How Persistent Low Returns Will Shape Saving and Retirement

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Chapter 9

Retirement Saving and Decumulation in a Persistent Low-Return Environment

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The effects of the 2007–2008 financial collapse and related Great Recession continue to impact the retirement well-being of millions of people. The Federal Reserve has kept its benchmark short-term interest rate at or near zero for several years in an effort to stimulate the economy. Although low interest rates can financially benefit those borrowing money to buy a house, a car, or to fund a new business, such low rates can directly weaken the financial well-being of retirees who are living off their life savings, while also making it more difficult for pension plans to accumulate assets necessary to pay future benefits without taking on additional risk by over-investing in stocks.

Low interest rates also translate into lower yields on fixed-income assets, meaning the interest (coupon) payments that seniors rely on in retirement will generally be lower than anticipated. This lack of income could lead to hardship, reduced consumption, and an inability to pay bills. A continued low interest rate environment affects the value of both defined benefit (DB) and defined contribution (DC) plans. To the extent that the difference between returns on stocks and bonds (the equity premium) is larger, or smaller, the low interest rate environment's impact is more, or less, limited to fixed-income assets. That has further implications for the impacts of different asset allocations in a low interest rate environment.

Several other chapters in this volume address how saving and retirement may be affected in a persistent period of low returns and/or low interest rates. For example, Blanchett et al. and Wallick et al. discuss optimal retirement savings in a period of low returns, while Ilmanen and Rauseo consider how to achieve greater returns and income in a low yield environment. The chapter by Horneff et al. takes a classic holistic approach to the life cycle planning problem, and confronts the low interest rate dilemma in that context.

Here we argue some grounds for skepticism that what we observe can be formalized as an objective 'strategy.' This is because so much of what we see has been a function of asset prices over the 2008–2014 period, and results will be conditional on initial levels of wealth over this period. And, while other chapters take a normative frame, addressing what can, or what ought

to be done, this chapter offers a more empirical frame, focusing on what households have actually done.

Over the low interest rate period we analyze two notable and generally positive trends. First, high wealth households have benefitted from strong equity returns. Second, home equity has served in a protective role for lower wealth households who own homes. But these successes are nuanced, since the bottom 90 percent of the 2014 wealth distribution experienced large losses in 2008, and it had not yet recovered by 2014. Moreover, the protective role of home equity has become limited. In particular, older persons in the bottom quarter of the wealth distribution, who are on average 18 or fewer years into retirement, have exhausted all their household wealth.

Of course, all groups took large and meaningful losses during the financial crisis, but in the low yield environment, those below the 90th percentile have not recovered, and those below the 25th percentile have consumed all their wealth. This does not mean that these households have no income: instead, Social Security income is a very important protective asset for these lower wealth households. We do not focus on households' use of Social Security wealth, because this wealth cannot change very much for individuals who have already claimed benefits. Yet, we acknowledge that those not yet in retirement might gain further income protection from delaying claiming Social Security retirement benefits (Reilly and Byrne in this volume).

While Social Security is an important program for low- and middle-wealth households, the finances of Social Security have also been challenged by the low interest rate environment. Low interest rates negatively impact Social Security's broader finances because Social Security Trust Funds depend in part on the interest earned on investments in US Treasury bonds. By law, Social Security must invest any surpluses in Treasury bonds and cannot buy or hold other financial assets such as stocks, mutual funds, or corporate bonds. Allocation-based strategies for contending with the low interest rate environment are not thus in the Social Security Administration's (SSA's) purview.

Revenue generated from interest payments to the Trust Funds has been declining since 2009 (US Social Security Administration 2016b). Although the Federal Reserve's policy of low interest rates is designed to stimulate economic growth, which is good for employment and wage growth on which the Trust Fund's financial position also depends, not all growth is equal in terms of its benefit to the Trust Funds.[1] In particular, declines in labor force participation over much of the recovery mean that there has been less employment and wage growth on which social security payroll taxes are levied.

Coupled with low interest rates, this lack of payroll tax revenue growth hastens the depletion of the combined Social Security Trust Funds, currently projected for 2034. Continued low interest rates, slow economic growth, and increases in the percentage of the US population in retirement

all contribute to a quicker depletion of the Social Security Trust Funds. This threatens the financial security of retirees as they face a risk of greater Social Security benefit cuts much sooner as a result of accelerated Trust Fund depletion.

One way to help current older workers focuses on delayed claiming strategies. In fact, we do see some evidence of delayed retirement and workforce re-entry among recent Health and Retirement Study (HRS) birth cohorts. For seniors who can delay claiming social security, there is an opportunity to increase their use of an inflation-protected annuity (US Social Security Administration 2017b). Further, the marginal cost of this strategy for individuals can be appealing. While private companies that sell annuities in the private sector generally adjust their payouts and make them less generous when life spans increase or when interest rates decrease, social security's age adjustments are fixed by law. Further, the Delayed Retirement Credit (DRC) has increased for those reaching age 65 since the turn of the century, making the returns for this strategy better than they were for most of the program's history.[2] For someone whose full retirement age is 66, each year of delayed claiming returns approximately 8 percent. Delaying claiming until age 70 thus results in a 32 percent higher monthly benefit, which can be appealing.

Further, given the continued trend away from employer-sponsored DB pensions, individuals are bearing more longevity risk. Longevity risk is driven by accumulation and allocation risks, as well as by decisions to draw down assets in retirement. A persistent low-interest rate environment makes the challenges of saving for retirement and spending in retirement more difficult, as it is difficult to make up for lost yields.

In what follows, we investigate impacts of the low interest rates over the 2008–2014 period in the HRS on savings, wealth, and asset allocation both before and in retirement. Following this, we consider alternative portfolio and wealth management strategies and their potential to add value in a persistent low return environment. First, however, we review the related prior literature.

Related Prior Literature

The financial crisis of 2007–2008 resulted in a great and unanticipated loss of wealth for millions of Americans. The US stock market, measured by the S&P 500 index, fell 56.7 percent over a little less than a year and a half.[3] Housing prices plummeted and the unemployment rate quickly rose into the double-digits. General confidence in the financial system was shaken. Financial wealth declined by 15 percent for the median household as a result of the 2008 financial crisis (Shapiro 2010). These economic

conditions dramatically changed the retirement landscape for millions of Americans and likely influenced retirement behavior as well.

This period was also remarkable for the speed at which the decline in financial markets, housing, and employment occurred, and, according to the HRS,[4] about 28 percent of older households reported that they had been affected 'a lot' by the financial crisis, 46 percent responded they had been affected 'a little', and only 26 percent said they were not affected (Hurd and Rohwedder 2010). Those already in retirement fared better than those not yet retired (Wells Fargo Securities 2012), suggesting that many households will face significant barriers to reaching their pre-recession retirement goals and will likely need to save more or work longer than originally planned.

A sudden and unplanned drop in wealth and income can have significant effects on retirement behavior. Younger or middle-aged workers have more than a decade before retirement, and so they still have time to recover financial losses. A financial shock that includes steep drops in the value of stock prices, investment portfolios, and housing assets might cause a delay in retirement plans[5] with workers remaining in the workforce longer so as to rebuild retirement savings (Bosworth and Burtless 2011). Those near or post-retirement are more limited in their ability to attain or maintain a secure retirement. For those near retirement, a financial crisis might change the timing of retirement.[6] For current retirees, sudden declines in wealth from housing assets and financial portfolios might force immediate changes in consumption.

The HRS data also provide evidence of the financial crisis on the timing of retirement.[7] Hurd and Rohwedder (2010) analyzed respondents who were working in 2008, and they found that the percentage of workers intending to work past age 62 increased 3.5 percentage points over the 58.2 percent proportion reported one year earlier.[8] The number of respondents reporting that they planned to work past age 65 increased even more: 7.8 percentage points above the 38.6 percent who responded they planned to work past age 65 in 2008 (Hurd and Rohwedder 2010). More recent survey research has confirmed that more seniors are working after the recession than before (Wells Fargo Securities 2012). The number of people indicating they plan to work past the age of 65, or work for some pay in retirement, has also risen (Coronado 2014).

Taken together, these facts suggest that many are planning on working longer and retiring later as a result of the financial crisis. Hurd and Rohwedder (2010:11) conclude that 'the economic crisis has caused households in and near retirement to suffer sizeable losses in assets. These households responded in several ways: they reduced spending and as a result, increased saving, they reported an intent to work longer, and anticipate bequeathing less' (Hurd and Rohwedder 2010: 14). Since the financial

crisis, the annual personal saving rate has also trended upward, from around 1 percent to near 6 percent (Glick and Lansing 2011). All else equal, a reduction in wealth from a negative financial shock appears to have resulted in workers near retirement increasing income and saving, by remaining in the workforce longer and reducing consumption.[9]

Of course, given gains in longevity, working longer may not reduce the total number of years spent in retirement. According to the Social Security Administration, a man reaching age 65 today can expect to live to age 84, on average, while a woman reaching age 65 can expect to live to almost 87 years old (US Social Security Administration 2017a). People retiring at age 65 should therefore plan to financially support themselves for at least 20 years, based on average longevity. Yet roughly one out of every four people age 65 today will live to age 90, while one out of every ten will live past age 95 (US Social Security Administration 2017a). Longer retirement periods therefore require more savings. A continued low-interest rate environment not only exacerbates challenges in saving for retirement during the accumulation phase, but it also greatly increases the risk of outliving retirement savings during the decumulation phase.

The loss of a job can also affect retirement behavior. As Bosworth and Burtless (2011: 24) noted, 'at ages past 60 and especially past 65 . . . reduced employment levels caused by a weak job market very quickly translate into reduced labor force participation rates' (Bosworth and Burtless 2011: 14). An employment shock, such as a sudden loss of a job and a labor market with high unemployment might hasten the decision on when to retire. The unemployment rate for workers aged 55 to 64 more than doubled during the Great Recession (US Bureau of Labor Statistics 2010a). Also, older workers who lost their jobs during this period were more likely to have longer durations of unemployment compared to younger workers. According to data from the US Bureau of Labor Statistics, 49 percent of unemployed workers aged 55 or older had been unemployed for 27 weeks or longer, compared with 28 percent of unemployed workers age 16 to 24, and 41 percent of unemployed workers age 25 to 54 (US Bureau of Labor Statistics 2010b). A Congressional Research Service study found that older workers who became unemployed have a higher incidence of withdrawing from the labor market (Congressional Research Service 2007). When they did so, they replaced earnings with other sources of income such as pensions and social security benefits. Unemployment among older workers contributes significantly to the probability of retirement (Bosworth and Burtless 2011).

Researchers have long recognized the role social security benefits play in a secure retirement.[10] Social security retirement benefits provide income security for millions of Americans, with 61 percent relying on social security for 50 percent or more of their income, and 33 percent relying on social security for 90 percent or more of their income.[11] While those with a greater

dependency on social security income are generally regarded as more economically vulnerable, the financial crisis has affected the income of these retirees less (Hurd and Rohwedder 2010). Thus, there is less to say about the impact of low interest rates on this population, as their exposure to financial market assets was limited.

For others, low interest rates are making it more difficult to achieve pre-set wealth targets. To achieve these targets, people can spend less and save more now, take on additional risk in the pursuit of higher yielding assets, work longer, and/or plan to spend less in retirement. None of these options are without costs, so a persistently low interest rate environment exacerbates challenges. According to one analysis, the likelihood of exhausting retirement assets increases from 21 percent to 54 percent in an extended period of low interest rates (Prudential Insurance Company of America 2013). In fact, our work with HRS data is consistent with the conclusion that the low interest rate period has contributed to a large increase in the risk of asset exhaustion.

Though the broad equity and housing markets are now recovering, those who sold their equity holdings, and who sold, or lost their homes, have not benefitted from the recovery. While there is conflicting evidence on whether retirees are falling short of adequate resources for retirement, the preponderance of evidence suggests that future retirees will be less financially prepared than in past decades (Fichtner 2014; Munnell et al. 2014).

Effects of the Low Interest Rate Environment on Saving, Wealth, and Asset Allocation

Our work with the HRS provides additional support for these conclusions.[12] The 1992–2014 HRS panel we employ contains self-reports at two-year intervals, affording the opportunity to examine the wealth of elderly households, observe allocations across financial assets, and look at income. After offering a descriptive look at the cohort comparisons, we decide how long-term trends have played out across various age groups ahead of, and throughout, the low interest rate period. The HRS age groups are obtained by segmenting the panel into five-year birth cohorts; those born between 1931 and 1935, 1936 and 1940, and so on, through 1956–1960. While we include this last birth cohort cluster, its age and relative short duration in the panel offer less information on savings and asset trajectories. Following this investigation of cohort dynamics, we then consider differences in experience across the wealth distribution.

Cohort-Based Descriptive Analyses. A first observation is that the value of bonds held outside of mutual funds has increased over time, but from-and-to low average levels. Figure 9.1 shows that there appears to be a general
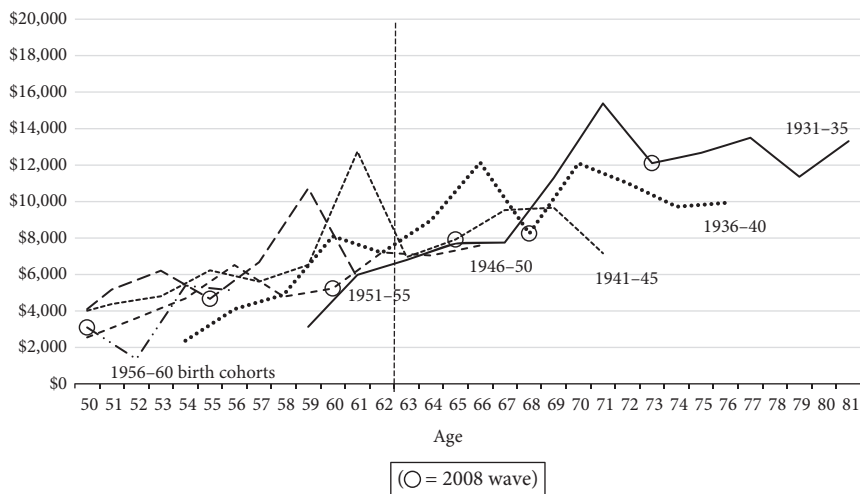
Figure 9.1. Value of bonds and bond funds for various cohorts over time

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014. Excludes bonds held inside mutual funds.

attenuation of growth in accumulations over the last two to three waves of HRS data (2010–2014). When viewing this figure, it is useful to keep in mind that interest rates were still declining in 2014. Other patterns are consistent with the idea that the lower interest rates since the Great Recession (i.e., past the circles marking the 2008 wave data for each cohort-group path) have continued to mute allocations in this type of investment.

Bonds have historically played a protective role for seniors' income, especially absent inflation risks. Accordingly, one might posit that risk sensitivity is an important predictor of bond allocations. Therefore we construct a four-point Arrow Pratt risk aversion scale from survey responses in the HRS and look at these groups separately in Figure 9.2 to investigate this intuition. Results show that 63 percent of the sample falls within the most risk averse category.

Targeting the least risk-averse 13 percent of the sample, we still find lower reliance on bond portfolios. There are some notable exceptions, however, especially among the oldest and youngest in our sample. Indeed, bond portfolios have generally done better than expected over this period as rates have not only been generally low but also declined over the period studied. Inflation has been quite low as well; thus it is possible that some among the least risk averse increased their investments in bonds, essentially making a bet, on appreciation related to declining interest rates (perhaps as a result of chasing past returns). Yet we are hesitant to make too much of
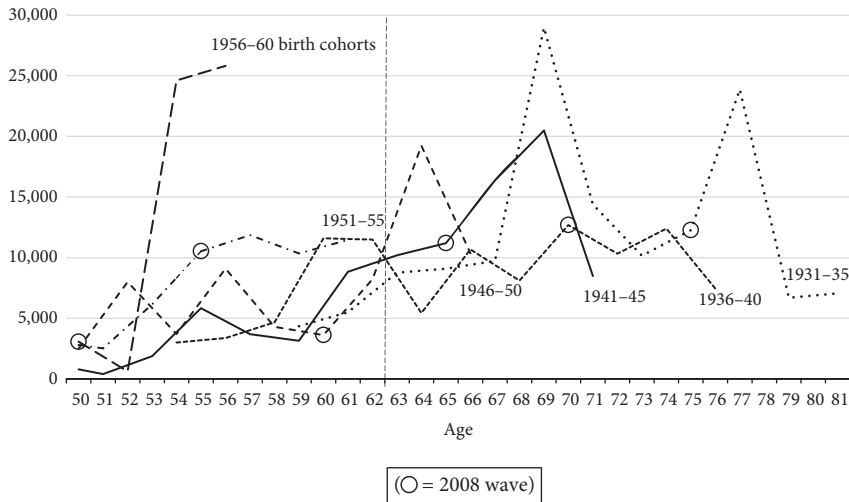
Figure 9.2. Value of bonds and bond funds for various cohorts over time in 2015 US dollars: those reporting as least risk averse via Arrow-Pratt measure HRS data 1992–2014

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014. Excludes bonds held inside mutual funds.

this because of small sample sizes and low overall reported balances in the data. Overall, even among the least risk averse, there was evidence of attenuation in bond accumulations in the period since the Great Recession.

Another historically protective asset has been the home. HRS data include information on home and mortgage values, allowing us to construct measures of home equity and the ratio of loan-to-value (LTV). We begin by charting the evolution of the value of households' primary residence. As of 2014, estimated values of primary residences had not fully recovered to the peak levels reached in 2008, but notably, the general patterns of declines were relatively uniform. Recent cohorts do not appear to have suffered from outsized home value depreciation over the period since the Great Recession. Generally, then, even after the financial crisis, homeowners have not suffered a major decline in this key retirement asset.[13] And reassuringly, homeowners have continued to pay down their mortgages, so the ratio of home loan to home value, LTV, has generally continued to decline. This shores up home values that might otherwise be at risk (see Figure 9.3).

In fact, though LTV has generally been higher for the more recent cohorts, since the youngest HRS cohorts have even accelerated their mortgage pay-downs relative to those that came before them. This is seen in the crossing of cohort-series at the top left of the graph in Figure 9.4. This could
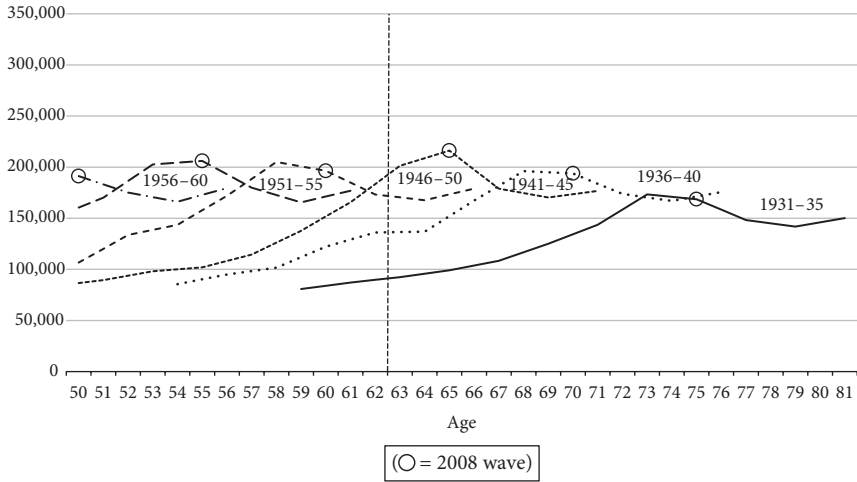
Figure 9.3. Value of primary residence for various cohorts over time in 2015 US dollars, HRS data 1992–2014

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.
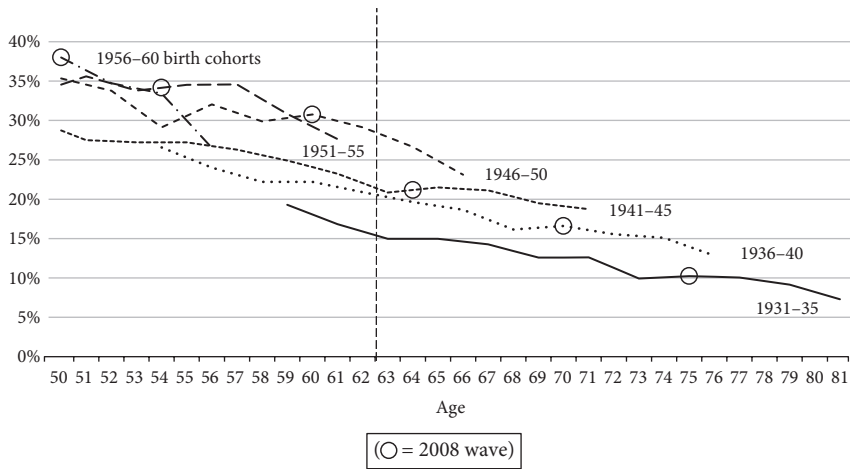

Figure 9.4. Loan to value: primary residence for various cohorts over time, HRS data 1992–2014

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

be the result of the stricter rules governing mortgage issuance which would tend to reduce refinancing and home-equity-based lines of credit. Yet, rather than being lender driven (and thus based on the supply of credit), the decline could also be demand driven. That is, borrowers might be more reluctant to borrow as much in the aftermath of the financial crisis. Finally, the pattern could be due to relative prices and opportunity costs—an impact of the low interest rate environment. For example, lower interest rates generate lower interest payments, reducing the realized value of mortgage interest deductions for tax purposes. It is certainly possible that each of these three factors plays a role in explaining the data.

Another real-estate-related asset category, 'other property,' might arguably be of value to aging households in a low interest rate environment, because (1) although these properties require ongoing maintenance, such holdings can pay a stream of rental income; and further because (2) they may appreciate in value. In fact, Figures 9.5 and 9.6 show a notable break in the real estate holding habits of cohorts based on risk preferences. For the most risk averse, one observes increasing holdings, even following the Great Recession (Figure 9.5). Yet for the least risk averse, accumulation patterns generally flatten or decline from the peak in 2008 (Figure 9.6). The mountain-like profile representing holdings for the 1951–55 cohort is distinct and perhaps has to do with more speculative real estate activity before and after the US housing bubble burst in 2007–2008 among these birth cohorts.[14]

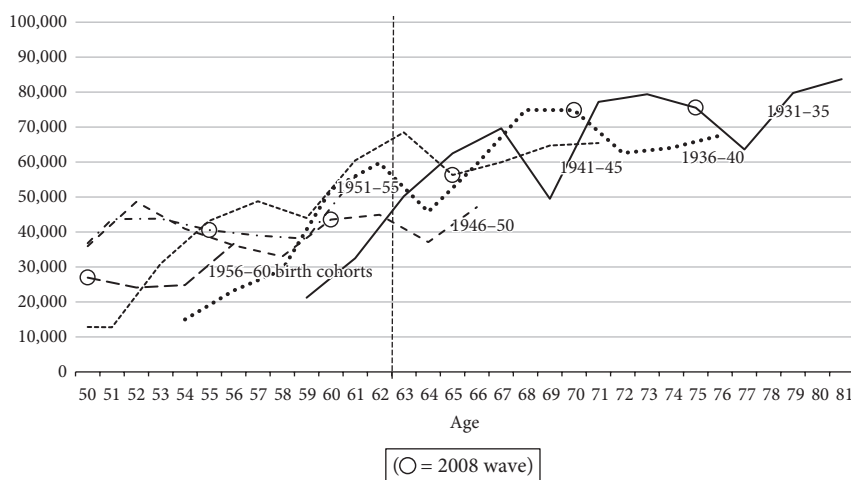
Figure 9.5. Net value of other real estate for various cohorts over time in 2015 US dollars: those reporting as most risk averse via Arrow-Pratt HRS data 1992–2014

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.
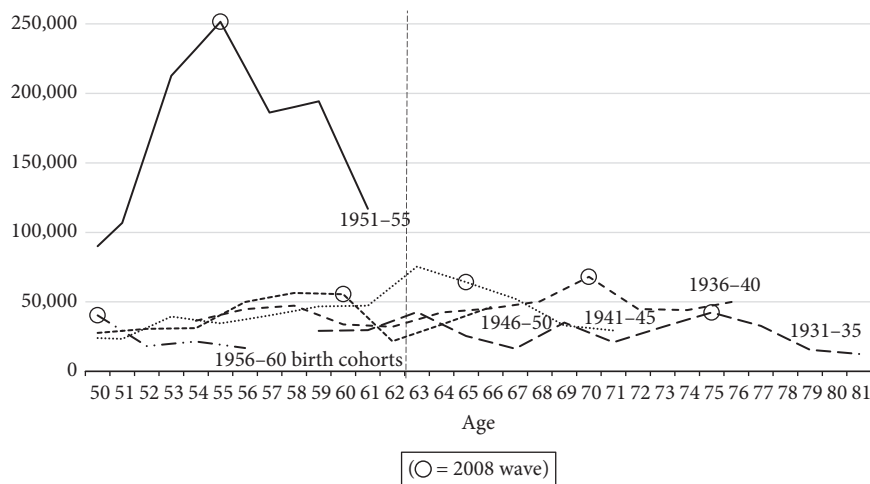
Figure 9.6. Net value of other real estate for various cohorts over time in 2015 US dollars: those reporting as least risk averse via Arrow-Pratt HRS data 1992–2014

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

Moving from consideration of assets that pay a stream of income or services (i.e. bonds, homes and rental properties) we next look at trends in income. Here the evidence suggests that younger cohorts are earning higher incomes for longer, but there is no general evidence of a compensating increase in income following the asset markdowns during in the Great Recession. That is, older households do not appear to have delayed exit or re-entered the labor market to any marked degree. (See Figure 9.7).

Interestingly, the general patterns for income tapering across cohorts are consistent with the evolution of mortgages illustrated in Figure 9.5. Younger cohorts have more income and hold higher mortgage balances at similar ages. A look at more liquid assets and short-term debt shows that cohorts have behaved very similarly over time. As a rule, they all generally hold liquid balances between $10,000 and $20,000 and manage their finances such that other debt tapers to the $4,000–$6,000 range by age 62–63.

In sum, focusing on balances for traditional retirement investments provides mixed results in terms of risk-return characteristics and both cash and asset management strategies. Observed patterns suggest delayed income tapering may be aligned with delayed mortgage payoff, and that investments in bonds may be muted in the low interest rate environment since the Great Recession. By comparison, the value of stocks (equity and mutual fund holdings) has grown for most cohorts following the negative shocks related to the financial crisis (Figure 9.8).
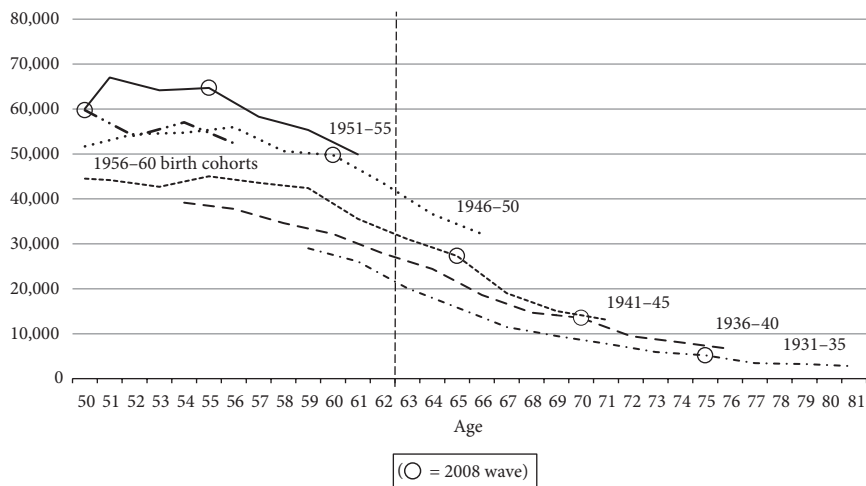
Figure 9.7. Earnings for various cohorts over time in 2015 US dollars, HRS data 1992–2014

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

Figure 9.8. Net value of equities and mutual fund holdings for various cohorts over time in 2015 US dollars, HRS data 1992–2014

Source: Authors' calculation from RAND HRS Version P panel data 1992–2014.
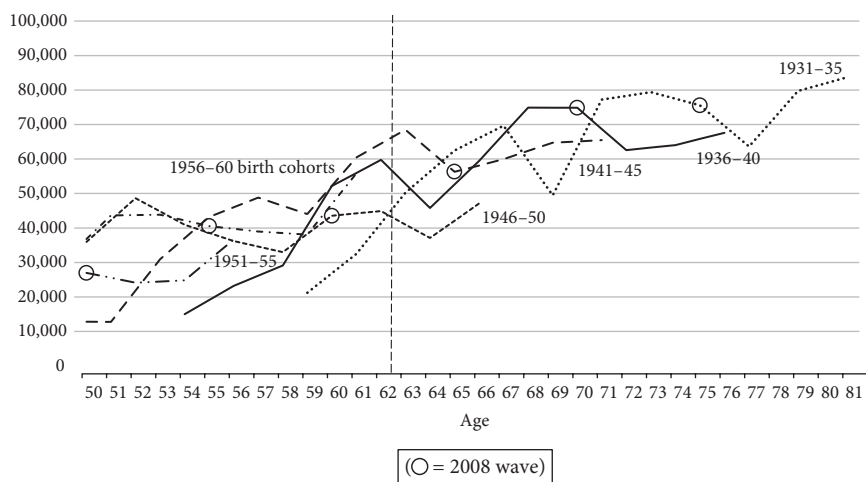
Wealth Experiences Through Retirement

So far, we have characterized the wealth and asset allocations of cohorts without considering whether members are retired, but we can also consider asset evolutions conditional on retirement. People self-report retirement in the HRS, and next we use these reports to tag households' evolution from this event forward. To this end we differentiate households by their place in the overall wealth distribution in 2014.

Again we compare cohorts based on where they were in 2008 to compare the evolution of wealth pre- and post-recession. Looking first at total wealth, we see that the Great Recession imposed a notable shock on assets across every wealth group: none were spared. Patterns during the recovery are quite different, however. The bottom 10 percent of households lost more than half their wealth between 2008 and 2010, and had not yet recovered as of 2014. In fact, on average they depleted their wealth around 16 years into retirement. Focusing on the bottom quartile of the 2014 wealth distribution, it too depleted its assets within about 18 years of retirement (see Figure 9.9). This is notable inasmuch as it is less than the 20-or-so years that financial advisors might use for longevity. By 18 years into retirement, the bottom 50 percent of all HRS households averaged only about $50,000 in net financial assets, and the 75th percentile of the distribution had just over twice that amount.[15]
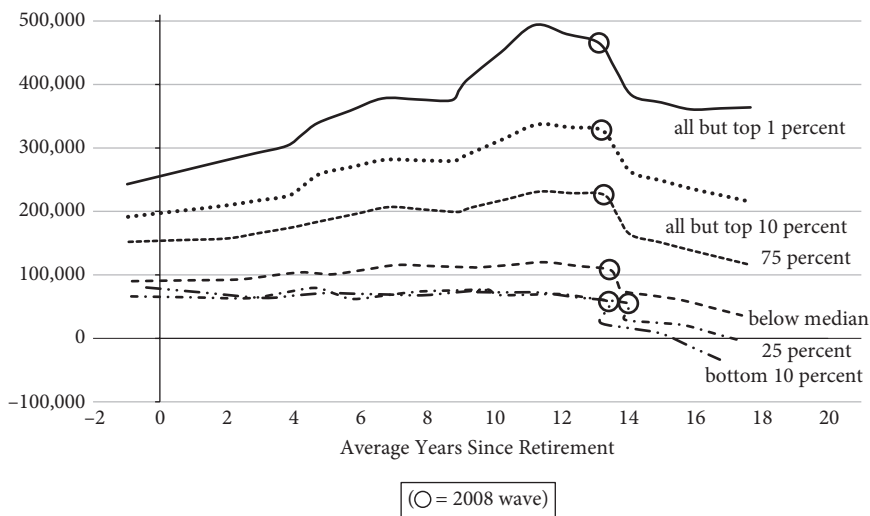

Figure 9.9. Average total assets in 2015 US dollars before and after retirement

Source: Authors' calculation from RAND HRS Version P panel data 1992–2014.

By contrast, the top 10 percent, who generally were older and had been retired longer at the time of the Great Recession, saw strong increases in their total assets, more than recovering their losses. Figure 9.10 makes it clear that the wealthiest 10 percent started with more assets before the Great Recession, but that does not explain why total wealth for this group grew afterwards. Specifically, this subgroup held higher allocations to stock and mutual funds, and it has increased its proportional allocations over time (see Figure 9.11). The same is true for allocations to bonds, though the proportions of these allocations are lower (Figure 9.12).[16]

One asset class where groups behaved more uniformly is with respect to allocations to very short-term debt investments, where all groups reduced allocations since the Great Recession. In 2008, these comprised from 1 to 4.4 percent of financial wealth, but since 2008, all groups curtailed their holdings between 1.2 and 2.4 percentage points.

There is also an interesting bit of evidence on liquidity, as seen in Figure 9.13. Early in our data, liquid asset positions were relatively uniform. But as groups moved toward 2014, cash increasingly made up a greater proportion of assets for those lower in the wealth distribution, until there was a collapse (correlated with insolvency).

While the cause of this trend remains unclear, there are two hypotheses worth considering. First, the increase in cash can be related to expenses rising relative to assets. Second, insolvency may in part be driven by
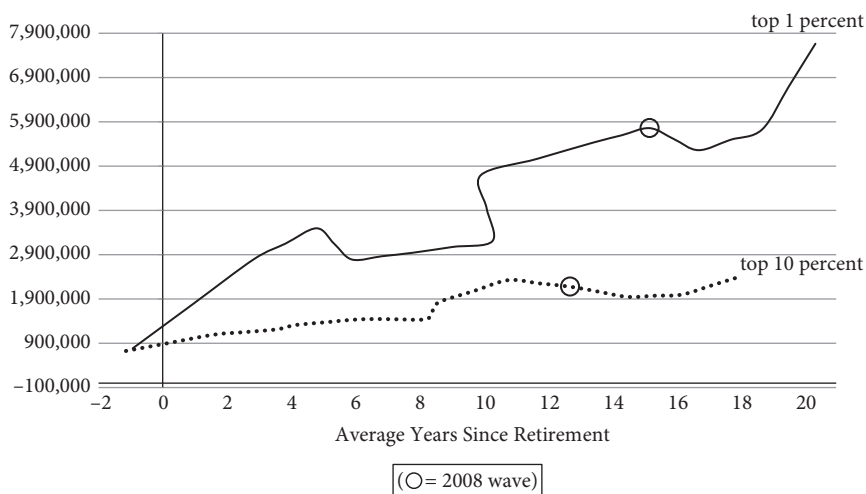
Figure 9.10. Average total assets before and after retirement in 2015 US dollars: for HRS households with a retired person

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

Figure 9.11. Proportion of stocks to total assets for HRS households with a retired person

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

Figure 9.12. Proportion of bonds to total assets for HRS households with a retired person (excludes bonds held through mutual funds)

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

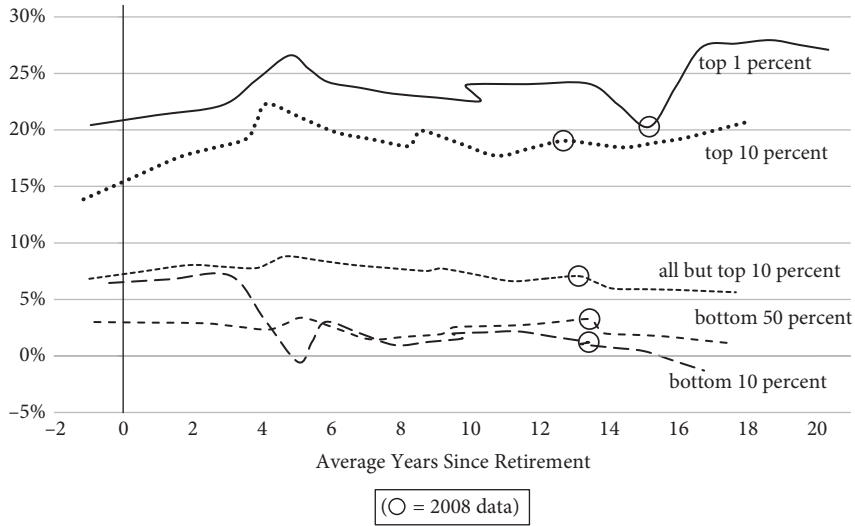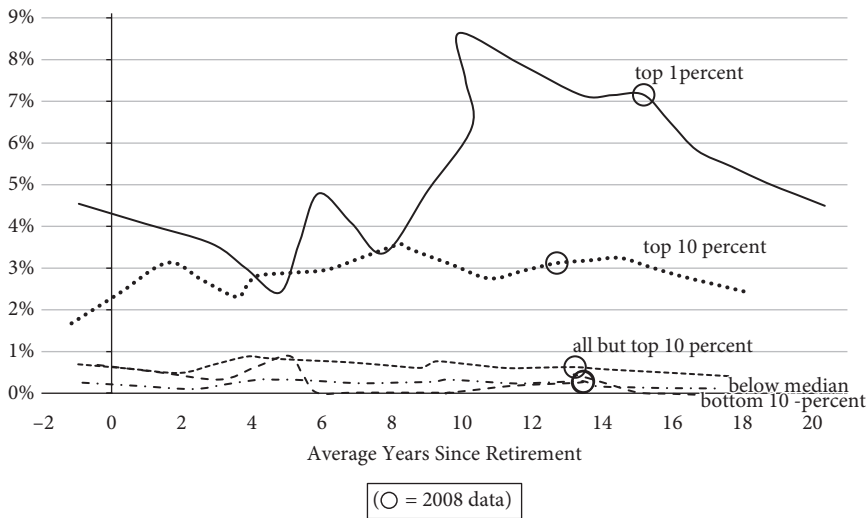**Figure 9.13.** Proportion of liquid to total assets for HRS households with a retired person

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

preferences to hold non-performing assets such as homes. Increases in liquid asset positions among the lower half of the 2014 wealth distribution emerged well ahead of the Great Recession, in support of the second hypothesis.

Moving to home values, conditional on owning a home, the lowest 25 percent of the asset distribution in 2014 appear to have relied on home equity to finance their retirement, to various degrees. For the bottom 10 percent of the wealth distribution, home equity drawdowns were nearly complete, as seen in Figure 9.14. This also confirms some degree of allocative response to changes in interest rates.

Multivariate Regression Analysis and Results

Next we employ the HRS data in order to explore potential factors contributing to total asset positions, controlling for household characteristics. We use multivariate regression and investigate bond and liquid allocations, in keeping with the idea that these assets, generally thought of as safe for elders, will be vulnerable in a low interest rate environment.

Our dataset includes household-level information that helps us to control for many important factors driving wealth and portfolio allocations. (See Table 9A.1, in the Appendix). To account for differential household mortality
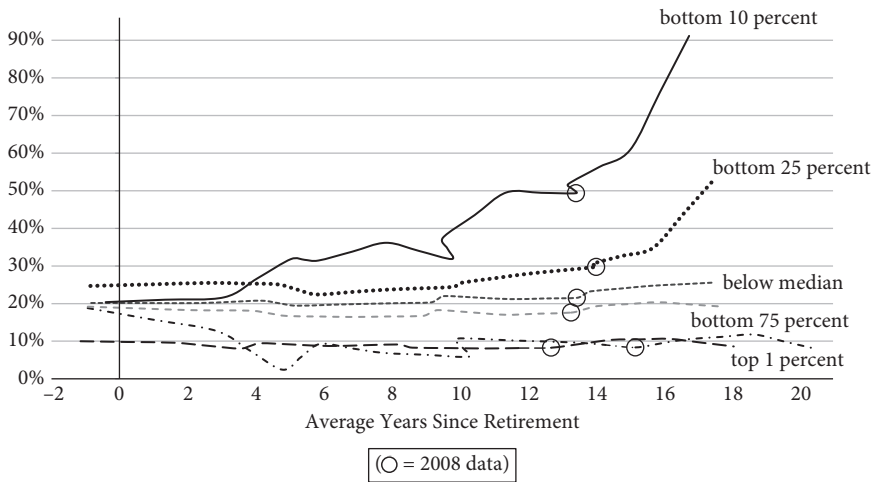
Figure 9.14. Loan to value for primary residence for HRS households with retired person

Source: Authors' calculations from RAND HRS Version P panel data 1992–2014.

and associated changes in household size, we include both household members separately, and we control on marital status, sex, and a marriage-gender interaction term. We use panel regressions for work and Tobit regressions for proportions or ratios.

Variables of interest. We target two types of dependent variables, the first being measures of total household wealth, and the second being measures of portfolio allocation. Household wealth is skewed, especially in the aftermath of the Great Recession, as we observed above. In regressions with the full sample, we employ two binary variables targeting the top and bottom 10 percent of the wealth distribution. We also run panel data Tobit regressions on portfolio allocations and on the home LTV dependent variable.

The explanatory variable of main interest is the low interest rate indicator, coded to equal 1 for all interviews following December 2008, which was the month the Federal Reserve dropped the Federal Funds Rate to a target range of 0–25 basis points. Because this key rate drives global interest rates for fixed income products, and because it stayed in the same near-zero target window well past the last 2014 interview date, this binary variable captures the low interest rate environment rather parsimoniously.

We also control on whether the respondent was retired and the number of years retired, tagging retirement as of the first interview announcement. The number of years retired is measured as the difference from retirement year and the interview date. Age and the square of age use the oldest living

spouse (in married households). Household education is similarly reported from the maximum education status using the HRS 5-point scale. As an additional measure for education, we calculate any spousal difference in household educational attainment. This education-spread in the household attenuates the return to the education variable. We also control for risk tolerance, employing a scaled Arrow Pratt measure derived in the RAND HRS dataset.

Finally, we include household level controls for race and ethnicity, marital status, sex, and cohort indicators, as well as whether they are in the top or bottom 10 percent of the wealth distribution.

Results. We first ran panel regressions to determine the impact of the low interest rate era on households' total asset position. In the sample of roughly 10,400 households, people experienced an average wealth shock of $84,000–$85,000 over the low interest period of 2009–2014. We note that this is controlling for retirement, labor force participation (ahead of and after initial retirement, and including part-time work), employer retirement plan, social security program participation, race, sex, marital status, age, cohort, and being in the top or bottom 10 percent of the wealth distribution. Our results are quite stable both in terms of economic and statistical significance (details appear in Table 9A.2). Additionally, among the lower portion of the wealth distribution, we found that the low interest rate period was again associated with very large declines in wealth.

Therefore, of course, protective factors that can be identified, for instance, the married and the better educated fared better. It also appears that some households re-engaged in market work when confronted with lower asset balances, as labor force participation is correlated with lower asset balances. This relationship flips, however, in the lowest 25 percent of the distribution (see Table 9A.3). We suspect that this has to do with a general paucity of assets for retirees in this group.

Turning to bond allocations, using the panel Tobit estimator, we observe estimated declines of roughly 0.1 to 0.2 percentage points for bond allocations during the low interest rate period. This represents a fairly large attenuation effect given the low proportions of bonds reported above. The attenuation is much larger for the top 10 percent of the wealth distribution, where bond holdings were greater earlier in retirement. These findings survive several robustness checks, remaining statistically significant at or above the 5 percent confidence level (see Table 9A.4).

We next explore how stock and mutual fund allocations evolved in the panel Tobit framework. Again, the low interest rate period was associated with declines in equity and mutual fund allocations of 1.4–1.5 percentage points, but for the top and bottom 10 percent of the wealth distribution, effects differed. The bottom 10 percent allocated away from this asset class,

by roughly an additional percentage point, while the top 10 percent increased its allocation by roughly 9 percentage points (see Table 9A.5).

Finally, we examine home LTV dynamics, where the estimates imply interest rate environment is a 2 percentage point increase in LTV. Again, however, the experiences of the top and bottom 10 percent were quite different. For the lowest 10 percent of the wealth distribution, there was a much larger 27 percentage point increase in LTV, while the LTV declined 11 percentage points among the top 10 percent. Thus, a 38 percentage point difference in the evolution of LTVs across these groups should give pause as to the financial security and overall stability of less well-off retirees, including the more fortunate among those who own homes (see Table 9A.6).

Conclusions

The Great Recession of 2007–2009 and the subsequent low interest rate environment deepened the challenges facing older Americans as they manage assets into and through retirement. Our analyses of traditional retirement holding yielded mixed results. For instance, most households took significant losses from which they have not fully recovered, yet results are heterogeneous. The wealthiest 10 percent saw marked improvements in its wealth since the Great Recession but around a quarter of retired households reported negative net asset positions by 2014. Those in the bottom quartile who own homes have extracted equity from their homes to finance their retirement.

While financial security in retirement may still be feasible, it surely will become challenging. Many will need to save more on their own and work longer, either retiring later or working part time in retirement. Additionally, older persons will need to consider the merits of delaying when they claim Social Security retirement benefits, to maximize the inflation-protected annuity this will produce.

Acknowledgments

Appendix: Data and Regression Tables

TABLE 9A.1 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
total assets ($2015)	226,564	356,349.30	990,892.60	−4,383,000.00	90,600,000.00
allocations and housing equity use					
equities & mutual funds	216,706	0.06	0.32	−40.00	80.00
bonds	216,706	0.01	0.05	−6.67	2.25
safe assets	216,706	0.03	0.26	−19.00	70.50
liquid assets	216,706	0.11	0.56	−110.00	43.50
loan to value for primary residence	174,537	0.19	0.29	0.00	1.50
Other variables					
low interest rate era {0, 1}	226,564	0.27	0.44	0.00	1.00
household labor force participation {0, 1}	182,814	0.47	0.48	0.00	1.00
household reports retirement {0, 1}	286,376	0.63	0.48	0.00	1.00
number of years retired	230,834	8.33	11.70	−22.00	78.92
household holds a DB pension {0, 1}	449,940	0.08	0.27	0.00	1.00
household holds a DC account {0, 1}	449,940	0.09	0.28	0.00	1.00
household has OASI income {0, 1}	226,564	0.59	0.49	0.00	1.00
household has SSI or DI income {0, 1}	226,564	0.09	0.29	0.00	1.00
home ownership {0, 1}	223,879	0.78	0.41	0.00	1.00
risk {., . . ., 4} least to most risk averse	230,772	3.28	1.08	1.00	4.00
education {max: respondent, spouse}[a]	449,916	3.34	1.40	1.00	5.00
education {max—min: respondent, spouse}	449,916	0.68	0.95	0.00	4.00
household white {0, 0.5, 1}	449,007	0.75	0.43	0.00	1.00

(*continued*)

TABLE 9A.1 Continued

Variable	Obs	Mean	Std. Dev.	Min	Max
household hispanic {0, 0.5, 1}	447,189	0.11	0.31	0.00	1.00
respondent is female	449,940	0.56	0.50	0.00	1.00
respondent is married	226,564	0.67	0.47	0.00	1.00
married & female	226,564	0.33	0.47	0.00	1.00
age {max: respondent, spouse}	226,562	68.33	10.72	24.67	109.67
age squared	226,562	4,784.27	1,513.78	608.44	12,026.78
person born 1931–35 {0, 1}	449,940	0.12	0.32	0.00	1.00
person born 1936–40 {0, 1}	449,940	0.13	0.34	0.00	1.00
person born 1941–45 {0, 1}	449,940	0.09	0.29	0.00	1.00
person born 1946–50 {0, 1}	449,940	0.10	0.29	0.00	1.00
person born 1951–55 {0, 1}	449,940	0.11	0.31	0.00	1.00
person born 1956–60 {0, 1}	449,940	0.10	0.30	0.00	1.00
2014 wealth in top 10 percent {0, 1}	226,564	0.07	0.26	0.00	1.00
2014 wealth in bottom 10 percent {0, 1}	224,976	0.07	0.26	0.00	1.00

Notes:
[a] Education codes: {1: less than high school (HS), 2: GED, 3: HS, 4: some college, 5: college & above}

Source: Authors' computations.

TABLE 9A.2 Panel regression analysis of total assets, full sample

Total Assets ($2015)	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat
low interest rate era {0,1}	−$84,351	−10.56	−$84,516	−10.58	−$83,610	−10.52	−$83,777	−10.57
household labor force participation {0, 1}	−$3,662	−0.28	−$11,749	−1.17	−$11,666	−1.16	−$11,711	−1.17
household reports retirement {0, 1}	$11,881	0.93						
number of years retired	$2,096	2.94	$2,194	3.11	$2,225	3.16	$2,206	3.14
household holds a DB pension {0, 1}	−$49,583	−5.99	−$49,883	−6.03	−$49,513	−6.00	−$49,501	−6.00
household holds a DC account {0, 1}	−$44,682	−5.70	−$44,775	−5.71	−$45,075	−5.77	−$45,097	−5.77
household has OASI income {0, 1}	$9,412	1.00	$10,641	1.14	$10,940	1.18	$10,885	1.18
household has SSI or DI income {0, 1}	−$28,723	−2.15	−$27,261	−2.06	−$27,589	−2.09	−$27,576	−2.09
home ownership {0, 1}	$136,572	12.55	$136,548	12.55	$137,251	12.68	$137,199	12.68
risk {,..., 4} least to most risk averse	−$6,033	−1.00	−$6,007	−1.00	−$6,562	−1.09	−$6,558	−1.09
education {max: respondent, spouse}[a]	$90,266	15.05	$90,251	15.04	$91,403	15.75	$91,384	15.75
education {max—min: respondent, spouse}	−$62,852	−8.72	−$62,757	−8.70	−$63,962	−8.89	−$63,913	−8.88
household white {0, 0.5, 1}	$63,024	3.68	$62,947	3.68	$59,813	3.50	$59,923	3.50
household hispanic {0, 0.5, 1}	−$9,327	−0.40	−$9,465	−0.40				
respondent is female	−$32,306	−1.54	−$31,972	−1.52	−$33,565	−1.60	−$28,294	−2.11
respondent is married	$57,473	3.25	$57,879	3.28	$58,282	3.34	$62,980	6.33
married & female	$6,374	0.31	$5,967	0.29	$6,719	0.33		
age {max: respondent, spouse}	$42,322	9.09	$42,882	9.30	$43,065	9.40	$43,044	9.40
age squared	−$212	−6.21	−$216	−6.39	−$218	−6.48	−$217	−6.47
person born 1936–40 {0, 1}	$78,544	4.18	$78,779	4.19	$75,871	4.03	$76,060	4.04
person born 1941–45 {0, 1}	$92,446	4.47	$92,898	4.49	$89,878	4.34	$90,198	4.36
person born 1946–50 {0, 1}	$138,146	6.40	$138,614	6.42	$138,180	6.41	$138,554	6.43
person born 1951–55 {0, 1}	$224,741	9.20	$225,043	9.21	$219,837	9.03	$220,338	9.07
person born 1956–60 {0, 1}	$150,886	3.60	$151,310	3.61	$149,181	3.56	$149,924	3.59
2014 wealth in bottom 10 percent {0, 1}	−$105,526	−3.39	−$105,387	−3.39	−$104,515	−3.36	−$104,569	−3.36

(*continued*)

Table 9A.2 Continued

Total Assets ($2015)	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat
2014 wealth in top 10 percent {0, 1}	$1,230,160	60.53	$1,230,057	60.51	$1,236,205	60.78	$1,236,274	60.78
constant	−$2,092,375	−12.91	−$2,102,129	−13.01	−$2,105,273	−13.13	−$2,109,482	−13.20
observations	87,381		87,415		87,832		87,832	
number of groups	10,408		10,408		10,426		10,426	
R-squared between	34.6%		34.6%		34.7%		34.7%	
R-squared overall	21.0%		21.0%		21.0%		21.0%	

Notes:
[a] Education codes: {1: less than high school (HS), 2: GED, 3: HS, 4: some college, 5: college & above}

Source: Authors' computations.

TABLE 9A.3 Panel regression analysis of total assets, subsamples of the wealth distribution

Panel Regression—Dependent Variable:	Full Sample		Bottom 90 percent		Bottom 75 percent		Bottom 50 percent		Bottom 25 percent		Bottom 10 percent	
Total Assets ($2015)	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat
low interest rate era {0, 1}	-$84,351	-10.56	-$78,081	-22.83	-$68,913	-21.15	-$45,828	-18.23	-$30,208	-7.51	-$71,325	-9.83
household labor force participation {0, 1}	-$3,662	-0.28	-$7,183	-1.26	-$10,552	-1.99	-$3,852	-0.97	$6,635	1.02	$12,773	1.10
household reports retirement {0, 1}	$11,881	0.93	$5,469	0.99	$2,376	0.46	-$242	-0.06	$3,463	0.52	$3,239	0.28
number of years retired	$2,096	2.94	$1,231	3.83	$566	1.99	$223	1.04	-$94	-0.30	$437	0.62
household holds a DB pension {0, 1}	-$49,583	-5.99	-$35,642	-9.96	-$19,027	-5.48	-$9,590	-3.36	-$14,671	-2.88	-$9,471	-1.12
household holds a DC account {0, 1}	-$44,682	-5.70	-$29,404	-8.68	-$17,749	-5.41	-$6,871	-2.60	$3,741	0.80	-$13,718	-1.77
household has OASI income {0, 1}	$9,412	1.00	-$2,018	-0.50	-$1,858	-0.49	$479	0.16	$2,478	0.53	$1,245	0.15
household has SSI or DI income {0, 1}	-$28,723	-2.15	-$26,283	-4.77	-$24,649	-5.04	-$15,919	-4.72	-$12,018	-2.46	-$11,650	-1.17
home ownership {0, 1}	$136,572	12.55	$120,605	26.74	$101,817	25.82	$81,806	30.93	$83,179	21.50	$75,407	10.08
risk {,..., 4} least to most risk averse	-$6,033	-1.00	-$2,039	-0.74	-$1,099	-0.45	-$1,344	-0.73	$2,151	0.87	$3,414	0.61
education {max: respondent, spouse}[a]	$90,266	15.05	$74,087	27.76	$42,964	18.41	$23,381	13.23	$18,404	7.46	$24,933	4.34
education {max–min: respondent, spouse}	-$62,852	-8.72	-$43,574	-13.28	-$24,724	-8.55	-$14,172	-6.32	-$12,117	-3.71	-$18,998	-2.54
household white {0, 0.5, 1}	$63,024	3.68	$72,653	9.76	$42,597	6.88	$9,277	2.13	$3,046	0.52	-$19,298	-1.43
household hispanic {0, 0.5, 1}	-$9,327	-0.40	-$25,903	-2.55	-$20,494	-2.44	-$12,299	-2.10	-$3,100	-0.40	$31,686	1.57
respondent is female	-$32,306	-1.54	-$10,704	-1.17	-$5,043	-0.63	-$1,657	-0.29	$3,617	0.46	$10,520	0.58
respondent is married	$57,473	3.25	$43,980	5.82	$27,978	4.07	$17,382	3.50	$15,421	2.12	$34,517	2.21
married & female	$6,374	0.31	-$1,436	-0.16	$8,638	1.08	$3,298	0.57	$5,528	0.65	-$3,207	-0.18
age {max: respondent, spouse}	$42,322	9.09	$27,411	13.83	$15,279	8.13	$6,490	4.51	$4,599	2.07	$3,264	0.76
age squared	-$212	-6.21	-$152	-10.49	-$84	-6.11	-$38	-3.60	-$27	-1.63	-$12	-0.36
person born 1936–40 {0, 1}	$78,544	4.18	$31,076	3.62	$13,732	1.83	-$13,984	-2.39	-$18,302	-2.18	$14,679	0.66
person born 1941–45 {0, 1}	$92,446	4.47	$32,410	3.41	$7,039	0.84	-$11,429	-1.76	-$18,114	-1.95	$10,675	0.48
person born 1946–50 {0, 1}	$138,146	6.40	$59,654	6.10	$17,598	2.03	-$7,047	-1.06	-$11,452	-1.22	$39,793	1.86
person born 1951–55 {0, 1}	$224,741	9.20	$79,884	7.25	$37,292	3.84	$11,114	1.52	-$15,952	-1.55	$19,227	0.85
person born 1956–60 {0, 1}	$150,886	3.60	$61,404	3.25	$16,155	0.99	-$16,236	-1.37	-$29,070	-1.85	-$3,721	-0.11

(continued)

TABLE 9A.3 Continued

Panel Regression—Dependent Variable: Total Assets ($2015)	Full Sample		Bottom 90 percent		Bottom 75 percent		Bottom 50 percent		Bottom 25 percent		Bottom 10 percent	
	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat	coefficient	z-stat
2014 wealth in bottom 10 percent {0, 1}	−$105,526	−3.39	−$117,588	−8.85	−$63,855	−6.10	−$14,897	−2.37	−$3,700	−0.57	—	—
2014 wealth in top 10 percent (0, 1)	$1,230,160	60.53	—		—		—		—		—	
constant	−$2,092,375	−12.91	−$1,276,248	−18.45	−$695,406	−10.68	−$274,813	−5.57	−$215,142	−2.85	−$234,398	−1.65
observations	87,381		75,907		59,509		33,621		13,966		3,534	
number of groups	10,408		9,091		7,230		4,276		1,898		500	
R-squared between	34.6%		19.1%		14.7%		15.4%		13.3%		15.7%	
R-squared overall	21.0%		12.4%		8.7%		10.0%		9.0%		13.0%	

Notes:
[a] Education codes: {1: less than high school (HS), 2: GED, 3: HS, 4: some college, 5: college & above}.

Source: Authors' computations.

TABLE 9A.4 Tobit regression analysis of bond allocations

Panel Tobit—Dependent Variable

Bond Allocations	Coefficient (%)	z-stat	Coefficient (%)	z-stat	Coefficient (%)	z-stat	Coefficient (%)	z-stat
low interest rate era {0, 1}	−0.1	−2.49	−0.1	−2.51	−0.2	−6.58	−0.2	−5.50
household labor force participation {0, 1}	−0.1	−2.07	−0.2	−3.61	−0.1	−2.99	−0.1	−3.07
household reports retirement {0, 1}	0.1	0.98						
number of years retired	0.0	2.85	0.0	3.05	0.0	3.49	0.0	3.01
household holds a DB pension {0, 1}	0.0	−0.13	0.0	−0.16	0.0	−0.28	0.0	−0.43
household holds a DC account {0, 1}	0.1	1.32	0.1	1.31	0.0	0.44	0.0	0.20
household has OASI income {0, 1}	−0.1	−2.18	−0.1	−2.04	−0.1	−2.13	−0.1	−1.75
household has SSI or DI income {0, 1}	−0.2	−2.47	−0.2	−2.37	−0.1	−2.71	−0.1	−2.01
home ownership {0, 1}	−0.2	−3.47	−0.2	−3.47	−0.2	−4.50		
alt regressor—loan to value							−0.1	−1.83
risk {, . . ., 4} least to most risk averse	0.0	0.35	0.0	0.36				
education {max: respondent, spouse}[a]	0.2	11.17	0.2	11.16	0.2	13.28	0.2	12.65
education {max−min: respondent, spouse}	−0.2	−6.35	−0.2	−6.33	−0.2	−7.38	−0.2	−7.48
household white {0, 0.5, 1}	0.3	4.13	0.3	4.13	0.2	4.78	0.2	4.18
household hispanic {0, 0.5, 1}	−0.1	−1.61	−0.1	−1.62	−0.1	−0.96	−0.1	−1.13
respondent is female	−0.1	−1.71	−0.1	−1.69	−0.2	−3.37	−0.2	−2.13
respondent is married	−0.1	−1.67	−0.1	−1.64	−0.2	−3.02	−0.2	−2.14
married & female	0.2	1.82	0.2	1.79	0.3	3.25	0.2	2.17
age {max: respondent, spouse}	0.1	2.22	0.1	2.36	0.0	1.97	0.1	2.51
age squared	0.0	−2.15	0.0	−2.29	0.0	−1.31	0.0	−2.07
person born 1936–40 {0, 1}	−0.3	−4.12	−0.3	−4.10	−0.3	−4.55	−0.3	−4.36
person born 1941–45 {0, 1}	−0.4	−5.69	−0.4	−5.65	−0.4	−5.65	−0.4	−5.22
person born 1946–50 {0, 1}	−0.5	−6.07	−0.5	−6.03	−0.4	−5.66	−0.4	−5.66
person born 1951–55 {0, 1}	−0.5	−5.59	−0.5	−5.57	−0.4	−5.11	−0.4	−5.00
person born 1956–60 {0, 1}	−0.6	−3.67	−0.6	−3.65	−0.2	−2.41	−0.3	−2.85
2014 wealth in bottom 10 percent {0, 1}	−0.2	−2.04	−0.2	−2.03	−0.2	−2.66	−0.1	−0.93
2014 wealth in top 10 percent {0, 1}	1.5	21.92	1.5	21.92	1.6	25.98	1.5	23.39
constant	-1.7	-2.08	-1.7	-2.15	-1.4	-2.09	-2.0	-2.74

Notes:
[a] Homeownership and LTV must be substituted in regression specifications.

Source: Authors' computations.

TABLE 9A.5 Tobit regression analysis of equity and mutual fund allocations

Panel Tobit—Dependent Variable

Equity and Mutual Fund Allocations	Coefficient (%)	z-stat	Coefficient (%)	z-stat	Coefficient (%)	z-stat	Coefficient (%)	z-stat
low interest rate era {0, 1}	−1.4	−3.67	−1.4	−3.68	−1.9	−6.91	−1.5	−8.11
household labor force participation {0, 1}	−2.0	−3.22	−2.1	−4.76	−2.0	−5.53	−2.0	−7.62
household reports retirement {0, 1}	0.2	0.38						
number of years retired	0.0	−1.08	0.0	−1.03	0.0	−1.02	0.0	0.19
household holds a DB pension {0, 1}	0.6	1.59	0.6	1.59	0.2	0.74	0.0	0.04
household holds a DC account {0, 1}	0.7	1.82	0.7	1.82	0.6	2.03	0.6	3.24
household has OASI income {0, 1}	−0.5	−1.01	−0.4	−0.96	−0.8	−2.13	−0.3	−1.33
household has SSI or DI income {0, 1}	−1.8	−3.09	−1.8	−3.09	−1.9	−4.18	−2.1	−6.09
home ownership {0, 1}	−1.7	−3.83	−1.7	−3.82	−1.5	−4.60		
alt regressor—loan to value[a]							0.7	2.61
risk {1, . . ., 4} least to most risk averse	0.0	−0.26	0.0	−0.26				
education {max: respondent, spouse}[b]	2.1	14.52	2.1	14.53	2.0	17.07	1.7	17.66
education {max—min: respondent, spouse}	−1.2	−7.18	−1.2	−7.17	−1.1	−8.15	−0.9	−7.77
household white {0, 0.5, 1}	2.6	6.13	2.6	6.13	2.5	7.86	2.3	8.39
household hispanic {0, 0.5, 1}	−1.8	−3.09	−1.8	−3.09	−1.4	−3.26	−1.5	−4.06
respondent is female	−0.7	−1.07	−0.7	−1.06	−0.3	−0.64	−0.6	−1.36
respondent is married	−0.4	−0.68	−0.4	−0.67	−0.1	−0.27	−0.5	−1.17
married & female	0.9	1.23	0.9	1.22	0.3	0.54	0.6	1.25
age {max: respondent, spouse}	−0.4	−2.01	−0.4	−1.98	−0.6	−3.66	−0.3	−2.89
age squared	0.0	2.20	0.0	2.17	0.0	4.38	0.0	3.19
person born 1936–40 {0, 1}	−0.7	−1.49	−0.7	−1.48	−0.6	−1.54	−0.9	−2.80
person born 1941–45 {0, 1}	−0.7	−1.40	−0.7	−1.39	−0.2	−0.58	−1.0	−2.84
person born 1946–50 {0, 1}	−1.4	−2.34	−1.4	−2.33	−0.8	−1.80	−1.1	−2.88
person born 1951–55 {0, 1}	−2.7	−3.78	−2.6	−3.78	−1.5	−2.95	−1.9	−4.67
person born 1956–60 {0, 1}	−2.8	−2.48	−2.8	−2.48	−1.4	−2.31	−1.8	−3.69
2014 wealth in bottom 10 percent {0, 1}	−2.4	−3.09	−2.4	−3.09	−2.5	−4.40	−2.4	−4.32
2014 wealth in top 10 percent {0, 1}	8.7	18.42	8.7	18.42	8.9	22.49	9.0	28.24
constant	15.0	1.96	14.8	1.94	18.0	3.23	11.2	2.75

Notes:
[a] Education codes: {1: less than high school (HS), 2: GED, 3: HS, 4: some college, 5: college & above}.
[b] Homeownership and LTV must be substituted in regression specifications.

Source: Authors' computations.

TABLE 9A.6 Tobit regression analysis of LTV ratios among homeowners

Panel Tobit—Dependent Variable

Loan to Value | Home Ownership	Coefficient (%)	z-stat	Coefficient (%)	z-stat	Coefficient (%)	z-stat	Coefficient (T)	z-stat
low interest rate era {0, 1}	2.0	8.33	2.0	8.33	2.0	8.46	2.0	8.47
household labor force participation {0, 1}	2.1	5.33	2.1	5.33	2.1	5.34	2.1	5.30
household reports retirement {0, 1}	−1.6	−4.32	−1.6	−4.32	−1.6	−4.30	−1.6	−4.19
number of years retired	−0.2	−7.20	−0.2	−7.21	−0.2	−7.11	−0.2	−7.08
household holds a DB pension {0, 1}	0.6	2.51	0.6	2.51	0.6	2.50	0.6	2.49
household holds a DC account {0, 1}	0.7	2.93	0.7	2.93	0.7	2.94	0.7	2.93
household has OASI income {0, 1}	0.6	2.21	0.6	2.21	0.6	2.22	0.6	2.04
household has SSI or DI income {0, 1}	0.6	1.34	0.6	1.34	0.6	1.32		
added regressor—equities allocation	2.0	5.35	2.0	5.35	2.0	5.35	2.0	5.34
risk {, …, 4} least to most risk averse	−0.7	−3.33	−0.7	−3.33	−0.7	−3.39	−0.7	−3.40
education {max: respondent, spouse}[a]	2.8	13.24	2.8	13.24	2.9	13.32	2.8	13.27
education {max—min: respondent, spouse}	−0.5	−2.10	−0.5	−2.10	−0.5%	−2.10	−0.5	−2.08
household white {0, 0.5, 1}	−3.3	−5.15	−3.3	−5.15	−3.2%	−5.15	−3.3	−5.18
household hispanic {0, 0.5, 1}	−1.6	−1.80	−1.6	−1.80	−1.5%	−1.77	−1.5	−1.77
respondent is female	0.0	−0.02						
respondent is married	3.1	5.14	3.1	7.07	2.7%	8.25	2.7	8.36
married & female	−0.6	−0.89	−0.6	−1.42				
age {max: respondent, spouse}	−1.8	−12.56	−1.8	−12.56	−1.8	−12.56	−1.8	−12.50
age squared	0.0	9.91	0.0	9.91	0.0	9.88	0.0	9.81
person born 1936–40 {0, 1}	3.1	4.74	3.1	4.74	3.1	4.69	3.1	4.69
person born 1941–45 {0, 1}	5.4	7.59	5.4	7.59	5.4	7.50	5.4	7.51
person born 1946–50 {0, 1}	8.4	11.26	8.4	11.26	8.4	11.18	8.4	11.21
person born 1951–55 {0, 1}	8.6	10.06	8.6	10.06	8.5	9.98	8.5	9.99
person born 1956–60 {0, 1}	10.4	7.03	10.4	7.04	10.2	6.92	10.2	6.93
2014 wealth in bottom 10 percent (0, 1)	27.2	21.99	27.2	21.99	27.1	21.98	27.2	21.99
2014 wealth in top 10 percent {0, 1}	−11.0	−15.97	−11.0	−15.97	−11.0	−15.96	−11.0	−15.98
constant	84.4	16.74	84.4	16.83	84.6	16.87	84.3	16.84

Notes:
[a] Education codes: {1: less than high school (HS), 2: GED, 3: HS, 4: some college, 5: college & above}.

Source: Authors' computations.

Notes

1. It is possible that the low interest rate environment will be around for a shorter period than some have projected.
2. For example, while the annual rate of increase for those born in 1933 or 1934 is 5.5 percent, for those born ten or more years later, the DRC is 8 percent per year.
3. The S&P 500 index value at market close on October 10, 2007 was 1562.47, and on March 9, 2009 it was 676.53. The National Bureau of Economic Research, the arbiter of the start and end dates of a recession, determined that the recession that began in December 2007 ended in June 2009, roughly coinciding with the peak and trough dates of the S&P 500 index.
4. The HRS is a longitudinal survey of health, retirement, and aging that has been conducted every two years since 1992 and interviews more than 22,000 Americans over the age of 50.
5. In this context, 'retirement plans' refer to peoples' goals, strategies and behaviors, not to DC or DB retirement plans.
6. The timing of retirement can be affected by more than age, including accumulated savings, the availability of an employer-provided pension, the willingness or ability to continue working part-time in retirement, personal health, access to health coverage, and general economic conditions.
7. The authors used data from the 2006 and 2008 core surveys, as well as data from two supplemental surveys, the Consumption and Activities Mail Survey (CAMS) and the HRS Internet Study. Although the time between the 2008 HRS interview and a subsequent 2009 HRS Internet survey was insufficient to observe actual behavior, the data nonetheless can be used to shed light on retirement expectations (Hurd et al. 2005).
8. What is described here are the expectations of working past either age 62 or age 65. Hurd et al. (2005) have found that these retirement expectations are predictive of actual retirement.
9. For a theoretical model of this behavior see Chai et al. (2012).
10. For a summary of research work on this area see Burkhauser et al. (2009).
11. These percentages are reported for aged units receiving benefits. An aged unit is defined by the Social Security Administration as 'a married couple living together or a nonmarried person, which also includes persons who are separated or married but not living together.' All figures in this sentence reported from: US Social Security Administration (2016a).
12. RAND version P include HRS data through the 2014 wave, all figures adjusted to 2015 dollars (Health and Retirement Study 2006).
13. This is consistent with Federal Reserve G20 Financial Accounts of US data, which show that as of Q3 2016 household owners' equity in real estate was 96.8 percent of the pre-recession peak, from Q1, 2006. Two years earlier, in Q3 2014 the recovery in these data was 77.9 percent—much less complete (Glick and Lansing 2011).

14. This cohort's wealth may evolve in ways that are interesting to other researchers in the future.
15. When considering these asset numbers recall that, as well as assets, the vast majority of those we are looking at here receive Social Security income. Asset depletion thus does not necessarily mean that 10–25 percent of households do not have resources on which to rely.
16. Because bonds can be held in mutual funds, we reason that the HRS data represent an under-reporting of bonds and over-reporting of equities, as a proportion of overall portfolios.

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