Empirical Analysis of the Relationship between Pension Fund Plan Ratio and Savings Rate[1]

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Abstract

This study analyses the relationship between pension fund plan ratio and savings rate. Due to the increasing of aging population and development of old-age security, the way of living for old-age and the concept to pension has undergone great changes. The ratio of pension fund plan is first defined and panel data are obtained from PRC's National Bureau of Statistics website. The study shows that there exists positive relationship between the savings rate and the ratio of pension fund plans, that is to say, if the ratio of pension fund increased by 1 percentage point, then the savings rate will increase 0.25 percentage points.

Keywords: the ratio of pension fund plans; savings rate; Eviews6.0; panel data

According to previous census data, China's population aged 65 and over has reached 7.0% in 2000, and in 2011, reach 9.1%. However, the child dependency ratio was 32.6% in 2000, and decreased to 22.1% in 2011. It's easy to see that China's aging population is constantly increasing development. Under the premise of dramatic demographic changes, China's pension fund is bound to face a lot of challenges.

Due to the increasing of aging population and development of old-age security, the way of living for old-age and the concept to pension has undergone great changes. Social pension insurance, including basic pension, annuity and personal savings gradually becomes the main source of income of people aged life. However, in recent years, China's old-age security career and household savings analysis show high level of household savings and multiple challenges social insurance funds faced. Based on the pension fund income, expenditure, the ratio of them and household savings plan, this paper analyses the relationship between pension fund plans and savings rates by empirical way.

1. Analysis of policy development and evolution of pension fund scheme[2]

Pension fund scheme refers to raising funds, expenditures and fund management in the analysis of pension fund. With the development of China's social security undertakings, pension insurance fund raising, use and management have also been continuously enriched and improved. In China, "Labor Insurance Regulations", promulgated in 1951, specifies the relative proportion of revenue and expenditure of the pension fund. This is the prototype of the pension fund plans, reflecting the corporate retirement for employees to share the responsibility and the economy. However, until 1991, the workers were incorporated into the pension fund plan in "Decision on Reform of Enterprise Workers' Pension", which defines the payment of premiums of corporate and individual workers. For the fund, individual contributions enriched it. With the establishment of personal accounts, the unified basic old-age insurance system is on the way. In 1997, "The Decision on the Establishment of a Unified Basic Old-age Insurance System for Enterprise Employees" clearly defined the proportion of enterprises and individual contribution, and described the accumulation of social pooling and individual accounts at this time.

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[2] Pension fund plan, the pension fund plan ratio were first introduced variables, mainly in order to better explain and analyze the problem. Pension fund plan in this paper mainly refers to pension fund income, expenses and plan ratio. Plan ratio is the ratio of the pension fund income and expenditure. If the value is greater than 1, pension fund accumulated; if less than 1, it indicates pension fund gaps exist; If equal to 1, then be understood as pension insurance fund in balance. Typically, the plan is equal to the ratio of 1, or slightly more than it. But according to changes in the structure of our population, our pension fund plans ratio changes with it.

Then, the pension fund expenses, that is to say, individual pension provisions have also been refined, as noting pension of two parts including basic pension and individual pension accounts. Since then, the development of pension fund schemes are more reflected in coverage and coverage adjustment and improvement areas.

In the year of 2005, pension insurance has expanded the coverage, "Decision on improve the basic old-age insurance system of enterprises t" provides for individual businesses and towns flexible employment to participate in pension insurance, including contribution rate, accounts established methods, and to receive standards and conditions of pension provisions in detail. In 2009, China put forward the "Guidance on Carrying Out the New Rural Social Pension Insurance Pilot" for rural pension problem, in the guidance, the income and expenditure of pension fund for rural residents are analyzed, which makes the development of China's old-age security undertakings taken a crucial step. Later, 18th National Congress of the Communist Party of China held in 2012, it noted: to adhere to full coverage, basic, multi-level, sustainable approach to enhance fairness, adapt mobility, to ensure sustainability, focusing on the completion of a comprehensive social security system covering urban and rural residents. Since then, China's pension fund began developing along with many a number of factors, such as: aging population, economic, technological, and cultural and so on.

According to the development and evolution of the pension fund scheme, it's easy to see that if economic factors are ignored, pension fund income showing a rising trend over the years, while the increase in the pension insurance fund expenditures are relatively slow. Thus, the pension fund plans ratio is showing a slow upward trend. If you take into account the impact of economic development, and the introduction of the present value of discussion, this trend is even more pronounced.

2. Security analysis of the pension fund scheme in game theory

Game Theory is the one with an interest in constrained environments, multiple individuals or groups based on strategy formulation and selections of others set or choose self strategy.

This paper analyzes the relationship between the support capacity of pension funds and the residents' willingness to save by the method of game theory. Among them, the support capacity of pension instead of pension fund plan ratio[3]. This article assumes that: multiple games are limited games; each participating subjects are rational; purpose of each participating body is using the optimal strategy to maximize benefits. In the game, everyone has two strategies to choices, which including raise standards or not. Game process does not consider the impact of economic development, improvement of living standards and other factors. The game is defined as:

$$G =< M, S_i, V_i > \qquad (1)$$

In the equation (1), M is the collection of participants; S_i is strategic set of participants; V_i is revenue function of participants.

2.1 The players

It assumes that government departments (design the rate of pension contribution) are the players P1; enterprises (pay part of the pension) as the players P2; personal (pay part of the pension) as the players P3. Expressed as:

$$M = \{P_1,\ P_2,\ P_3\} \qquad (2)$$

2.2 The players' strategy

All the players, there are two strategies to improve the standard (C) and does not raise the standard (N), expressed as:

$$S_i = \begin{cases} S_1 = C \\ S_2 = N \end{cases} \qquad (3)$$

In the strategy set, if the government (P1) take enforcement action to improve standards for businesses and individuals, enterprises would improve standards and pass the improve standard on part of individuals in the future, therefore, for enterprises, the strategic choice is actually passed, and not passed.

3 The support capacity of pension instead of pension fund plan ratio, mainly taking into account the design of the ratio, the level of the ratio representative of the level the level of support capacity.

For an individual, after the implementation of the policy, individuals under the guarantee of self-consumption levels remain unchanged, raising the standard and does not raise the standard, meaning increased social security contributions, increasing personal savings.

2.3 Revenue analysis of the players

Government departments have chosen to raise the standard time, according to the analysis of China's current level of pension payment, the subsidies of financial sector will increase that reduce their own interests. As a social rule maker, there has a certain tendency to limit the standard within a certain range. For enterprises, which tend to shift the burden of interest, so as to ensure their own interests; for an individual, the individual pays how much pension is passive, and individual's trend to like the strategic choice which accounting to the amount of pension paid and future expectations.

$$V_i = \begin{cases} V_1 = R_1 \\ V_2 = R_2 \\ V_3 = R_3 \end{cases} \qquad (4)$$

2.4 Process Simulation

When studying the pension fund issue, according to the actual situation, the whole game process is repeated, with full information on the dynamics and infinite process. To simplify the problem, this article will be simplified it to a static one-time single, complete information game. Figure 1 shows the simulated results of a single game.

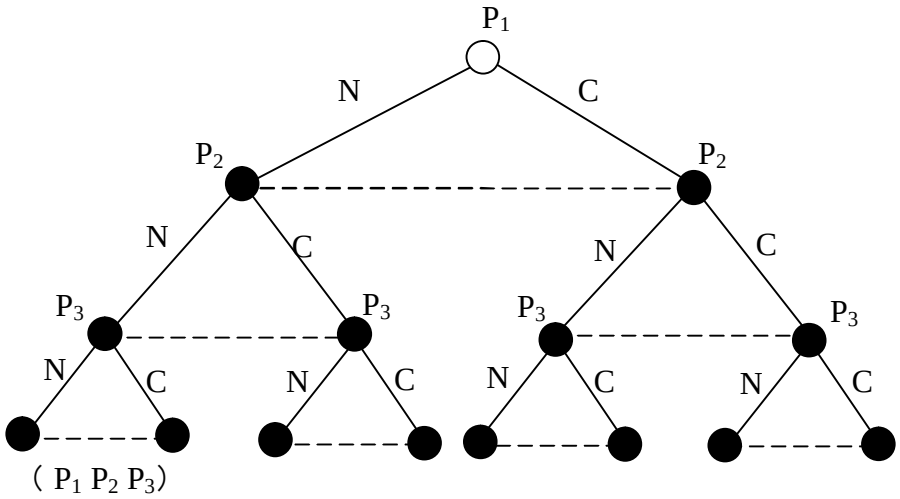

Figure 1 tree of Process

By game analysis, it shows that the support capacity of pension funds and the residents saving are complementary, and the level of personal savings and government pension's policy has a very close relationship. When the government design standards of pension fund program, not only need to consider the pension fund's own security capacity, but also enterprises' willingness to passed on the pension funds, which really balance the relationship between the pension fund and the savings rate that ensure social harmony and stability.

3. Empirical analysis

Because of China's pension fund is used at the provincial level, therefore, the part of empirical analysis select the panel data[4] of country's 31 provinces between 2001-2011of the relevant variables. In the empirical process, the methods of stationary test and regression analysis are used.

Firstly, it set the social pension fund plan ratio as independent variables X, the savings rate was the dependent variable Y. Table 1 shows the statistical analysis results of the two variables.

When using panel data analysis, unit root test is used to analyze the stability of the data. In the paper, the method of LLC, Fisher-ADF, Fisher PP are used to test the variables X and Y. Table 2 shows the results of unit root test. It shows that due to three P-values, the panel data of the various sequences.

[4] Data Sources: China statistical yearbook and statistical yearbook of provinces.

Table 1: descriptive statistics of variables

	X	Y
Mean	1.291964	0.251613
Median	1.242369	0.249748
Max	4.444744	0.470353
Min	0.917078	0.082158
Variance	0.271380	0.055677

Table 2: the results of unit root test

Test methods	Variable X		Variable Y	
	Test value	P values	Test value	P values
Levin, Lin & Chu t*	-25.1434	0.0000	-18.8913	0.0000
ADF - Fisher Chi-square	254.565	0.0000	238.119	0.0000
PP – Fisher Chi-square	294.131	0.0000	264.586	0.0000

As the impact of demographic and economic level, there is a different relationship between the provincial pension fund plans ratio and savings rates. In order to study the relationship between them, the paper select model as well as considering the impact of differences and contact among the individual variables. The general model established suitable for panel data as follows:

$$y_{it} = \alpha_i + \beta x_{it} + \varepsilon_{it}, \quad i = 1,2,\cdots, \quad N; t = 1,2,\cdots T \qquad (5)$$

In the general model, y is the urban household savings rate, in units of%; x is the ratio of pension fund plan of 31 provinces (municipalities and autonomous regions), the unit is%. The modeling assumes a linear relationship exists between them. By using software Eviews6.0, taken Least Squares method, it uses regression analysis of the relevant data, and gets a fixed effects model regression equation as follows:

$$Y = 0.235026 + 0.012839 * \mathrm{X} \qquad (6)$$

The regression equation shows that there has positive relationship between the pension fund plan ratio and the savings rate, that the pension fund plans ratio increases every 1 percentage point in the savings rate will rise by 0.25 percentage points. This is mainly related to pension system and the level of protection of pension funds.

4. Conclusions and Implications

Based on the relevant variables and data of 31 provinces (municipalities and autonomous regions) over the years, in this paper, quantitative analysis and regression analysis method are used to study the following conclusions: (1) there is a positive relationship between savings rate and the pension plan ratio, and the pension fund plans rose one percentage point each , the savings rate rose 0.25 percentage points ; (2) according to the level of economic development of the region as well as levels of old-age security in different provincial and municipal, there is a big difference between savings rates and pension funds ratio;(3)according to the results of the fixed effects model analysis, the alternative relationships between individual pension savings and pension funds are also affected by other factors, such as regional economic level, or the population structure. Therefore, a regional plan to adjust the ratio of the pension fund has a very important significance for the promotion of sustainable balance.

References

Guo Guangzhi,Yang Cuiying 2010. The relationship between the financial responsibility of the local social security and economic development: based on the panel data of 31 provinces in China. Northwest population,3(6):1-4, 9.

Wang Wei 2008. Determinants of Chinese household saving rate: An analysis based on dynamic panel data at provincial level of the period 1995-2005. Finance research, 34(2):53-64.

Wei Shouke, Lei Alin, Albrecht Gnauck 2009. Application of game theoretic models to solve the benefit conflicts in water resources management. Journal of hydraulic engineering, 40(8):910-918.