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**Analysis of the amount of money that residents need to retire in thirty years in
Zhejiang province**

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by

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Abstract

With the rising trend of China's aging population, providing for the aged has gradually become a hot topic in society. People are starting to talk about how much they need to save to meet their retirement needs. This thesis focuses on the pension plans of residents in Zhejiang province, predicts the amount of personal savings required in retirement (2048) after 30 years, and explores the relationship between inflation rate, government pension payments and personal saving. Results show that, in addition to the government provided the pension plan, individuals need to save up to 15 812781 in 2048 to support their retire life. Inflation rate has positive impact on personal saving, and government pension payments has no impact on personal saving. Base on this analysis, feasible measures for governments and individuals have been proposed to improve pension plans.

Keywords: retirement, inflation rate, individual saving, government pension payment

1. INTRODUCTION

In this section, the reason and importance for this study will be discussed. In addition, research question and methodology for this research also be illustrated.

Nowadays, with the increase of China's aging population, old-age care has become a hot topic in society. According to He, Ning & Zhu (2017), in 2017, 17.3 percent of China's population was over 60, or 241 million people. By 2050, China's 65-year-old population is expected to reach 487 million, or nearly 35 percent of the population. China has the fastest aging population in modern history. As the number of elderly Chinese increases, more and more young and middle-aged people begin to care about how much extra money they need to save for the future retire life of old age in addition to participating in the basic pension plan provided by the government.

In this thesis, under the condition that residents' quality of life remains unchanged, it explores how much money Zhejiang residents need to prepare for retirement and puts forward some suggestions for the improvement of China's basic pension plan.

The research on this issue is helpful to explore how the government can better improve the pension policy, help individuals to develop a more comprehensive pension plan, and solve social problems to some extent.

In order to address this topic, the following four questions will be put forward and solved:

- 1) To explore China's social pension system developed;
- 2) To predict the amount of money that people need to save when retire in 30 years except for government pension;
- 3) To find out the impact of inflation and government pension payments on personal savings;

4) To provide suggestions for the pension plan of residents in Zhejiang province.

To solve the above problems, this thesis uses time value of money analysis to predict how much personal savings residents in Zhejiang need when they retire. On this basis, multiple regression analysis is used for analysis the impact of inflation and government pension payments on personal saving.

2. LITERATURE REVIEW

In this section, the research done by existing knowledge on this topic and some helpful findings on this topic will be introduced.

2.1 Background of Pension System

2.1.1 Structure of Social Pension System in China

A basic factor when analyzing Chinese pension insurance system is trying to understand the background of it. The first thing that needs to be discussed when analyzing this is the structure of it. Zhang (2016) found that the current Chinese pension insurance system has four subsystems. First is The Urban Enterprise Pension system covers urban employees, who are mainly employees of large private enterprises and state-owned enterprises. Second is The Rural Pension Scheme. Third is the non-employment pension scheme for urban residents. The fourth, is for government employees such as teachers. About a billion people in China have joined the program, or 85 percent coverage. Zhang (2016) also found that a billion people joined pension system. In addition, according to Cai & Chen (2014) China hopes to build a nationwide basic old-age insurance system by 2020. This means that the coverage of China's basic pension system is very large, which also guarantees the life of most people after retirement. In this way, the social pension system that combines by employers and individuals is built basically. China's pension system relies more on business than government paying. The national pension system covers the most

areas. Private annuities, which rely on corporate benefits, do not cover most people. And individual pension savings is still in primary stage.

2.1.2 History of Pension System in China

Another thing that need to be understand is the history of pension system in China. According to Cai & Cheng (2014) conducted that before 1970s, working units (no employment contract under socialism) provide retired money which equals to 80% salary. After 1970, with the further development of China's opening to the world, the increasing demand for labor force employment determined that China needed a more flexible new work system, in which both employers and employees could decide whether to stay or leave. A new system of labor contracts has emerged, but workers at state-owned companies have retained social benefits that will keep them employed for life, leading to a split in China's pension plans.

Zhang (2016) found that it wasn't until 1997 that the Chinese government decided to build a three-pillar system. The first pillar requires employers and employees to contribute separately to the pension system. Employees pay 8% of their salary, employers pay 20%, and employees who continue to pay for 15 years will receive pension benefits. The second pillar is the enterprise annuity system and it was established in 2004. This is a voluntary occupational pension system. Under this system, employers will pay no more than 12 percent of employees' wages and employees will pay no more than 6 percent of their wages. By the end of 2015, 23.17million workers had participated in this plan. The third pillar is personal savings, which reached 49% in 2014. Meanwhile, since 2005, the government has encouraged workers to contribute to pensions for longer, meaning that the longer they pay, the more benefits they will receive after retirement, rather than dividing them up by 15 years.

2.2 The current situation of basic pension and personal savings in China

2.2.1 Extent of the national basic pension insurance in China satisfy the retirees

According to Zhang (2016) found that the national basic pension insurance which is also the first pillar in the Chinese pension system can help people get 60% compares to salary when they retired. Sun & Liu (2016) also found that China want to create a social security system with relied on individual employment contract responsible for contributions to pensions. Chinese pension arrangement represents a case of incomplete universalism, and the basic pension plan of the government only stipulates the minimum level of old-age care, and the primary task of old-age care still lies with individuals. The national basic pension insurance cannot satisfy people's needs. In that situation, for people to have the same quality of life after retirement as before, they must find the right way to save.

2.2.2 Saving rate in Zhejiang Province and China

According to Luo & Kinugasa (2018) examined that China's savings rate has been among the highest in the world, larger than 47%. Thus, the personal saving is nearly 10146 yuan in Chinese average, and 16450 in Zhejiang Province. Besides, Jin & Xie (2015) concluded that housing assets account for 79 percent of the total assets of urban residents, helping middle-class families gain wealth. It means Chinese people are willing to invest house as their saving assets. In addition, He & Feng (2008) found that If people are saving for retirement, the decline in pension wealth will lead to an equally skilled increase in the rest of the household. If the goal is not to save for retirement, changes in pension wealth do not affect savings. Personal savings rates in the 35-49 age group would be significantly affected by pension wealth, and rising pension wealth would allow spending on education and health care to rise faster than consumer spending. Besides, Cristadoro & Marconi (2012) found that The lifestyle of urban households accounts for the high savings rate, while preventive

incentives such as elderly people's pension and medical care and young families' saving for their children's education are likely to account for the increase in household savings in China.

2.3 Inflation Rate and Personal Saving

Changes in inflation rates help explain changes in China's savings rate. According to Chaturvedi, Dholakia, & Kumar (2008) concluded that, for Asian countries, inflation has a significant negative impact on economic growth but positive impact on savings rates. The personal savings rate varies with the rate of inflation. Apparently, savings are not blind but purposeful. However, Zhang & Wan (2016), made an empirical study on the annual growth rate and its influencing factors of the deposit balance of Chinese honest residents, and the results show that the change of inflation rate is negatively correlated with the annual growth rate of the deposit balance of Chinese honest residents.

2.4 Suggestions of Pension System

2.4.1 Problems of Nation Pension System

China's current pension system is faced with many urgent challenges, which makes it difficult to sustain. According to Zhang (2016), an ageing population, distrust of the pension system among workers and low returns from pension funds undermine government pension schemes, and China is projected to run a pension deficit by 2030. To illustrate, the number of people over 65 in China is rising every year and is expected to reach 24%, or 331 million, by 2050. China is expected to run a pension deficit by 2030 if it adjusts soon, creating serious social problems. Zhang (2016) also found that the return on investment on state pensions is too low, which leads to distrust of the system and prevents the pension gap from being filled.

According to Dong & Wang (2016) examined that when China imposed the pension system, the government should have provided some subsidies to employees who are about to retire or have already retired, but they did not. This creates a pension deficit from the moment it was created, and since contributors take a long time to get their money back, the problem is not imminent. But at a time when population growth is slowing and the number of contributors is about to grow faster than the number of retirees, the system will run out of money. The above viewpoints are the existing and urgent problems in China's pension system. If China fails to solve these problems, its economy, society and people's life will be greatly affected.

2.4.2 Solutions on National Pension System

In China, many experts and scholars have proposed some solutions to the problems existing in the pension system. Zhang (2016) proposed Chinese government should raise the retirement age and expanding China's pension investment license in order to address the pension deficit. The average retirement age in China is about 55, the earliest retirement in the world. This is because China has not raised the retirement age since the founding of the People's Republic of China. However, with the development of the economy, the life expectancy of the people in China is constantly increasing, so China needs a new retirement age to adapt to the development of the economy.

Zeng, Zhang & Liu (2017) supposed after the implementation of the universal two-child policy, the accumulated deficit of the pension fund will be postponed. If more than 54% of eligible couples have a second child, the pension fund will not run a cumulative deficit until 2090. It is true that China's previous one-child policy has slowed population growth to a large extent but has contributed to the country's ageing population. As Wang, Beland, &

Zhang (2014) found, China should raise the rate of return on pensions, reduce the pension deficit through its own profits.

3. METHODOLOGY AND DATA

In this section, the dataset from the samples and models and hypothesis which I used to prove will be discussed.

3.1 Discussion and Explanation of Dataset

In this thesis, I used the time value of money to predict how much people would need to save when they retire in 30 years, in addition to the government pension, to meet their retirement life up to the age of 76 (the average life expectancy in China is 76). First, I choose 2048 as the retire year. Second, by calculating the difference between 2009 and 2018 per capita consumption expenditure (PCCE) and Government per capita pension payment (GPCP), the amount of personal savings required for 10 years is obtained. Then, using the inflation rate of 17 years, the predicted PCCE and GPCP and their average change amount from 2039 to 2048 are obtained. After that, I made further projections of projected savings between 2049 and 2067, and then converted the savings into 2048 to get the final total.

To analyze inflation rate and government pension payments on personal savings, I collected the inflation rate, change of government pension payments and change of personal saving between 2001 and 2018.

I found all this historical data in National Bureau of Statistics of China and Bloomberg.

3.2 Discussion of Sample

Since the average retirement age in China is 57 years and the average life expectancy is 76 years, and the most recent data I could find was 2018 (The World Bank, 2019), I chose 2048 as the expected retirement year and calculated the savings until 2067. I choose PCCE and GPCP from 2009 to 2018 because the earliest per capita expenditure data in China can

be found is 2009, and inflation rate chooses 17 years because the change rate of PCCE and GPCP is only 17 years.

3.3 Discussion and Explanation of Your Methodology

Descriptive correlation design was used to evaluate the relationship between variables. First, I'll use the time value of money model to calculate how much individuals will have to save for the future when they retire in 2048. Secondly, in order to examine the impact of inflation and government pension payments on savings, I will use multiple regression analysis to find out the relationship between them.

3.4 Discussion and Explanation of Your Model and Hypotheses

Model 1: To calculate amount of money that people need to save in 2048, in addition to receive national pension insurance.

To predict PCCE and GPCP from 2039 to 2048:

$$\text{Future Price} = \text{Current Price} * (1+I)^N$$

Where

Future Price = Predict PCCE from 2039 to 2048, Predict GPCP from 2039 to 2048

Current Price = Current PCCE from 2009 to 2018, Current GPCP from 2009 to 2018

I = Average inflation rate in 17 years

N = Numbers of year

To calculate the predict PCCE and GPCP from 2049 to 2067:

$$\text{Future Price} = \text{Current Price} * (1+I)^N$$

Where

Future Price = Predict PCCE from 2049 to 2067, Predict GPCP from 2049 to 2067

Current Price = PCCE in 2048, GPCP in 2048

I = Average change of consumption, Average change of pension payment

N = Numbers of year to 2048

To calculate the time value of money for year 2048

$$\text{Current Price} = \frac{\text{Future Price}}{(1 + I)^N}$$

Where

Current Price = Time value of money in 2048

Future Price = Predict personal saving in 2049 to 2067

I = Average inflation rate

N = Number of years to 2048

Model 2: To analyze the relationship between inflation rate, government pension payment, and personal saving.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + e_i$$

Where

y = Independent variable, Change rate of personal saving rate, annually

x₁ = Depend variable, Inflation rate, annually

x₂ = Depend variable, Change rate of basic pension payment, annually

e_i = Error term

Hypothesis:

1. At the significance level of 5%, inflation rate does impact change rate of saving.
2. At the significance level of 5%, change rate of basic pension payment does impact change rate of personal saving rate.

4. ANALYSIS AND FINDINGS

4.1 Time value of money analysis for retirement

In this part, time value of money model will be used to calculate the certain amount of money people who live in Zhejiang Province need to saving in thirty years when they retire in addition to government basic pension insurance they receive, considerate the inflation rate impact. (choose 2048 as the retire year because the latest figures are 2018).

Table 1 below presents the per capita consumption expenditure (PCCE) and government per capita pension payment (GPCP) between 2009 and 2018.

Table 1 per capita consumption expenditure and government per capita pension payment in ten years

Year	PCCE (RMB, YUAN)	GPCP (RMB, YUAN)
2009	17476.98	4586.22
2010	19896.21	5402.9
2011	21474.87	6071.26
2012	23871.23	6725.27
2013	25253.51	7709.18
2014	27241.74	8513.61
2015	28661.27	10024.59
2016	30067.66	10629.76
2017	31924.23	12056.22
2018	34597.92	13425.87

Table 2 shows the inflation rate in 17 years (2002 to 2018), and the average inflation. By using $\text{Future Price} = \text{Current Price} \times (1+I)^N$, which is the Predict PCCE = Current PCCE $\times (1+\text{average Inflation})^{30}$ and Predict GPCP = Current GPCP $\times (1+\text{average inflation})^{30}$. here, can predict the PCCE and GPCP in thirty years, which are 2039 to 2048. Besides, the average change of PCCE and GPCP in thirty years can also be calculated in the following Table 3.

Table 2 inflation rate from 2002-2018

Year	Inflation Rate %
2002	-0.4
2003	3.2
2004	2.4
2005	1.6
2006	2.8
2007	6.5
2008	1.2
2009	1.9
2010	4.6
2011	4.1
2012	2.5
2013	2.5
2014	1.5
2015	1.6
2016	2.1
2017	1.8
2018	1.9
Average	2.46

Table 3 Predict the PCCE and GPCP in thirty years and the average change

	PCCE (RMB)	GPCP (RMB)	Change of PCCE	Change of GPCP
2039	36219.91	9504.64		
2040	41233.60	11197.16	13.84%	17.81%
2041	44505.27	12582.29	7.93%	12.37%
2042	49471.58	13937.69	11.16%	10.77%
2043	52336.74	15976.78	5.79%	14.63%
2044	56456.74	17643.90	7.87%	10.43%
2045	59398.62	20775.31	5.21%	17.75%
2046	62313.27	22029.49	4.91%	6.04%
2047	66160.90	24985.73	6.17%	13.42%
2048	71701.94	27824.24	8.38%	11.36%
AVERAGE			7.92%	12.73%

Besides, by using $PCCE(2048) \times (1 + \text{average change of consumption})^N$, can predict personal consumption from 2049 to 2067 (assumption life expectancy is 76 years). By using $GPCP(2048) \times (1 + \text{average change of pension payment})^N$ can predict how much money people will get from government pension insurance from 2049 to 2067. Here, N stands for the number of years to 2048. Then calculate the difference between these two can get

calculate how much extra money people need to save in addition to the government pension plan from 2049 to 2067. The data are shown in the figure 4 below.

Table 4 the predict PCCE and GPCP and the difference in 2049 to 2067

Year	Predict PCCE (RMB)	Predict GPCP (RMB)	Difference
2049	77379.70	31366.56	46013.14
2050	83507.05	35359.85	48147.20
2051	90119.60	39861.52	50258.08
2052	97255.77	44936.31	52319.46
2053	104957.02	50657.16	54299.85
2054	113268.09	57106.34	56161,75
2055	122237.28	64376.57	57860.71
2056	131916.71	72572.38	59344.33
2057	142362.60	81811.59	60551.00
2058	153635.65	92227.06	61407.60
2059	165801.37	103968.52	61832.86
2060	178930.44	117204.78	61725.66
2061	193099.14	132126.17	60972.97
2062	208389.79	148947.20	59442.60
2063	224891.25	167909.72	56981.53
2064	242699.38	189286.36	53413.01
2065	261917,65	213384.48	48533.17
2066	282657.74	240550.53	42107.21
2067	305040.13	271175.10	33865.03

After using time value of money formula, current price = future price/ $(1+i)^N$, which is Time value of money (2048) = Difference in certain year/ $(1+\text{average inflation rate})^{\text{number of years to 2048}}$, the total amount of extra savings required in addition to government pension in retirement year 2048 will be calculated in Table 5.

Table 5 Time value of Money from 2049 to 2067 and total extra saving required in 2048

Year	Time value of Money (2048)
2049	44908.91
2050	45864.04
2051	46725.91
2052	47475.09
2053	48089.67
2054	48544.99
2055	48813.30
2056	48863.47
2067	48660.56
2058	48165.44
2059	47334.34
2060	46118.30
2061	44462.68
2062	42306.46
2063	39481.63
2064	36212.39
2065	32114.38
2066	27193.67
2067	21345.85
Total	¥ 812781.09

After using the time value of money, all the savings required for retirement are converted to 2048, and I get this amount is ¥ 812781.09, meaning that in addition to the government provided pension plan, individuals need to save up to ¥ 812,781.09 in 2048 (¥ 392,051.4 in 2019 now) to meet their retirement needs for the next 19 years.

4.2 Multiple regression analysis

In this section, I would like to test the impact of inflation and government pension payments on personal savings by using multiple regression analysis model to address my last research question and give some feasible measures from the government and individual perspective

I use a multiple regression to analysis the relationship between inflation rate, change of government pension payments and change of personal saving between 2001 and 2018,

“ $y = \beta_0 + \beta_1x_1 + \beta_2x_2 + e_i$ ”. In this model, β_0 represents the constant term, x_1 stands for inflation rate, x_2 stands for change rate of basic pension payment, β_1, β_2 stand for the coefficient of Inflation rate and of the change rate of basic pension payment respectively. Y stands for change rate of saving. In this analysis, change rate of saving= $\beta_0 + \beta_1$ inflation rate + β_2 change rate of basic pension payment + e_i . Hence, my hypothesis is that the inflation rate and change rate of basic pension payment will have impact on change rate of saving.

4.3 Regression result and analysis

Number of Obs=17 R-squared=0.326 Adj R-square=0.23

Table 6 Regression results

Change rate of saving	Coef.	P-value	95% conf.	Standard Error
Inflation rate	0.028	0.027	0.0476619	0.011
Change rate of basic pension payment	0.205	0.676	0.9082638	0.491

According to analysis results, adj R-square = 0.23 which means 23% change rate of saving can be explained by inflation rate and change rate of basic pension payment. The coefficient of inflation rate is positive, which means the inflation rate and change rate of saving have positive relationship. To be specific, when inflation rate increases 1%, the change rate of saving increased by 2.8%. The coefficient of change rate of basic pension payment is large than 0, which means the change rate of basic pension payment and change rate of saving have positive relationship, and when change rate of basic pension payment increase 1%, the change rate of saving increase by 20.5%.

Because p-value of Inflation rate is 0.027, which is less than 0.05. I can reject my null hypothesis, that is, the inflation rate does not affect the saving rate; p-value of change rate

of basic pension payment is 0.676, which is larger than 0.05, meaning that I cannot reject my null hypothesis, that is, the change rate of basic pension payment does affect the change rate of personal saving rate. This result is same as Chaturvedi, Dholakia, & Kumar (2008) conclusion, which is inflation has positive impacts on savings rates. The personal savings rate varies with the rate of inflation. Besides, personal saving accounts for a large percentage of retire plan rather than government basic pension plan. This means that the Chinese are more willing to save as much as they can rather than trust government pension plans. My results consistent with those of Zhang (2016) showing employees have distrust of the pension system.

According to my results and findings, I come up with the following suggestions to improve Chinese pension system:

1) Zhang (2016) found that the return on investment on state pensions is too low, which leads to distrust of the system and prevents the pension gap from being filled. The government should try to improve the return on investment of pension insurance to make people more confident in the pension plan provided by the government, thus reducing the pressure on individuals' personal savings.

2) According to Zhang's (2016) suggestion, government could raise contribution rate for the government pension system, so that the employer could contribution more money for their employees. The pressure of personal saving could be reduced.

3) Raise the average retirement age in China. According to the research of Gao (2009), the current low retirement age in China will lead to the phenomenon of low pension returns after retirement. With the development of China's economy and the improvement of people's living quality, people have the ability and conditions to work longer. Raising the

retirement age increases people's incomes and relieves the pressure on governments and individuals to provide for the elderly.

4) Individuals can also increase their personal savings by diversifying their investments or by buying additional pension plans on their own. To support individual retirement.

5 CONCLUSION & LIMITATION

Pension insurance has always been a hot topic in the society. In order to explore personal savings, this thesis used the time value of money model, and multiple regression model to study how much money people need for retirement, and the relationship between inflation rate, government payments and personal savings. In the time value of money model, the PCCE and GPCP from 2009 to 2018 and the inflation rate in 17 years were used to predict the PCCE and GPCP from 2039 to 2067. Finally, the difference obtained was converted to 2048, and get the total savings amount is 812,781.09 yuan. In addition, after the multiple regression model analysis, inflation rate has positive relationship with personal savings, however, government payments have no impact on personal savings. Based on these findings, some recommendations have been present to improve this system. For example, government should try to improve the return on investment of pension, raise contribution rate for the government pension system, raise the average retirement age, and individuals could increase their personal savings by diversifying their investments.

This study focuses on the pension plan in Zhejiang province. The first constraint, however, is on the data on consumer spending per person. The sample of this study is ten years of per capita consumption expenditure data. The time span is small. There may be deviations from the actual situation. Second, the study does not divide the study population into urban and rural populations, and the data may be too optimistic or negative compared

to the actual situation. Third, the average inflation rate of 17 years is used to forecast government expenditure and per capita income, which may be biased against the actual situation. Finally, this study studies the relationship between inflation rate, change rate of basic pension payment and personal saving. Therefore, in future research, other factors can be added to explore the pension plan in Zhejiang province.

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Appendix

Appendix A Multiple regression results for inflation rate, change rate of basic pension payment and personal saving.

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.571046135							
R Square	0.326093689							
Adjusted R Square	0.229821358							
Standard Error	0.069710168							
Observations	17							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	2	0.032920253	0.016460126	3.387200538	0.063124313			
Residual	14	0.068033105	0.004859507					
Total	16	0.100953357						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.058208172	0.062298174	0.934347964	0.365961047	-0.075408123	0.191824467	-0.075408123	0.191824467
inflation rate %	0.028452651	0.011492334	2.475793933	0.026684661	0.003804046	0.053101256	0.003804046	0.053101256
Change Rate of Basic Pension payment	0.204622188	0.479197138	0.427010455	0.675865686	-0.823153455	1.232397831	-0.823153455	1.232397831

Appendix B change of consumption and change of pension payment

	Per capita consumption expenditure	Government per capita pension payment	Change of consumption	change of pension payment
2039	36219.91	9504.64		
2040	41233.60	11197.16	13.84%	17.81%
2041	44505.27	12582.29	7.93%	12.37%
2042	49471.58	13937.69	11.16%	10.77%
2043	52336.26	15976.78	5.79%	14.63%
2044	56456.74	17643.90	7.87%	10.43%
2045	59398.62	20775.31	5.21%	17.75%
2046	62313.27	22029.49	4.91%	6.04%
2047	66160.90	24985.73	6.17%	13.42%
2048	71701.94	27824.24	8.38%	11.36%
			average	average
			7.92%	12.73%

Appendix C Difference between PCCE and GPCP (2009-2018)

	Per capita consumption expenditure	Government per capita pension payment	Difference
2009	17476.98	4586.22	12890.76
2010	19896.21	5402.9	14493.31
2011	21474.87	6071.26	15403.61
2012	23871.23	6725.27	17145.96
2013	25253.51	7709.18	17544.33
2014	27241.74	8513.61	18728.13
2015	28661.27	10024.59	18636.68
2016	30067.66	10629.76	19437.9
2017	31924.23	12056.22	19868.01
2018	34597.92	13425.87	21172.05