financial means to increase the supply of pension security. [4]

3. Problems faced in providing for the elderly

3.1. Low pension insurance benefits and inadequate regulations

The rate of return on pension insurance is sometimes less than the rate of inflation, which confronts the problem that pension insurance accounts do not realize the preservation of assets, let alone asset appreciation. It may be related to the current economic environment; the economy is going down and profit-making has become difficult. It may also be related to the current monetary policy; the country wants to stimulate the economy and wants the people to spend money on consumption and investment rather than saving. So deposit rates fell, and the pension product happened to be invested in some bonds and fixed deposits for the sake of stability. This is perhaps the main reason

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for the poor returns. Some nursing homes have problems such as chaotic management and unstandardized services, and the State has no specific implementing documents for this area of management. The conditions for the establishment of nursing homes are simple. There are no clear rules for the subsequent management of the institutions, and there are no laws and regulations for the supervision of the institutions, so the rights and interests of the elderly are not protected.

3.2. Mixed quality of investors and contribution pressure

Due to the late development of China's financial market, laws and regulations are not sound, the quality of many investors is not high, many people do not have the basic financial knowledge, as well as the use of financial knowledge and practice for operation. Many investors follow the herd effect, their behavior is blind, herd-like, and most of them are speculators. Their behavior will indirectly bring harm to the financial market, and some people may use it to manipulate the market, at this time some financial products based on pension insurance will be harmed, and investors will suffer losses. For employees, the unit contributes 20% and the individual 8%. For active employees, since the unit and the individual pay 16% and 8% respectively, the higher the contribution ratio, the higher the basic pension, so for active employees, the higher the contribution ratio the better. For urban and rural residents, the higher the contribution ratio, the more the individual account pension will be, so for urban and rural residents, the higher the contribution ratio, the better. For the flexible employment people, due to the pressure of contributions, and most of them into the co-ordinated account, only a small portion of the individual account, so for the flexible employment people, according to the minimum contribution can be, and then consider the deposit or commercial pension insurance to supplement the old age, which will be more cost-effective for some people working in big cities barely afford; but for those who do not work and participate in commercial pension insurance The proportion of people who have no job and participate in commercial pension insurance is very large, ranging from a few thousand dollars to tens of thousands of dollars. Therefore, the percentage of contribution to pension insurance should not be homogenized.

3.3. High pressure on the functioning of pension insurance accounts

The pension system is based on a pay-as-you-go system, which makes it easy to guarantee the national standard of living, and through the pay-as-you-go system, it is possible to ensure that the standard of living of retirees does not decline as a result of insufficient accumulation of funds. Easy to operate, the system has relatively low management costs, does not require excessive personal information, and simplifies the operation process. Avoiding the risk of inflation: Since the pay-as-you-go system is a system of collection and use in the current period without long-term accumulation, it can effectively avoid the risk of depreciation of funds due to inflation. Strong redistributive function: through the redistribution of income between generations, the pay-as-you-go system can realize social equity and reflect the welfare of society. However, the pay-as-you-go system also has some drawbacks: it is difficult to cope with the challenge of an aging population. With an aging population, which is exactly the problem we are facing, the contribution rate may need to be increased substantially, which is not what we want. This is because it can lead to heavy contemporary burdens and difficulties in mobilizing funds. It may also increase the financial burden on the State, which may be aggravated by the pay-as-you-go system in the light of the ageing of the population and the expansion of the scope and standardization of social security. It is also not conducive to economic development, as excessive tax or contribution rates may affect the competitiveness of enterprises' products and, consequently, economic development. Negative incentives for labor supply and savings: This financing model may have a negative impact on labor supply and savings.

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3.4. Future growth of the retired population

The rapid growth of the economy and the increasing pressure on young people in all aspects of society have led to a decrease in the number of newborns; as shown in Table 1, it can be seen that the number of births per year has been decreasing year by year[3]. With the development of science and technology, people can live longer and longer thanks to medical achievements. This creates a problem for pension insurance. In the future, there will be fewer people paying premiums and more people receiving pension insurance, which adds a lot of pressure on the pay-as-you-go pension insurance, even if it is a partially funded system.

Table 1: births

year	births(thousand)
2014	16780
2015	16550
2016	17860
2017	17230
2018	15230
2019	14650
2020	12020
2021	10620
2022	9560

4. Solution

4.1. Encouragement of fertility

Encouraging births is the most effective and direct way to make up for the gap between the elderly and the labor force with the number of newborns. But it's relatively difficult to implement. According to the National Bureau of Statistics: in 2023, China had 9.02 million births, a birth rate of 6.39%, and a natural population growth rate of -1.48 per thousand. Through the data, it is possible to show that there is now a great change in the measurement of the cost of childbearing among young people and in the actual action of the different perceptions from one generation to the next. On the one hand, at present, the main body of people of childbearing age is mainly the one-child generation, which has a higher level of education and greater pressure to compete for jobs. At a time of rapid economic and social development, the time and money costs involved in childbearing, parenting and education are high, and the pressures of housing, education and employment have made many young people hesitant and deterred from giving birth, presenting a contradiction between "wanting to give birth" and "not daring to give birth". On the other hand, although the relevant laws have made clear provisions for the protection of women's rights and interests in childbirth, they still have to face a series of complex and acute challenges, and the most central problem is undoubtedly the contradiction between childbirth and the workplace. Many women are worried that giving birth will bring about potential risks in the workplace, such as pay cuts, dismissal and marginalization, and these practical factors that have to be taken into consideration have become the maternity concerns that women in the workplace can't get around.

4.2. Building a Portfolio of Assets to Increase Retirement Benefits

The optimal risk portfolio is utilized to build a portfolio for asset appreciation, specifically, gathering data and calculating the rate of return and standard deviation of its individual securities or

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assets, while taking into account the macroeconomic environment as well as the Merrill Lynch Investment Clock Theory and selecting assets to invest in that are consistent with the economic theory. For risk-free assets, the choice could be treasury bonds, and then, based on the rate of return and standard deviation, the weighting of each asset is calculated. For example, if XA+XB=1, calculate the expected return of the portfolio, and the variance of the portfolio, as well as the covariance and correlation coefficient relationships. Depending on the specific needs you can calculate the minimum variance weights, or the optimal risk portfolio. It may be that, under the same conditions, a pension fund invested only in treasury bonds is exposed to less risk, but the return is very low indeed. However, in the case of a portfolio of assets, a professional investment manager will be able to allocate more different weights, combine mathematical bias derivation and economic principles to make the best judgment, and end up with a much higher return than investing in individual securities, realizing an increase in the value of the assets. It is also possible to use models such as Laura Malvaez, who estimates model parameters based on historical data from the Mexican inflation derivatives market within the framework of Jarrow & Yildirim's three-factor model, using Quasi-Monte Carlo Simulation (QMS). A European option model for inflation is developed and a pricing model is run. Finally, Bermudan options on inflation derivatives were also priced [5]. This approach utilizes financial derivatives to protect against inflation and to guarantee the return on pension benefits.

4.3. Preventing Fund risks and strengthening sub-risk management

When selecting investments, you can pay attention to the duration of the securities and use the duration model to immunize especially against fluctuations in market interest rates. Duration is less than or equal to the maturity of the security, and interest income on the security plus in investment income plus income from the sale of the bond is the same regardless of fluctuations in market interest rates over the range of duration. First of all, the coupon rate of the bond will not change, so the interest income is the same, and then the investment income, that is, the interest rate at the market rate of interest on the return on investment, can be calculated by the end of the annuity coefficient. The income from the sale of the bond is equal to the nominal value of the bond plus the last installment of the interest rate, discounted at the market rate of interest. By comparing the income from investing with the income from the sale of bonds, it was demonstrated that if the market interest rate had declined, the income from the sale of bonds would have increased, making up for the loss of income from reinvestment at the low interest rate level, so the total cash flow did not change [6].

For risk prevention, it is important to focus on the volatility of assets and liabilities held, and the concept of VaR (value at risk) can be introduced. If the pension fund has a clear day-to-day knowledge of its holdings, its N-day market risk can be calculated from VaR VaR=DVaR*N^(1/2)

Assuming that the daily value risk can be calculated when the returns conform to a standard normal distribution, the current value * (2.33*standard deviation-mean daily return). If an investment organization can determine market risk, it is more conducive for professional investors to make more profitable decisions.

4.4. Personalized Aging

Many of the current pension financial products are homogenized and do not meet the needs of people, some of whom are risk averse, some of whom are risk neutral, and some of whom are risk preferred. Homogenized products cannot meet the returns they require for their funds. For example, the portfolio calculated by the minimum variance group is suitable for risk averse people, and this portfolio minimizes risk. For those who are risk-averse, they can use some derivative products as

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the underlying funds. In this way, the differentiation of such products not only meets the needs of individuals, but also pools the idle funds of society for optimal asset allocation.

5. Conclusion

As a result of the analysis in this paper, in the face of all the problems of pension funds, the use of investment portfolios for their capital allocation. For example, Risk diversification: The risk of failure of a single investment can be reduced by diversifying across different asset classes and industries. Capital Appreciation: The potential for assets in a portfolio to increase in value as market conditions change, thereby increasing an investor's wealth. Achievement of investment objectives: portfolios can be customized according to individual financial goals and risk tolerance to help achieve the pension fund's long-term or short-term objectives. Value at risk is an important risk management tool and de-quantifying risk is one of its characteristics. VaR provides a quantitative way to measure the maximum loss that a portfolio or a single asset can suffer at a certain confidence level. In contrast to traditional risk assessment methods, which also allow for ex ante risk assessment, VaR allows potential risks to be calculated ex ante, rather than only measured after the fact. VaR applies to portfolios, VaR not only applies to individual financial instruments, but also calculates the risk of portfolios consisting of multiple financial instruments. VaR is used to estimate the appropriate amount of capital an investor needs when exposed to market risk, in line with financial regulation. Despite the advantages of these financial concepts, it has some limitations, such as how returns and risks are selected, the selection of risk-free coefficients, and the fact that the market is not perfectly competitive as assumed, all of which can lead to differences in the structure of the calculations compared to reality. In the future, scholars can consider more variables to be added to the model to make their estimates more accurate and the theory more relevant to practice.

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