5-2015

Discussing Economic Factors' Effects on Personal Saving Rate

Zhong Wang
Utah State Univesity

DISCUSSING ECONOMIC FACTORS' EFFECTS

ON PERSONAL SAVING RATE

by

Zhong Wang

A research paper submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

ECONOMICS

Approved:

Dr. Frank Caliendo, Chair Department of Economics & Finance Major Professor	Dr. Devon Gorry Department of Economics & Finance Committee Member

Dr. Man-Keun Kim
Department of Applied Economics
Committee Member

UTAH STATE UNIVERSITY
Logan, Utah

2015

ABSTRACT

Discussing Economic Factors' Effects on Personal Saving Rate

by

Zhong Wang, Master of Science

Utah State University, 2015

Major Professor: Dr. Frank Caliendo

Department: Economics & Finance

Business capital and investment are increasingly moving abroad as globalization occurs, and worldwide economic integration is accordingly strengthened. The extremely low personal saving rate in the United States and the extremely high personal saving rate in China are always a concern for economists. This project uses data from the United States and economic and econometric methodologies to analyze and discuss several economic factors that affect the U.S. personal saving rate. The result shows that the housing and stock market booms, an increasing interest rate, and a decrease in the ratio of workers to retirees cause the decrease in personal saving rate, and there is strong evidence that an increased social security tax also leads to a decrease in personal saving rate.

PUBLIC ABSTRACT

Discussing Economic Factors' Effects on Personal Saving Rate

by

Zhong Wang, Master of Science

Utah State University, 2015

Major Professor: Dr. Frank Caliendo

Department: Economics & Finance

Business capital and investment are increasingly moving abroad as globalization occurs, and worldwide economic integration is accordingly strengthened. The extremely low personal saving rate in the United States and the extremely high personal saving rate in China are always a concern for economists. This project uses data from the United States and economic and econometric methodologies to analyze and discuss several economic factors that affect the U.S. personal saving rate. The result shows that the housing and stock market booms, an increasing interest rate, and a decrease in the ratio of workers to retirees cause the decrease in personal saving rate, and there is strong evidence that an increased social security tax also leads to a decrease in personal saving rate.

ACKONOWLEDGEMENTS

First and foremost, I would like to thank Dr. Frank Caliendo for his patience and rigorous academic attitude. I shall extend my thanks to my committee members, Dr. Devon Gorry and Dr.Man-Kem Kim, who have provided valuable guidance and comments in every step of my research paper with their enlightening instruction, impressive kindness and patience.

I would like to give special thanks to my parents: Wang, Liping and Yang, Airong for their material and moral support. I could not have completed my thesis without all of you.

Zhong Wang

CONTENTS

LIST OF TABLES

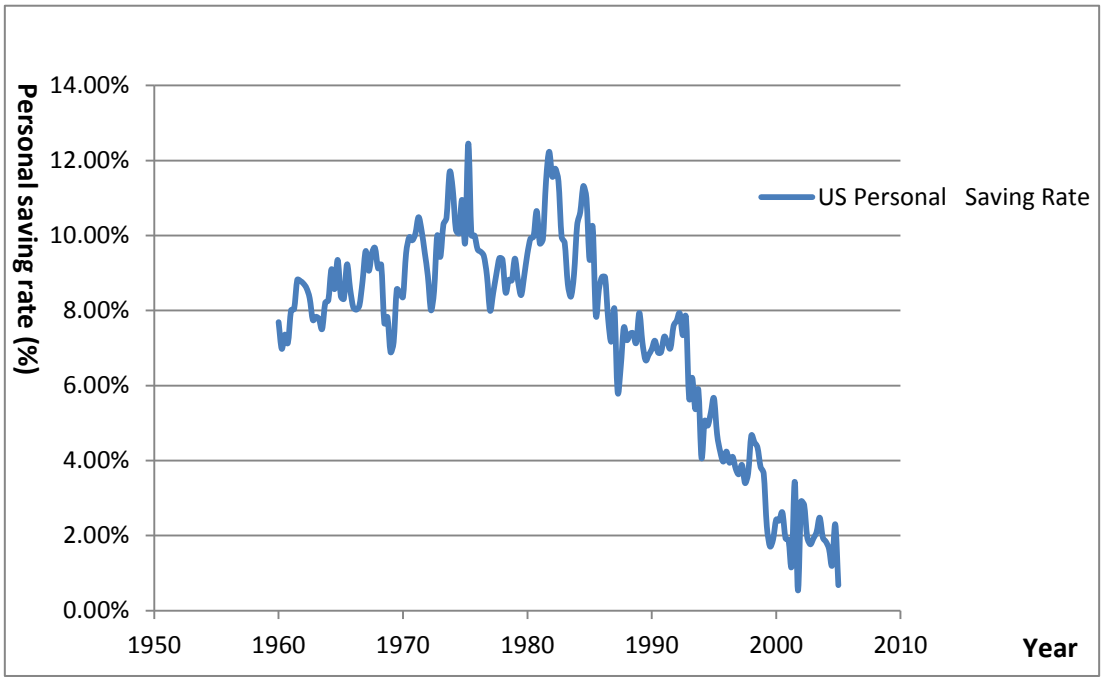
LIST OF FIGURES

INTRODUCTION

Over the past several decades, the U.S. personal saving rate has declined sharply and it is still very low, compared to other countries. For instance, the current personal saving rate in Sweden is 27.48%, in Germany 9.7%, and in Austria 10.14%. From 1960 to 2005, a nearly 50-year period, the average personal saving rate in the United States is only 7.3%.

A lower personal saving rate increases consumption and can help an economy recover from a financial crisis in the short term. For example, the U.S. personal saving rate reached its bottom around 0.68% in 2005, the edge of the beginning of the financial crisis of 2008. After that, the personal saving rate went up slowly to 6% in 2010, which is still extremely low and lower than the average personal saving rate of 7.3% from 1960 to 2005. But the low personal saving rate means people's spending increased during that period and boosted the consumption that helped the economy recover (Lansing, 2011). However, that low saving rate accordingly slows the growth of the economy in the long run(Garner, 2006).

Figure 1.U.S. personal saving rate



Source: U.S. Bureau of Economic analysis

Thus, the low personal saving rate and its downward trend have always been of great concern to both U.S. policy makers and economists. Savings are a main source of investment if those savings can transfer into investment effectively, so the investment will promote economic development. Therefore one of the concerns is that an unusually low personal saving rate will lead to insufficient national savings that cannot keep up with high speed economic growth in the long run, in turn leading to excessive dependence on overseas capital (Marquis, 2002). Personal saving rate here follows its common definition as the fraction of an individual's income that is not consumed. It indicates not only how much money the individuals can save for future use but also suggests how good or bad the U.S. economy is at a particular time

because a low personal saving rate means that the U.S. economy is growing rapidly in the short run. However, business capital and investment are increasingly moving abroad as globalization occurs, and worldwide economic integration is accordingly strengthened. Therefore, every country is involved in the worldwide marketplace and plays their own roles to maintain the global economic balance. So the slightest adjustment in the economic market of the United States, which is regarded as the world's biggest economic entity, will have significant influence on other countries. As a result, it is no wonder why other countries are also paying close attention to the U.S. economic situation, especially to its saving behaviors.

The formula for personal saving rate is represented as personal income minus personal consumption, and then divided by personal income(Marquis, 2002). As is commonly understood, personal saving rate only briefly tells people how to calculate their saving rate by providing people with what percentage their savings can cover. It cannot explain to people, in relation to their individual saving behaviors, why that much money is to be saved and what makes them save more or less. Therefore, my research goal is to expand the model in Lansing (2005) to add two important factors that affect personal saving rate. It increases the power of the model by explaining why the personal saving rate has been decreasing over time in the United States. In other words, this project discusses what economic factors affect how much money people would save for future use. With the answer to this question, individuals can better understand personal saving rate and what will happen to their savings when varied adjustments are applied by the government and policymakers, such as taxes and social

welfare. For example, if the Federal Bank decided to decrease the interest rate, it means that, on the one hand, they are encouraging people to spend more money to stimulate economic growth, and on the other hand the low interest rate will decrease people's saving.

Many researchers are exploring how these economic factors are correlated with the personal saving rate, and their publications are the basic data I collected and explored for my own project on how these factors can influence the personal saving rate.

LITERATURE REVIEW

According to Bruce (2006),in 2005, the U.S. personal saving rate reached its lowest point with negative 0.5% since the Great Depression. A negative personal saving rate does not mean that an individual has no savings but that consumption is greater than income, which suggests that nothing is saved and at the same time the individual is dipping into previous savings or has to borrow money from the bank or someone else to pay bills. Bruce (2006) also stressed that massive amounts were expended in individual investments such as the stock market and real estate booms.

There are several reasons that lead to the low personal saving rate: i) increasing asset prices, where it costs individuals more money to buy those assets that had increased their consumption; ii)higher debt-related pressure, because persistent high unemployment will make individuals spend more money for their basic material needs; and iii) a rise in strategic defaults causes individuals to spend more money,

which not only increases retail sales but also increases individual consumption(Harrison, 2010).

General research on the personal saving rate can be found easily, e.g., that of Ping (2010), Verma and Lichtenstein (2000), Marquis (2002), and Guidolin and La Jeunesse (2007). For example, a study made by Marquis(2002) introduced the measurement of the personal saving rate using National Income and Product Accounts (NIPA) by the U.S. Department of Commerce—the most universal measure of the personal saving rate. Marquis calculates disposable income minus personal outlays in NIPA and then calculates personal saving rate by dividing personal savings by disposable personal income. Marquis also analyzes why the NIPA personal saving rate has fallen by focusing on two factors: first, the wealth effect, where in general people would like to spend more money when they are rich or they perceive themselves to be rich and second, the increase in labor productivity, through which total income will increase due to the high labor productivity if consumption remains the same, and the personal saving rate will go down. The booms in the housing and stock markets are the most important reasons for the decline of personal saving rate.

Another paper by Peach and Steindel (2000) showed that one of the problems of using NIPA as a tool for measurement is that the real U.S. household's disposable income is understated because its growth cannot keep pace with the growth of consumers' outlays. There are two ways to correct the personal saving rate: remove the taxes paid on capital gains from personal tax or add realizations of capital gains to personal income.

Samavati, Adilov, and Dilts's (2013) research added another dimension to the understanding of personal saving rate by introducing and discussing the main factors influencing personal saving rate, including personal income, wealth, expected future earnings, and interest rate. The researchers ran a regression for personal saving rate on four explanatory variables—capital personal income, net work index, prime rate, and labor productivity—using data from 1956 to 2010. The results show that household net worth and the interest rate are significant to the personal saving rate.

In research by Chen, Mazzocco, and Személy (2010), several steps were taken to discuss and prove that it is significant that the ratio of health expenditure to other expenditures on its own can explain the drop in personal saving rate. Then, a model was developed which enabled them to evaluate whether households responded to the increasing health expenditure. The research results indicate that a growth in health expenditure is related to a decrease in personal saving rate, because even 1 percentage point's increase in health expenditure will lead to a decrease of 0.57 to 0.67 percentage points in personal saving rate.

In Tunc and Yavas's (2014) study, the authors attempted to stress the main factors in personal saving rate with a special focus on mortgage payments. This paper also discusses other possible factors of personal saving rate and incorporates them into their model, including income growth rate, interest rate, terms of trade, public saving rate, return of stock market, etc. In this paper, the authors find that mortgage payment rate is negatively related to personal saving rate, and the results also show that interest rate is positively related to personal saving rate.

Quite a few other studies also focus on the influence of specific factors on personal saving rate. For example, a study by Ewing and Payne (1998) found that consumer sentiment as a significant economic indicator can show the feelings of individuals about the overall health of the economy. In this paper, the researchers determined the long-term relationship between consumer sentiment and personal saving rate by regressing personal saving rate on consumer sentiment, disposable income, and one-year Treasury bonds with constant maturity. The results show that consumer sentiment in the long run is negatively related to the personal saving rate. The higher the consumer sentiment is, the lower the personal saving rate will be. The study also shows that an increase in the interest rate will lead to an increase in personal saving rate. However, an increase in disposable income will lead to a decrease in personal saving rate.

Studying consumption behaviors also informs our knowledge of people's saving behaviors. Dynan and Maki (2001) analyzed consumer expenditures, focusing on the wealth effect and the consumptive behaviors of stockholders as well as non-stockholders. Their results show that capital gains are positively correlated to personal consumption, where roughly 1 dollar capital gains lead to 5 to 15 cents' increase in consumption, which means 5 to 15 cents' decrease in saving (with reported securities less than $100,000).

However, most of the above research focuses on the effects of specific factors on personal saving rate. Lansing (2005) introduced and discussed the problems of the basic measurement of personal saving rate related to its definition, given as "the

fraction of after-tax personal income that remains after subtracting various types of consumption expenditures," which would understate the real personal saving rate.

Lansing noticed that the personal saving rate remained low and declined, and in contrast with other studies that have examined the reasons for and effects of the personal saving rate, the main research goal of Lansing was to explain what is behind the declining U.S. personal saving rate and explore the relationships between personal saving rate and related economic factors.

Lansing offers a statistical model for measuring individuals' saving behaviors

> by regressing the personal saving rate on a constant and three explanatory variables: (1) the ratio of household stock market wealth to personal disposable income,[1] (2) the ratio of household residential property wealth to personal disposable income,[2] and (3) the yield on a 10-year Treasury bond.[3]

Lansing chose these three variables based on previous literature by Marquis (2002), and the data using in his regression are collected from Bureau of Economic Analysis. Lansing (2005) explains that these three variables are important because

> "The wealth ratios capture the idea that households perceive asset appreciation to be a substitute for the practice of saving out of wage income. The 10-year Treasury yield is a measure of the perceived return to saving and captures the fact that asset valuation ratios are strongly influenced by movements in nominal interest rates."

In this way, it was determined that the personal saving rate will rise if the

---

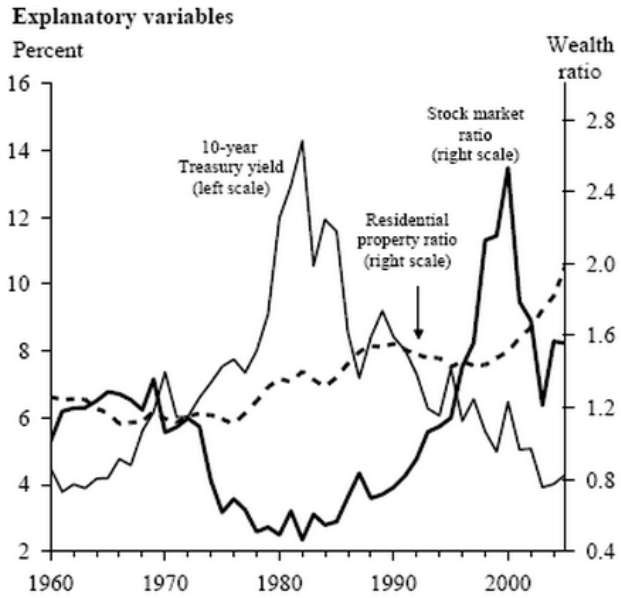
[1] The ratio of household stock market wealth to personal disposable income is calculated by using the net worth of household stock market wealth value divided by the personal disposable income.

[2] The ratio of household residential property wealth to personal disposable income is calculated by using the net worth of household residential property wealth divided by the personal disposable income

[3] The yield on 10-year Treasury bond is the interest rate that will be paid on buying a 10-year bond.

bubbles of the stock market and housing market burst or if interest rates go up. According to Figure 2 and Figure 3, together with Lansing's model, the growth in residential property and stock market ratios and the decrease in the 10-year Treasury yield are the causes of the low personal saving rate and its downward trend. Lansing's paper provides my research the basic model for how these economic factors can influence the personal saving rate.

Figure 2. Explanatory variables



Source: Lansing (2005) Figure 3

Figure 3. Actual vs. fitted saving rate

Source: Lansing (2005) Figure 4

DATA AND METHODOLOGY

Disposable Income

The general definition of disposable income is personal income minus personal taxes, such as income tax and wage-based taxes ("Disposable and discretionary income," 2015). In general, income consists of all kinds of receipts that enrich taxpayers, including compensation of employees, interest, dividends, rents, and so on. The income data are compiled from taxpayers' tax returns as collected by the Internal Revenue Service (IRS).

Personal Consumption Expenditures

Personal consumption expenditures, as an original measure of all types of products and services targeted to individuals and consumed by individuals, are collected by Bureau of Economic Analysis (“Personal consumption,” 2015). It collects personal consumption expenditures by using a wide range of source data and estimates in personal consumption, based not only on the varied statistical surveys—mainly from the Census Bureau (BEA’s Benchmark Input-Output Accounts, Services Annual Survey, Quarterly Services Survey, Annual Retail Trade Survey, Advance Monthly Retail Sales Survey, and Economics Census), the Center for Medicare and Medicaid Statistics (National Health Expenditures Account), and the Bureau of Labor Statistics (Consumer Price Index, Producer Price Index, and Consumer expenditures Survey)—but also on reports from government agencies and private organizations, including the consumption of both durable and non-durable goods and services such as vehicles and furnishings(BEA, 2015).

The model in Lansing (2005) shows a way to understand which factors cause the decrease in personal saving rate and which factors can increase it. Table 1 here shows the summary of every variable in Lansing’s model. The data range is from 1960 to 2005, and the data set contains 181 observations. The personal saving rate ranges from .05% to 12.5% and the average personal saving rate is 7.3%. The stock market ratio ranges from 0.447 to 2.553 and the average is 1.071. The residential property ratio ranges from 1.093 to 1.988 and the average is 1.361. The 10-year

Treasury yield ranges from 3.6% to 14.8% and the average rate is 7%.

Table 1. Summary Statistics

Variable	Observations	Mean	Std Dev	Min	Max
Personal saving rate	181	0.073	0.028	0.005	0.125
Stock market ratio	181	1.071	0.466	0.447	2.533
Residential property ratio	181	1.361	0.196	1.093	1.988
10-year treasury yield	181	0.070	0.025	0.036	0.148

Data source: Taken from a review file supplied by Kevin J. Lansing, SF Fed

The regression model in Lansing (2005)is first estimated to find out the extent to which those economic factors can affect personal savings.

(0)$PSR_t = b_0 + b_1 SMR_t + b_2 RPR_t + b_3 TY_t + u_t$

wherePSR_t is the personal saving rate at time t, SMR_t is the stock market ratio at time t, RPR_t is the residential property ratio at time t,TY_t is the 10-year yield of Treasury bonds at time t, and u_t is the error term which follows the classical assumptions.

Table 2.Summary of Regression (0)

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.20610	0.00574	35.90	<.0001
SMR	-0.02654	0.00212	-12.51	<.0001
RPR	-0.08857	0.00384	-23.05	<.0001
TY	0.23066	0.03724	6.19	<.0001
Number of observations	181			
Adjusted R-square	0.8885			
AIC	-1683.33			
F-stat	479.02			

Note: SMR: stock market ratio, RPR: residential property ratio, and TY: yield on 10-year Treasury bonds.

The result above shows that both stock market ratio(SMR) and residential property ratio(RPR)influence the personal saving rate negatively, while the 10-year Treasury yield(TY)influences the personal saving rate positively, which matches Lansing's (2005) analysis about how these three variables would influence personal saving rate.

In this paper, social security tax and ratio of workers to retirees are added to Lansing's (2005) model. Anyone who earns money as an employee or as a self-employed individual must pay the social security tax. As a wage-based tax, social security tax is also included in income tax. An increase in social security tax will lead to a decrease in personal disposable income, which will decrease the personal saving rate when consumption is constant. So, social security tax is assumed to be significantly related to personal saving rate.

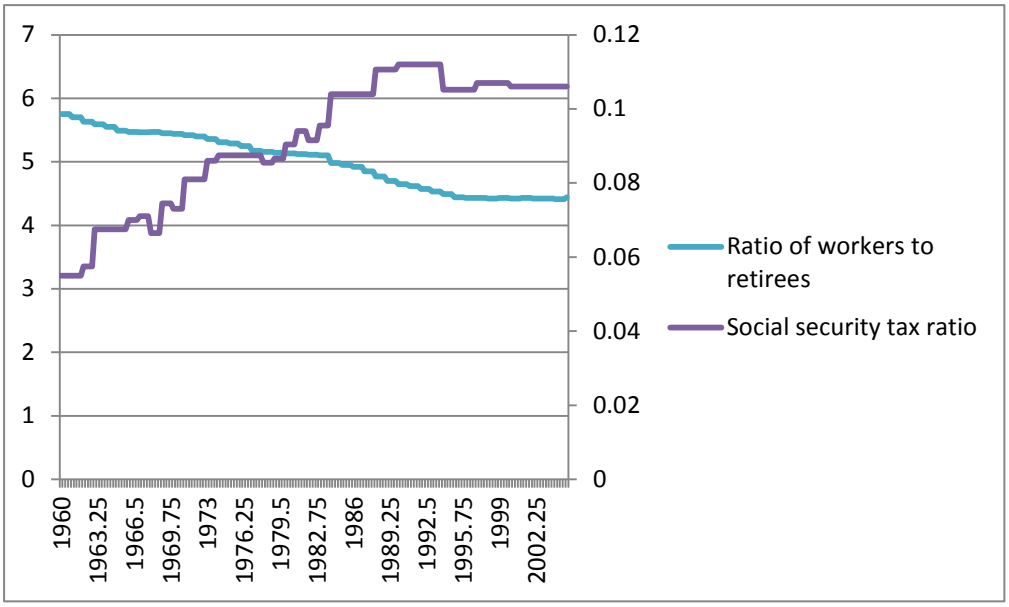
The ratio of workers to retirees is calculated as the number of people aged 20 to 64 divided by the number of people aged65 and older in the total population. (Tylecote, 2013) While retirees have no income and live off their savings, only workers earn an income and would save money for future use. When the ratio of workers to retirees decreases, the number of workers decreases (or the number of retirees increases), which means that the total amount of disposable income decreases if consumption is constant. Therefore, personal saving rate is expected to decrease, which shows that the ratio of workers to retirees is positively related to personal saving rate. As shown in Table 3 below, the social security tax ranges from 5.5% to 11.2% and the average tax ratio is 9.1%. The ratio of workers to retirees ranges from 4.41 to 5.750 and the average ratio is 5.002. And as Figure 4 makes clear, the social security tax goes up and ratio of workers to retirees goes down over time.

Table 3. Summary Statistics

Variable	Observations	Mean	Std Dev	Min	Max
Social security tax	181	0.091	0.017	0.055	0.112
Ratio of workers to retiree	181	5.002	0.440	4.410	5.750

Source: U.S. Bureau of Economic analysis

Figure 4. Explanatory variables



Note: social security tax ratio is on right scale

In my regression 1, added social security tax to the basic model.

(1)$PSR_t = b_0 + b_1 SMR_t + b_2 RPR_t + b_3 TY_t + b_4 SST_t + u_t$

wherePSR_t is the personal saving rate at time t, SMR_t is the stock market ratio at time t, RPR_t is the residential property ratio at time t, TY_t is the 10-year yield of Treasury bonds at time t, SST_t is the social security tax at time t, and u_t is the error term which follows the classical assumptions.

Table 4. Summary of Regression (1)

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.20042	0.00578	34.69	<.0001
SMR	-0.02475	0.00211	-11.71	<.0001
RPR	-0.07279	0.00576	-12.64	<.0001
TY	0.31077	0.04240	7.33	<.0001
SST	-0.25554	0.07120	-3.59	0.0004
Number of observations	181			
Adjusted R-square	0.8955			
AIC	-1694.11			
F-stat	386.61			

Note: SMR: stock market ratio, RPR: residential property ratio, TY: yield on 10-year Treasury bonds, and SST: social security tax.

The table above shows that social security tax has a negative effect on personal saving rate, which keeps other variables constant with a 1% increase in social security tax, leading to a 0.25% decrease in personal saving rate. The results meet my expectation about the negative correlation between social security tax and personal saving rate.

In regression 2, I add ratio of workers to retirees to the basic model and run the regression.

(2)$PSR_t = b_0 + b_1 SMR_t + b_2 RPR_t + b_3 TY_t + b_4 RWR_t + u_t$

wherePSR_t is the personal saving rate at time t, SMR_t is the stock market ratio at time t, RPR_t is the residential property ratio at time t, TY_t is the 10-year yield of Treasury bonds at time t, RWR_t is the ratio of workers to retirees at time t, and u_t is the error term which follows the classical assumptions.

Table 5. Summary of Regression (2)

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.04269	0.02474	1.73	0.0862
SMR	-0.01939	0.00217	-8.93	<.0001
RPR	-0.05491	0.00605	-9.07	<.0001
TY	0.33850	0.03691	9.17	<.0001
RWR	0.02045	0.00303	6.75	<.0001
Number of observations	181			
Adjusted R-square	0.9109			
AIC	-1723.03			
F-stat	461.21			

Note: SMR: stock market ratio, RPR: residential property ratio, TY: yield on 10-year Treasury bonds, and RWR: ratio of workers to retirees.

The result shows that the ratio of workers to retirees has a positive effect on personal saving rate, which keeps other variables constant with a 1-unit increase in the ratio of workers to retirees, leading to a 0.02% increase in personal saving rate. It also meets the expectation according to the definition of personal saving rate, that is, if the total disposable income decreases while the total consumption is constant, the personal saving rate will decrease.

Both social security tax and ratio of workers to retirees are added to the basic model.

(3)$PSR_t = b_0 + b_1 SMR_t + b_2 RPR_t + b_3 TY_t + b_4 SST_t + b_5 RWR_t + u_t$

wherePSR_t is the personal saving rate at time t, SMR_t is the stock market ratio at time t, RPR_t is the residential property ratio at time t, TY_t is the 10-year yield of

Treasury bonds at time t,$SST_t$is the social security tax at time t, RWR_t is the ratio of workers to retirees at time t, and u_t is the error term which follows the classical assumptions.

Table 6. Summary of Regression (3)

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.21425	0.05008	-4.28	<.0001
SMR	-0.01315	0.00227	-5.79	<.0001
RPR	-0.04915	0.00566	-8.69	<.0001
TY	0.26159	0.03647	7.17	<.0001
SST	0.82474	0.14322	5.76	<.0001
RWR	0.05489	0.00660	8.32	<.0001
Number of observations	181			
Adjusted R-square	0.9247			
AIC	-1752			
F-stat	443.02			

Note: SMR: stock market ratio, RPR: residential property ratio, TY: yield on 10-year Treasury bonds, SST: social security tax, and RWR: ratio of workers to retirees.

The table above shows that social security tax now has a positive effect on personal saving rate when adding both variables into Lansing's model. It does not meet my expectation that when people can afford more social security tax, which will lower their disposable income, they can save more money at the same time. But the results also show that the ratio of workers to retiree is still positively correlated to personal saving rate, which does meet my expectation.

CONCLUSION AND DISCUSSION

The table below has collected all runs of the regressions in which personal saving rate is the dependent variable specified, for ease of interpretation:

Table 7. Summary of Regressions

	Lansing	Reg1	Reg2	Reg3
Stock market ratio	-0.02654***	-0.02475***	-0.01939***	-0.01315***
	(0.00212)	(0.00211)	(0.00217)	(0.00227)
Residential property ratio	-0.08857***	-0.07279***	-0.05491***	-0.04915***
	(0.00384)	(0.00576)	(0.00605)	(0.00566)
10-year Treasury yield	0.23066***	0.31077***	0.33850***	0.26159***
	(0.03724)	(0.04240)	(0.03691)	(0.03647)
Social security tax ratio		-0.25554***		0.8247***
		(0.07120)		(0.14322)
Ratio of workers to retirees			0.02045***	0.05489***
			(0.00303)	(0.00660)
Intercepts	0.20610***	0.20042***	0.04269***	-0.21425***
	(0.00574)	(0.00578)	(0.02474)	(0.05008)
Number of observations	181	181	181	181
Adjusted R-square	0.8885	0.8955	0.9109	0.9247
AIC	-1683.33	-1694.11	-1723.03	-1752.44
F-stat	479.02	386.61	461.21	443.02

Note: Standard errors in parenthesis. ***Significant at the 1% level. AIC: Akaike's Information Criteria

Data source: Taken from a review file supplied by Kevin J. Lansing, SF Fed2. U.S. Bureau of Economic Analysis

From the summary table we can easily find that though Lansing's (2005) model has better F-stat, the three new regressions, especially regression (3),have better adjusted R-square and AIC values than Lansing's (2005) model. This means that adding social security tax and ratio of workers to retirees to Lansing's (2005) model can better explain personal saving rate than Lansing's model alone. But unfortunately the sign of the social security tax changed in the final model regression (3), which I cannot understand and explain here and therefore merits further study.

Figure 5. Actual personal saving rate vs. fitted value (final model (3))

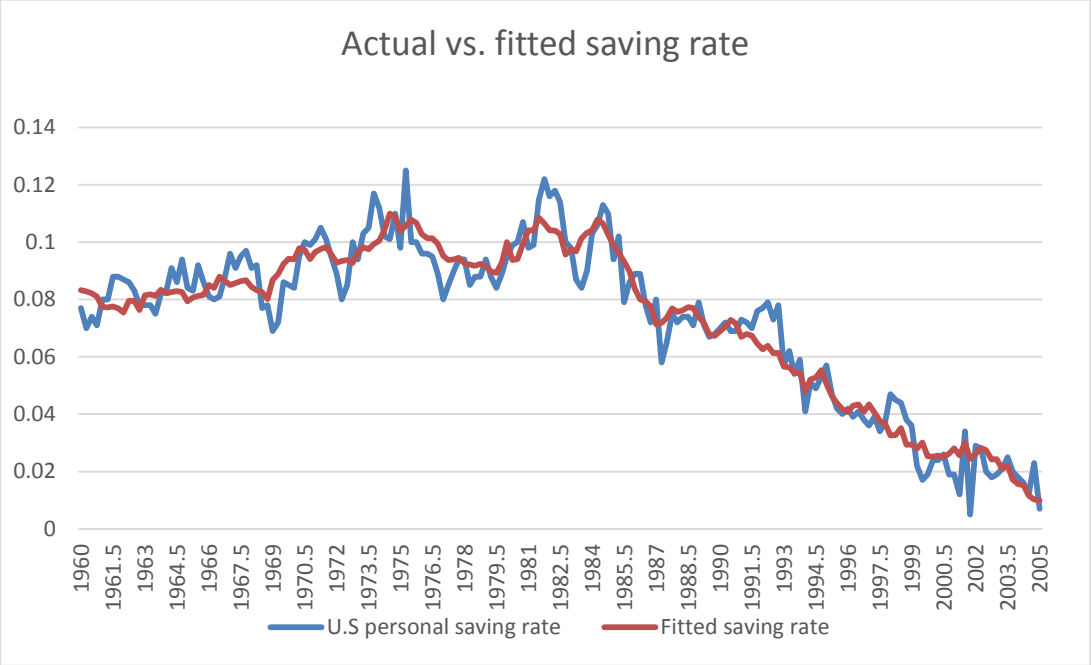


Figure 5 here suggests that the decline in the U.S. personal saving rate in recent decades is mainly related to the stock market and housing booms, the increase in social security tax, and the low ratio of workers to retirees over the same period.

My final model looks at market ratios. First, the stock market ratio: keeping other variables constant, a 1-unit increase in stock market ratio will lead to a 0.013% decrease in personal saving rate. Regarding the residential property ratio, keeping other variables constant, a 1-unit increase in residential property ratio will lead to a 0.049% decrease in personal saving rate. As for the 10-year Treasury yield, keeping other variables constant, a 1-percent increase in 10-year Treasury yield will lead to a 0.26% increase in personal saving rate. As for the social security tax, keeping other variables constant, a 1-percent increase in social security tax will lead to a 0.82%increase in personal saving rate. As for the ratio of workers to retirees, keeping other variables constant, a 1-unit increase in ratio of workers to retirees is associated with a 0.054% increase in personal saving rate.

Figure 6.Fitted value vs. Kevin Lansing's model

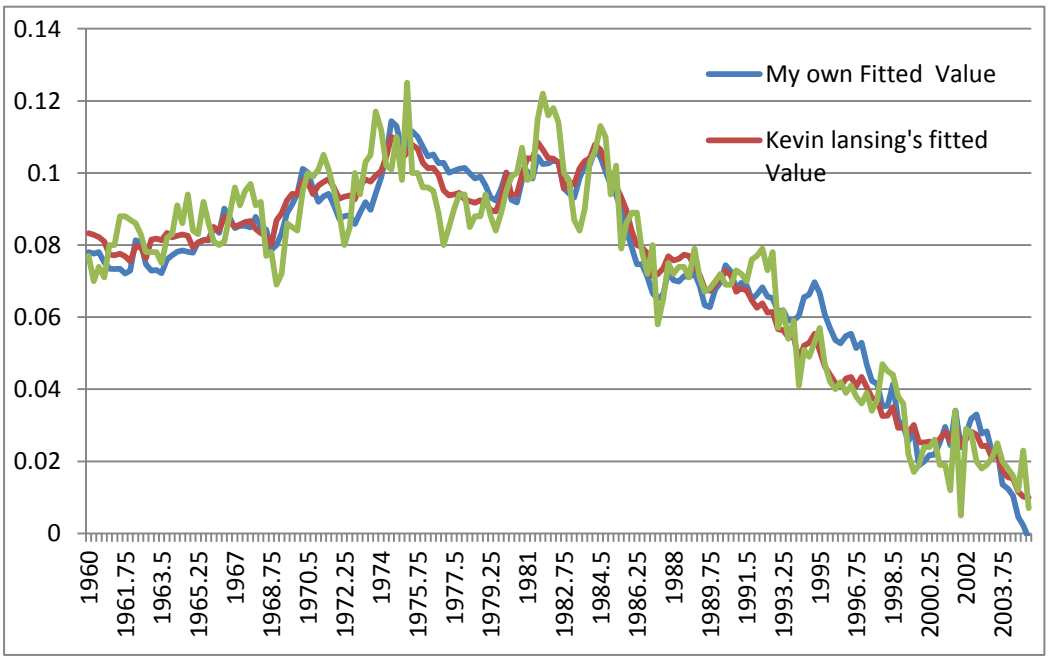


Figure 6 here plots the U.S. personal saving rate together with both the fitted saving rate from Kevin Lansing's model and from my own model. However, the final model is not perfect because there is a bias positively associating social security tax with personal saving rate, which is opposite to expectations. According to the definition of disposable income as after-tax income, social security tax is subtracted from an individual's income, which will lower the individual's disposable income. I believe that there is still strong evidence proving that the social security tax is significantly negatively associated to the personal saving rate. Though the results do not perfectly meet the expectations, they are still sufficiently significant that both social security tax and ratio of workers to retirees should be included in the final model to help us better understand personal saving rate.

Moreover, the final model (3) still suffers from missing variables, data limitations, bias, and innumerable policy implications. Regarding the missing variables, all the variables discussed in the final model are only part of the variables that have an influence on disposable income and consumption. There are additional economic factors which should be added to the final model in order to make the regression more accurate in reflecting every change in the personal saving rate. Further, these missing variables are part of the reason for the bias existing in the final model (3), which has changed the sign of the social security tax. Additionally, the social security tax data used in the regressions are the sum of both the employee-paid and employer-paid portions. In general, employee and employer will cover the social security tax half and half, but the reality may vary; also, self-employed individuals

have to pay it all. So social security taxes vary from person to person, and the data here should be more specific and accurate. In addition, the ratio of workers to retirees does not consider the number of people in the labor force, but the number of people in the total population, especially the number of people aged 20 to 64, which may include people outside the labor force, such as university students and the unemployed.

Finally, regarding policy implications, I think they are one of the most important reasons for the different personal saving rates in different countries, including well-developed countries—the rates vary because of the countries' different policy implications. For example, it is known that American people do not like saving money at all or they only save much less money while Chinese people would save more than 30%, or even 50%, of their income for future use. By researching and discussing the effects of economic factors on personal saving rates, it gives me a better understanding of people's saving behaviors.

Table 8.National Saving Rate, China vs. the United States (Unit: percent)

Country/year	2001	2002	2003	2004	2005
China	40.2	41.8	44.6	47.0	51.0
U.S	16.1	13.9	12.9	13.4	14.4

Source: ADB; OECD; national data

From the table above, we can find that China's national saving rate is much

higher than that of the United States, and personal saving makes up the largest part of national saving, which means that Chinese people save more money than American people do in daily life. But, can we say that Chinese people have a higher quality of life than Americans do? And that China's economy is better than the U.S. economy?

Unfortunately, the answer is no, and the fact is that Americans live a better life than most Chinese people do, and also the U.S. economy is better than China's. The truth is that different national conditions make it impossible to determine whether people live a good life or bad life and which economy is better based on the personal saving rate because there are other reasons beyond the economic factors that can also influence the personal saving rate. Are there any other factors that make China's personal saving rate so high? In other words, why would Chinese people have to save more money for future use? First, an incomplete social security system, high education costs, high medical costs, and increasing prices require people to save more money for future use. In addition, there is also no official unemployment rate in China due to the huge population base. Everyone expects to be admitted into public service, so they have to work very hard in case they could be fired unexpectedly. People in China get nearly 0 income when unemployed. As a result of these, Chinese people prefer saving rather than spending. China's personal credit system is incomplete. Very few people in China like to pay by installment because the incomplete credit system makes it hard for them to borrow money from banks.

An area of further study would be to complicate this model for factors in national personal saving rates by including the various economic and life conditions

of the people. To a certain extent, personal saving rate is a good reflection of a country’s economic situation, but it is important to know more about national conditions because sometimes the data does not convey all the key details.

REFERENCES

Bruce, L.(2006, Mar. 8). Negative personal savings rate: What does it mean? *Bank rate*. Retrieved from http://www.bankrate.com/finance/savings/negative-personal-savings-rate-what-does-it-mean.aspx

BEA, (2015, December) CHAPTER 5: PERSONAL CONSUMPTION EXPENDITURES http://www.bea.gov/national/pdf/chapter5.pdf

Chen, Y., Mazzocco, M., and Személy, B.(2015, May).*Explaining the decline of the U.S. saving rate: The role of health expenditure.* Retrieved from http://www.econ.ucla.edu/mazzocco/doc/SavingRate.pdf

Disposable and discretionary income. (2015, Mar. 2). Retrieved Nov. 2, 2015, from Wikipedia: https://en.wikipedia.org/wiki/Disposable_and_discretionary_income

Dynan, K. E., and Maki, D. M. (2001), Does stock market wealth matter for consumption? *Finance and Economics Discussion Series, 2001*(23), 1–43. Retrieved from http://www.federalreserve.gov/pubs/feds/2001/200123/200123pap.pdf

Ewing, B. T., and Payne, J. E. (1998). The long-run relation between the personal savings rate and consumer sentiment. *Financial Counseling and Planning, 9*(1), 89–96. Retrieved from https://afcpe.org/assets/pdf/vol919.pdf

Garner, C.A. (2006). Should the decline in the personal saving rate be a cause for concern? *Economic Review, Second Quarter*. Retrieved from https://www.kansascityfed.org/publicat/econrev/pdf/2q06garn.pdf

Guidolin, M., and La Jeunesse, E. A. (2007). The decline in the U.S. personal saving rate: Is it real and is it a puzzle? *Federal Reserve Bank of St. Louis Review, November/December*, 491–514. Retrieved from https://research.stlouisfed.org/publications/review/07/11/Guidolin.pdf

Harrison, E. (2010, Mar. 31).Three potential explanations for the continued fall in US savings rate. *Credit Write downs*. Retrieved from https://www.creditwritedowns.com/2010/03/three-potential-explanations-for-the-continued-fall-in-us-savings-rate.html

Lansing, K. J. (2005, Nov. 10). Spendthrift nation. *FRBSF Economic Letter, 2005-30*, 1–3.Retrieved from http://www.frbsf.org/economic-research/publications/economic-letter/2005/november/spendthrift-nation/

Lansing, K. J. (2011, Jan. 10). Consumers and the economy, part I: Household credit and personal saving. *FRBSF Economic Letter, 2011-01*, 1–5. Retrieved from http://www.frbsf.org/economic-research/publications/economic-letter/2011/january/consumers-economy-household-credit-personal-saving/

Larsen, W. R. (2002, Oct. 10). *Worker to retiree ratio.* Retrieved from http://www.justsayno.50megs.com/wr_ratio.html

Ma, G., and Yi, W.(2010),China's high saving rate: Myth and reality. *BIS Working Papers, 312*. Retrieved from http://www.bis.org/publ/work312.pdf

Marquis, M.(2002). What's behind the low U.S. personal saving rate? *FRBSF Economic Letter, 2002-09*, 1–3. Retrieved from http://www.frbsf.org/economic-research/publications/economic-letter/2002/march/what-is-behind-the-low-us-personal-saving-rate/

Peach, R., and Steindel, C.(2000).Nation of spendthrifts? An analysis of trends in personal and gross saving. *Current Issues in Economics and Finance, 6*(10), 1–6. Retrieved from http://www.ny.frb.org/research/current_issues/ci6-10.pdf

Personal consumption expenditures price index. (2015, Oct. 10). Retrieved Nov. 2, 2015, from Wikipedia: https://en.wikipedia.org/wiki/Personal_consumption_expenditures_price_index

Ping, J.(2010, June 9).National personal savings rate definitions: NIPA vs. FoFA. *My Money Blog*. Retrieved from http://www.mymoneyblog.com/national-personal-savings-rate-definitions-nipa-vs-fofa.html

Reasons behind low US personal savings rate. (2013, Aug. 3). *Finance Maps of the World*. Retrieved from http://finance.mapsofworld.com/savings/us/low-rate.html

Samavati, H., Adilov, N., and Dilts, D. A. (2013).Empirical analysis of the saving rate in the United States. *Journal of Management Policy and Practice, 14*(2), 46–53. Retrieved from

http://www.na-businesspress.com/JMPP/SamavatiH_Web14_2_.pdf

Tunc, C., and Yavas, A. (2014). *Determinants of saving rate in the US: The role of mortgage payments.* Retrieved fromhttps://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=MWMFall2014&paper_id=34

Tylecote, A.(2013). *The long wave in the world economy: The current crisis in historical perspective.* London, England, and New York, NY: Rout ledge.

Verma, S., and Lichtenstein, J.(2000).*The declining personal saving rate: Is there cause for alarm?* Retrieved from http://assets.aarp.org/rgcenter/econ/ib42_alarm.pdf