THE RECENT STOCK MARKET FLUCTUATIONS AND RETIREMENT INCOME ADEQUACY

Christian E. Weller
Center for American Progress

INTRODUCTION

By early 2000, the stock market run-up ended. In the ensuing decline, wealth fell precipitously. Simultaneously, the needs for more retirement savings grew. Life expectancy rose, the baby boom generation approached retirement, and incomes continued to rise, necessitating increasing savings to reach similar standards of living in retirement as previously.

Due to the falling resources and rising needs retirement income adequacy fell. But it is possible that households had built up enough of a buffer to withstand the ensuing drop in wealth and to still be adequately prepared for retirement. This paper estimates by how much the adequacy of retirement savings declined, whether and when households were adequately prepared for retirement, and how long it will take for the average household to reach the same level of retirement income adequacy as at the peak of the boom.

Understanding whether households were adequately prepared for retirement during the boom of the 1990s has important policy implications. If households were adequately prepared for retirement and if they continued to be adequately prepared for retirement after the fall in wealth, the policy focus would be less on increasing savings, but more on the distribution of household savings. But if households were inadequately prepared for retirement, greater public policy efforts have to be made to increase savings overall and not just for particular groups.

THE STOCK MARKET AND HOUSEHOLD WEALTH

The analysis uses two data sources, the Flow of Funds Accounts (FFA) and the Survey of Consumer Finances (SCF) from the Board of Governors of the Federal Reserve System [BoG, 2002a, 2002b, 2002c, 2002d, 2002e]. The FFA provides quarterly data describing the financial flows in the U.S. economy by sector from 1952 to the present. The household sector in the FFA comprises both households and nonprofit organizations[1]. In comparison, the SCF is a triennial cross-sectional survey of the assets and liabilities of a representative sample of all households.

Christian E. Weller: Center for American Progress, 805 15th Street NW, Suite 400, Washington, D.C. 20005. E-mail: cweller@americanprogress.org.

Household wealth declined sharply after the stock market boom ended. From March 2000 to March 2001, stock holdings declined by $3 trillion [BoG, 2002, Table L.100]. Falling prices accounted for 86 percent of this decline, and share sales for the rest. Stocks fell by another $1.2 trillion by June 2002. Total household wealth fell year-on-year during six out of nine quarters ending in the second quarter of 2002, making this its only losing streak in the post-war era. By June 2002, households had lost $3.3 trillion since March 2001 [BOG, 2002, Table B.100]. The resulting real decline was large enough to erase most gains since late 1998, so that real household wealth was 2 percent below that of December 1998 by June 2002.

One indication of retirement income adequacy is the wealth to income ratio. If age earnings profiles are constant, if the employment to population ratio by age stays the same, and if the overall employment to population is constant, average wealth relative to average income is just the average household's wealth to its average income over its working life adjusted by a constant. This implies that households of different ages and different cohorts were on the path to reaching the same wealth to income ratio relative to retirement needs as previous generations of older workers. In June 2002, financial wealth was 2.5 times personal income, the lowest level since June 1995, suggesting a sharp drop in retirement income adequacy from 2000.

Since the wealth decline followed rapid growth, households may have had a buffer built up that still left them adequately prepared for retirement. To measure retirement income adequacy, the actual wealth to income ratio needs to be compared to a target.

There are three concepts of retirement income adequacy. First, a household may be adequately prepared if it can maintain the same real consumption as during its working years. Usually, 80 percent of pre-retirement income is considered adequate [Aon, 2001]. Households no longer need to save for retirement, taxes are lower, work related expenses disappear, the family size of retirees is smaller than that of workers, and households eventually pay off their debt. Second, retirement income adequacy can be defined as a constant nominal level of consumption in retirement. Hence, real consumption is expected to decline in retirement. Third, real consumption may decline if the marginal utility of consumption is constant and uncertainty about income and life expectancy are introduced [Engen et al., 1999]. The marginal utility of certain consumption today is higher than the marginal utility of uncertain consumption in the future.

Findings on retirement savings adequacy differ. Gustman and Steinmeier [1999] concluded that households were adequately prepared because the average household could replace 86 percent of pre-retirement income in nominal terms. Engen et al. [1999] found that 40-50 percent of households fell short of what they needed for adequate retirement income. As their calculations were based on a stochastic model, only 50 percent of households should be expected to meet the target savings. Their replacement ratio for the median household was still 72 percent, leading the authors to conclude that households were close to being adequately prepared for retirement.

Several studies concluded that households were inadequately prepared for retirement. Moore and Mitchell [1997] found that the median household would have to save an additional 16 percent annually of earnings if it were to retire at age 62 and an

additional 7 percent annually for retirement at age 65. Their estimate of a savings rate of 7.3 percent for households wishing to retire at age 65 was three times of what households actually saved [Moore and Mitchell, 1997]. This meant that households had on average between 75 percent and 88 percent - depending on marital status – of what was needed when retiring at 65 in 1992 [Mitchell and Moore, 1998]. Bernheim [1993] calculated that baby boomer households were only at 34 percent of their target savings rate. Also, Gustman and Steinmeier's [1999] find that households fell short by 28 percent, using a real replacement ratio. Lastly, Wolff [2002a] concluded that 61 percent of households could not replace 75 percent of their pre-retirement income in retirement in 1998, up from 56 percent of households in 1992.

What does a shortfall relative to adequate savings mean? In some cases, a shortfall will still allow households to finance most of their expected consumption. Engen et al. [1999] point out that the households used in Moore and Mitchell [1997] could still finance more than 90 percent of the consumption prescribed by their model with no additional savings.

The distribution of wealth matters. Engen et al. [1999] calculated that households in the 75 percent percentile - the closest income group for households with average incomes - had 121 percent to 172 percent of what they needed for retirement. For the median household, the same ratios ranged from 47 percent to 124 percent. Thus, the median household reached only 62 percent of the preparedness of the average household in 1992. Moreover, Wolff [2002a] showed that the gap between average and median wealth to income ratios grew further by 1998. Gustman and Steinmeier [1999] found that households in the bottom quartile had nominal replacement ratios of 50 percent and real replacement rates of 33 percent, compared to nominal replacements of 121 percent and real replacement rates of 81 percent for the top quartile. Also, Wolff [2002a] found that 16 percent of households could replace less than 25 percent of their pre-retirement income and that 43 percent of households could replace less than half of their pre-retirement income during retirement. Thus, some households will face retirement consumption shortfalls, even if households are on average adequately prepared[2].

To make ends meet, when facing an income shortfall, households will have to curtail their retirement consumption. In fact, one of the distinctions between studies that concluded that households are adequately prepared for retirement and those that did not is their consumption pattern in retirement. Engen et al. [1999] and Gustman and Steinmeier [1999] concluded that households are adequately prepared for retirement based on declining real consumption.

Changes in consumption after retirement suggest that retirees will reduce housing and related costs by about 20 percent, and that low income household, which are more likely to fall short of adequate retirement, will be more likely to reduce food and clothing expenditures than higher income households [Aon, 2001]. Research on how working families cope with income shortfalls also suggest that reduction in the number of meals taken or in the amount eaten is one of the primary ways to reduce consumption [Boushey et al., 2001]. Savings shortfalls may mean reduced living standards, which may be not be desired by the household.

RETIREMENT INCOME ADEQUACY IN THE 1990S

To calculate retirement income adequacy in the 1990s, the findings by Engen et al. [1999] and Gustman and Steinmeier [1999] are used as starting points. While Engen et al.'s [1999] study optimizes the marginal utility of consumption under uncertainty, Gustman and Steinmeier [1999] focus on maintaining a certain standard of living in retirement. Moreover, Gustman and Steinmeier [1999] calculate nominal and real replacement ratios. And both studies concluded that households were adequately prepared for retirement. Hence, the results here are likely representing the upper bound of retirement preparedness for the average household.

Although the calculations for target wealth to income or replacement ratios vary, the determinants of these ratios are similar across studies. Target rate calculations begin by identifying the optimal consumption level in retirement, and then calculate the necessary savings. Consumption is usually a function of income, personal tax rates before and after retirement, and life expectancy [Wolff, 2002a; Gustman and Steinmeier, 1999; Mitchell and Moore, 1998; Moore and Mitchell, 1997]. In Engen et al.'s [1999] study, consumption is additionally a function of personal time preference and risk aversion. The required savings are calculated by assuming a long-term real rate of return. The only time varying determinants are tax rates and life expectancy, although often a simplified tax schedule that is constant over time is used. Target ratios thus can be extrapolated by adjusting for changes in average life expectancies.

Most studies that have calculated target wealth to income or replacement ratios, relied on data from 1992 [Gustman and Steinmeier, 1999; Engen et al., 1999; Mitchell and Moore, 1998; Moore and Mitchell, 1997]. Hence, the actual wealth to income ratios are adjusted by demographic changes to allow for a comparison with the target ratios in 1992.

Gustman and Steinmeier [1999] provide a nominal replacement ratio of 86 percent and a real replacement ratio of 60 percent in 1992. These ratios are increased by one-fifth to account for the lower income needs of retirees, raising them to 103 percent and 72 percent, respectively. The replacement ratios are further adjusted as they included social security[3]. The adjusted real replacement ratio without housing wealth was 72 percent. Assuming that the remaining 28 percent had to be covered by financial wealth, private wealth would have to increase by 47 percent, i.e. financial wealth equaled 53 percent of its target. With housing wealth, private wealth was at 67 percent of its target in 1992. Thus, the private wealth to income ratio for 1992 was either 100 percent, 67 percent (real, with housing wealth), or 53 percent (real, without housing wealth) of the target private wealth to income ratio.

Engen et al.'s [1999] methodology can also be used to calculate how much of their target wealth to income ratio households had reached in 1992. Engen et al. [1999] reported a target wealth to income ratio for the 75th percentile of the SCF, which includes the average household, of 4.39. The financial wealth to income ratio for 1992 [BoG, 2002b] amounted to an average of 1.78, and the financial and housing wealth to income ratio to 5.23 for married households headed by somebody between the ages of 51 and 62. That is, households had 41 percent of their target financial wealth to income ratio, and they had 119 percent of their target financial and housing wealth to

income ratio. Since these targets are derived by optimizing the marginal utility of consumption, instead of assuming a constant standard of living, no further adjustments $\hat{\lambda}$ are made.

The target values are held constant over time, but the actual wealth to income ratios are adjusted to hold demographics constant at the level of 1992[4]. Cohorts with higher life expectancy should be expected to have more savings for retirement. Thus, wealth to income ratios are deflated by the changes in the life expectancy at age 65. Also, wealth to income ratios are aggregated over all households. As the share of older workers is increasing, this aggregate measure should decline. Again, the ratios are deflated by the changes in the share of the elderly. Similarly, wealth to income ratios should increase if the average age of workers is rising since workers have fewer years to save for retirement, again requiring deflation of the ratios:

$$(1) \qquad \frac{\hat{W}_t}{Y_t} = \frac{W_t}{Y_t} \Big/ \left(1 + \left(\frac{AGE_t - AGE_{2001}}{AGE_{2001}} \right) * \alpha + \frac{(LE65_t - LE65_{2001}) / LE65_{2001}}{\beta} - \frac{65plus_t - 65plus_{2001}}{65plus_{2001}} \right)$$

$$(1)' \qquad \alpha = (1 + r_{LT})^{(AGE_t - AGE_{2001})}$$

$$(1)'' \qquad \beta = (1 + r_{LT})^{(LE65_t - LE65_{2001})}$$

The adjusted wealth to income ratio, W/Y, in period t is the actual wealth to income ratio adjusted for changes in the average age, *AGE*, of workers, for changes in the life expectancy at 65, *LE65*, and for changes in the over 65 year olds, *65plus*, relative to 1992. Further, changes in the average age and the life expectancy are also adjusted for the lost or gained compounded interest, where the long-term interest rate, r_{LT}, is equal to the ten-year treasury rate in period t[5]. The input values are actual changes of the average age of workers, of life expectancy at age 65 [SSA, 2002, 2001], and of the share of the population over 65 [Census, 2002].

Table 1 summarizes the changes in the adequacy levels from 1992 to 2001[6]. If the starting point in 1992 was an adequacy level below 100 percent, households – on average – never reached adequate retirement savings. If the starting point in 1992 was 100 percent or higher, households continued to have more than adequate retirement savings through 2001. The losses in adequacy were substantial, and large enough to reduce retirement income adequacy at the end of 2001 to the same level as in 1995 or as in 1996, depending on the definition of wealth. The declines are less pronounced when housing wealth is included. The losses in adequacy from 1999 to 2001 ranged from 12 percentage points for financial and housing wealth with a starting adequacy level of 67 percent to 31 percentage points for financial wealth with a starting ad-

equacy level of 100 percent. It is noteworthy that only if it is assumed that households reduce their consumption in retirement, households were on average adequately prepared for retirement in 2001.

TABLE 1
CHANGES IN RETIREMENT INCOME ADEQUACY FOR THE AVERAGE HOUSEHOLD, 1992 TO 2001

Year	Financial wealth to income			Financial and housing wealth to income		
Adequacy level in 1992	**100%**	**53%**	**41%**	**119%**	**100%**	**67%**
	Actual to target levels	**Actual to target levels**	**Actual to target levels**	**Actual to target levels**	**Actual to target levels**	**Actual to target levels**
1993	103.2	54.6	41.4	119.1	101.3	67.9
1994	100.4	52.6	39.3	114.0	97.9	65.6
1995	109.5	58.0	43.3	121.1	105.0	70.4
1996	115.2	61.0	45.7	123.6	107.7	72.2
1997	124.8	66.1	49.7	129.2	113.4	75.9
1998	129.6	68.6	51.5	132.5	116.7	78.2
1999	142.4	75.3	58.1	144.7	126.0	84.4
2000	123.3	65.3	48.8	130.6	114.3	76.6
2001	111.1	58.8	43.0	124.9	108.9	72.9

Notes: Author's calculations. See text for detailed descriptions of the methodology and data sources. Data for calculations based on Engen et al. [1999] – 42 percent adequacy and 131 percent adequacy, respectively – exclude pension reserves

So far, the discussion has focused on the average household. To calculate the figures for the median household, two steps are necessary. First, the actual wealth to income ratios for the median household are calculated by interpolating the ratio of actual wealth to income ratios for the average household relative to the median household between 1992, 1995, and 1998. For the years after 1998, the ratio of the two wealth to income ratios is assumed to change at the average rate of change from 1989 to 1998 (table 1). Multiplying the wealth to income ratios from the FFA with the ratio of median to average wealth to income ratios generates the wealth to income ratio for the median household. Second, the wealth to income ratio for the median household is extrapolated as before, and compared to a target wealth to income ratio of 2.92 in 1992 [Engen et al., 1999]. The average financial wealth to income ratio for the median decile in 1992 was 1.65, and the average financial and housing wealth to income ratio for the median decile was 4.09. Hence, the median household had reached 56 percent of its target when only financial wealth is considered and 140 percent when financial and housing wealth are considered.

Table 2 shows the changes in retirement income adequacy for the median household. The adequacy ratios increased in 1997, 1998, and 1999, and declined thereafter. Moreover, the financial wealth to income ratio's decline is more pronounced for the median household than for the average household since the median household's financial wealth to income ratio is declining relative to the average household's. The median household was worse prepared for retirement in 2001 than in 1992, when only financial wealth is considered. The opposite is true, when housing wealth is added as the adequacy ratio is still 20 percent higher in 2001 than it was in 1992.

TABLE 2
CHANGES IN RETIREMENT INCOME ADEQUACY FOR THE MEDIAN HOUSEHOLD, 1992 TO 2001

Year	Ratio of median to average financial wealth to income ratios	Ratio of median to average financial and housing wealth to income ratios	Actual to target levels, financial wealth to income, with 56% adequacy in 1992	Actual to target levels, financial and housing wealth to income, with 140% adequacy in 1992
1993	81.81	74.16	49.7	141.9
1994	77.88	75.80	44.9	140.2
1995	77.60	79.12	49.3	154.0
1996	77.31	82.44	51.9	163.8
1997	77.03	85.76	56.2	178.1
1998	74.47	85.31	56.3	181.6
1999	71.92	84.85	61.3	197.1
2000	69.37	84.40	49.6	177.0
2001	66.82	83.93	42.1	168.3

Notes: Author's calculations. See text for detailed descriptions of the methodology and data sources. Data for calculations exclude pension reserves.

THE FUTURE OUTLOOK

Given the previous section's results, two issues arise. If the initial adequacy level was 100 percent or above and further increases were desired by households, the question is how long it would take households to reach peak adequacy levels again. If the starting point of less than 100 percent was correct, the question is how long it would take to reach adequate retirement savings.

Generally speaking, retirement savings are described by the well-known life cycle hypothesis. Households increase their savings with age during their working lives and decumulate their savings when they retire to maintain a predetermined level of consumption [Mirer, 1979; Modigliani and Brumberg, 1954]. Under uncertainty, each household's desired consumption depends on its age, its income, its time preference rate, its risk aversion, and the expected rate of return. With a positive time preference rate, households require a non-negative rate of return on their savings to compensate for foregoing current consumption. Since the measure used here is an aggregate wealth to income ratio, changes in the share of over 65 year olds should affect wealth to income ratio, such that a greater share of over 65-year-olds would result in a lower wealth to income ratio. Thus, retirement wealth is a function of income, age, life expectancy, the share of over 65 year olds, time preference, risk aversion, and the rate of return.

For the 1990s, income growth, demographic changes and time preference, equal to the real rate of return, suggest a rising wealth to income ratio. Increases in wealth need to at least keep pace with increases in income prior to retirement. Engen et al. [1999] even suggest that higher income earners should have more retirement wealth relative to their incomes as they face greater income uncertainty. As income growth accelerated in the latter part of the 1990s, increases in wealth should have also increased, possibly faster than income. Also, since the average age of workers rose, life expectancy at 65 increased or remained stable, and the share of over 65-year olds

declined from 1997 to 1999 savings should have increased, too. Moreover, from 1992 to 1999, the stock market grew annually by 17.4 percent, whereas income increased by 5.2 percent per year, suggesting a naïve growth rate of wealth to income of 12.2 percent. Instead, wealth to income increased only by 5.8 percent per year. Most household assets were not held as corporate equities, also reflecting households' risk aversion [Engen et al., 1999; Barsky et al., 1997]. At their peak, households' direct and indirect equity holdings amounted to 49.5 percent of total financial assets in 1999 [BoG, 2002a, Table B.100e]. Thus, the average rate of return on households' aggregate portfolio – defined as holding gains relative to total financial assets – was 8.1 percent over the same period, or 9.6 percentage points less than the average stock market growth rate [BoG, 2002a, Tables B.100, F.100 and L.100]. Also, savings models assume constant age (and cohort) specific savings rate. But unexpected increases in household wealth can lead to lower savings rates. Households contributed about 8.7 percent of personal disposable income to their financial assets from 1992 to 1999, below the average of 12.2 percent for the prior forty years [BoG, 2002a, Tables F.100 and L.100]. Similarly, more assets and higher incomes allowed households to borrow more since they had more collateral. Household debt relative to personal disposable income grew from 82 percent at the end of 1992 to 98 percent at the end of 1999 [BoG, 2002a, Tables B.100 and F.100]. On average, households borrowed more when assets rose and when they fell. Debt increased 1.3 times as much as year-on-year holding gains when holding gains were positive, and 1.4 times as much as the absolute decline in holding gains, when holding gains were negative [BoG, 2002a, Tables B.100 and F.100]. The declines of asset values may be associated with simultaneous income drops. The correlation coefficient between annual changes in personal disposable income (PDI) and debt from 1952 to 2001 is 0.38, and the correlation coefficient between changes in PDI and consumer credit is 0.72. Thus, household debt is used for consumption smoothing.

To analyze possible paths for future wealth to income ratios, a parsimonious model that still has good predictive abilities, defined by the following equation, is used:

$$(2)\quad \ln\left(\frac{\breve{W}}{Y}\right)_t = \beta_0 + \beta_1 \ln(ROR)_t + \beta_2 \ln\left(\frac{E}{A}\right)_t + \beta_3 \ln\left(\frac{S}{PDI}\right)_t + \beta_4 \ln\left(\frac{\breve{W}}{Y}\right)_{t-1} + \varepsilon_t$$

where the adjusted wealth to income ratio, W/Y, depends on the weighted average of the real rate of return, ROR, on the share of equities out of financial assets, E/A, on the savings rate, S/PDI, and on the lagged dependent variable. The term ε is a normally distributed random error term. A logarithmic specification is used for each variable.

All economic variables are from the FFA [BoG, 2002a], except the CPI, which is taken from BLS [2002]. The data for life expectancy are from NCHS [2002] and SSA [2002]. Average age is calculated as a weighted average of workers covered by Social Security in a given year [SSA, 2002]. Missing demographic data are interpolated.

The dependent variable is the demographically adjusted wealth to income ratio. Because Engen et al.'s [1999] calculations assume a fixed portion of retirement income to result from pensions, wealth is calculated with and without pensions. Hence,

all determinants of a standard life cycle model, age, life expectancy and income, are controlled for by the design of the dependent variable. Further, by adjusting this measure for changes in the population make-up, this ratio should theoretically be a constant plus a random error term.

But it is possible that the wealth to income ratio may systematically vary with four factors, as discussed earlier. For one, households may borrow against their assets. This is controlled for by the dependent variable as wealth is the difference between assets and liabilities. Second, the rate of return, the savings rate[7] and the portfolio allocation may differ systematically from their trend. Thus, the adjusted wealth to income ratio is a function of these three variables plus the lagged dependent variable, which is included to account for omitted variables.

The model describes the determinants of the wealth to income ratio for the average household. Additional factors that may influence household savings are ignored, such as race, education, marriage status, and homeownership. Hence, the results are those for a representative household. What is lost in specificity on the household level, though, is gained in terms of accuracy of the influence of each macro economic factor since the use of aggregate data allows for the use of higher frequency data, i.e., quarterly data instead of annual or tri-annual data.

To test if the model has good predictive powers, the following procedure is employed. The model is estimated from 1952 to 1997[8], thus preserving the standard 18 quarterly observations for goodness of fit tests [Makridakis and Hibon, 2000]. The three contemporaneous explanatory variables are forecast through the second quarter of 2002, by randomly generating 1,000 observations for each variable in each quarter. To avoid unreasonable values, the savings rate cannot be negative, the real rate of return has its lower bound defined by its historic minimum, and the equity allocation cannot be less than 2.5 standard deviations below its long-term average. Further, the savings rate, the equity allocation and the real rate of return cannot be higher than 2.5 times above their means[9]. Comparing each forecast's root mean squared error (RMSE) to that of a random walk yields Theil's U statistics of 0.28 for the wealth to income ratio, 0.33 for the financial wealth to income ratio, 0.12 for the wealth to income ratio excluding pension reserves, and of 0.61 for the financial wealth to income ratio without pension reserves. That is in each case, the model is a better predictor than the random walk model.

TABLE 3
ASSUMPTIONS FOR INPUT VARIABLES

Variable	Definition	Mean	Standard deviation
ROR	Weighted average of real rate of return	3.41	9.15
ROR2 (without pension reserves)	-	3.40	8.51
E/A	Share of equities out of total assets	29.15	7.24
E/A2 (without pension reserves)	-	26.66	7.92
s	Personal savings rate	7.94	2.11

Notes: All figures are in percent. Real rates of return are annualized values. For detailed variable definition see text.

To forecast wealth to income ratios, the regression is estimated from 1952 to 2001 (table 4). The real rate of return is a consistent significant and positive predictor, the equity allocation is also consistently positive, but not always significant, and the personal savings rate is unexpectedly negative when pension reserves are included, but positive, when they are excluded. In the case of the wealth to income ratio that excludes pension reserves, though, there appears to be a positive relationship between savings rates and the wealth to income ratio.

TABLE 4
REGRESSION ESTIMATES FOR WEALTH TO INCOME RATIO

Explanatory Variables	Fin. wealth (incl. pensions) to income	Wealth (incl. pensions) to income	Fin. wealth (w/o pensions) to income	Wealth (w/o pensions) to income
$\ln(ROR)_t$	0.065***	0.047***		
	(0.003)	(0.002)		
ln(ROR2)			0.071***	0.044***
			(0.004)	(0.002)
$\ln(E/A)_t$	0.055***	0.004		
	(0.009)	(0.005)		
$\ln(E/A2)_t$			0.025***	0.012***
			(0.009)	(0.005)
$\ln(S/PDI)_t$	-0.027***	-0.021***	0.012**	-0.001
	(0.006)	(0.005)	(0.006)	(0.003)
$\ln(W/Y)_{t-1}$		0.891***		
		(0.019)		
$\ln(FW/Y)_{t-1}$	0.794***			
	(0.028)			
$\ln(W2/Y)_{t-1}$				0.911***
				(0.020)
$\ln(FW2/Y)_{t-1}$			0.964***	
			(0.016)	
Constant	0.797***	0.521***	-0.152**	0.334***
	(0.145)	(0.120)	(0.066)	(0.114)
N	193	193	193	193
Adj. R-squared	0.978	0.982	0.980	0.953

Notes: All estimates are based on 2-Stage Least Squares (2-SLS). Standard deviations in brackets.
* Indicates significance at the 10 percent-level.
** Indicates significance at the 5 percent-level.
*** Indicates significance at the 1 percent-level.

The analysis of the simulations focuses on two issues. First, how long will it take households to recover their losses relative to their incomes? And second, how long will it take households – on average – to reach adequate retirement income? The results for the financial wealth to income ratio – including pensions – are summarized in table 5. In particular, households, in the aggregate, have no realistic chance of reaching the peak value of wealth to income reached in 1999 in the next 50 years. But there is an increasing chance over the next 50 years that their aggregate financial wealth to income ratio will be 10 percent or 15 percent higher than it was in 2001. Moreover, the average household is virtually guaranteed to maintain an adequate retirement wealth to income ratio if the starting adequacy level was 100 percent.

These results should not be surprising. The adjusted wealth to income ratio should remain theoretically constant. In other words, households can only increase their

wealth to income ratios over time by saving more than they traditionally have, if rates of return are higher than historical averages, or if risk aversion is not constant. To see this, consider a best case scenario (table 5), whereby the real rate of return, and the equity allocation are assumed to be equal to the average of the period from 1995 through 1999 with 10.2 percent and 40.5 percent, respectively. The savings rate is assumed to remain at its historic average of 7.9 percent. Under this scenario, the average household would reach its previous peak again in 2014. Hence, even under extraordinary circumstances, it would take more than a decade to recover the wealth to income losses for the average household.

TABLE 5
SUMMARY OF SIMULATION RESULTS FOR FINANCIAL WEALTH TO INCOME (INCLUDING PENSIONS), 2005 TO 2050

Year	Prob. of falling below past peak	Actual rel. to peak (best case scenario)	Prob. of 10% gain rel. to 2001	Prob. of 15% gain rel. to 2001	Prob. of 20% gain rel. to 2001	Prob. of adequate savings with 100% 1992	Prob. of adequate savings with 53% 1992
2005	100	91	5	0	0	100	0
2010	100	98	21	1	0	100	0
2020	100	101	30	3	0	100	0
2030	100	101	32	3	0	100	0
2040	100	101	34	3	0	100	0
2050	100	101	33	2	0	100	0

Note: All figures are in percent.

Table 6 shows similar results for the total wealth to income ratio, with the exception that here, even in the best case scenario, the average household is not expected to reach its previous peak again. This is due to the fact that gains from a higher equity share and from a higher rate of return are significantly smaller than for other wealth to income ratios.

TABLE 6
SUMMARY OF SIMULATION RESULTS FOR WEALTH TO INCOME (INCLUDING PENSIONS), 2005 TO 2050

Year	Prob. of falling below past peak	Actual rel. to peak (best case scenario)	Prob. of 10% gain rel. to 2001	Prob. of 15% gain rel. to 2001	Prob. of 20% gain rel. to 2001	Prob. of adequate savings with 100% adequacy in 1992	Prob. of adequate savings with 67% adequacy in 1992
2005	100	78	0	0	0	100	0
2010	100	75	1	0	0	100	0
2020	100	74	0	0	0	98	0
2030	100	74	6	0	0	89	0
2040	100	74	9	0	0	91	0
2050	100	74	9	0	0	93	0

Note: All figures are in percent.

Using financial wealth without pensions, households are expected to reach their peak again with financial wealth, aside from pensions, in about ten years (table 7). This series excludes all DB pensions and hence may be influenced by the growth of DC plans as long as they are cashed out. It is important, though, to keep in mind that the fact that the target ratio is kept constant assumes that the share of income paid for by pensions remains stable, too. This seems a particularly strong assumption since the incidence of DB has declined, while much of DC wealth is not transferred into annuities. Moreover, whether the past and expected future increase in DC plans will constitute an increase in retirement income adequacy for the average household depends on whether DC plans increase private savings or not. The empirical literature finds support for both positions [Engen and Gale, 2000; Poterba, et al., 1996a, 1996b]. Further, the rise in DC plans has also coincided with rising wealth inequality. The median household may see smaller increases in the wealth to income ratio than the average household, if inequality rises.

TABLE 7
SUMMARY OF SIMULATION RESULTS FOR FINANCIAL WEALTH TO INCOME (EXCLUDING PENSIONS), 2005 TO 2050

Year	Prob. of falling below past peak	Actual rel. to peak (best case scenario)	Prob. of 10% gain rel. to 2001	Prob. of 15% gain rel. to 2001	Prob. of 20% gain rel. to 2001	Prob. of adequate savings with 42% adequacy in 1992
2005	100	99	52	17	3	0
2010	96	136	94	81	60	0
2020	30	220	100	99	97	0
2030	6	308	100	100	100	0
2040	1	388	100	100	100	0
2050	1	456	100	100	100	0

Note: All figures are in percent.

The results for the total wealth without pensions relative to income exhibit a slight tendency in the forecast for the ratio to increase, albeit very slowly (table 8). But the average household is not expected to reach its peak again, under reasonable assumptions, within the next 50 years, and there is only a small chance of seeing a 10 percent or 15 percent gain relative to 2001.

CONCLUSION

The stock market fluctuations of the 1990s led to large increases in household wealth. As retirement is the most important savings goal, this paper analyzes how the fluctuations of wealth may have affected retirement income adequacy between 1992 and 2001. Moreover, this paper estimates how financial wealth relative to income, and consequently retirement income adequacy, may develop in the future.

The findings paint a mixed picture. The average household was adequately prepared for retirement, even after the decline in the stock market, if it is assumed that

retirement income will fall in retirement. If a fixed real level of retirement income is considered, the average household was inadequately prepared for retirement, even after dramatic wealth gains in the 1990s.

TABLE 8
SUMMARY OF SIMULATION RESULTS FOR WEALTH TO INCOME (EXCLUDING PENSIONS), 2005 TO 2050

Year	Prob. of falling below past peak	Actual rel. to peak (best case scenario)	Prob. of 10% gain rel. to 2001	Prob. of 15% gain rel. to 2001	Prob. of 20% gain rel. to 2001	Prob. of adequate savings with 131% adequacy in 1992
2005	100	98	0	0	0	100
2010	100	108	2	0	0	100
2020	100	120	8	0	0	100
2030	100	125	12	1	0	100
2040	100	127	12	1	0	100
2050	100	128	13	1	0	100

Note: All figures are in percent.

The losses in average household wealth since 1999 were substantial, leaving many households in 2001 as well off as in 1995 or 1996, depending on the definition of wealth. Moreover, on average households can only expect to reach their peak wealth to income levels again within the next 10 to 20 years if either their savings rate is assumed to increase, or if an above average real rate of return is assumed, or both. Without such changes, it is also unlikely that households will be able, on average, to reach an adequate level of retirement savings, assuming that their income needs in retirement do not decline in real terms.

The aggregate numbers suggest that many households may continue to be inadequately prepared for retirement. Further, the results also suggest that substantial improvements in the retirement income adequacy of households are on average hard to foresee without institutional changes that would increase the personal savings rate or the expected rate of return. However, the savings rate seems to be a more appropriate policy target than the expected rate of return.

Consequently, as new policy proposals are discussed to reform the U.S. retirement system, their likely effects on personal savings rates should be considered. If the personal savings rate is likely to increase, the adequacy of retirement savings is also likely to grow. For instance, research suggests that savings incentives, such as 401(k) plans may be useful in raising personal savings rates for low income households, but not for high income ones.

NOTES

I am grateful to Eileen Appelbaum, Beth Almeida, Amy Harris, Bernie Morzuch, and one anonymous referee for their comments on earlier versions of this article. All remaining errors are my sole responsibility.

1. Data for nonprofit organizations are available from 1987 to 1999. Since the wealth held by nonprofits averaged 4 percent of total household sector wealth, the figures here overstate the wealth of households only by a small factor.
2. Mitchell et al. [2000] and Engen et al. [1999] found that black and Hispanic married households experienced a larger shortfall in adequacy than whites, and that less education resulted in less adequacy. Mitchell and Moore [1998] also found that single households were less adequately prepared than married ones.
3. As the adjusted nominal replacement ratio was 100 percent, no further savings, and no further adjustments were needed.
4. As the economic determinants of target ratios are time invariant, no changes are made to the target ratios.
5. This assumes an age-invariant savings rate and a constant labor force participation rate for people 65 and older.
6. Errors may arise as the FFA and the SCF define the household sector differently. Adjusting the values from the SCF, calculating the actual to target values and comparing these to the ratios based on the SCF shows no systematic error. The FFA based adequacy was 8 percent lower than the SCF based one in 1995, but 0.6 percent higher in 1998. The FFA based financial and housing wealth adequacy was 1.7 percent higher than the SCF one in 1995, but 12 percent lower in 1998.
7. As the savings rate may be endogenously related to the dependent variable due to the wealth effect, it is instrumented by regressing it on its own value lagged once and on all other explanatory variables.
8. All variables are stationary.
9. See table 3 for the details on the input variables.

REFERENCES

Aon Consulting. *Replacement Ratio Study*, Chicago, IL: Aon Consulting, 2001.

Barsky, R. B., Juster, T., Kimball, M. S., Shapiro, M.. Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study. *Quarterly Journal of Economics*, May 1997, 537-79.

Bernheim, D. *Is the Baby Boom Generation Preparing Adequately for Retirement?, Summary Report*. Princeton NJ: Merrill Lynch & Co. Inc., 1993.

Board of Governors of the Federal Reserve (BoG). *Flow of Funds Accounts of the United States*. Washington, D.C.: BoG, 2002a.

_____. *Extract of the Full Public Data Set, Survey of Consumer Finances 1992*, Updated on March 15, 2002. Washington, DC: BoG, 2002b.

_____. *Extract of the Full Public Data Set, Survey of Consumer Finances 1995*, Updated on March 15, 2002. Washington, DC: BoG, 2002c.

_____. *Extract of the Full Public Data Set, Survey of Consumer Finances 1998*, Updated on March 15, 2002. Washington, DC: BoG, 2002d.

_____. *Extract of the Full Public Data Set, Survey of Consumer Finances 1989*, Updated on March 15, 2002. Washington, DC: BoG, 2002e.

Boushey, H., Brocht, C., Gundersen, B., and Bernstein, J. *Hardships in America: The Real Story of Working Families*. Washington, D.C.: Economic Policy Institute, 2001.

Bureau of Labor Statistics (BLS). *Consumer Price Index for All Urban Consumer*. Washington, D.C.: BLS, www.bls.gov, 2002.

Engen, E., and Gale, W. *The Effects of 401(k) Plans on Household Wealth: Differences Across Earnings Groups*. NBER Working Paper No. 8032, Cambridge, MA: National Bureau of Economic Research, 2000.

Engen, E. M., Gale, W.G., and Uccello, C. E. The Adequacy of Household Saving. *Brookings Papers on Economic Activity*, 1999, 65-165.

Gustman, A., and Steinmeier, T. L. Effects of Pensions on Savings: Analysis with Data from the Health and Retirement Study. *Carnegie-Rochester Conference Series on Public Policy*, June 1999, 271-324

Makridakis, S., and Hibon, M. The M3-Competition: Results, Conclusions, and Implications. *International Journal of Forecasting*. October-December 2000, 451-76.

Mirer, T. The Wealth-Age Relation Among the Aged. *American Economic Review*, June 1979, 435-443.

Mitchell, O. S., and Moore, J. F. Can Americans Afford to Retire? New Evidence on Retirement Saving Adequacy. *Journal of Risk and Insurance*. September 1998, 371-400.,

Mitchell, Olivia, Moore, James, and Phillips, John. Explaining Retirement Saving Shortfalls, in *Forecasting Retirement Needs and Retirement Wealt*, edited by O. S. Mitchell, B. Hammond, and A. Rappaport. Philadelphia, PA: University of Pennsylvania Press, 2000.

Modigliani, F., and Brumberg, R. Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data, in *Post-Keynesian Economics*, edited by K. Kurihara. New Brunswick, NJ., 1954

Moore, J. F., and Mitchell, O. S. Projected Retirement Wealth and Saving Adequacy in the Health and Retirement Survey, NBER Working Paper No. 6240, Cambridge, MA: National Bureau of Economic Research, 1997.

National Center for Health Statistics. *Interpolated Abridged Life Table*. Washington, D.C.: NCHS, 1996.

Poterba, J., Venti, S., and Wise, D. How Retirement Saving Programs Increase Savings, *Journal of Economic Perspectives*. Fall 1996a, 91-112.

_____. *Personal Retirement Saving Programs and Asset Accumulation: Reconciling the Evidence*. NBER Working Paper No. 5599, Cambridge MA: National Bureau of Economic Research, 1996b.

Social Security Administration (SSA). *2002 Trustees Report of Old Age, Survivorship and Disability Insurance Trust Funds*. Washington DC: SSA, 2002.

_____. *2001 Annual Statistical Supplement*.Washington DC: SSA, 2001.

U.S. Bureau of the Census (Census). International Data Base. Washington, D.C.: Bureau of the Census, 2002, http://www.census.gov/ipc/www/idbnew.html

Wolff, E. *Retirement Insecurity: The Income Shortfalls Awaiting the Soon-to-Retire*. Washington, DC: Economic Policy Institute, 2002a.

_____. Is the Equalizing Effect of Retirement Wealth Wearing Off? unpublished manuscript, New York University, 2002b.