

Empirical Analysis of the Saving Rate in the United States

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After two decades of decline, the personal saving rate in the United States has increased since the onset of the Great Recession. This paper empirically analyzes the factors affecting the saving rate and factors that contributed to the recent increase in the saving rate. Our results imply that changes in the determinants of the saving rate suggested by economic theory can explain much of the recent trend in the personal saving rate. Specifically, reduction in the household net wealth had the largest contribution to the increase in the saving rate, while reduction in interest rates negatively affected households' incentives to save. These findings have important policy implications.

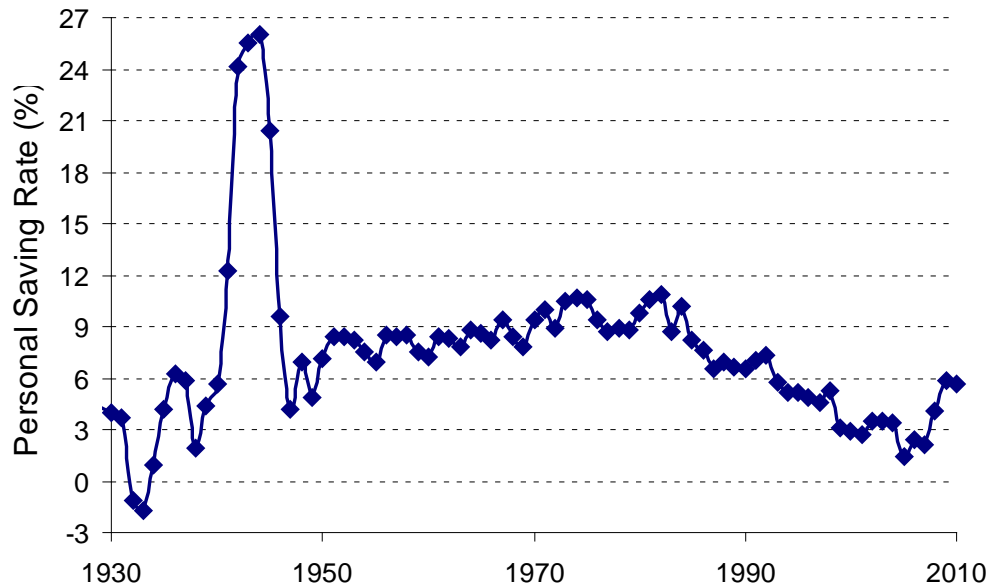
INTRODUCTION

The U.S. saving rate has historically been much lower relative to the saving rate of Japan and the 12 nations that make the Euro-zone. For example, between 2000 and 2004 the Euro-zone countries saved 10.5% of their disposable income while Japanese saved 6% of theirs. The saving rate for the U.S. over the same period was only 3.2%. In fact, it was consumers who carried the U.S. economy out of recession in the 80s and 90s and for over two decades United States was known to be a nation of “shop until you drop.” Since the early 1980s U.S. personal saving rate declined steadily from a high of 10.9 percent in 1982 to a low rate of 1.4 percent in 2005. This downward trend represented a dramatic change in the behavior of personal saving rate because during the preceding three decades, the personal saving rate had experienced an upward trend. While in the 1950s the average personal saving rate was 7.94 percent, the 1960s and 1970s had witnessed the average personal rates climb to 8.29 and 9.59 percent, respectively. More recently, however, and especially around the onset of the 2007 recession, dubbed the “Great Recession,” personal saving rate seems to have staged a turnaround. It climbed systematically, registering at 2.1, 4.1, 5.9, and 5.7 percent for 2007, 2008, 2009, and 2010 respectively.

Figure 1 presents the behavior of U.S. personal saving as a percentage of disposable personal income from 1930 to 2010. Figure 1 shows the highest personal saving rate in the United States occurred in 1944 at 26% and the lowest in 1933 at -1.7%, implying that large shocks to the economy could have a significant effect on the saving rate. The figure also shows that after over two decades, the downward trend in the movement of the saving rate since 1980s seems to have changed course in the opposite

direction. Even though it might be too early to declare evidence of a turnaround, the current readings of the data certainly provide indication of an upward trend. However, it is not yet clear whether this upswing in the saving rate represents a short-term phenomenon due to fluctuations in economic activity.

FIGURE 1
PERSONAL SAVING AS A PERCENTAGE OF PERSONAL DISPOSABLE INCOME



There are two dimensions of the behavior of personal saving rate worthy of examination: one is the short-run with implications for business cycle, and the other is the long-run behavior with implications for economic growth. First, consumption/saving decisions by households are important because personal consumption expenditures constitute around 70 percent of total expenditures in the United States' economy. Consequently, short-run expansion or contraction of the economy is closely tied to the consumption/saving decisions of households. For example, since the 2007 economic contraction where most people have experienced either a falling or a meager increase in their income, ironically, they have responded by increasing their savings. Therefore, devising a successful short-run stabilization policy can benefit from a better understanding of spend or save decisions of consumers. Second, to the extent that domestic savings finance domestic investment, personal savings play a vital role in the formation of capital and thus the long-run growth path of the economy.

It is the purpose of this paper to examine the U.S. personal saving rate in order to empirically investigate whether the determinants suggested by the economic theory can account for the observed behavior of this variable. The findings can help in formulating a more effective policy response in dealing with business cycle fluctuations in economic activity.

The rest of the paper is organized as follows. Section two presents a brief review of the literature. The empirical model to be tested, as well as the data and their sources, are discussed in section three. In the fourth section we report the empirical results followed by the final section which contains discussions and conclusions.

LITERATURE REVIEW

As suggested by John Maynard Keynes (Keynes, 1936), current disposable income is the main determinant of households' consumption/saving decisions. Specifically, he argued that consumers save a

proportion of their additional income and thus marginal propensity to save is between zero and one. This approach models household saving as a linear function of current income with a positive slope and a negative intercept. This allows personal saving rate to fall below zero if income is below its break-even rate. Keynes' approach to modeling the saving behavior was widely used in short-term policy making. However, later research provided more detailed analysis of personal saving.

Keynes' model implied that the average propensity to save, and thus the saving rate, would increase as income increases. This created the fear that during the periods of rising income, such as post World War II period, households might over-save causing an eventual stagnation for the economy. Empirical studies of long term saving behavior, however, indicated that saving rate did not change much despite increases in per-capita income (Kuznets, 1946; David and Scadding, 1974). Thus, several new theories were developed to explain this empirical observation. Milton Friedman's Permanent Income Hypothesis and Franco Modigliani's Life Cycle Income Hypothesis are the two theories most commonly used to explain personal saving behavior over the long run.

Milton Friedman hypothesized that current consumption primarily depends on the present discounted value of current and future lifetime income, also known as permanent income (Friedman, 1957). Temporary fluctuations in income (transitory income) do not affect consumption much because consumers save or borrow in order to smooth their consumption. Thus, consumers are more likely to save temporary increases in income, but not permanent increases in income.

According to the Life Cycle Income Hypothesis, income varies systematically (predictably) over the person's lifetime (Modigliani, 1986; Modigliani, 1988; Gourinchas and Parker, 2002). Consumers will use saving and borrowing to transfer income from high-income periods to low-income periods. People base their consumption decisions on their expected future income, wealth and life-expectancy so that consumption can be allocated smoothly over the remaining years of life. Modigliani presented empirical evidence in support of the Life Cycle Income Hypothesis (Modigliani, 1986; Modigliani, 1988).

The rate of interest is another factor that affects the rate of personal saving. Bailey's analytical model explained how changes in the interest rate influence consumers' consumption-saving decisions through substitution and wealth effects (Bailey, 1957). The substitution effect is always positive because a decrease in the interest rate reduces the opportunity cost of current consumption. This encourages more current consumption and less saving. Similarly, an increase in the interest rate increases incentives to save because it raises the opportunity cost of current consumption. The direction of the wealth effect, however, could be negative and might offset the substitution effect. For example, a person targeting a certain future wealth level for retirement might have to save more in order to achieve that target when the interest rate falls. Thus, the net effect of a change in the interest rates on saving is ambiguous.

Among the more recent studies, Maki and Polumbo investigate the effect of household wealth on the personal saving rate in using household level data for 1990s (Maki and Polumbo, 2001). Their findings indicated that high-income and high-education cohorts experienced both largest gains in wealth and largest decreases in saving rates. On the other hand, the results showed that other cohorts experienced modest changes in household wealth and saving rates during the same period. They concluded that the increase in household financial wealth, which was fueled by the increase in the stock market prices, partly explained the decrease in the personal saving rate in the United States in the 1990s.

Marquis focused on the increase in household wealth as a major factor explaining the low saving rates in the United States in 1990s and early 2000s (Marquis, 2002). In addition, the author argued that rising labor productivity affects the saving rate because it affects current and future labor income. The third explanation offered for the decline of saving rate during that period is the increased access to consumer credit, which relaxed consumers' liquidity constraints and increased their current consumption. While Marquis analyzed many factors studied in our paper, he did not conduct an empirical study to explore the effects of various factors on the saving rate. Marquis argued that the low personal saving rate could be a cause for concern if the country may become too reliant on foreign capital for economic growth. However, the author concluded that because the changes in the personal saving rate were mostly dictated by changes in financial wealth and other fundamental determinants of the saving rate, the decline in the U.S. saving rate was a reflection of efficient use of the country's resources.

To summarize, prior theoretical and empirical research suggest that current income, wealth, future income, and the interest rates are the main determinants of the personal saving rate. Thus, we include these variables in our empirical model to be tested.

METHODOLOGY AND DATA

As discussed in the previous section, the main factors that affect the personal saving rate are current income, wealth, expected future earnings and the interest rate. While we were able to collect data on current income, wealth and interest rates, expected future earnings are not directly observable. Thus, we use productivity as a proxy for expected future earnings because earlier research have shown that earnings positively correlate with productivity in the long run, but not necessarily in the short run (Walsh, 2004; Marquis, 2002). Our model specification is shown below.

FIGURE 2 PERSONAL SAVING RATE EMPIRICAL MODEL

$$SAV_t = \beta_0 + \beta_1 INC_t + \beta_2 NW_t + \beta_3 INT_t + \beta_4 PROD_t + t + \varepsilon_t,$$

where the subscript t indexes periods of time ($t = 1, 2, \dots, T$). The personal saving rate (SAV) is the dependent variable. The explanatory variables are the real per capita current income (INC), the net worth-income ratio (NW), the interest rate (INT), the labor productivity (PROD) and the time trend (t). We have included the time trend in our model to capture systematic changes in the saving rate not explained by other independent variables.

Data for the personal saving rate were obtained from the Bureau of Economic Analysis (BEA) web site.¹ Personal saving rate data represent annual personal saving as a percentage of disposable personal income. Real per capita current disposable personal income statistics were constructed from disposable personal income data obtained from the BEA and the population statistics which were obtained from the US Census Bureau.² INC variable in our model represent annual percentage change in real per capita disposable personal income. Annual net worth data were obtained from the Flow of Funds Accounts of the United States report prepared by the Federal Reserve.³ Net worth index was calculated by subtracting liabilities from the assets of households and nonprofit organizations, and then dividing the result by disposable personal income. Thus, the net worth index represent net worth of households and nonprofits as a percentage of disposable income. The interest rate in our model is represented by the bank prime rate data as reported by the Federal Reserve.⁴ Labor productivity data were obtained from the Bureau of Labor Statistics (BLS) web site.⁵ PROD variable in our model represent annual percent change in labor productivity.

Summary statistics for all the variables are presented in Table 1. Our data set starts at 1956 because it was the earliest year for which the information for all variables was available. Table 1 shows that the average personal saving rate for the period 1956-2010 was 7.09. While the highest saving rate, 10.9 percent, occurred in 1982, the lowest saving rate, 1.4 percent, was observed in 2005. The average increase in per capita personal income was 1.36 percent per year. This variable declined to its lowest value, -4.05 percent, during the 1974 recession and its highest value, 5.50 percent, in 1964. The average net worth was 505.81% of disposable personal income. U.S. households and nonprofit organizations had lowest net worth in 1974 (425.2%) and the highest net worth during the peak of the recent housing bubble in 2006 (646.9%). During 1956-2010 the average value of the prime rate in the U.S. was 7.48 percent. Prime rate hit its lowest value at 3.25 percent in 2009-2010 when the Federal Reserve Bank kept the federal funds rate at record low levels – between zero and 0.25 percent. The highest prime rate, 18.87 percent, occurred in 1982 when the Federal Reserve Bank increased the federal funds rate in order to fight inflation which had been caused by high oil prices. The average change in labor productivity was 2.13 percent per year. The largest decrease in labor productivity, -1.6 percent, was observed in 1974 and the highest increase in labor productivity, 4.6 percent, was observed during the “jobless recovery” of 2002.

TABLE 1
SUMMARY STATISTICS (1956-2010)

	Mean	Std.Dev.	Min	Max
Personal Saving Rate	7.09	2.5364	1.40	10.90
Per Capita Personal Income	1.36	1.8220	-4.05	5.50
Net Worth Index	505.81	50.1827	425.20	646.90
Prime Rate	7.48	3.1819	3.25	18.87
Labor Productivity	2.13	1.4942	-1.60	4.60

The correlation matrix of the variables is reported in the appendix. The correlation levels between the independent variables are rather low, implying that the estimated model is unlikely to suffer from multicollinearity problem. The highest correlation is between INC and PROD variables (0.621) because change in labor productivity affects not only future income, but it can affect current income as well. Thus, we perform statistical analysis both by including as well as excluding PROD variable from the model. Our empirical results are presented in the next section.

RESULTS

Regression results are presented in Table 2. We estimated the model described by (1) using the Ordinary Least Squares (OLS) and Prais-Winsten methods. The OLS estimated results are reported in columns (A) and (C), and the Prais-Winsten results in columns (B) and (D). The latter regressions control for autocorrelation of the error terms. First, consider regressions described in columns (A) and (B). Both regressions yield similar results. As expected, NW has negative and statistically significant effect on the saving rate at 1% level. The coefficient of the NW variable is -0.026, implying that a 100 percentage points decrease in net household worth ratio increases the personal saving rate by about 2.6%. Interestingly, net household worth decreased by 113.5% from 615.6% to 502.1% between 2007 and 2010 due to drop in housing prices and the stock market. The regression results reported here suggest that this drop in net worth should push up the saving rate by about 2.9% from 2007 to 2010. The personal saving rate during this time period has increased by 2.6% from 2.1% in 2007 to 5.7% in 2010. Thus, changes in consumer wealth explain the recent uptick in the personal saving rate very well.

INT has positive and significant effect at the one percent level. This implies that the substitution effect of interest rate changes dominates the wealth effect and that higher interest rates encourage saving by increasing the opportunity cost of current consumption. Specifically, a one percent increase (decrease) in the interest rate increases (decreases) the personal saving rate by about 0.2%. INC and PROD variables have statistically insignificant effects on the personal saving rate. This finding suggests that the changes in income do not explain the gyrations in the personal saving rate. The trend variable has a negative and statistically significant effect at the one percent level. The negative coefficient implies that some other factors not related to the four main factors identified by economic theory could be contributing to the changes in the saving rate. The value of the trend coefficient is -0.087. This implies that the personal saving rate in the United States was declining by 1% every 11-12 years after controlling for changes in income, net wealth and the interest rate.

TABLE 2
REGRESSION RESULTS

	A	B	C	D
Constant	21.012*** (14.41)	19.366*** (10.95)	21.400*** (15.16)	19.295*** (11.06)
INC	0.072 (0.86)	0.128 (1.64)	0.120* (1.69)	0.137** (2.13)
NW	-0.026*** (-9.52)	-0.023*** (-6.63)	-0.027*** (-9.66)	-0.022*** (-6.59)
INT	0.208*** (4.69)	0.189*** (3.41)	0.192*** (4.61)	0.186*** (3.48)
PROD	0.110 (1.05)	0.017 (0.18)		
t	-0.087*** (-10.21)	-0.088*** (-7.14)	-0.086*** (-10.20)	-0.088*** (-7.15)
N	55	55	55	55
Adj R-squared	0.891	0.774	0.891	0.771
DW d		1.915		1.908
ρ		0.415		0.430

t-statistics are in parenthesis

* significant at 10% level

** significant at 5% level

*** significant at 1% level

As explained in the previous section, we also estimated the model while omitting PROD variable because labor productivity was the only variable that exhibited a high correlation with current income. These regression results are presented in columns (C) - (D) of Table 2. The values of coefficients and their significance levels for NW, INT and time trend variables are almost identical to the results reported in regressions (A) and (B). Thus, the results are robust to the model specification. In addition, the coefficient of the INC variable is positive and significant at 10% and 5% levels. This result is consistent with theoretical predictions that higher income levels correspond with higher saving rates. The value of the coefficient is around 0.12, implying that a one percent increase in real per capita disposable personal income increases the personal saving rate by about 0.12%. Thus, the size of the coefficient is too small and cannot fully explain recent increases in the saving rate.

CONCLUSION

Our results confirm that changes in the determinants of the saving rate suggested by economic theory can explain much of the recent trend in the personal saving rates. Specifically, we find that changes in

household net worth play an important role and negatively affect the saving rate. The interest rate is another factor that has statistically significant effect on the saving rate. We find that there is a positive relationship between the interest rate and the saving rate, which indicates that changes in the interest rate affects the saving rate largely due to the substitution effect, i.e., by affecting the opportunity cost of current consumption. While changes in income can affect the saving rate as well, the statistical results related to changes in income are not as strong as the results on other determinants of the saving rate.

The personal saving rate in the United States has increased in the recent years after two decades of a decline. Reduction in household net wealth explains rather well why the personal saving rate has increased since the onset of the Great Recession. Other factors cannot explain this increase in the saving rate. Specifically, the interest rates have fallen during this time period. This decline should reduce, not increase, the saving rate, however. Also, the regression results indicate that the coefficient of the INC variable is too small to account for recent changes in the saving rate. Thus, findings of the study support the policy actions pursued in the United States in stabilizing the financial markets as well as those in support of the home ownership.

ENDNOTES

1. Bureau of Economic Analysis, www.bea.gov, accessed June 15, 2011.
2. US Census Bureau, www.census.gov, accessed June 15, 2011.
3. US Federal Reserve, report on Flow of Funds Accounts of the United States, <http://www.federalreserve.gov/RELEASES/z1/Current/data.htm>, accessed June 15, 2011.
4. US Federal Reserve, Federal Reserve Statistics Release H.15: Selected Interest Rates, <http://www.federalreserve.gov/releases/h15/data.htm>, accessed June 15, 2011.
5. Bureau of Labor Statistics, www.bls.gov, accessed June 15, 2011.

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APPENDIX

TABLE A1
THE CORRELATION MATRIX

	SAV	INC	NW	INT	PROD
SAV	1				
INC	-0.0503	1			
NW	-0.8125	0.2097	1		
INT	0.2808	-0.4367	-0.2783	1	
PROD	-0.1385	0.6214	0.1846	-0.4971	1