The impact of interest rates on the National Retirement Risk Index

Authors: Alicia Haydock Munnell, Anthony Webb, Rebecca Cannon Fraenkel

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By Alicia H. Munnell, Anthony Webb, and Rebecca Cannon Fraenkel*

Introduction

The National Retirement Risk Index (NRRI) measures the share of working-age households who are "at risk" of being unable to maintain their pre-retirement standard of living in retirement. The Index is calculated by comparing households' projected replacement rates – retirement income as a percent of pre-retirement income – with target rates that would allow them to maintain their living standard. The Index is the percent of households for which the projection falls short of the target. The NRRI is based on the Federal Reserve's *Survey of Consumer Finances* (SCF). The SCF is a triennial survey of a nationally representative sample of U.S. households, which collects detailed information on households' assets, liabilities, and demographic characteristics. The NRRI results show that, even if households work to age 65 and annuitize all their financial assets, including the receipts from reverse mortgages on their homes, more than half of households are at risk.

Real – inflation-adjusted – interest rates enter into the NRRI calculation primarily through the assumption that households purchase an inflation-indexed annuity with their assets at retirement. These assets include 401(k)/IRA holdings, financial assets outside of tax-preferred plans, and the proceeds from accessing home equity through a reverse mortgage. The higher the interest rate, the more income these financial assets produce. This effect is partially reduced by the fact that the portion of the house that can be accessed through a reverse mortgage varies inversely with the nominal interest rate. Interest rates do not play a role during the asset accumulation period, because, as described below, assets at 65 are based on the steady relationship by age between wealth and income reported in the SCF. This *brief* explores the percent of households at risk under two alternative interest rate scenarios: 1) real rates remain at zero as currently suggested by the yield on 10-year Treasury Inflation-Protected Securities (TIPS); or 2) real rates revert to the 4-percent level experienced when the indexed securities were first introduced in the 1990s.

The discussion proceeds as follows. The first section describes the nuts and bolts of constructing the NRRI. The second section discusses the role of interest rates in the NRRI and reports the results. The final section concludes that changing interest rates has only a modest effect on the NRRI, and that, regardless of the interest rate, today's workers face a major retirement income challenge.

* Alicia H. Munnell is director of the Center for Retirement Research at Boston College (CRR) and the Peter F. Drucker Professor of Management Sciences at Boston College's Carroll School of Management. Anthony Webb is a research economist at the CRR. Rebecca Cannon Fraenkel is a research associate at the CRR. The Center gratefully acknowledges Prudential Financial for its sponsorship of the National Retirement Risk Index.

The Nuts and Bolts of the National Retirement Risk Index

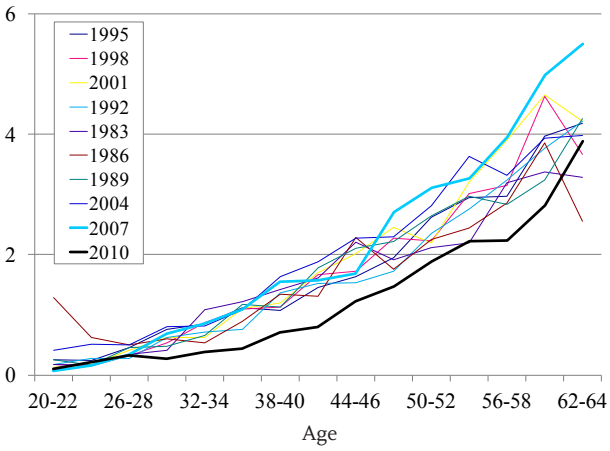
Constructing the National Retirement Risk Index involves three steps: 1) projecting a replacement rate – retirement income as a share of pre-retirement income – for each member of a nationally representative sample of U.S. households; 2) constructing a target replacement rate that would allow each household to maintain its pre-retirement standard of living in retirement; and 3) comparing the projected and target replacement rates to find the percentage of households "at risk."

Projecting Household Replacement Rates

The exercise starts with projecting how much retirement income each household will have at age 65. Retirement income is defined broadly to include the proceeds from all of the usual suspects plus housing.[1] Retirement income from financial assets and housing is derived by projecting assets that households will hold at retirement, based on the stable relationship between wealth-to-income ratios and age that is evident in the 1983-2010 SCFs. As shown in Figure 1, wealth-to-income lines from each survey rest virtually on top of one another, bracketed by 2007 values on the high side and 2010 values on the low side. This steady relationship is surprising given the shift from defined benefit to defined contribution plans, because accrued wealth in defined benefit plans is not included in the SCF data while defined contribution assets are included. As a result, an increasing reliance on defined contribution plans would have been expected to show up as more wealth accumulation over time. In addition to the pension shift, other factors would also have been expected to lead to increased household wealth over time, such as longer lifespans, higher health care costs, and lower returns. Despite all these developments, though, the wealth-to-income ratios have remained quite stable.[2]

Sources of retirement income that are not derived from SCF-reported wealth need to be estimated directly. For defined benefit pension income, the projections are based on the amounts reported by survey respondents. For Social Security, benefits are calculated directly based on estimated earnings histories for each member of the household. Once estimated, the components are added together to get total projected retirement income at age 65.

Figure 1. Ratio of Wealth to Income by Age from the *Survey of Consumer Finances*, 1983-2010



Source: Authors' calculations based on U.S. Board of Governors of the Federal Reserve System, *Survey of Consumer Finances* (SCF), 1983-2010.

To calculate projected replacement rates, we also need income *prior to* retirement. The items that comprise pre-retirement income include earnings, the return on 401(k) plans and other financial assets, and imputed rent from housing. In essence, with regard to wealth, income in retirement equals the annuitized value of all financial and housing assets; income before retirement is simply the return on those same assets.[3] Average lifetime income then serves as the denominator for each household's replacement rate.

Estimating Target Replacement Rates

To determine the share of the population that will be at risk requires comparing projected replacement rates with a benchmark rate. A commonly used benchmark is the replacement rate needed to allow households to maintain their pre-retirement standard of living in retirement. People clearly need less than their full pre-retirement income to maintain this standard once they stop working since they pay less in taxes, no longer need to save for retirement, and often have paid off their mortgage. Thus, a greater share of their income is available for spending. Target replacement rates are estimated for different types of households assuming that households spread their income so as to have the same level of consumption in retirement as they had before they retired.[4]

Calculating the Index

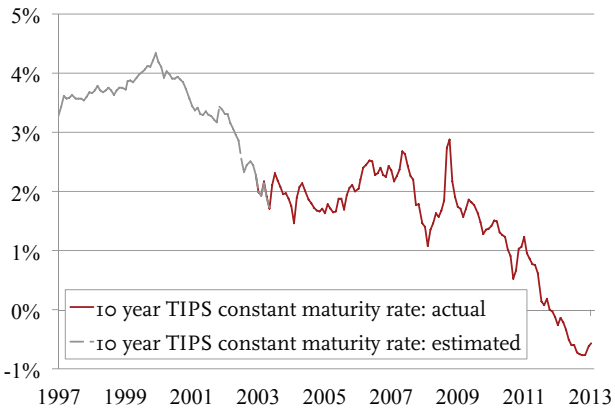
The final step in creating the Index is to compare each household's projected replacement rate with the appropriate target. Households whose projected replacement rates are more than 10 percent below the target are deemed to be at risk of having insufficient income to maintain their pre-retirement standard of living. The Index is simply the percentage of *all* households that are more than 10 percent short of their target.

The NRRI under Alternative Interest Rate Scenarios

Interest rates play a role in the NRRI calculation because households are assumed to purchase an inflation-indexed annuity with their financial assets – 401(k)/IRA holdings, financial assets outside of tax-preferred plans, and the proceeds from a reverse mortgage. The gain (loss) from higher (lower) interest rates is slightly offset by the fact that the portion of the house that can be accessed through a reverse mortgage varies inversely with the interest rate.[5] As just discussed, interest rates do not play a role on the accumulation side, because assets at 65 are based on the steady relationship by age between wealth and income observed in the SCF over almost 30 years.

This analysis considers two alternative interest rate scenarios. The first scenario has the real interest rate at zero percent for the full period,[6] as suggested by the current yield on Treasury Inflation-Protected Securities (TIPS) (see Figure 2). The second scenario considers a robust recovery, with the real interest rate slowly climbing from its 2010 level to a rate of 4 percent, the approximate level after TIPS were introduced in the 1990s.[7] These alternatives are compared with the 2010 baseline scenario, where interest rates are tapered from 2010 rates for households approaching retirement to 2004 rates (2.2 percent) for younger cohorts.[8] The year 2004 is used because it represents the most normal economic period and stable interest rate environment experienced in recent years.

Figure 2. Real Interest Rates on 10-year TIPS, 1997-2013



Note: The interest rate from 1/1/03 onward is that on the 10-year constant maturity TIPS. The interest rate prior to 1/1/03 is the authors' estimate of the 10-year constant maturity rate, based on TIPS market data.
Source: Federal Reserve Bank of St. Louis (2013).

The results of the exercise show relatively little change in the NRRI overall. It rises slightly, from 53 percent to 54 percent, when rates are low and falls slightly when rates are high (see Table 1).

Table 1. Percent of Households "At Risk" at Age 65 by Income Group and Interest Rate

Income group	Real interest rate		
	0%	Baseline (about 2%)	4%
All	54%	53%	51%
Lowest third	61	61	61
Middle third	56	54	51
Highest third	46	44	40

Source: Authors' calculations.

The change in the percentage at risk for all households is surprisingly small, given the large changes in real interest rates. The explanation is threefold. First, changes in interest rates have a muted effect on annuity income. One's initial thought might be that

a doubling of interest rates would lead to a doubling of retirement income. But annuity payouts consist of a return of principal along with interest earnings. Since changes in interest rates only affect the interest portion of the annuity payout, the impact on the full annuity payout is much smaller. Hence, a retiree with $100,000 will receive $507 per month from an inflation-indexed annuity when the real interest rate is 4.0 percent compared to $324 per month when it is 0 percent.[9]

Second, financial assets for most households are only a modest portion of their total wealth. For example, as shown in Figure 3, financial assets are only 10 percent of total wealth (including the present discounted value of Social Security and benefits from defined benefit pensions) for households aged 55-64 in the middle third of the income distribution. And, those in the lowest third, who rely heavily on Social Security for their retirement income, have miniscule levels of financial assets.

Third, housing wealth is a significant asset for many households. But, as described below, the impact of changes in interest rates on the payout from a reverse mortgage is partially offset by changes in the amount that can be borrowed.

The change in the percent of households at risk by age group shows that the households age 50-59 are less affected by the shift to a zero-percent rate than their younger counterparts (see Table 2). The reason is that the change from the baseline rate is smaller for older households than for younger households because their baseline rate is lower.

Table 2. Impact of Changing Interest Rate by Age Group

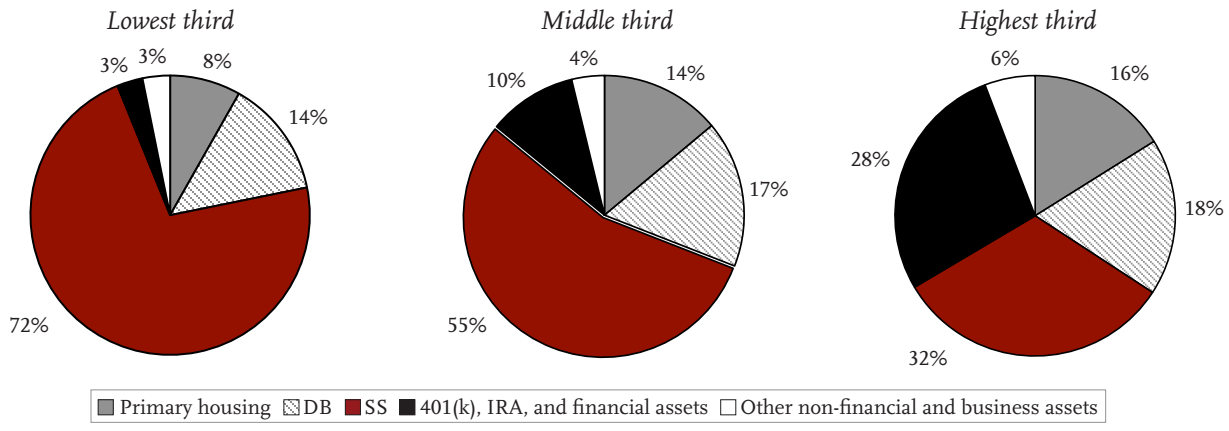
Age group	Real interest rate		
	0%	Baseline (2%)	4%
All	54%	53%	51%
30-39	64	62	60
40-49	57	55	52
50-59	44	44	42

Source: Authors' calculations.

Interest Rates and Reverse Mortgages

As noted, one complication in the simple story that higher interest rates produce more income and vice versa is the fact that interest rates also directly influence the amount that can be borrowed. For example, under the federal Home Equity Conversion Mortgage program for reverse mortgages, at a real interest rate of zero, 64 percent of the value of the house can be borrowed. At 4 percent, only 30 percent can be borrowed.[10] The reason for this variation is that, at higher interest rates, interest on the original amount borrowed cumulates more rapidly. To prevent an unacceptable increase in the risk of the loan, plus accumulated interest, exceeding the sale proceeds of the house, the lender must reduce the amount of the original loan. Thus, the change in the portion of the value of the house that can be borrowed offsets the

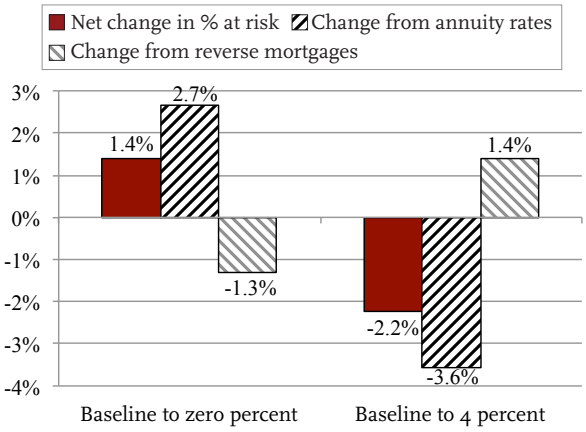
Figure 3. Financial Wealth as a Percent of Total Wealth by Income Group, Households 55-64, 2010



Note: The values reflect the mean of the middle 10 percent of each income tercile.
Source: Authors' calculations based on the 2010 SCF.

direct effect of interest rates on annuity income. For example, an interest rate of zero increases the share of households at risk by 1.4 percentage points, which (with rounding) is the net effect of a 2.7-percentage-point increase due to lower annuity rates and a 1.3-percentage-point decrease due to the ability to borrow more against the house (see Figure 4).

Figure 4. Impact of Reverse Mortgages on the Percent at Risk



Note: To decompose the change in percent at risk, the projections are run sequentially. First, the change from annuity rates is calculated by holding the percent of the value of the house available to borrow constant at the baseline level. Second, the percent of the house available is also allowed to vary, giving the net change. The change from reverse mortgages is the difference between these two numbers.
Source: Authors' calculations.

Conclusion

This NRRI analysis shows that, as of 2010, more than half of today's households will not have enough retirement income to maintain their pre-retirement standard of living even if interest rates rise substantially above their current low. Households are less vulnerable than expected to today's historically low interest rates, but higher interest rates would also provide no real cure to the problem of inadequate retirement saving.

Three factors explain the modest effect of interest rates on retirement security. First, changes in interest rates never hit annuity payouts with full force, because the principal portion of the payout is unaffected by interest rates. Second, most households have relatively little financial wealth. Finally, housing wealth is significant for many households, but the impact of movements in interest rates is partially offset by changes in the amount that can be borrowed through a reverse mortgage.

Endnotes

1 The Index does not include income from work, since labor force participation declines rapidly as people age.

2 For more detail on this analysis, see Delorme, Munnell, and Webb (2006) and Munnell (2012).

3 Interest on both mortgage debt and non-mortgage debt is subtracted from the appropriate components of both retirement income and pre-retirement income.

4 To ensure a stable replacement rate target, the analysis assumes that households calculate their targets based on expected rates of return when they enter the workforce. An alternative approach, which would be consistent with a life-cycle savings model, would be for households to continually update those targets based on realized returns and revisions to expectations of future returns.

5 The income obtainable on an inflation-indexed annuity depends on the real interest rate. The amount that a household can access through a reverse mortgage depends on the nominal interest rate.

6 The period of the analysis ends in 2045, when the youngest members of the NRRI sample turn 65 and are assumed to retire.

7 The 4-percent interest rate is fully phased in by 2021, so that younger households benefit more. Households retiring from 2016-2020 receive annuity income that is a blended average of the income payable when the interest rate is 4 percent and the income payable when the interest rate is at the 2010 level of 0.9 percent.

8 In the baseline scenario, the interest rate climbs from 0.9 to 2.2 percent over the period 2015-2038.

9 This example is for an individual born in 1956 and retiring in 2021. The year 2021 was chosen because it is when the 4-percent rate is fully phased in. The calculation is made by determining the expected present value of a joint life and two-thirds survivor annuity using the 10-year TIPS interest rate and then calculating annuity rates at other interest rates, using the same expected present value. In practice, insurance companies offering inflation-linked annuities do not completely hedge their liabilities by investing exclusively in TIPS, and the duration of annuities exceeds ten years. But calculations based on an assumption that insurers price annuities by reference to the yield on 10-year Treasury bonds provide reasonable estimates of the effect of *changes in* interest rates on annuity rates.

10 The calculations are before mortgage insurance premium, closing costs, and servicing cost set-aside. They assume a 2.5 percent inflation rate and a 2.5 percent lender's margin, so the nominal rates are 5 percent for the low-interest-rate scenario and 9 percent for the high-interest-rate scenario.

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The Center for Retirement Research at Boston College was established in 1998 through a grant from the Social Security Administration. The Center's mission is to produce first-class research and educational tools and forge a strong link between the academic community and decision-makers in the public and private sectors around an issue of critical importance to the nation's future. To achieve this mission, the Center sponsors a wide variety of research projects, transmits new findings to a broad audience, trains new scholars, and broadens access to valuable data sources. Since its inception, the Center has established a reputation as an authoritative source of information on all major aspects of the retirement income debate.

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Contact Information

Center for Retirement Research
Boston College
Hovey House
140 Commonwealth Avenue
Chestnut Hill, MA 02467-3808
Phone: (617) 552-1762
Fax: (617) 552-0191
E-mail: crr@bc.edu
Website: http://crr.bc.edu

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