Does the Benefit of Deferring Social Security Offset the Opportunity Cost to Do So?

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Executive Summary

- This study examined the extent to which deferring the claiming date for Social Security benefits preserved an individual's tax-deferred retirement assets, thus enhancing the ability to provide for constant real consumption.
- The analysis incorporated the relevant reductions and credits for early and late claiming, mortality risk, stochastic investment returns, and the availability of longevity insurance.
- Results provide guidance for financial planners to help clients make the optimal claiming decision.
- For single and married individuals with substantial savings, the deferral of benefits reduced the risk of retirement asset exhaustion.
- The results demonstrate the unique nature of the Social Security asset in the retirement portfolio as well as the value of self-insuring against longevity risk.

Thirty-eight years after the shift toward defined contribution plans commenced, increasing numbers of individuals are approaching retirement with an accumulation of tax-deferred savings[1] and asking: how patient should I be when it comes to claiming Social Security benefits?

The question is important because a new retiree faces a difficult trade-off. The annual Social Security benefit—indexed to inflation and uncorrelated with the returns on stocks and bonds—increases as the claiming age is delayed from 62 to 70. However, the retiree will have to spend down his or her nest egg while waiting to claim the higher benefit. Retirees may not have the resources to adequately analyze this trade-off. Therefore, this paper provides guidance for financial planners wanting to help clients decide whether to claim Social Security early, late, or sometime in between.

This study investigated the impact of the Social Security claiming decision on the sustainability of an individual's tax-deferred portfolio by modeling the experience of a new retiree who aspires to constant real annual consumption. The optimal claiming decision minimizes the risk that the individual will exhaust his or her retirement savings and be forced at some point to limit consumption to what is provided by Social Security.

A Monte Carlo simulation was used to examine the extent to which deferring the stream of Social Security benefits reduced the asset exhaustion risk facing a retirement portfolio. The study incorporated three resources available to every new retiree: (1) the initial amount of retirement savings; (2) Social Security; (3) and longevity insurance.[2] Individuals were assumed to have a simple objective: constant real consumption, provided for by some or all of these three resources.

The simulation ran a contest between the detrimental effect of front-loaded asset withdrawals and the benefit of higher deferred Social Security benefits. The model incorporated current mortality rates and maximum Social Security benefits, and projected investment experience based on the history of asset returns and inflation. In light of current low interest rates, this study then re-evaluated the results under the assumption that future asset returns and inflation will be lower than their historical averages.

Claiming Social Security at age 70 (having retired earlier) while enjoying constant real consumption requires an accelerated reduction in tax-deferred assets during the time that the retiree is waiting for the higher Social Security benefit. Those early supplemental drawdowns increase the chance that he will run out of money later, thereby failing to achieve his consumption goal. The objective of this study was to examine whether the higher inflation-adjusted benefit from deferred claiming was sufficient to compensate for the opportunity cost incurred to acquire it.

An important contribution of this analysis is an examination of the incremental value of insuring against longevity risk. In some of the simulations, it was assumed that the individual either purchased longevity insurance or replicated the coverage synthetically. The latter occurred by "ring fencing" the portion of the portfolio that would have otherwise been used to purchase coverage.

Literature Review

The Social Security claiming decision has been examined from several perspectives. Meyer and Reichenstein (2012) examined how the claiming decision affected the longevity of tax-sheltered assets of a single individual. They assumed that the retiree's objective was to maintain constant real consumption, and they assumed that the retiree applied the 4 percent rule to the tax-sheltered portfolio, thus implying a constant real return to the retirement portfolio. Further, they assumed all retirees plan for a 30-year retirement. Under their assumptions, they found that claiming Social Security late can add as much as 10 years to the life of the retirement nest egg.

Shoven and Slavov (2014a, 2014b) compared the value of the benefits forfeited by a delay in claiming against the expected value of the increase attributable to deferred credits, accounting for mortality risk. Their results showed that substantial gains were available to single and married households in the current zero real interest rate environment, but that as rates rise, claiming at age 62 becomes optimal.

Rose (2015) demonstrated that delaying the start of benefits from age 62 to age 66 produced a higher rate of return on the benefits postponed than delaying all the way to age 70. However, delaying the start of benefits beyond age 66, all the way to maximum of age 70, continued to positively impact the future standard of living for recipients.

Warshawsky (2015) used a simulation that incorporated stochastic investment returns and inflation to assess the relative merits of the 4 percent rule versus an immediate lifetime annuity and concluded that a combination of the two methods dominates either employed separately.

How patient should I be when it comes to claiming Social Security benefits?

Hubener, Maurer, and Mitchell (2016) employed a life cycle model to examine the optimal configuration of work and retirement, consumption and saving, and financial risk exposure. They found that claiming early was optimal for households with low income and low wealth, whereas wealthier households could take advantage of the greater cash flow stream made available by delayed claiming credits.

This paper's contribution to the literature on claiming Social Security is that it considered individuals and married couples who retire with a nest egg of tax-deferred stocks and bonds and must decide when to claim Social Security benefits. It incorporated current mortality tables as well as stochastic asset returns and inflation based on historical data, and it considered the availability of inflation-adjusted longevity insurance (deferred annuities).

This study also examined variations on the 4 percent rule (Bengen 1994), whereby 4 percent of the nest egg is consumed in the first year of retirement, and inflation-adjusted withdrawals are made each year after that. In this paper's terminology, a 62-year-old retiree following the 4 percent rule would amortize his assets over 25 years, until age 87. Finke, Pfau, and Blanchett (2013) argued that the 4 percent rule no longer works given current low returns to financial assets.

This study also analyzed how the claiming decision interacts with the nest egg portfolio as the retiree seeks to achieve the goal of constant real consumption over their remaining life span. Consumption smoothing as an objective can be traced back to Irving Fisher's 1930 model of intertemporal consumption (Fisher 1930) and is a central tenet of Franco Modigliani's life cycle hypothesis of consumption and saving (Modigliani and Brumberg 1954). Kotlikoff and Burns (2008) argued that retirement portfolios should be managed to provide smooth lifetime consumption.

Social Security Benefit Basics

The dollar amount of the retirement benefit available from Social Security is a function of career earning history and the age at which benefits are claimed. The current full retirement age is 66, and benefits may be claimed as early as age 62. A benefit reduction is assessed in relation to the full retirement age amount for each month that benefits are claimed prior to attainment of age 66. Deferred claiming credits increase the benefit for each month that claiming occurs after that time. An individual claiming at the earliest possible time will receive an annual benefit that is 25 percent lower than the full retirement age amount. Claiming at age 70 (when the deferred credit stops accruing) results in a benefit increase of 32 percent.

Married individuals are eligible for the greater of the spousal benefit or the benefit attributable to their own career earnings. Upon the death of a spouse, a married individual is entitled to the entire benefit earned by the spouse, if it is higher. Delayed claiming is therefore equivalent to purchasing a deferred joint and survivor life annuity, with the higher deferred benefit purchased by relinquishing near-term benefits.

Methodology and Assumptions

Claiming ages. The simulation examined the portfolio implications of the decision to claim Social Security benefits at three different ages: 62 (the earliest allowable age), 66 (the current full retirement age), and 70 (the age at which benefit increments for delayed claiming stop). The claiming decisions examined (specifically at ages 62, 66, and 70) are representative of the behavior of more than 75 percent of all persons filing for Social Security benefits in 2013; more than one-third of retirees claim at age 62 (Munnell and Chen 2015).

Earnings and savings. The simulation assumed that the individual earned, over his career, at least the maximum taxable earnings ($118,500 in 2016) that are subject to the tax for the Old Age, Survivors, and Disability Insurance (OASDI), and that the taxes on that contribution base were paid in each of the prior 35 years. This entitled the individual to the maximum Social Security benefit at any claiming age.

The maximum monthly benefit at age 62 is currently $2,102; at age 66 it is $2,639; and at age 70 it is $3,576. The simulation assumed that the individual accumulated tax-deferred savings from their career earnings in amounts ranging from $100,000 to $3 million. This range covers the majority of U.S. households ages 55 to 64 who have any retirement savings; according to a May 2015 GAO report, households at the 90th percentile of savings have amassed a nest egg of about $718,000.[3]

Life expectancy. The model ran 10,000 simulated lives for a retiree. In each "life," a year of death was assigned based on the current life tables used by the Social Security Administration. Thus, a simulated male retiree had about a 50 percent chance of living until age 85, and only a 1 percent chance of living past age 100.

Portfolio. The retiree's nest egg was invested 60 percent in large-capitalization stocks and 40 percent in long-term Treasury bonds. Over many scenarios, this mix consistently resulted in the lowest failure probabilities. For each year of a simulated life, the realized returns for both asset classes, along with the corresponding values for inflation, were selected by randomly drawing a year from the period 1926 to 2015. (Note that because inflation and the returns on stocks and bonds were all picked from the same year, the simulation preserved the historical correlations between these asset classes.)

Inflation. Inflation was measured using the Consumer Price Index for All Urban Consumers (CPI-U) and the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W). Annual consumption expenditures were tied to the CPI-U, whereas Social Security benefits were linked to the CPI-W. Stock, bond, and CPI-U values were obtained from Roger Ibbotson's *2016 Stocks, Bonds, Bills and Inflation Yearbook*, and the CPI-W for the year came from the St. Louis Fed's FRED database (fred.stlouisfed.org).

Low-return adjustments. The high valuation of financial assets concurrent with ultra-accommodative central bank policies has led to concerns that future investment returns may be lower than the historical ones used in these simulations. A combination of lower average returns with no corresponding reduction in return volatility should enhance both the value of the deferred claiming credits and constant real cash flows provided by Social Security. The model, therefore, also examined the risk of asset exhaustion and the optimal claiming decision under the assumption that future investment returns will retain their historical volatility, yet offer lower expected values. Specifically, the historical yearly returns on both stocks and bonds were reduced by 4 percent each year, and inflation figures were reduced by 1.5 percent each year. Thus, in the "low returns" simulation runs, the average value for CPI-U was 1.49 percent, and the returns to bonds and stocks averaged 2.20 percent and 7.85 percent, respectively. This means that the average real return to stocks and bonds declined by 2.5 percent, while the average annual equity risk premium remained equal to its historical value.[4]

Spending strategies. Next, the retiree's target level of consumption was fixed in real terms. Retirement spending was modeled under four different assumptions: (1) the retiree amortizes their nest egg over their median remaining life span; (2) the retiree purchases longevity insurance, which begins to pay off at the end of the median life span; (3) the retiree self-insures by taking the amount he would have spent on retirement insurance and "ring-fencing" that amount when determining the appropriate spending level; and (4) the retiree amortizes his nest egg assuming he will live to age 100. These four spending strategies are analyzed next in more detail.

It was assumed that in the first year of retirement (age 62 or 66), consumption was set equal to the age 62 or age 66 Social Security benefit, plus 1/*N* of the nest egg, where *N* was the retiree's median remaining life span. In effect, the retiree amortized the nest egg over the remaining life expectancy (to age 85 for men and age 88 for women), at a real interest rate of zero—which was the approximate yield on five-year TIPS as of this writing.

Subsequently, annual consumption was set equal to the prior year's consumption, adjusted for changes in the CPI-U. For example, a male who retires at age 66 with a $1 million nest egg would set initial (age 66) consumption equal to the age 66 Social Security benefit of $31,668 plus 1/19 of his nest egg ($52,632) for total consumption of $84,300.[5] Under this spending strategy, the retiree bears the risk of living past his life expectancy and must hope that the nest egg portfolio earns high enough returns to finance consumption past that age.

Note that if this retiree claimed Social Security at age 66, initial consumption would be financed by a combination of Social Security benefits and nest egg withdrawals, whereas if he deferred claiming to age 70, he must finance initial consumption entirely from his nest egg. The simulation thus runs a contest between the detrimental effect of higher asset withdrawals in the early years, versus the benefit of higher Social Security payments to be received later. Consumption is linked to the CPI-U, whereas annual increases to Social Security benefits are linked to the CPI-W. Therefore, a retiree who defers claiming until age 70 will be hurt in scenarios where CPI-U exceeds CPI-W in the early years of retirement.[6]

The model assumed that consumption expenditures (C) and Social Security benefits (S) were paid/received in the middle of the year. Thus, the retiree's wealth (W) at the end of any year (t) was given by:

$$W_t = [W_{t-1} \times (1+R_t) - C_t + S_t\,] \times (1+R_t) \qquad [1]$$

Where R_t is half the year's return on the portfolio; that is, $(1+R_t)^2$ equals one plus the annual return to the portfolio.

A failure occurs when W_t is negative for any year prior to death, which means that the retiree has exhausted the nest egg and must live on Social Security benefits alone. A success occurs when the retiree realizes the goal of maintaining constant real consumption up until the year of death; that is, W_t remains positive for all years of the retiree's life.

Longevity insurance. Although the initial simulations assumed that the retiree faced exposure to the risk that he would outlive his assets, subsequent models incorporated some form of protection. The first involved the purchase of longevity insurance. Longevity insurance was offered in the form of an inflation-protected deferred annuity—a stream of cash flow that begins at some point in the distant future and continues for the remaining life of the recipient. Those promised cash flows were purchased with a single payment today. The amount of that single payment was based on the length of the deferral period and the life expectancy of the individual at the time of purchase.

The deferred annuity purchased in the simulations provided a constant real amount of income starting at age 85 for males and age 88 for females, and continued until the death of the insured. Longevity insurance was purchased on the retirement date (age 62 or 66). Because the required expenditure reduced the initial value of tax-deferred assets, the level of constant real consumption over the life of the individual was lower than it was in the prior simulations. Determining the initial level of consumption in this case was more complicated because the amount of insurance to buy and initial consumption had to be determined simultaneously:

Let
W_0 = initial nest egg
W^* = nest egg remaining after purchasing longevity insurance
T = years until longevity insurance pays off
i = expected annual inflation (CPI-U) between today and time T
Y = cost to purchase an inflation-adjusted annuity that pays $1 at age T
C_0 = initial level of consumption upon retirement

Because the goal was to maintain constant real consumption, the retiree must purchase enough longevity insurance to create a year T cash inflow of $C_0 (1 + i)^T$. This will cost $Y [C_0 (1 + i)^T]$ today, leaving a nest egg of $W^* = W_0 - Y [C_0 (1 + i)^T]$.

To determine initial consumption C_0, the retiree will amortize the remaining nest egg W^* over T years, so:

$$C_0 = \frac{W^*}{T} = \frac{W_0 - Y[C_0(1+i)^T]}{T} \qquad [2]$$

Solving for C_0 gives:

$$C_0 = \frac{W_0}{T+Y(1+i)^T} \qquad [3]$$

To illustrate, suppose a 66-year-old male retiree with a nest egg of $1 million will purchase an inflation-indexed annuity that begins to pay off at age 85 (T = 19). Assume that expected inflation is 3 percent (the historical average from 1926 to 2015). To determine the cost of longevity insurance, quotes were obtained from several insurance companies for inflation (CPI-U) adjusted life annuities for various combinations of gender, current age, and target payoff date T. On average, these quotes indicated that purchasing an annuity that paid $1 of monthly income beginning at age 85 would cost $29 for a 66-year-old male. Thus, for a 66-year-old male, $1 of annual real income beginning at age 85 would cost $29/12, or $2.42 today.

Putting this all together, the retiree must set initial consumption to:

$$C_0 = \frac{1{,}000{,}000}{19 + (\frac{29}{12})(1.03)^{19}} = \frac{1{,}000{,}000}{23.2376}$$

$$= \$43{,}034$$

Table 1: Probability of Exhaustion of Tax-Deferred Savings with Age 66 Retirement

Tax-Deferred Savings	Unhedged Longevity Risk Claim Social Security		Longevity Insurance Claim Social Security		Self-Insurance Claim Social Security		Age 100 Amortization Claim Social Security	
	Age 66	Age 70	Age 66	Age 70	Age 66	Age 70	Age 66	Age 70
Simulations Based on Historical Asset Returns and Inflation								
$100,000	4.02%*	94.14%	2.00%*	96.44%	1.65%*	92.09%	0.43%*	88.92%
$200,000	4.20%	4.03%	1.66%*	16.68%	1.41%	1.73%	0.18%*	0.50%
$300,000	4.40%	1.42%*	1.67%	1.32%*	1.49%	0.19%*	0.21%	0.02%*
$400,000	4.45%	1.55%*	1.71%	0.86%*	1.33%	0.15%*	0.18%	0.03%*
$500,000	5.24%	2.19%	1.95%	1.13%*	1.50%	0.33%*	0.13%	0.01%*
$600,000	5.50%	2.95%*	2.03%	1.09%*	1.76%	0.49%*	0.16%	0.00%*
$700,000	5.55%	2.84%*	1.96%	1.10%*	1.85%	0.61%*	0.23%	0.02%*
$800,000	5.98%	3.61%*	2.16%	1.30%*	2.06%	0.64%*	0.18%	0.01%*
$900,000	6.13%	3.92%*	1.93%	1.35%*	1.77%	0.89%*	0.11%	0.03%*
$1,000,000	5.85%	4.32%*	2.25%	1.40%*	2.20%	0.93%*	0.20%	0.02%*
Simulations Based on Low Asset Returns and Inflation								
$100,000	5.29%*	95.59%	3.29%*	96.65%	2.71%*	94.33%	0.75%*	91.97%
$200,000	8.09%	7.13%*	3.76%*	28.78%	2.72%*	4.06%	0.45%*	1.64%
$300,000	10.23%	2.43%*	4.33%*	5.87%	4.05%	0.26%*	0.60%	0.01%*
$400,000	12.36%	3.97%*	5.32%	4.68%*	5.01%	0.53%*	0.66%	0.00%*
$500,000	13.31%	5.57%*	5.77%	5.06%*	5.70%	1.00%*	0.69%	0.02%*
$600,000	14.00%	7.53%*	5.77%	5.47%	6.32%	1.38%*	0.65%	0.02%*
$700,000	14.76%	8.82%*	6.84%	5.88%*	6.19%	1.77%*	0.99%	0.07%*
$800,000	15.62%	10.46%*	6.66%	6.09%	6.96%	2.49%*	0.98%	0.11%*
$900,000	15.51%	11.57%*	6.76%	6.14%	7.17%	3.62%*	0.96%	0.17%*
$1,000,000	16.25%	12.01%*	7.08%	6.86%	7.65%	3.94%*	1.10%	0.22%*

Notes: *For a given retirement spending strategy, a yellow shaded cell indicates that the failure probability at that claiming age is significantly different from the unshaded failure probability at the 5 percent level of significance.

plus the age 66 Social Security benefit of $31,668, for a total of $74,702.

To maintain constant real consumption, the retiree needs $43,034(1.03)^{19} = $75,460 at age 85. Purchasing an inflation indexed annuity with this age-85 cash payment costs $182,613 today, leaving a nest egg W^* of $817,387. Note that using these parameters, buying longevity insurance was essentially equivalent to determining first-year consumption by amortizing the initial nest egg W over slightly more than 23 years (to age 89), rather than to age 85 (over 19 years).

Of course, in order to forecast the required age 85 payoff from the annuity, the retiree must make an assumption about the CPI-U between now and age 85. As a consequence, unexpectedly high inflation over that period will increase the probability of asset exhaustion, while lower-than-expected inflation (resulting in a higher-than-needed annuity payout) will reduce it. Note that this approach implicitly assumes that Social Security payments will keep pace with the CPI-U. Also note that when the retiree purchases longevity insurance, his wealth at the end of any year (given by equation 1), will be increased by the payoff to the longevity insurance, which is also assumed to be received in the middle of the year.

Longevity insurance is costly because the buyer must pay a pro rata share of administrative fees and adverse selection costs. Therefore a "synthetic" insurance strategy whereby the retiree self-insured their longevity risk was examined. Here the retiree reduced his first-year consumption to the amount that would be available had he purchased a deferred annuity ($74,702 in the numerical example above). However, rather than turning $182,613 over to an insurance company, as in that example, the retiree simply retained that money in his portfolio. The retiree was thus fully exposed to longevity risk, but the extra cash generated by the "ring-fenced" portion of the nest egg served as an added buffer against asset exhaustion.

Lastly, the model examined what might be called the ultimate version of self-provided longevity insurance—amortization of tax-deferred assets to age 100, which is, in a practical sense, the upper bound of the individual's life span. Here the retiree traded off the near certainty that he will not outlive the nest egg for substantially lower consumption while living, since (for example) a 66-year-old male is now amortizing his nest egg over 34 years rather than 19.

Results

The simulations generated a large amount of information that may be viewed from several different perspectives.

A new retiree whose nest egg is fixed in size is likely to be interested in the results at a given wealth level, whereas a financial planner with clients who have nest eggs of varying sizes might be more interested in how the optimal strategy changes as wealth levels change. Evidence is provided from both perspectives in a series of tables.

For ease of reporting, the tables are truncated at nest egg levels of $1 million, because in all simulations, the failure probabilities did not change in any meaningful way at higher wealth levels. Thus, in terms of determining an optimal spending and claiming strategy, a retiree with a nest egg greater than $1 million can refer to the results for a $1 million portfolio.

Retiring at age 66. Table 1 contains the results of the initial simulation exercise. It presents the probability of exhausting the tax-deferred retirement savings of a 66-year-old, newly retired male[7] claiming Social Security at either age 66 or age 70, for all four longevity risk scenarios: (1) unhedged; (2) hedged with the purchase of a deferred annuity; (3) hedged with equivalent synthetic insurance; and (4) hedged with amortization of retirement savings to age 100.

The top half of Table 1 shows results using historical asset returns, and the bottom half shows results using low asset returns as described earlier. For each longevity risk scenario and wealth level, a yellow-shaded cell indicates that one claiming age has a significantly lower failure probability than the unshaded claiming age (in all tables the null hypothesis that the difference between any two probabilities is zero was tested using a binomial t-test). Recall the goal of this exercise: the retiree wishes to maintain constant real consumption over his remaining life span, and the table provides the probability that he will fail to achieve this goal.

Turning first to the decision as to when to claim Social Security, for a retiree with $100,000 or less in savings, claiming at age 66 was preferred, because for any given method of dealing with longevity risk, failure probabilities were significantly lower when doing so. At these levels, the nest egg was simply too small to support withdrawals of $31,668 per year (the age-66 benefit) while waiting four years to collect the higher age-70 benefit.

For the retiree who purchased longevity insurance, claiming at age 66 was preferred if the size of the nest egg was $200,000 or less.

At savings levels of $200,000 and above, the optimal claiming strategy depended on the retiree's hedging strategy as well as assumptions about future returns. Looking at the historical return simulations, when longevity risk was unhedged, the retiree was indifferent between claiming at age 66 or 70 with initial savings of $200,000. The increase in the benefit from waiting until age 70 to claim seems to be perfectly balanced against the fact that the higher benefit will be received for fewer years. That changed when the initial level of savings exceeded $300,000, causing claiming at age 70 to dominate.

In contrast, under the low-returns scenario, claiming at age 70 dominated for wealth levels as low as $200,000. Here, the boost to Social Security benefits obtained by waiting until age 70 to claim was relatively more valuable because the nest egg portfolio was underperforming relative to historical norms.

For the retiree who purchased longevity insurance, claiming at age 66 was preferred if the size of the nest egg was $200,000 or less; at higher wealth levels the risk of asset exhaustion was lower if Social Security was claimed at age 70. However, in the low-return environment, claiming at age 70 reduced (or held constant) the risk of asset exhaustion for portfolio values of $400,000 or more, because the implied return from deferring the claiming date had greater value.

In contrast, under the self-insurance strategy, claiming at age 70 was optimal for wealth levels of $300,000 or more under both return regimes. In this approach, the retiree bore the risk of outliving the nest egg, so the boost to Social Security benefits at age 70—indexed to inflation and paid until death—was a valuable hedge against longevity risk. Amortizing to age 100 produced similar results.

The spending strategy with the lowest failure probability was not necessarily the "optimal" strategy, because the low failure rate was often obtained at the cost of lowering today's consumption. Any given retiree might well prefer a higher failure rate when balanced against higher consumption today. However, when comparing the purchase of longevity insurance versus self-insuring, a lower failure rate was clearly preferable, because by construction, consumption was the same in these two strategies.

In both the historical and low-return simulations, self-insuring was preferred to purchasing a deferred annuity from a life insurance company, because the assets retained in the retiree's portfolio earned a relatively high return compared to the return on those assets implicit in the cost and payout of the deferred annuity. This higher return made up for the fact that the risk of outliving the nest egg was higher with the self-insured strategy.

Finally, note that in all simulation runs, failures generally occurred when the nest egg suffered poor investment performance, coupled with higher than normal inflation, during the first years

Table 2: Probability of Exhaustion of Tax-Deferred Savings with Age 62 Retirement

Tax-Deferred Savings	Unhedged Longevity Risk Claim Social Security			Longevity Insurance Claim Social Security			Self-Insurance Claim Social Security			Age 100 Amortization Claim Social Security		
	Age 62	Age 66	Age 70	Age 62	Age 66	Age 70	Age 62	Age 66	Age 70	Age 62	Age 66	Age 70
Simulations Based on Historical Asset Returns and Inflation												
$100,000	2.08%*	59.91%	95.53%	1.46%*	88.85%	96.47%	1.20%*	53.26%	95.51%	0.35%*	42.32%	95.42%
$200,000	2.11%	1.55%*	58.06%	1.05%*	2.20%	79.30%	0.81%	0.27%*	50.54%	0.18%	0.01%*	38.37%
$300,000	2.07%	1.40%*	14.01%	1.17%*	1.03%*	28.18%	1.03%	0.27%*	9.08%	0.11%	0.00%*	4.11%
$400,000	2.69%	1.52%*	3.46%	1.31%*	1.03%*	8.19%	1.07%	0.41%*	1.87%	0.10%	0.02%*	0.45%
$500,000	2.95%	2.02%*	1.65%*	1.33%*	1.08%*	2.84%	0.95%	0.49%*	0.52%*	0.17%	0.02%*	0.05%*
$600,000	2.93%	2.19%	1.56%*	1.47%	1.11%*	1.62%	1.11%	0.65%	0.31%*	0.19%	0.01%*	0.01%*
$700,000	3.04%	2.41%	1.83%*	1.51%	1.13%*	1.48%	1.19%	0.58%	0.25%*	0.16%	0.02%*	0.01%*
$800,000	3.33%	2.37%	1.82%*	1.48%	1.40%	1.21%	1.21%	0.77%	0.47%*	0.15%	0.09%	0.00%*
$900,000	3.25%	2.87%	1.87%*	1.45%	1.26%	1.47%	1.12%	0.96%	0.49%*	0.21%	0.04%*	0.01%*
$1,000,000	3.43%	2.72%	2.21%*	1.63%	1.69%	1.40%	1.38%	0.91%	0.57%*	0.22%	0.01%*	0.04%*
Simulations Based on Low Asset Returns and Inflation												
$100,000	4.02%*	70.54%	96.21%	2.53%*	89.27%	96.31%	1.83%*	65.27%	95.86%	0.53%*	55.46%	95.29%
$200,000	5.35%	2.39%*	74.23%	2.77%*	3.49%	84.18%	2.62%	0.85%*	67.17%	0.40%	0.05%*	56.82%
$300,000	6.98%	2.77%*	26.02%	3.77%	2.51%*	39.31%	2.96%	0.59%*	19.84%	0.42%	0.00%*	10.59%
$400,000	8.36%	4.38%*	8.04%	4.79%	2.74%*	14.49%	4.07%	1.25%*	5.07%	0.45%	0.05%*	2.20%
$500,000	9.38%	6.36%	4.32%*	5.02%	3.27%*	6.06%	4.77%	1.90%*	1.80%*	0.62%	0.09%*	0.40%
$600,000	9.93%	7.02%	4.16%*	5.85%	3.52%*	4.17%	4.98%	2.43%	1.03%*	0.60%	0.12%*	0.07%*
$700,000	10.92%	7.47%	4.57%*	5.79%	4.48%	3.86%*	5.10%	3.27%	1.10%*	0.85%	0.19%	0.04%*
$800,000	10.99%	9.19%	5.51%*	6.44%	4.41%*	4.39%*	5.87%	3.19%	1.55%*	0.90%	0.32%	0.01%*
$900,000	11.87%	9.33%	6.48%*	6.69%	4.67%*	4.23%*	5.71%	3.56%	1.72%*	1.32%	0.16%	0.01%*
$1,000,000	12.15%	10.21%	7.27%*	6.45%	5.29%	4.58%*	5.98%	4.15%	2.08%*	1.09%	0.30%	0.05%*

Notes: *For a given retirement spending strategy, if one cell is shaded yellow, that failure probability is significantly lower than the other two at the 5 percent level. If two cells are shaded yellow, those failure probabilities are not significantly different, but each is significantly lower than the unshaded failure probability at the 5 percent level.

of retirement. For example, consider a retiree with a $500,000 nest egg who retired at age 66, claimed at age 70, and did not hedge longevity risk. In "failed" runs, the average portfolio return in the first five years of retirement was 3.8 percent, and the CPI-U averaged 4.4 percent. In contrast, "successful" runs saw an average portfolio return of 9.5 percent coupled with average CPI-U of 2.6 percent in the first five years.

Retiring at age 62. Next, consider the scenario in which an individual retires at age 62, invests retirement savings in a 60/40 stock/bond portfolio, and claims benefits at three different ages: 62, 66, or 70.

Separate simulations used historical returns and low returns, and the results are summarized in Table 2. In this table, for a given wealth level and spending strategy, one cell is shaded yellow if the failure probability at that claiming age was significantly lower than the other two, and two cells are shaded if they have statistically equivalent failure probabilities, and both are significantly lower than the third, unshaded, cell.

Note that the failure probabilities in Table 2 can't be directly compared to the results in Table 1, because they refer to a different set of scenarios. In Table 2, the retiree spends the age 62 Social Security benefit plus 1/*N* of the nest egg, where *N* is four years longer than in Table 1. Hence, annual consumption for the 62-year-old retiree is somewhat lower than for the 66-year-old retiree.

Table 2 indicates that a retiree with $100,000 or less in savings should claim Social Security immediately, as failure is a near certainty if claiming is delayed until age 66 or 70. As before, the nest egg is too small to support four or eight years of withdrawals while waiting to collect a higher benefit.

Turning to wealth levels of $200,000 and above, for the historical return simulations there was little support for waiting until age 70 to claim when purchasing longevity insurance, or amortizing the nest egg to age 100. When claiming at age 70 with retirement savings of $600,000 or more, there was only one case in which age-70 probabilities were statistically significantly lower, and the difference was not economically significant. This is in contrast to the results in Table 1 for a 66-year-old retiree, which showed that when purchasing longevity insurance or amortizing to age 100 waiting to claim at age 70 made sense. For the 62 year old, however, it appeared that waiting eight years to begin collecting Social Security left the nest egg too vulnerable to a sequence of poor portfolio returns and high inflation over that time span.

For example, consider an individual with a $400,000 nest egg who retires at age 62, claims at age 70, and does not hedge against longevity risk. Table 2

Table 3: Probability of Exhaustion of Tax-Deferred Savings for Married Couples with Age 66 Retirement

Age 66 retirement, with wife claiming Social Security at age 66 and husband claiming Social Security at ages 66 or 70

Tax-Deferred Savings	Historical Returns/Age 85 Husband claims at:		Historical Returns/Age 100 Husband claims at:		Low Returns/Age 85 Husband claims at:		Low Returns/Age 100 Husband claims at:	
	Age 66	Age 70	Age 66	Age 70	Age 66	Age 70	Age 66	Age 70
$100,000	8.77%*	93.60%	4.35%*	87.65%	9.46%*	95.01%	4.46%*	91.56%
$200,000	7.39%	5.04%*	2.95%	1.19%*	9.91%	8.37%*	3.68%	1.93%*
$300,000	7.91%	2.63%*	2.48%	0.71%*	11.73%	3.51%*	3.52%	0.79%*
$400,000	7.98%	2.78%*	2.47%	0.86%*	12.52%	3.73%*	3.50%	0.98%*
$500,000	8.00%	3.39%*	2.53%	0.87%*	14.26%	4.95%*	3.27%	1.31%*
$600,000	8.62%	3.55%*	2.56%	0.92%*	15.50%	6.14%*	3.69%	1.30%*
$700,000	8.97%	4.52%*	2.47%	0.95%*	15.96%	7.21%*	3.89%	1.27%*
$800,000	9.02%	4.64%*	2.62%	1.14%*	17.16%	8.77%*	3.81%	1.58%*
$900,000	9.34%	5.41%*	2.58%	1.23%*	17.51%	10.36%*	4.90%	1.76%*
$1,000,000	9.70%	5.55%*	2.63%	1.43%*	17.82%	11.59%*	4.21%	1.73%*

Notes: *For a given retirement spending strategy, a shaded yellow cell indicates that the failure probability at that claiming age is significantly different from the unshaded failure probability at the 5 percent level of significance.

Table 4: Probability of Exhaustion of Tax-Deferred Savings for Married Couples with Age 62 Retirement

Age 62 retirement, with wife claiming Social Security at age 62 and husband claiming Social Security at ages 62, 66, or 70

Tax-Deferred Savings	Historical Returns/Age 85 Husband claims at:			Historical Returns/Age 100 Husband claims at:			Low Returns/Age 85 Husband claims at:			Low Returns/Age 100 Husband claims at:		
	Age 62	Age 66	Age 70	Age 62	Age 66	Age 70	Age 62	Age 66	Age 70	Age 62	Age 66	Age 70
$100,000	6.69%*	61.24%	96.33%	3.91%*	43.90%	95.24%	7.61%*	72.22%	96.41%	4.00%*	56.88%	95.46%
$200,000	6.02%	3.79%*	68.81%	2.87%	1.32%*	47.91%	8.06%	3.80%*	76.74%	3.30%	1.28%*	60.69%
$300,000	5.63%	3.62%*	17.43%	2.40%	1.12%*	4.53%	9.18%	4.42%*	26.62%	3.57%	1.48%*	9.20%
$400,000	6.01%	3.86%*	4.11%*	2.33%	1.38%	0.77%*	10.40%	5.17%*	7.72%	3.67%	1.35%*	1.58%*
$500,000	5.37%	4.09%	2.68%*	2.31%	1.35%	0.68%*	11.51%	6.86%	4.06%*	3.61%	1.70%	0.64%*
$600,000	6.50%	4.47%	2.37%*	2.33%	1.59%	0.60%*	11.93%	7.62%	3.34%*	3.71%	1.85%	0.60%*
$700,000	6.84%	5.15%	2.58%*	2.44%	1.47%	0.72%*	13.41%	8.81%	3.89%*	4.06%	1.95%	0.72%*
$800,000	6.39%	5.33%	2.55%*	2.74%	1.50%	0.48%*	14.39%	9.55%	4.58%*	4.14%	2.34%	0.65%*
$900,000	7.17%	6.31%	3.45%*	2.78%	1.62%	0.59%*	14.89%	10.30%	4.96%*	4.36%	2.32%	0.78%*
$1,000,000	6.91%	6.21%	3.79%*	3.09%	1.60%	0.94%*	15.43%	10.93%	5.75%*	4.24%	2.21%	1.05%*

Notes: *For a given retirement spending strategy, if one cell is shaded yellow, that failure probability is significantly lower than the other two at the 5 percent level. If two cells are shaded yellow, those failure probabilities are not significantly different, but each is significantly lower than the unshaded failure probability at the 5 percent level.

indicates a failure rate of 3.46 percent. In the first five years of failed runs, the portfolio averaged a return of 0.1 percent versus a CPI-U of 4.9 percent, while in successful runs the portfolio returned 9.7 percent annually, versus inflation of 2.7 percent. For nest eggs of $600,000 or more, claiming at age 70 was optimal in the unhedged and self-insured scenarios.

Considering the results for the simulated low-return environment, there was a clearer case for waiting to claim at age 70 in some instances. Specifically for retirees with nest eggs of $500,000 or more, claiming at 70 was optimal if longevity risk was unhedged or hedged via self-insurance. For nest eggs larger than $700,000, claiming at age 70 was preferred to claiming at age 66 if the retiree purchased longevity insurance or amortized to age 100.

As before, note that the lower failure rate for "Age 100 Amortization" relative to "Unhedged Longevity Risk" in Table 2 is not necessarily preferable because it is purchased at the cost of lower annual consumption. But, it's reasonable to compare failure probabilities for longevity insurance versus self-insurance directly, because by construction, consumption was the same in these two scenarios. In contrast to the findings in Table 1, here self-insurance dominated purchasing a deferred annuity regardless of what was assumed about future returns and inflation. At any savings level, the failure probability in the shaded square(s) with self-insurance was significantly lower than the shaded square(s) with purchased longevity insurance.

Married couples. This section examines the optimal claiming decision for heterosexual married couples. The analysis was motivated by the survivorship benefit that entitles the surviving spouse to the benefit of the deceased, if higher. Given that women outlive men on average, a set of simulation exercises determined whether the risk of asset exhaustion was affected by the joint claiming decisions of the spouses.

There was one change to the model as described so far: the simulation assumed that both spouses retire at age 62 (or age 66), and set first-year consumption for the couple equal to twice the age 62 (or age 66) Social Security benefit, plus 1/*N* of the nest egg. When one spouse dies, the next year's consumption was set to one-half of consumption in the prior year.[8]

Credits for deferral effectively generate an average annual return of 8 percent.

Table 3 contains the simulation results assuming retirement at age 66, and Table 4 reports the results to simulations that model retirement at age 62. The analysis examined amortization of the nest egg to either age 85 or age 100, using both historical investment returns and the low-return scenario employed earlier. Given that the objective was to explore the impact of survivor benefits, longevity insurance was not incorporated into these simulations.

In contrast to the simulations reported in Table 1 and Table 2 for a single male, prescriptions for the married couple are more clear-cut. Turning to Table 3, for a couple retiring at age 66 with a nest egg of $100,000 or less, both parties should claim at age 66, regardless of the spending strategy or return regime. For nest eggs of $200,000 or more, results suggest that the wife should claim at 66 and the husband should claim at 70 under all scenarios.

When both spouses retire at age 62 and the wife claims immediately, Table 4 indicates that the husband should claim at age 62 if savings are $100,000 or less, at age 66 if savings are between $200,000 and $400,000, and at age 70 if savings equal or exceed $500,000.

The "stair-step" patterns to the yellow-shaded cells in Table 3 and Table 4 demonstrate the conclusion that the more wealth the married couple starts with, the later the husband should claim. However, because the size of the nest egg required to claim at age 70 exceeds what 75 percent of all savers currently possess, the conclusion once again is that claiming Social Security at age 70 is the optimal choice for only a minority.

Implications for Financial Planners

As the gap has gradually widened between life expectancy and the Social Security full retirement age, the promised benefit stream has evolved from being strictly old age insurance (payments received in the few remaining years of life) to representing a unique, long-duration asset in the portfolio—one that provides a premium to the riskless return when claiming is deferred, is indexed to a less conservative measure of inflation, and is uncorrelated with the return on other financial assets. The simulation results presented here analyzed the claiming decision in that context.

For a client on the cusp of retirement, with the size of the nest egg essentially fixed, the decision of when to claim Social Security has an impact on the feasibility of maintaining constant real consumption. This paper's results provide a set of guidelines for planners to follow.

First, a strategy of deferring the claiming date for Social Security is generally feasible if the client has at least $300,000 in retirement assets upon leaving the workforce. Meeting or exceeding that threshold creates a realistic opportunity to maintain their desired standard of living while waiting to file for a higher Social Security benefit. Clients with smaller retirement accumulations should claim Social Security immediately upon retirement.

Second, if future investment returns are expected to be lower than their historical averages, advising the client to claim late makes constant real consumption more likely. That is because lower future expected returns reduce the opportunity cost of waiting for Social Security benefits. Another way of looking at that finding is: credits for deferral effectively generate an average annual return of 8 percent. A reduction in returns on the retirement portfolio makes the return on deferral relatively more attractive, so deferral becomes more valuable.

Finally, the simulations demonstrated the financial advantage of having a client self-insure against longevity risk while claiming Social Security benefits on a delayed basis. Clients who anticipate living beyond their expected life span may benefit from a deferred annuity, thereby trading off current consumption for a guaranteed level of future consumption. Rather than incur a cash outflow to acquire an actual longevity insurance contract, the results showed that it was more prudent to sequester, or ring-fence, the funds that would otherwise be spent on the deferred annuity and reduce consumption by a pro rata amount. Claiming Social Security later enhanced the likelihood that the self-insurance strategy would do the best job of preserving a client's portfolio.

This study points to the valuable role that a financial planner can play in shepherding a client through the process of claiming Social Security and spending their nest egg through-out retirement. In particular, a new retiree might be reluctant to spend down his or her portfolio while waiting four or eight years to claim Social Security. The results here can be used to help demonstrate the benefits of that trade-off. ■

Endnotes

1. The Revenue Act of 1978 included a provision that became Internal Revenue Code Sec. 401(k), paving the way for the establishment of defined contribution plans. And according to the *2016 Investment Company Fact Book* (ici.org/pdf/2016_factbook.pdf), at the end of 2015, 60 percent of U.S. households had some tax-advantaged retirement savings, and IRA and defined-contribution plan assets invested in mutual funds totaled $7.1 trillion.
2. It was implicitly assumed that the retiree was not covered by a defined benefit pension plan. The merits of longevity insurance are discussed by Scott (2015), Sexauer, Peskin, and Cassidy (2015), and Ezra (2016).
3. See "Retirement Security: Most Households Approaching Retirement Have Low Savings," at gao.gov/assets/680/670153.pdf.
4. Although these adjustments are ad hoc, the inflation and bond figures are consistent with recent U.S. experience. The U.S. inflation rate for the 12 months ended September 2016 was 1.5 percent, and the 30-year T-Bond yield was 2.32 percent on September 30, 2016. A 5.65 percent equity risk premium is consistent with the survey evidence in Fernandez, Ortiz, and Fernandez (2016). And, qualitative conclusions about a low return environment are unchanged if these values are varied slightly.
5. Comparable pre-tax income in the year prior to retirement would have been $91,435, assuming the retiree earned exactly the Social Security maximum of $118,500. Subtracting $9,065 in OASDI and Medicare taxes and $18,000 of pre-tax salary contributed to the tax-deferred plan leaves $91,435. This individual will therefore live on 92 percent of pre-retirement earnings, which is line with the conventional wisdom that a retiree needs 70 percent to 100 percent of their pre-retirement income to live comfortably.
6. On the other hand, if there is deflation, consumption is reduced by CPI-U, but Social Security benefits are unchanged even if CPI-W is negative. From 1926 to 2015, the CPI-U averaged 2.99 percent per year, whereas the larger of zero and CPI-W averaged 3.39 percent per year. But, in 42 of these 90 years, CPI-U exceeded CPI-W.
7. All simulations were run on the assumption that the individual was female. She was expected to live between three and four years longer than a male, and so the simulation amortized her nest egg to age 88 in the "unhedged" scenario. Her cost of longevity insurance was slightly more than a male's. Although she will live longer, the deferred annuity started paying out at a later date, and these two effects offset to some extent. Thus, no substantive conclusions in the analysis changed depending on the gender of the retiree.
8. The model assumed that each spouse had their own separate earnings history and was eligible for their own Social Security benefit. Variations of the model, wherein the female earned a lower benefit than the male, and where household expenses only fell by 25 percent rather than 50 percent upon the death of the first spouse, did not significantly affect any conclusions regarding the optimal claiming age of the male as reported in Table 4.

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