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**Retirement: analysis of the amount of money that you will need to retire in thirty  
years**

In Partial Fulfillment of the Requirements  
for the Bachelor of Science in Finance

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## Abstract

The topic of the paper is to analysis the amount of money that you will need to retire in 30 years. Considering the imperfect pension system and medical insurance system in China, people have to save money early to keep away from the unknown risk in the future. For getting an approximate amount of money people need to save, two samples were set to analyze the differences between male and female, high-quality and normal life, and the first-tier city and second-tier city. Furthermore, a questionnaire was designed for collecting primary data targeting to people who live in China. There are three hypotheses related to the questionnaire. After running analysis, only H0 was rejected, which means the level of cities affects people's retirement savings. H1 and H2 were accepted, which proves that age and gender does not affect people's retirement saving.

Keywords: Retirement; Pension; Saving money; First-tier City; Second-tier City

## 1. Introduction

Most of the traditional Chinese people would like to save money early for retirement, which leads to a different lifestyle with the majority of American people. Chinese people hate conspicuous consumption. The most important reason why Chinese people prefer to save money is that the social welfare undertakings of housing, health care, retirement and so on are not completed.

Since the beginning of introducing universal health insurance, the number of people participating in basic medical insurance for urban workers increased from 94.01 million in 2002 to 200 million in 2008 (Song). Although, the increasing number of participants was huge. The situation of Chinese health insurance is not optimistic. It will cause some problems. First, the government pays more attention to state-owned enterprise staffs rather than urban residents who work in private enterprise or are unemployed, which result in inequality in basic medical insurance for different groups of urban people. Second, the majority of state-owned enterprises are located in urban areas. It is difficult for people in the rural area to get equal health insurance. The rural population is 57.661 million which is 41.48 percent of the total population. (Ning) The other reason is that the hospital implemented the policy of “medical supplementation” which allowed the hospital to make a profit from selling medicine at 15%-20%. Therefore, some hospitals are selling a large number of imported drugs and high-end nutritional supplements, blindly use high-end medical equipment, resulting in high medical costs.

Since 2009, China’s housing prices have once again entered a period of rapid rise. The national average house price increase from 3800 yuan in 2007 to 6237 yuan at the end of 2013. The cumulative increase is 64.1%, and an average annual increase is 10.4% (Gao). Considering that this price is only the average selling price and the trend of housing development is moving away from the central city, the actual increase in house

prices will be higher. As housing prices continue to increase, the real estate bubble continues to increase. The huge gap of wealth in Chinese society impacts the allocation of housing resources badly. The middle-age group of people, especially those who got a lot of money from compensation, have a hobby of buying houses or apartments and holding them tight in hands. All these elements will force people to save more and earlier.

As of 2018, China's population aged 60 and over was 249.49 million, accounting for 17.9% of the total population. Among them, the population aged 65 and over was 166.58 million, accounting for 11.9% of the total population (Chu). It caused a core problem, a huge gap in pensions. According to the statistics of the Ministry of Human Resources and Social Security, if the financial supplement of 354.8 billion yuan is removed, the current income and expenditure gap of the basic pension insurance fund of enterprises reached 123.1 billion yuan. In fact, since 2001, among the urban state-owned enterprises and collective enterprise workers covered by basic pensions, the average growth rate of participants has been 4.04%, which is lower than the average increase in the number of retired employees which is 6.64% ([www.euchinasprp.eu](http://www.euchinasprp.eu)).

Due to the long-term risks of government pensions, personal pension deposit is becoming more and more important. Figuring out the amount of money people need for retirement can help them improve life plan and get a happier retirement life.

The purpose of this paper is to analyze the amount of money you need to retire in thirty years. The paper aims to answer the research questions: (1) what is the amount of money people need for surviving and having a happy life after retiring in China? (2) what are the differences in retirement savings between first-tier cities and other cities? (3) How can an aging problem impact retirement savings?

## 2. Literature Review

The literature review chapter draws on the available academic literature and focusses on the relationship between Chinese retirement policy, retirement living cost and the impact of aging problem in retirement savings.

### 2.1 Chinese Retirement Policy and the Current Status

#### 2.1.1 China's Multi-Layered Pension System

##### Public Pension System

China's public pension system adopts a combination of social pooling and personal accounts. The system consists of four schemes (Fang).

- Basic Old-Age Insurance (BOAI)
- Public Employee Pension (PEP)
- Urban Resident Pension (URP)
- New Rural Resident Pension (NRP)

##### Occupational Pension

There are two parts:

- Enterprise Annuity: According to the "Enterprise Annuities Pilot Scheme", the supplementary pension system voluntarily established by enterprises and their employees based on participating in basic old-age insurance (Laws).
- Occupational Annuity: It is the second pillar pension plan for institutions. It is a means of making up for the decline in the basic pension benefits after the retirement system of the government and institutions is merged (Fang)

##### Private Annuity Insurance

Currently, the commercial annuity business has grown rapidly in China, with an average annual growth rate of 16.9% between 2001 and 2014 (Fang).

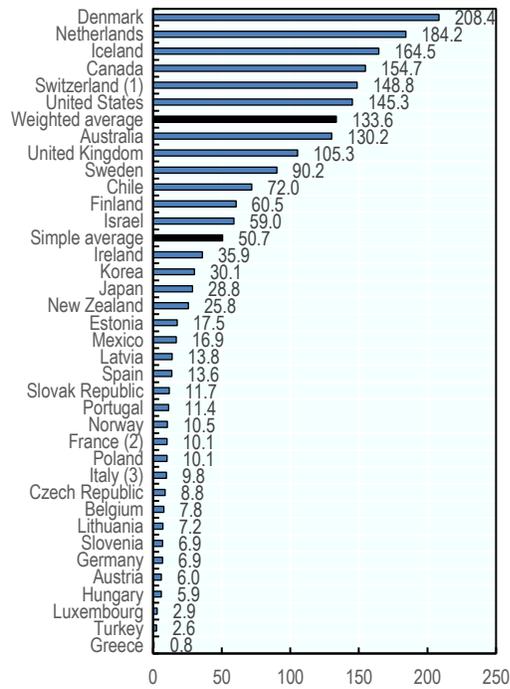
### 2.1.2 Three-Pillar Pension System

Zhang and Harte (Zhang) pointed out that there are three pillars in China's pension system. First is by the basic endowment insurance fund and the national social security fund. The second is enterprise annuity and occupational annuity. The third is the individual pension. Comparing with The United States, china's pension asset reserves are still relatively small, accounting for only 14% of GDP in 2015, while the United States is 121%.

## 2.2 The Current Status

There is a huge gap in China's Pension system. According to the statistics of the Ministry of Human Resources and Social Security, if the financial supplement of 354.8 billion yuan removed in 2014, the current gap of basic pension reached 123.1 billion yuan ([www.euchinasprp.eu](http://www.euchinasprp.eu)) The funding needs of public pension funds will surge in the next few years and are expected to increase from 3.97 trillion yuan in 2015 to 7.28 trillion yuan (Zhang)

According to the statistics of the OECD, at the end of 2018, the second and third pillars of the OECD countries accounted averagely for 52.9%, while China's second and third pillars accounted for only 1.6% of GDP. The structure of China's pension system is unreasonable.



Source: OECD Global Pension Statistics.

The benefit amount of this pension system is very low, with a country average of 81 yuan (13 US dollars) per month. Shanghai setting its pensions at 540 yuan (88 US dollars) per month, whereas in Kunming, pensioners receive 84 yuan (14 US dollars) (Security).

### 2.3 Retirement Living Cost in China

The main part of retirement living costs is general living cost, such as expenditure for food, clothes and so on. In the analysis of general living costs, Shanghai and Chengdu are taken as the sample of first-tier cities and second-tier cities. In Shanghai, a single person monthly cost is 4404.79 yuan without rent. The average monthly rental of an apartment in the city center is 7355.06 yuan. The average monthly rental of an apartment outside of the city center is 3413.88 yuan (NUMBEO). In Chengdu, a single person monthly cost is 3535.36 yuan without rent. The average monthly rental of an apartment in the city center is 2092.86 yuan. The average monthly rental of an

apartment outside of the city center is 1578.12 yuan (NUMBEO, Cost of Living in Chengdu).

## 2.4 The Impact of the Ageing problem in Retirement saving

In recent decades, with the strict implementation of the family planning policy, China's birth rate has rapidly declined, and the demographic structure has undergone tremendous changes. The rapid economic growth and the improvement of living standards and medical technology have led to a rapid rise in the average life expectancy of Chinese people. In 1953, at the time of the first census, the proportion of the elderly over 65 years old in China was only 4.4% and has increased to 9.7% in 2013. By 2050, it is expected that the proportion of the elderly over 65 years old will exceed 30% (Wang) The aging of the population ages the age structure of a country's population and negatively affects its

National saving rate, this paper defines this effect of population aging as the "burden effect." However, Wang and Ai (Wang) states that the savings rate of China's urban population has the opposite characteristics of the life cycle, that is, the oldest households in the sample have the highest savings rate.

## **3. Methodology & Data:**

### 3.1 Discussion and explanation of dataset

My topic is an analysis of the amount of money that you will need to retire in thirty years. In my research questions, the data of two cities, Shanghai and Chengdu

picked up as the sample of the first-tier city and the second-tier city will be used in the paper. The data needed about these two cities:

- Average house prices
- House loan

The data needed about people who live in these two cities:

- Expenditure for food
- Expenditure on clothes
- Expenditure for housing
- Expenditure for traffic and telecommunications
- Expenditure on kids' education
- Expenditure for entertainment
- Expenditure for health care
- Utility fee
- Salary

Primary data of this study were collected by a questionnaire published online. The questionnaire focuses on people who are above 18 years old and having a steady salary. The first three questions are about basic information like gender, age, and region. For the region, there are two options, first-tier city and second-tier city, which is for analyzing the relationship between the level of cities and people's retirement savings. The second part of my questionnaire focuses on people's salary levels and the expected saving percentage.

Due to the retirement age in China, male citizens have to retire after 60 years old. Female cadres have to retire after 55 years old, and the female worker has to retire after 50 years old.

A Young female (20-25 years old)

The paper will create a research target, a young white-collar woman. She represents the majority of graduated female students with a normal living standards.

The hypothesis is: single, no house and car; living in a rental house around 10-40 square meters; taking buses and subway; order take-out meals every day; main expenditure is buying clothes and cosmetics; she has rarely been sick; her main entertainment is karaoke with friends.

A Middle-aged Male (30 years old)

30-year-old males are a special social group, who live a much happier life but under tremendous pressure.

The hypothesis is: married, his wife is a housewife; has one child, who went to government primary school (the main expenditure for education is buying stationary and cram school); owned a 100 square meter house (had paid down payment, 20-year installment); owned a mid-range car (5-year installment), traveling domestically and broadly each once a year; more entertainment like dinner party; gifts for family members and social; no smoking and drinking.

In the questionnaire, a simple random sampling method will be used. The research population will be randomly selected in China. The questionnaire will be conducted through So Jump, a professional platform for online questionnaire surveys, evaluation, and voting, and WeChat. The sample size is 100.

### 3.2 Discussion and explanation of the model and null hypotheses

The methodology is divided into two parts. A simple calculation will be used in the first part. All the secondary data like all kinds of expenditure, house prices will be used to calculate the living cost of sample 1 and sample 2. Living cost is highly related to

retirement saving, which helps people decide how many percentages of money they should withdraw from their salary to save for retirement.

The formula of living cost is:

$$\begin{aligned} \textit{Total Retirement Saving} \\ = \textit{Expected Percentage of Yearly Saving} * \textit{Yearly Salary} \end{aligned}$$

The formula of house loan is:

$$\begin{aligned} \textit{Loan Payment} &= \frac{\textit{Loan Amount}}{\textit{Discount Factor}} \\ \textit{Discount Factor} &= \frac{(1 + I)^n - 1}{I * (1 + I)^n} \end{aligned}$$

where  $n$  is the number of payments

$I$  is the periodic interest rate

The formula of the amount of money that you will need to retire in thirty years is:

$$\textit{Balance} = Y * \textit{Total Living Cost} - \textit{Total Pension}$$

where  $Y$  is the years to live

I developed three hypotheses which are related to five questions asked in the questionnaire:

$H_0$ : The level of city that people live in has no effect on the amount of money people will save for retirement.

$H_0$ : The age has no effect on the amount of money people will save for retirement.

$H_0$ : The gender has no effect on the amount of money that will save for retirement.

#### **4. ANALYSIS & FINDINGS**

Sample 1 is a female who is 20-25 years old. The hypothesis is: single, no house and car; living in a rental house around 10-40 square meters; taking buses and subway; order take-out meals every day; main expenditure is buying clothes and cosmetics; she has rarely been sick; her main entertainment is karaoke with friends.

Sample 2 is a male who is 30 years old. The hypothesis is: married, his wife is a housewife; has one child, who went to government primary school (the main expenditure for education is buying stationary and cram school); owned a 100 square meter house (had paid down payment, 20-year installment); owned a mid-range car (5-year installment), traveling domestically and broadly each once a year; more entertainment like dinner party; gifts for family members and social; no smoking and drinking.

##### 4.1 The living cost of sample 1 and 2

Her expenditure in one year is 49177.44 yuan. The expenditure on food is 1200 yuan per month because she eats take-out meals every day only for lunch and dinner. Each meal is 20 yuan. "No breakfast" saved a lot for her. Purchasing clothes and cosmetics is a large part of her total expenditure, which is 1000 yuan per month. The cost of transportation is low in Chengdu, which is 60 yuan for her. The bus system charges people 1 yuan per time. If you hold a discount card, you can get a 50% discount. The subway system charges start from 2-10 yuan within 70 kilometers. If it is more than 10 yuan, the price increases by 1 yuan for every 20 kilometers. The largest expenditure for her is a rental fee, which is 1578.12 yuan for a 100 square meter apartment. She spends 60 yuan per month for the utility.

As the sole source of income in the family, his total expenditure is huge, which is

533808.59 yuan per year. For providing balanced nutrition for his wife and kid, he spends 4549 yuan on food every month. His only kid needs to have three different after-school courses every week, which costs 2400 yuan every month. The expenditure on transportation is 1000 yuan every month. The expenditure on entertainment is 800 yuan every month. The loan is the largest part of living costs. He needs to pay 30326.94 yuan every month for a 20-year house loan and 2658 yuan for a 5-year car loan. The expenditure for traveling every year is 24000 yuan. The expenditure on social networking every month is 500 yuan. The utility is 250 yuan every month.

According to CLB, the average annual pension reached 37,840 yuan (China's social security system). We can calculate the total retirement savings people needed. The life expectancy of females at birth in 2017 is 78.8 in China (Han, Female life expectancy in China 2007-2017). For sample 1, she needs 272,098.56 yuan for keeping her life after retirement. The life expectancy of males at birth is 74.9 in China (Han). For sample 2, he needs 7,439,520 yuan for keeping his life after retirement.

From the data, I figured the expenditure on food in the first-tier city is lower than in the second-tier city. However, the price difference is huge in the house. The average housing price in Chengdu is 14000 yuan/square meter. The average housing price in Shanghai is 56000 yuan/square meter.

	Shanghai	Chengdu	Difference
The average price of animal by-products	19.16 yuan	25.50 yuan	-6.34
The average price of fruits	5.70 yuan	5.50 yuan	0.2
The average price of fish	9.65 yuan	10.83 yuan	-1.18
The average price of vegetable	4.84 yuan	4.01 yuan	0.83

Table 1: Average price of daily life expenses in Shanghai and Chengdu

People need to save a lot more for living a high-quality retirement life. The male lives a life with a house, a car, which the young female does not have. The male eats meals with better nutrition. In the meanwhile, the female has only two take-out meals every day. The male can afford to travel once a year with family. The young female can only go karaoke. Apparently, the male has a life with higher quality, but the cost is the need for larger retirement saving if he wants to keep a high-quality life after retiring.

Males need to save more than females. In traditional Chinese culture, males are always described as the sole pillar of families. In my analysis, the male sample needs to feed his housewife and only child. There are more expenditures than the female sample.

#### 4.2 Hypothesis Test

The first hypothesis I tested is:

*H<sub>0</sub>: The level of city that people live in has no effect on the amount of money people will save for retirement.*

This hypothesis is related to third and fifth questions: Region, and How many percent of your yearly earning will be saved for retirement? The independent factor is the region. There are two options in the third question, the first-tier city or the second-

tier city. The dependent factor is the amount of money people will save for retirement. There are two options in the fifth question,  $\leq 10\%$  or  $>10\%$ . After running regression analysis in excel, the p-value of the region is 0.0362. The  $H_0$  will be rejected because the p-value of the region is smaller than 0.01. Therefore, the level of cities has effect on the amount of money people will save for retirement.

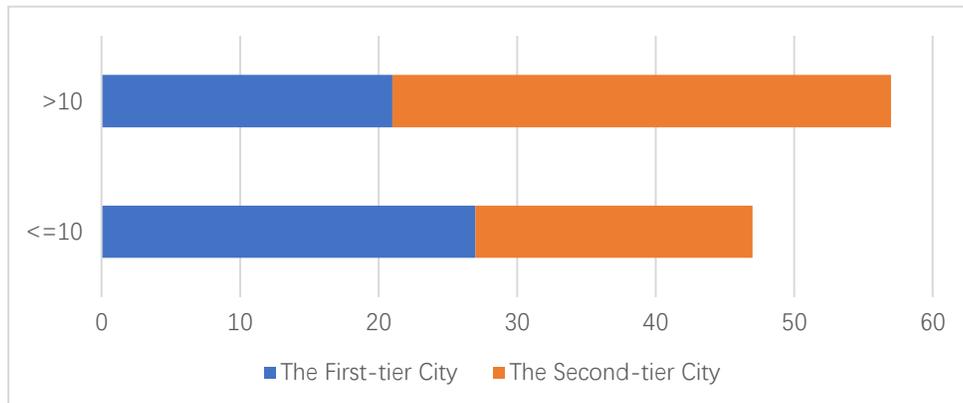


Figure 1: The First-tier and Second-tier cities

According to my data set, there are 48 respondents from the first-tier cities. 27 respondents chose " $\leq 10\%$ ", and 21 of them chose " $>10\%$ ". There are 56 respondents from the second-tier cities. 20 of them chose " $\leq 10\%$ ", and 36 of them chose " $>10\%$ ". From this chart, it is apparent that people from second-tier city would like to save more than people from first-tier city.

The second hypothesis is

$H_0$ : *The age has no effect on the amount of money people will save for retirement.*

This hypothesis is related to the second and fifth questions: age, and How many percent of your yearly earning will be saved for retirement? The independent factor is age. There are five options in the second question, under 22, 22-26, 27-31, 32-36, Above 36. The dependent factor is the amount of money people will save for retirement. There are two options in the fifth question,  $\leq 10\%$  or  $>10\%$ . After running regression analysis in excel, the p-value of the age is 0.8206. The  $H_1$  will be accepted because the p-value of the age

is bigger than 0.1. Therefore, the age has no effect on the amount of money people will save for retirement.

The third hypothesis is *H2: The gender has no effect on the amount of money that will save for retirement*. This hypothesis is related to the first and fifth questions: gender, and How many percent of your yearly earning will be saved for retirement? The independent factor is gender. There are two options in the first question, male and female. The dependent factor is the amount of money people will save for retirement. There are two options in the fifth question,  $\leq 10\%$  or  $> 10\%$ . After running the t-Test analysis in excel, the p-value is 0.8900. The H2 will be accepted because the p-value of the gender is bigger than 0.1. Therefore, the gender has no effect on the amount of money people will save for retirement.

## 5. Conclusion

In conclusion, I explored the retirement saving of Chinese people who live in different levels of cities and different quality of life. The process of exploring allows me to know deeply about China's pension system. The disadvantages and imperfection of the pension system make people be concern about their financial risk after retirement. Through two samples, I had a rough idea about how much money people need to save for retirement in 30 years. At last, I investigated how three factors affect the amount of money people expect to save for retirement.

I set two totally different samples, a 20-25 years old female and a 30 years old male. These two samples have a completely different life in Chengdu and Shanghai that represent the second-tier and first-tier cities. Through collecting secondary data about living cost online, I got an approximate total amount of money they need to save for

retirement in 30 years. There is a huge difference between the two numbers. This idea leads to further investigation of influence factors of retirement saving.

Using questionnaires to collect primary data and running analysis helped me figure out how three factors, gender, age, and region affect people's retirement savings. In Appendix B, the results show the region does have effect on people's retirement savings. The age and gender do not have effect on the retirement saving.

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## Appendix A Questionnaire

# **Questionnaire on Retirement Saving of Chinese First-Tier and Second-Tier Cities' People**

I am a senior college student at Wenzhou Kean University, and I am currently doing a survey to investigate retirement saving of Chinese people. All the information collected in this survey is used for academic research only, your privacy will be kept confidential. Thank you for taking this survey.

If you have any questions about this survey, please feel free to contact me(yangho@kean.edu). I really appreciate all your support and cooperation!

**In the first section, I will ask you to answer some questions about your personal information. Your answers to this section will help this study get more accurate results. This questionnaire will collect data in an anonymous way and information collected will only be used for this study.**

Gender:

- Male
- Female

Age:

- Under 22
- 22-26
- 27-31
- 32-36
- Above 36

Region:

- First-tier Cities, such as Beijing, Shanghai, Guangzhou...
- Second-tier Cities, such as Chengdu, Wenzhou, Hefei...

Yearly earnings:

- Under 30,000 RMB
- 30,000 ~ 80,000 RMB
- 80,000 ~ 150,000 RMB
- 150,000 ~ 800,000 RMB
- Above 800,000 RMB

**The retirement saving simply refers to the amount of money (percent) that can be taken out of your earnings and allow you to reasonably expect to save for the future as you retire, to prevent from running out of money.**

How many percent of your yearly earning will be saved for retirement?

- ≤10%
- >10%

## Appendix B Regression Analysis for Region

### *Regression Statistics*

Multiple R	0.205701798
R Square	0.04231323
Adjusted R Square	0.032924144
Standard Error	0.49179187
Observations	104

### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	1.089972527	1.089972527	4.5066	0.036183521
Residual	102	24.66964286	0.241859244		
Total	103	25.75961538			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	1.232142857	0.15644121	7.876076008	4E-12	0.92184246	1.5424433
Region	0.205357143	0.096734944	2.122884815	0.0362	0.013483841	0.3972304

### Appendix C Regression Analysis for Age

#### Regression Statistics

Multiple R	0.205701798
R Square	0.04231323
Adjusted R Square	0.032924144
Standard Error	0.49179187
Observations	104

#### ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	1.089972527	1.089972527	4.5066	0.036183521
Residual	102	24.66964286	0.241859244		
Total	103	25.75961538			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	1.232142857	0.15644121	7.876076008	4E-12	0.92184246	1.5424433
Age	0.205357143	0.096734944	2.122884815	0.0362	0.013483841	0.3972304

### Appendix D T-test for Gender

t-Test: Two-Sample Assuming Unequal Variances

	<i>Male</i>	<i>Female</i>
Mean	1.53846154	1.54807692
Variance	0.25093353	0.25009335
Observations	104	104
Hypothesized Mean Difference	0	
df	206	
t Stat	-0.1385329	
P(T<=t) one-tail	0.44497731	
t Critical one-tail	1.65228414	
P(T<=t) two-tail	0.88995463	
t Critical two-tail	1.97154667	