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**The relationship between social pension insurance payment and consumption in
China**

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for the Bachelor of Science in Finance

by

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Abstract

With the increasing level of the aging population in China, the social pension insurance payment is increasing every year. This paper, based on Feldstein's life cycle theory and used social pension insurance payment and consumption in different regions as panel data, analyzes the relationship between social pension insurance payment and consumption in China. The result shows that there is a significant positive correlation between social pension insurance payment and consumption. Also, all of the analyzed regions are in the same position as the main effect, with significant positive correlation. So, there are reasons to believe that social pension insurance has substitution effect to residents' savings. When the payment of social pension insurance increases, residents' savings level will decrease and the consumption level will increase accordingly.

Keywords: Pension, Consumption, Life Cycle Theory

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Introduction

Under the condition of the aging population in many developed and developing countries, the pressure of economy gradually increases. Social pension insurance system seems to play an increasingly important role in relieving the stress of the aging population. Therefore, the research aim to study the relationship between social pension insurance payment and consumption in order to get the effect degree of pension payment to economy.

According to the United Nations, a country is already an aging country if the percentage of the population over 65 years old is larger than 7%. In recent years, China's aging trend is intensifying. The 2018 statistical communique on national economic and social development of China shows that 11.9% of China's population is 65 years of age or older. Also, the regional difference of elder support rate is obvious. Social pension insurance can ensure labor force reproduction and maintain social stability, so it is an important measure to solve the problem of population aging.

Also, the choice some elders make when they receive pensions will affect the economic growth, because consumption is an important part of GDP. Feldstein's (1974) extended life cycle theory illustrate that under different level of the future expected income, people may make different decisions about consumption. When they hold the opinion that social pension insurance provides a certain source of pension income in the future, they may save less and spend more. It is substitution effect. On the other hand, when people think that the retirement income provided by social pension insurance is not enough to

guarantee the living standard after retirement, they will save more and spend less. If most of the elders choose to spend those pensions, it is beneficial to economic growth; if most of the elders would more like to save those pensions, the speed of economic growth may be slow. Therefore, it is necessary to discuss the relationship between pension payment and consumption in China, and the result may give us some hints about the optimism level of residents' future expected income in different regions. If the optimism level is high, it means residents have high enthusiasm in supporting social pension insurance system. It is helpful for the future development of the social pension insurance system. Otherwise, local government should take measure to increase residents' confidence about social pension insurance in order to improve the efficiency of the social pension insurance system.

After discussing the relationship between social pension insurance payment and consumption in China, I will divide China's 31 provinces (except Taiwan, Hongkong and Macao) into seven regions, which are Central region (Henan, Hubei and Hunan), North region (Beijing, Tianjin, Shanxi, Hebei and Inner Mongolia), Eastern region (Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi and Shandong), South region (Guangdong, Hainan, Guangxi), Northwest region (Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang), Northeast region (Heilongjiang, Jilin and Liaoning) and Southwest region (Chongqing, Sichuan, Guizhou, Yunnan and Tibet). Then regression analysis will be used to analyze the correlation of social pension insurance payment and consumption of these seven regions 2010-2017.

Hypothesis:

H_0 : When the payment of social pension insurance increases, the consumption level also will decrease accordingly.

H_1 : When the payment of social pension insurance increases, the consumption level will increase accordingly.

Literature Review

1. Aging Population

1.1 Situation in the World

Population aging is a demographic occurrence that happens when elderly individuals start to be a big proportion of the complete population. In the 19th decade, this tendency has become a global concern. Now, aging is existing in many advanced and developing countries. (Song, 2015) From a global perspective, population aging has become an irreversible trend of population development, which will undoubtedly bring significant impact on economic growth. Global work-age growth in population in 2016 slowed to approximately 1.0%, up from an average of 1.6% in the previous 20 years. Global working-age population growth is projected to further decelerate, as a consequence of United Nations predictions. This will have an effect in nations accounting for 64% of the world's GDP in terms of the PPP and 78% for nominal GDP, in order to bring this in view. Morgan Stanley's worldwide study is in step with the assessment carried out by the International Monetary Fund over the winter, which claimed that Europe's aging population is likely to trigger dramatic declines in productivity and severe financial issues.

Indeed, poor productivity growth in Italy is one of the major causes of the stagnant economy of the country. ("How devastating the world's aging population could be for global economy", 2016)

All of these mentions us that, in some countries, the aging problem is becoming serious and may exert detrimental influence on the economy.

1.2 Situation in China

In recent years, the social and economic development of China has been rapid, so people's living standards have been greatly improved, the average life expectancy of the population has been extended, and the problem of population aging has become increasingly serious. In fact, in 2000, China has already been a worldwide aging community with more than 10% of the total population aged over 65 years, and the level used to define a worldwide aging community is 7%. According to the recent World Bank study, China is the leading country in aging in East Asia and the Pacific, aged quicker than any other area in history. ("China: China focus: Aging population has limited impact on china growth: World bank", 2015) Inevitably, the trend of population aging is constraining China's economic development, and the pension system is worth to attract more attention.

2. Pension

2.1 Function of Pension

Pension funds are sets of commitments that elders will receive a more or less set annuity for the remainder of their life on pension (and in general some extra fee to the employees' wives). (Keenan, 2008) As one of the basic social security systems, pension can guarantee the reproduction of the labor force and maintain social stability, and it is an important means to solve the problem of population aging. (Tang & Zhang, 2019). Therefore, how to make full use of the advantages of pension is really important to explore.

2.2 Pension System in China

In the 1990s, the Chinese government switched the pure pay-as-you-go social pension insurance system to a mixed system that combines pay-as-you-go with investment-based individual account. (Yang, 2017) At present, China's social pension insurance system basically consists of three pillars: basic pension, enterprise annuity and voluntary individual savings pension, supplemented by subsistence allowance, social security fund and non-economic assistance. (Ye, 2019) Actually, some people hold the opinion that reforming of the pension system is necessary, and the pension payment from the government should be more targeted. According to O'Keefe, China's true task is to make the pension system more sustainable. He thinks China's present pension scheme is very diverse and should increase the pooling of pension cash. ("China: China focus: Aging population has limited impact on china growth: World bank", 2015)

3. Consumption

3.1 The Influence of Aging Population in Economy in China

Aging population brings challenges to China's economic and social development in terms of economic growth rate, welfare and quality. It not only indirectly influences the quantity of economic growth through affecting labor, capital, technological progress and income inequality, but also directly influences the quantity of economic growth through output and comprehensive index of total factor productivity. (Dai & Ma, 2019)

3.2 The Relationship between Consumption and Economic Growth in China

Consumption is an important part of GDP. In 2015, consumption added 66.4%, up

from 15.4% in 2014, to the Gross Domestic Product. In 2016, consumption increased the development level of the nation's total item by 64.6%. (Adversario, 2018)

3.3 Theory of the Relationship between Social Pension Insurance Payment and Consumption

The theory of domestic consumption can be traced back to the classic works of Keynes – “Absolute Income Hypothesis”. Keynes believed that current consumption of residents depends on the disposable income of the current period. With the increase of disposable income, both the average propensity to consume and the marginal propensity to consume decrease. From the perspective of the whole society, the larger the income distribution is, the lower the average consumption tendency will be, so the consumption level will decline. Therefore, pension will affect the consumption level of residents through affecting the income distribution of the whole society. (Zhao & Li, 2018)

However, the life cycle consumption theory proposed by Modigliani, an American economist, on the basis of Keynes pointed out that residents would live in the whole life plan their consumption expenditure within the time range of the cycle, pursue the optimal allocation of consumption throughout the life cycle, and achieve the maximization of lifetime consumption utility. The consumption level of residents is not determined by their current disposable income, but by their expected lifetime income, including labor income and other income such as household wealth. Social pension insurance system can provide stable pension income for residents, so the pension income can be regarded as a component of the expected income in a lifetime. Pension insurance increases residents'

lifetime expected income and improves residents' consumption level. (Hou, 2019)

Research Design

Feldstein (1974) analyzed with the extended life cycle theory and proposed that social endowment insurance had two impacts on residents' consumption behavior. On the one hand, social pension insurance provides a certain source of pension income, which can reduce residents' pension savings and thus increase consumption level. Feldstein thought it is a kind of substitution effect of social pension insurance for residents' savings. On the other hand, when residents think that the retirement income provided by social pension insurance is not enough to guarantee the living standard after retirement, they will choose to increase precautionary savings during the working period, which will reduce the consumption level during the working period. Social pension insurance causes residents to increase their pension savings in order to guarantee their living standard in the retirement period. Feldstein thought it is reduced retirement effect. The effect of social pension insurance on residents' consumption will depend on the comprehensive effect of these two effects. (Hou, 2019)

Based on it, I build a model like this:

$$Consumption_{it} = \beta_0 + \beta_1 Pension_payment_{it} + \varepsilon_{it}$$

$Consumption_{it}$ is the total consumption of residents in different regions per year from 2010 to 2017.

$Pension_payment_{it}$ is the total social pension insurance payment in different regions per year from 2010 to 2017.

β_0 is the constant term, and ε_{it} is the error term, which measures the sampling error.

Data and Basic Information

Data source is the panel data in different regions from 2010 to 2017. The reason why the panel data is selected is that compared with the cross-section data, it controls the heteroscedasticity and other deviations caused by the unobservable economic variables in the estimation of the ordinary least square method, making the model setting more reasonable and the sample estimators of model parameters more accurate. Compared with the time series model, it expands the sample information and improves the validity of the estimator. At the same time, it can better identify and measure the unobservable effects of time series or cross-section data, and help to build and test more complex behavior models. 8 years of time series and data from 31 provinces per year combined to form a data source of 248 sample data.

All data derive from the statistical communique on national economic and social development of China and official data from China National Bureau of Statistics.

Results

The result of regression analysis:

Regression Result		
Region	Multiple R	Significance F
Central region	0.957471463	8.25626E-13
Eastern region	0.934625694	6.54769E-26
Southwest region	0.882981402	4.77681E-14
Northwest region	0.854476281	2.32011E-12
China	0.844500949	1.1597E-68
South region	0.840861605	2.6829E-07
Northeast region	0.830448283	5.1182E-07
North region	0.739653268	4.96431E-08

<i>Dependent variable:</i>	
total_consumption	
Pension_Payment	108.853*** (4.401)
Constant	243,274,261,673.000*** (29,654,820,937.000)
Observations	248
R ²	0.713
Adjusted R ²	0.712
Residual Std. Error	338,917,508,659.000 (df = 246)
F Statistic	611.692*** (df = 1; 246)
<i>Note:</i>	* p<0.1; ** p<0.05; *** p<0.01

	(1)	(2)	(3)
Pension_Payment	67.959*** (4.053)	70.121*** (10.350)	94.244*** (4.880)
Constant	522,299,909,685.000*** (33,447,634,602.000)	369,104,235,839.000*** (43,101,636,830.000)	464,412,097,423.000*** (50,198,063,227.000)
Observations	24	40	56
R ²	0.927	0.547	0.874
Adjusted R ²	0.924	0.535	0.871
Residual Std. Error	84,541,979,727.000 (df = 22)	171,239,755,250.000 (df = 38)	242,541,647,302.000 (df = 54)
F Statistic	281.088*** (df = 1; 22)	45.901*** (df = 1; 38)	372.969*** (df = 1; 54)

Note:

<i>Dependent variable:</i>				
total_consumption	(4)	(5)	(6)	(7)
	182.579*** (25.056)	82.291*** (8.116)	135.286*** (19.349)	81.364*** (7.017)
	248,934,473,548.000 (173,798,384,897.000)	95,493,316,100.000*** (20,608,908,116.000)	287,420,281,259.000*** (52,848,113,670.000)	143,365,344,159.000*** (41,716,460,147.000)
	24	40	24	40
	0.707	0.730	0.690	0.780
	0.694	0.723	0.676	0.774
	631,569,118,026.000 (df = 22)	94,809,734,697.000 (df = 38)	147,936,263,482.000 (df = 22)	178,244,721,610.000 (df = 38)
	53.098*** (df = 1; 22)	102.811*** (df = 1; 38)	48.886*** (df = 1; 22)	134.457*** (df = 1; 38)

*p<0.1; **p<0.05; ***p<0.01

The seven grouped regressions are as follows: Central region, North region, Eastern region, South region, Northwest region, Northeast region, Southwest region.

After regression analysis, the value of Multiple R is about 0.84 at the 0.05 level of significance, so there is a significant positive correlation between social pension insurance payment and consumption in China. Also, all of the P-value are smaller than 0.01 in the seven regions, so the seven regions are in the same position as the main effect, with positive correlation. Thus, the hypothesis “When the payment of social pension insurance rises, the consumption level also will increase accordingly” is thereby accepted.

From the regression results, although the correlation of social pension insurance payment and consumption growth in the seven regions is positive, but there are differences. From

the picture, we can see Central region's social pension insurance payment has the highest correlation with the region's consumption; North region's social pension insurance payment has the lowest correlation with the region's consumption. Only North region's correlation is smaller than 0.8, it means that North region's social pension insurance payment and the region's consumption is positively correlated, but other regions' social pension insurance payments and consumptions have significant positive correlation. This difference may reflect that different regions have different levels of pension insurance development or different levels of policy support, but these factors are difficult to measure. More importantly, I think different provinces' urban floating population is an essential reason to explain the relevantly low correlation in North region.

North region includes Beijing, Tianjin, Shanxi, Hebei, and Inner Mongolia. According to different provinces' urban floating population ranking table in 2019, we can know Beijing's ranking is fourth (7.943million population), and Tianjin's ranking is sixth (4.982million population). So, people in North region likely consume in other regions, and it will decrease the correlation. Therefore, we have a reason to explain why the correlation between social pension insurance payments and consumptions is a little bit low.

Region	Average Pension Payment	Average GDP	Ratio
Eastern region	6874112930	3426452821429	0.00201
Central region	7068560021	8504641625000	0.00083
Southwest region	4383293305	6155546500000	0.00071
South region	4651923699	8429758750000	0.00055
Northwest region	1742564743	3559775250000	0.00049
Northeast region	2241510853	5125154000000	0.00044
North region	3240224695	9198285250000	0.00035

Also, in this table, we can know the different region's ratio of average pension payment and average GDP from 2010 to 2017. Obviously, Central region's ratio is still in the top of the ranking, and North region's ratio is the lowest. The result is consistent with the result discussed above. It has a further demonstration of the pension payment's effect to consumptions and GDP.

The result that there is a significant positive correlation between social pension insurance payment and consumption in China's different regions may give us some hints about the optimism level of residents' future expected income. According to the substitution effect of Feldstein's life cycle theory, when people have positive attitude to the future expected income, they would more like to consume more and save less. Obviously, the result tells us that when the pension payment increases, people would more like to consume more. So, we have the reasons to believe that pension payment increases people's confidence to the future expected income, and plenty of the residents in China have positive attitude to the development of social pension system and think the pension income is enough to support their future life.

Because of the high optimism level of social pension insurance system, residents will have high enthusiasm in supporting social pension insurance system. It is helpful for government officials to complete relevant work effectively and improve the future development of the social pension insurance system, which will further increase China's future economic growth. Otherwise, local government should take various measures to increase residents' confidence about social pension insurance in order to improve the efficiency of the social pension insurance system, which is inefficient to improve the

economic growth.

Contributions and Limitations

Contributions:

1. There is a significant positive correlation between social pension insurance payment and consumption in China. So, we can increase the investment in social security to stabilize residents' expectation of future income, so as to expand consumer demand and realize the transformation to the economic growth model driven by domestic demand.
2. There are regional differences in the effect of the development of social pension insurance on consumption growth. Therefore, it is necessary to promote the balanced development of social pension insurance business, so as to better drive the consumption growth in some regions
3. When the pension payment increases, people would more like to consume more. So, we have the reasons to believe that pension payment increases people's confidence to the future expected income, and the plenty of residents in China have positive attitude to the development of social pension system and think the pension income is enough to support their future life.

Limitations:

1. In this paper, only one independent variable of social pension insurance payment is used, and no other control variables are considered.
2. This paper just makes a simple correlation analysis between social pension insurance

payment and consumption expenditure, without seeking the causal relationship between them and the mechanism of their action.

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Appendix

The regression result of China and 7 regions:

China									
Regression Statistics									
Multiple R	0.844500949								
R Square	0.713181854								
Adjusted R Square	0.712015926								
Standard Error	3.38919E+11								
Observations	248								
ANOVA									
	df	SS	MS	F	Significance F				
Regression	1	7.026E+25	7.03E+25	611.6863	1.16E-68				
Residual	246	2.826E+25	1.15E+23						
Total	247	9.852E+25							
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%	
Intercept	2.43279E+11	2.965E+10	8.203656	1.31E-14	1.849E+11	3.02E+11	1.85E+11	3.02E+11	
X Variable 1	108.8526687	4.4012364	24.73229	1.16E-68	100.18376	117.5216	100.1838	117.5216	

Central region									
Regression Statistics									
Multiple R	0.957471								
R Square	0.916752								
Adjusted R Square	0.912787								
Standard Error	8.09E+10								
Observations	23								
ANOVA									
	df	SS	MS	F	Significance F				
Regression	1	1.51E+24	1.51E+24	231.2571	8.26E-13				
Residual	21	1.37E+23	6.54E+21						
Total	22	1.65E+24							
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%	
Intercept	5.38E+11	3.32E+10	16.20064	2.42E-13	4.69E+11	6.07E+11	4.44E+11	6.32E+11	
X Variable 1	15567440000	64.86749	4.265594	15.20714	8.26E-13	55.9967	73.73828	52.79006	76.94492

North region									
Regression Statistics									
Multiple R	0.739653								
R Square	0.547087								
Adjusted R Square	0.535168								
Standard Error	1.71E+11								
Observations	40								
ANOVA									
	df	SS	MS	F	Significance F				
Regression	1	1.35E+24	1.35E+24	45.90132	4.96E-08				
Residual	38	1.11E+24	2.93E+22						
Total	39	2.46E+24							
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%	
Intercept	3.69E+11	4.31E+10	8.563578	2.11E-10	2.82E+11	4.56E+11	2.82E+11	4.56E+11	
X Variable 1	70.12145	10.34995	6.775051	4.96E-08	49.16907	91.07384	49.16907	91.07384	

Eastern region								
Regression Statistics								
Multiple R	0.934626							
R Square	0.873525							
Adjusted R Square	0.871183							
Standard Error	2.43E+11							
Observations	56							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	2.19E+25	2.19E+25	372.9625	6.55E-26			
Residual	54	3.18E+24	5.88E+22					
Total	55	2.51E+25						
Coefficients								
	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%	
Intercept	4.64E+11	5.02E+10	9.251805	9.96E-13	3.64E+11	5.65E+11	3.64E+11	5.65E+11
X Variable 1	94.24348	4.879988	19.31224	6.55E-26	84.45969	104.0273	84.45969	104.0273

South region								
Regression Statistics								
Multiple R	0.840862							
R Square	0.707048							
Adjusted R Square	0.693732							
Standard Error	6.32E+11							
Observations	24							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	2.12E+25	2.12E+25	53.09769	2.68E-07			
Residual	22	8.78E+24	3.99E+23					
Total	23	3E+25						
Coefficients								
	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%	
Intercept	2.49E+11	1.74E+11	1.432343	0.166102	-1.1E+11	6.09E+11	-1.1E+11	6.09E+11
X Variable 1	182.5792	25.0561	7.286816	2.68E-07	130.616	234.5423	130.616	234.5423

Northwest region								
Regression Statistics								
Multiple R	0.854476							
R Square	0.73013							
Adjusted R Square	0.723028							
Standard Error	9.48E+10							
Observations	40							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	9.24E+23	9.24E+23	102.8084	2.32E-12			
Residual	38	3.42E+23	8.99E+21					
Total	39	1.27E+24						
Coefficients								
	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95%	Upper 95%	
Intercept	9.55E+10	2.06E+10	4.633665	4.14E-05	5.38E+10	1.37E+11	5.38E+10	1.37E+11
X Variable 1	82.29049	8.115875	10.13945	2.32E-12	65.86076	98.72022	65.86076	98.72022

Northeast region								
Regression Statistics								
Multiple R	0.830448							
R Square	0.689644							
Adjusted R Square	0.675537							
Standard Error	1.48E+11							
Observations	24							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	1.07E+24	1.07E+24	48.88642	5.12E-07			
Residual	22	4.81E+23	2.19E+22					
Total	23	1.55E+24						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.87E+11	5.28E+10	5.43861	1.83E-05	1.78E+11	3.97E+11	1.78E+11	3.97E+11
X Variable 1	135.2859	19.349	6.991882	5.12E-07	95.15854	175.4133	95.15854	175.4133

Southwest region								
Regression Statistics								
Multiple R	0.882981							
R Square	0.779656							
Adjusted R Square	0.773858							
Standard Error	1.78E+11							
Observations	40							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	4.27E+24	4.27E+24	134.4577	4.78E-14			
Residual	38	1.21E+24	3.18E+22					
Total	39	5.48E+24						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.43E+11	4.17E+10	3.436771	0.00144	5.89E+10	2.28E+11	5.89E+10	2.28E+11
X Variable 1	81.36413	7.016816	11.59559	4.78E-14	67.15933	95.56893	67.15933	95.56893