

FINAL REPORT – PERSONAL SAVINGS

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Some people are concerned with the recent decrease in personal savings in America. It has been suggested that factors such as increases in wealth, especially due to housing prices contributes to this decline ^[1]. To explore this issue, this paper studies the relationship between personal savings and disposable personal income, taking into account the recent rise in housing prices.

I. INTRODUCTION

Recently in America, personal savings has rapidly decreased. Savings is important because it provides future consumption for individuals as well as resources for investment in the nation as a whole.

Traditionally, the biggest factor in determining personal savings is disposable personal income (DPI). The portion of DPI which is saved is known as the personal savings rate. However, the recent decline in personal savings cannot be explained by changes in DPI alone. Thus, additional factors such as increases in wealth due to rapid rises in housing prices have been suggested to explain this discrepancy ^[1].

II. FITTING AND INTERPRETATION

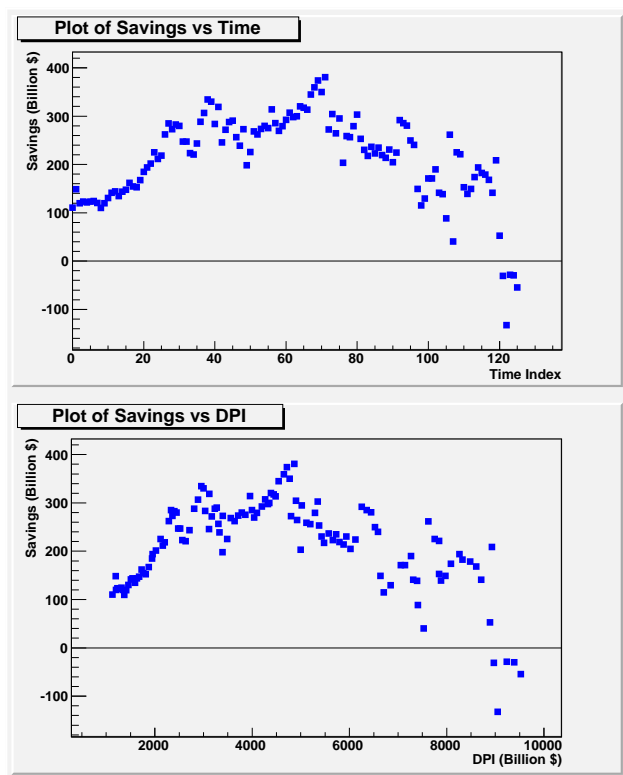


FIG. 1: Graph of personal savings versus Time Index (top), where the first index, 0 = Q1-1975 and the last index, 125 = Q2-2006; and graph of personal savings versus DPI (bottom).

Using data from the St. Louis Federal Reserve ^[2] on personal savings and DPI (shown in FIG 1 and TABLE V) and the Office of Feral Housing Enterprise Oversight (OFHEO) on housing prices ^[3], Various regressions were run to examine the effects of DPI and housing prices on personal savings. The data on personal savings and DPI are given in billions of dollars. The data on housing prices is the Housing Price Index (HPI). This index is nominal and normalized to the year 1980. All data is available quarterly for the years 1975 through 2006.

A. Personal Savings vs DPI

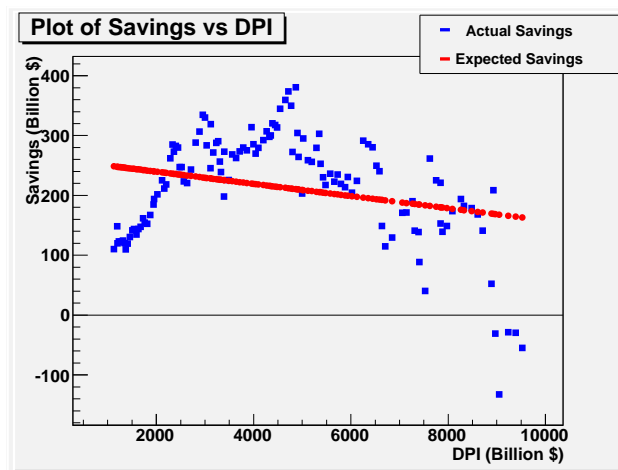


FIG. 2: Graph of Expected and Actual personal savings versus DPI. Expected savings is calculated according to (1).

Coefficient	Value	Std Error	t-value
A_0	260.05	16.78	15.5
A_1	-0.010	0.0032	-3.13
R^2	0.0732		
\bar{R}^2	0.0656		
F	9.79	for $R^2 = 0$	

TABLE I: Table showing the fit statistics for (1)

A regression of the personal savings on DPI using the equation

$$Savings_t = A_0 + A_1 DPI_t \quad (1)$$

yielded the results listed in TABLE I and displayed in FIG 2. Although the fit is significant according to the F-statistic, as the low R^2 value of 0.0732 suggests, this fit to the data does not adequately explain the personal savings. Looking at FIG 2, there seem to be shifts in the savings rate, which (1) cannot take into account.

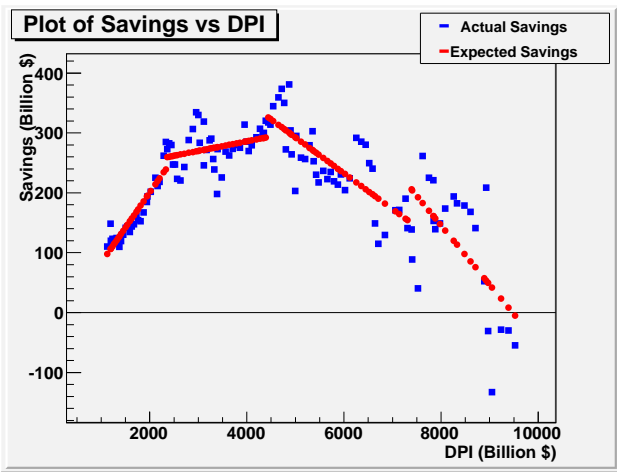


FIG. 3: Graph of Expected and Actual personal savings versus DPI. Expected savings is calculated according to (2).

Coefficient	Value	Std Error	t-value
$B_{0,0}$	-33.82	41.7	-0.81
$B_{0,1}$	0.12	0.02	4.76
$B_{1,0}$	255.83	59.77	4.28
$B_{1,1}$	-0.1	0.03	-3.66
$B_{2,0}$	625.81	66.29	9.44
$B_{2,1}$	-0.18	0.03	-6.76
$B_{3,0}$	971.01	135.54	7.16
$B_{3,1}$	-0.22	0.03	-7.44
R^2	0.743		
$\overline{R^2}$	0.728		
F	48.74	for $R^2 = 0$	

TABLE II: Table showing the fit statistics for (2)

In 1982, America experienced a serious recession. As the data suggests, this recession probably had an impact on the savings rate. This type of assumption can be logically justified. During recessions people often experience hardships such as the loss of jobs. Due to these new budget constraints, people are forced to change their spending and saving habits. After keeping these new habits for a certain period of time, people become used to them and when the recession eventually ends, they persist in their new habits. In addition to the 1982 recession, there may also have been effects from the 1991 and 2001 recessions on the savings rate.

To account for the changes in the savings rate due to the recessions, dummy variables (E_i) were used to form the following equation:

$$Savings_t = B_{0,0} + B_{0,1}DPI_t + B_{1,0}E_1 + B_{1,1}E_1DPI_t + B_{2,0}E_2 + B_{2,1}E_2DPI_t + B_{3,0}E_3 + B_{3,1}E_3DPI_t \quad (2)$$

where $E_1=1$ for 1982-1990, $E_2=1$ for 1991-2000, and $E_3=1$ for 2001-2006 (all $E_i=0$ otherwise). The fit statistics for (2) are displayed in TABLE II and graphed in FIG 3.

As can be seen from FIG 3 and the increased $\overline{R^2}$, (2) is an improvement over (1). Testing $B_{i,j} = 0$ ($i=1,2,3$ $j=0,1$), yielded an F-value of 51.2558. Thus, allowing for changes in the savings rate during each period of recession seems justified. This can also be seen in the significance of the t-values for the coefficients $B_{i,j}$ in TABLE II. This fit says that while 12 cents was saved for every dollar of DPI before 1982, during and after the 1982 recession only 2 cents was saved for every dollar of DPI. In addition, the savings rate became negative after 1991.

B. Including HPI

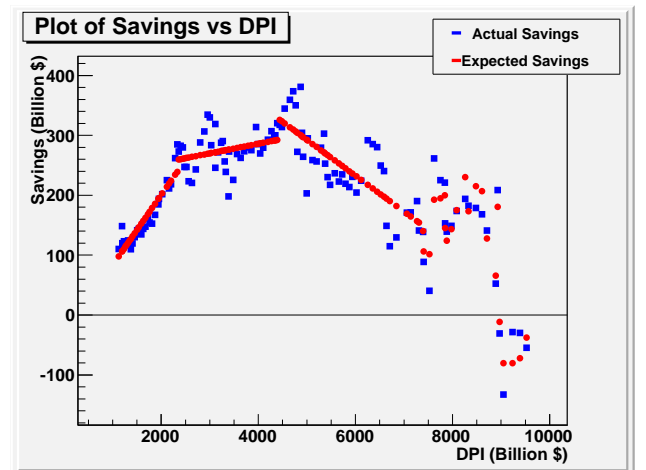


FIG. 4: Graph of Expected and Actual personal savings versus DPI. Expected savings is calculated according to (3).

Coefficient	Value	Std Error	t-value
$C_{0,0}$	-33.82	29.87	-1.13
$C_{0,1}$	0.12	0.02	6.64
$C_{1,0}$	255.83	42.82	5.97
$C_{1,1}$	-0.1	0.02	-5.11
$C_{2,0}$	625.81	47.49	13.18
$C_{2,1}$	-0.18	0.02	-9.43
$C_{3,0}$	-1781.88	276.64	-6.44
$C_{3,1}$	0.48	0.07	6.97
$C_{3,2}$	-9.72	0.91	-10.63
R^2	0.869		
$\overline{R^2}$	0.860		
F	97.22	for $R^2 = 0$	

TABLE III: Table showing the fit statistics for (3)

To account for the recent negative personal savings, the HPI was taken into account. As suggested by others, the increase in housing prices may help to explain the recent decrease in personal savings. Personal savings was regressed on DPI and the HPI (only since 2001, to simulate a 'recent effect') according to the equation

$$\begin{aligned} Savings_t = & C_{0,0} + C_{0,1}DPI_t + C_{1,0}E_1 + C_{1,1}E_1DPI_t \\ & + C_{2,0}E_1 + C_{2,1}E_2DPI_t + C_{3,0}E_3 \\ & + C_{3,1}E_3DPI_t + C_{3,2}E_3HPI_t \end{aligned} \quad (3)$$

where $E_1=1$ for 1982-1990, $E_2=1$ for 1991-2000, and $E_3=1$ for 2001-2006 (all $E_i=0$ otherwise). The fit statistics for (3) are displayed in TABLE III and graphed in FIG 4.

The increase in $\overline{R^2}$ for (3) compared with (2) suggests that taking into account the HPI is justified. Also, as can be seen from the t-values and F-statistic in TABLE III, all coefficients are significant. The fit to the data for (3), like (2), says that while the 12 cents was saved for every dollar of DPI before 1982, during and after the 1982 recession only 2 cents was saved for every dollar of DPI. In addition, -6 cents was saved for every dollar of DPI for the period 1991-2001, and 58 cents was saved for every dollar of DPI after 2001. Also, as is expected, the negative value of $C_{3,2}$ indicates that increases in housing prices decreases personal savings.

Other regressions using the periods 1982-1990, 1991-200, and 2001-2006 as the base period were run. In each regression the coefficients $B_{i,j}$ corresponding to terms outside of the base year had significant t-values (see TABLE IV). So, each period (1975-1981, 1982-1990, 1991-200, and 2001-2006) has savings rates which are significantly different from one another. Thus, allowing for changes in the savings rate during each period of recession, as specified, is justified. Also, the insignificance of $C_{1,1}$ when running the regression with 1982-1990 as the base period suggests that the savings rate during that period of time was not significantly different from zero.

Coefficient	corresponding period	t-value (1982-1990)	t-value (1991-2000)	t-value (2001-2006)
$C_{0,0}$	1975-1981	-5.97	-13.18	6.44
$C_{0,1}$	1975-1981	5.11	9.43	-6.97
$C_{1,0}$	1982-1990	7.24	-7.71	7.36
$C_{1,1}$	1982-1990	1.77	6.86	-8.66
$C_{2,0}$	1991-2000	7.71	16.04	8.68
$C_{2,1}$	1991-2000	-6.86	-9.34	-9.84
$C_{3,0}$	2001-2006	-7.36	-8.68	-6.6
$C_{3,1}$	2001-2006	8.66	9.84	8.98
$C_{3,2}$	2001-2006	-10.63	-10.63	-10.63

TABLE IV: Table showing the t-values for regressions using different periods as the base period. Base period is listed in parenthesis and the period corresponding to the coefficient is given for clarity.

III. SUMMARY

It is apparent that when examining the personal savings rate, the effects of recessions on people's saving habits is important. Also, to explain the recent and rapid decrease in personal savings, taking into account housing prices (or potentially other types of wealth) is also important. Taking housing prices into account indicates that recent decreases in personal savings is at least partially justified.

On the other hand, a savings rate of 0.58 for the period 2001-2006 as suggested by this regression is too high to be believable. However, adding other variables to the model such as stock prices may prove useful.

IV. REFERENCES

[1] Garner, Alan. *Should the Decline in the Personal Saving Rate Be a Cause for Concern.* www.kc.frb.org/publicat/econrev/PDF/2Q06garn.pdf (2006).

[2] Data can be found at: <http://research.stlouisfed.org/fred2/>.

[3] Data can be found at: <http://www.oftheo.gov/HPI.asp>.

Date (M/D/Y)	Personal Savings (Billion Dollars)	HPI	DPI (Billion Dollars)
1/1/1975	110.5	61.63	1126
4/1/1975	148.6	62.97	1193.2
7/1/1975	120	62.32	1199.1
10/1/1975	123.2	63.27	1231.5
1/1/1976	121.7	64.38	1263.5
4/1/1976	122.9	66.29	1284.5
7/1/1976	124.4	66.82	1315.8
10/1/1976	120.2	68.1	1346.1
1/1/1977	109.8	70.09	1372.5
4/1/1977	119.5	72.81	1411.3
7/1/1977	130.3	74.71	1454.3
10/1/1977	141.4	77.14	1504.6
1/1/1978	144	79.57	1538.9
4/1/1978	134.8	82.41	1589
7/1/1978	143.8	84.94	1630.5
10/1/1978	147.5	87.51	1674.8
1/1/1979	162	91.41	1725.8
4/1/1979	154.6	93.99	1760.2
7/1/1979	152.6	96.02	1813.9
10/1/1979	167.4	97.91	1874.2
1/1/1980	184.9	100	1944
4/1/1980	194	101.06	1955.2
7/1/1980	201.6	104.27	2021.2
10/1/1980	225.4	104.65	2115.5
1/1/1981	211.6	105.77	2161.9
4/1/1981	218.3	107.83	2202.8
7/1/1981	262.2	109.25	2289.6
10/1/1981	285.1	109.63	2330.1
1/1/1982	273.1	110.97	2359.7
4/1/1982	282.7	111.54	2399.1
7/1/1982	280.1	111.09	2447.2
10/1/1982	247.2	112.03	2478.7
1/1/1983	247.2	114.02	2521.2
4/1/1983	223.3	115.24	2564.3
7/1/1983	220.6	116.07	2635.1
10/1/1983	243.3	116.54	2712.9
1/1/1984	288.2	118.24	2805.3
4/1/1984	306.5	120.28	2885.4
7/1/1984	334.5	121.44	2955
10/1/1984	330	122.77	3002.4
1/1/1985	283.7	124.57	3032.2
4/1/1985	318.9	126.63	3117.5
7/1/1985	245.7	129	3115.4
10/1/1985	271.8	130.77	3172.2
1/1/1986	287.7	133.33	3233.4
4/1/1986	290.5	136.27	3269.1
7/1/1986	256.4	138.86	3307.2
10/1/1986	238.9	141.42	3330.7
1/1/1987	273	144.55	3397.1
4/1/1987	198.1	147.29	3389.4
7/1/1987	225.6	149.63	3484.5
10/1/1987	268.7	151.01	3562.1
1/1/1988	262.4	153.71	3638.5
4/1/1988	273.7	156.97	3711.3
7/1/1988	280	158.68	3786.9
10/1/1988	275.5	160.36	3858.2
1/1/1989	314	162.48	3954.9
4/1/1989	285.3	164.65	3993.4
7/1/1989	269.7	168.45	4038.8
10/1/1989	279.5	170.04	4099.5
1/1/1990	292.6	170.73	4198.2
4/1/1990	307.2	170.68	4268.1
7/1/1990	297.8	171.28	4325.7
10/1/1990	300	170.48	4351.3

1/1/1991	320.4	171.78	4387.1
4/1/1991	317.7	172.56	4441.8
7/1/1991	313.7	172.54	4483.7
10/1/1991	344.7	174.9	4544.5
1/1/1992	359.4	176.05	4651.4
4/1/1992	373.8	175.68	4716.1
7/1/1992	350.1	177.45	4768.6
10/1/1992	380.9	178.19	4869.6
1/1/1993	272.4	177.92	4801.6
4/1/1993	304.3	179.4	4901.1
7/1/1993	264.5	180.49	4924.3
10/1/1993	295.1	181.88	5020.8
1/1/1994	203.3	182.73	4998.7
4/1/1994	258.8	183.34	5118.1
7/1/1994	256.3	183.84	5197.5
10/1/1994	279.4	183.39	5293.1
1/1/1995	302.9	184.07	5350.9
4/1/1995	253	187.28	5376.3
7/1/1995	230.3	190.19	5427.1
10/1/1995	217.6	191.69	5478.6
1/1/1996	236.5	194.03	5574.5
4/1/1996	223	194.22	5656.6
7/1/1996	234.9	194.97	5727.5
10/1/1996	219.2	196.64	5795.3
1/1/1997	213.7	198.44	5877.4
4/1/1997	230.6	200.05	5936.7
7/1/1997	204.7	203	6020.8
10/1/1997	224.3	205.66	6120.5
1/1/1998	291.7	208.8	6255.9
4/1/1998	285.4	210.44	6357.7
7/1/1998	280.5	213.34	6448.1
10/1/1998	249.6	215.9	6522.1
1/1/1999	240.4	218.09	6586.7
4/1/1999	149.1	221.04	6638.6
7/1/1999	115	224.45	6708.2
10/1/1999	129.7	226.96	6846.2
1/1/2000	171.2	231.67	7059.2
4/1/2000	171.3	235.58	7141.2
7/1/2000	190.1	240.15	7266.4
10/1/2000	141.2	244.1	7309.3
1/1/2001	138.6	250.41	7392.1
4/1/2001	88.7	254.87	7407.6
7/1/2001	261.6	259.1	7622.8
10/1/2001	40.5	262.48	7524.8
1/1/2002	225.4	266.74	7751.5
4/1/2002	221.2	271.73	7841.7
7/1/2002	153	277.59	7845.4
10/1/2002	139.3	281.97	7881.7
1/1/2003	149.1	285.71	7975.5
4/1/2003	173.9	289.29	8087.6
7/1/2003	194	294.2	8261
10/1/2003	182.5	304.06	8326
1/1/2004	178.9	309.24	8481.6
4/1/2004	168.3	317.77	8607.1
7/1/2004	141.2	331.97	8706.3
10/1/2004	208.9	340.29	8931.2
1/1/2005	52.5	349.61	8890.9
4/1/2005	-30.8	362.38	8969.7
7/1/2005	-132.6	374.23	9047.7
10/1/2005	-28.5	385.76	9236.1
1/1/2006	-29.7	394.23	9388.8
4/1/2006	-54.6	398.85	9522.4

TABLE V: Table showing the raw data^{[2],[3]}.