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SHOULD HOUSEHOLDS BASE ASSET DECUMULATION STRATEGIES ON REQUIRED MINIMUM DISTRIBUTION TABLES?

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Abstract

Households managing wealth decumulation in retirement must trade off the risk of outliving their wealth against the cost of unnecessarily restricting their consumption. Devising an optimal decumulation plan, reflecting uncertain mortality and asset returns, is well beyond the abilities of most households, who likely rely on rules of thumb. Using numerical optimization, we compare one such rule of thumb - consuming the age-related percentage of remaining wealth specified in the IRS Required Minimum Distribution (RMD) tables – with alternatives and with the theoretical optimal. We show that in models that incorporate uncertain investment returns a decumulation strategy based on the RMD tables performs better than plausible alternatives, such as spending the interest and dividends, consuming a fixed 4 percent of initial wealth, or decumulating over the household's life expectancy. The RMD tables generally result in too little wealth being consumed at younger ages, and are, therefore, relatively attractive to households with low intertemporal elasticities of consumption. But all the above strategies fall well short of the theoretical optimum.

Introduction

Over the last 30 years, 401(k) and other defined contribution retirement plans have displaced defined benefit pension plans in the private sector. Defined benefit plans traditionally provided benefits in the form of a lifetime annuity. In contrast, in 401(k) plans, annuitization is voluntary, rare, and often not even a plan option. Participants face the challenge of decumulating their wealth over their remaining lifetimes, trading off the risk of outliving that wealth against the cost of unnecessarily restricting their consumption.

Devising an optimal plan requires the application of numerical optimization techniques that are beyond the abilities of households and their financial advisers. Households, to the extent that they plan decumulation at all, must rely on rules-of-thumb that are clearly sub-optimal. For example, a widely advocated rule is to consume 4 percent of initial wealth.[1] Although Bengen (1994) shows that a household following this strategy is at relatively low risk of outliving its wealth, the 4 percent rule fails the test of optimality because the amount consumed does not respond to realized investment returns.

This paper explores an alternative approach, namely for households to base their decumulation strategies on Required Minimum Distribution (RMD) tables. These specify the minimum amounts that must be drawn out of IRA and 401(k) accounts to avoid tax penalties. Although the IRS makes no claim that the withdrawals are optimal, a strategy based on these tables does satisfy two important requirements of an optimal decumulation strategy. First, assuming no bequest motive, the percentage of remaining wealth that is consumed each year will increase with age, reflecting decreasing remaining life expectancy. Second, the dollar amount consumed will respond to fluctuations in the market values of financial assets.

Assuming plausible preference parameters, and using numerical optimization techniques, we compare a strategy based on the RMD tables with three alternative rules of thumb: 1) the 4 percent rule described above; 2) spending the interest and dividends while preserving the capital; and 3) spending down over one's life expectancy. We also calculate an optimal strategy and evaluate the RMD and alternative strategies in terms of "strategy equivalent wealth," the percentage by which the initial financial assets of a household following the optimal strategy would have to increase so that it would be indifferent between adopting that strategy and following the RMD or other rule of thumb. We test the sensitivity of our findings to alternative

[1] A Google search for "four percent rule" and "retirement" produces over 50,000 hits.

assumptions regarding rates of return, household wealth, risk preferences, annual mortality risk, and marital status.

We first consider a model in which the household invests only in a single risk-free asset. We then extend the analysis to include a choice between risky stocks and a risk-free bond, assuming that the household adopts either an optimal or a typical portfolio allocation. We then consider high and low mortality households.

When we assume only a single, risk-free asset, we find that a strategy of using the RMD tables performs not quite as well as strategies of spending the interest and dividends, and following the 4 percent rule. But all the rules of thumb fall well short of the theoretical optimal. When we allow the household to invest in risky assets, the RMD strategy often outperforms the alternatives, while still falling short of the theoretical optimal. Relative to the optimal, households using the RMD consume too little early in retirement. The financial planning literature claims that the four percent rule is appropriate for households holding a mixed stock-bond portfolio. We show that this strategy is highly sub-optimal for such households and is only attractive to risk-averse households prepared to hold an all-bond portfolio. The above results are robust to reasonable alternative assumptions about mortality risk.

The remainder of this paper is organized as follows. Section 1 presents a model of optimal wealth decumulation in retirement. Section 2 discusses how households appear to behave in practice, and critiques plausible rules of thumb. Section 3 describes the RMD tables. Section 4 compares both a decumulation strategy based on the RMD and plausible alternatives with the theoretical optimal, and tests the sensitivity of these results to alternative assumptions about risks, asset allocations, and preferences. Section 5 concludes.

1. A model of optimal wealth decumulation in retirement

Households managing wealth decumulation in retirement must trade-off the risk of outliving their wealth against the cost of unnecessarily restricting their consumption. According to economic theory, they will choose a consumption and decumulation plan that maximizes:

$$\sum_{t=65}^{T} B^{t-65}(\rho_t^m U_m + \rho_t^f U_f) \qquad (1)$$

This represents the sum of the husband's and wife's utilities from age 65 to time *T*, an assumed maximum age of death, discounted by a rate of time preference, *B*, which may vary between households but is assumed to be 3 percent, and multiplied by ρ_t^m and ρ_t^f the probabilities that at time *t*, the husband and wife are alive.

We follow the literature (Brown and Poterba, 2000) and assume a constant relative risk aversion (CRRA) utility function of the following form:

$$U_m(C_t^m, C_t^f) = \frac{(C_t^m + \lambda C_t^f)^{1-\gamma}}{1-\gamma}, U_f(C_t^m, C_t^f) = \frac{(C_t^f + \lambda C_t^m)^{1-\gamma}}{1-\gamma} \qquad (2)$$

where λ equals the complementarity of consumption between husband and wife, assumed to be 0.5.[2] We assume coefficients of risk aversion of 2 and 5. Estimates in the academic literature range between 2 and 10, depending in part on whether the estimates are derived from portfolio theory, purchases of insurance, economic experiments, or preferences over lotteries (Chetty, 2003). We assume that the marginal utility of consumption does not vary with age.

In each period, households choose how much to consume, and how to allocate their wealth between stocks and bonds. We assume that stock returns are log-normally distributed with a mean of 6.5 percent and a standard deviation of 20.0 percent, the average for the period 1926-2010.[3] One treatment of bonds would calculate the mean and standard deviation of historical returns and their covariance with stock returns. But Campbell and Viceira (2002) argue that this approach overstates the riskiness of bonds. In contrast to short-term deposits, which provide a guaranteed return of capital but an uncertain annual income, long-term bonds provide a guaranteed return on capital and a guaranteed return of capital on maturity.[4] If a long-term investor knew his consumption requirements with certainty, he could fund them by buying a portfolio of bonds of appropriate durations. We therefore assume that bonds yield a fixed real 3 percent return, approximating to the yield on long-dated corporate bonds, after deducting

[2] An alternative would be to assume that basic living expenses, possibly an amount equal to Social Security benefits, did not contribute to utility. For a given coefficient of risk aversion, households would then choose a lower initial level of consumption and a less rapid decline in consumption with age.
[3] Authors' calculations based on Ibbotson Associates (2010) data.
[4] Corporate bonds are subject to default risk. Government bonds and most short-term deposits are backed supported by government guarantees.

anticipated inflation.[5] Given our assumption regarding the risk and return on long-dated bonds, our households are assumed to be unwilling to hold short-term deposits.

Since short-term deposits constitute a substantial proportion of most households' portfolios, we also consider a model in which households hold typical portfolio allocations. Short-term nominal interest rates are currently close to zero and are substantially less than zero after deducting anticipated inflation, well below the historical average.[6] To reflect both current and prospective short-term interest rates, we assume that short-term deposits yield a real 1 percent return.

We consider single men, single women, and married couples aged 65. The household receives retired worker and spousal benefit from Social Security in the amounts of $12,000 and $6,000 a year, respectively.[7] In the event of the wife dying, spousal benefit ceases. In the event of the husband dying, the wife switches to the survivor benefit, also assumed to be $12,000 a year. We assume that the household has $100,000 or $250,000 of financial assets, approximating to the 60th and 80th percentiles of the distribution of financial assets among retired households. Under the assumption of constant relative risk aversion, households with smaller amounts of financial wealth, relative to their Social Security wealth, will prefer a faster decumulation of financial assets. But the maintenance of liquidity may be an important consideration for households with modest amounts of financial assets, and we therefore do not attempt to model strategies for households with less than $100,000. Likewise, we do not analyze the most affluent, for whom bequests may be an important consideration. We ignore housing equity.[8] Each period, the household decides what percentage of its wealth to consume and how to allocate its remaining wealth between stocks and a risk-free bond. We do not model the

[5] Yields are currently at historic lows. At 30 December 2011, the current yield on the FINRA-Bloomberg active U.S. corporate bond index was 4.68 percent. The mean forecast for inflation over the coming 10 years from the Survey of Professional Forecasters published by the Federal Reserve Bank of Philadelphia is 2-2.5 percent, implying a real return of 2.18-2.68 percent. Investors in corporate bonds face default risk and an uncertain inflation rate. Both of these risks can be eliminated by holding Treasury Inflation Protected Securities (TIPS), which currently yield less than 1 percent, but which have yielded more than 2 percent in the recent past.

[6] Historical averages are potentially misleading, reflecting the inflation shocks of the 1970s and 1980s. Survey of Professional Forecasters data on the one-year anticipated rate of inflation is available only from 1981. We estimate inflation expectations for the period 1960 to 1981 using a time series model. Using the above data, we calculate that the anticipated real interest rate on 1-year Treasury bills averaged just over 2 percent during the period 1960-2011.

[7] In 2009, the average Primary Insurance Amount for new retired worker benefit awards to men was $1,563. Social Security Administration (2010) Table 6.B4. http://www.ssa.gov/policy/docs/statcomps/supplement/2010/6b.pdf

[8] Venti and Wise (2004) show that households typically do not consume housing equity until advanced old age. We acknowledge that some households may retain housing equity as self-insurance against medical and long-term care costs (Davidoff, 2010).

option to purchase an annuity, as rates of voluntary annuitization are extremely low.[9] We model the federal income tax, and in particular, its treatment of Social Security income.[10]

2. How do households behave and why do rules of thumb fall short?

Many elderly households retain large amounts of wealth until advanced old age. Hurd and Rohwedder (2010) find evidence of decumulation by elderly singles but find limited evidence for couples, possibly reflecting a desire to preserve wealth for the surviving spouse. DeNardi, French, and Jones (2010) find that elderly single women decumulate their financial assets very slowly and attribute this to the risk of uninsured medical costs.

It is unclear what decision rules households adopt. Webb (2009) analyzes a variety of plausible rules of thumb. One strategy is to spend the interest and dividends while preserving the capital. This strategy has a number of serious drawbacks. First, the household will die and leave its initial wealth plus capital gains unconsumed, an outcome that may or may not accord with the strength of its bequest motive. Second, both initial consumption and the rate of growth of consumption will depend on asset allocation, and may not accord with the household's preferences. The dividend yield on the S&P 500 stock market index is approximately 2 percent, far less than the interest return on an investment in bonds. So households that invest in stocks will have lower initial income than those that invest in bonds. Third, the household may allow its need for income to dictate its portfolio allocation, arriving at a portfolio that sub-optimally trades off risk against return.

A second strategy is to spend down over one's life expectancy or to an age at which there is a low probability of surviving. The variant of this strategy that we model is to consume a fraction of initial wealth equal to:

$$\frac{r}{1-(1+r)^{-t}}$$

[9] A substantial literature considers optimal portfolio allocation strategies when the household has the option to annuitize – for example, Horneff, Maurer, Mitchell, and Dus (2008) and Horneff, Maurer, Mitchell, and Stamos (2010).

[10] The taxation treatment of Social Security benefits is as follows. First, the household's "combined income" is calculated. This equals regular taxable income plus 50 percent of Social Security income. The amount of Social Security income that is taxable is the minimum of three tests: (1) 50 percent of combined income over the first threshold ($25,000 for singles and $32,000 for married couples), plus 35 percent of combined income over the second threshold ($34,000 for singles and $44,000 for married couples); (2) 50 percent of benefits plus 85 percent of combined income over the second threshold; (3) 85 percent of benefits. Internal Revenue Service (2012) http://www.irs.gov/pub/irs-pdf/p915.pdf

in each period, where *r* is the risk-free interest rate, and *t* is life expectancy at retirement. This is clearly sub-optimal in that the household fails to smooth its consumption. In the period in which financial assets are exhausted, consumption drops to the amount of the household's Social Security benefits.

A third strategy is to spend a fixed percentage of initial wealth each period. Bengen (1994) calculated that a household adopting this strategy faced only a small probability of outliving its wealth. This strategy is sub-optimal, because it does not respond to realized asset returns. If asset returns are higher than expected, the household can and should respond by increasing consumption. If, conversely, the household is on track to exhaust its wealth in a few years, it should reduce current consumption and not delay until its financial assets are exhausted. The strategy also fails to reflect the prediction of the life-cycle model that households should, at least to some extent, prefer higher consumption early in retirement when they are more likely to be alive to enjoy it.[11]

Elderly households also invest their financial assets very conservatively, holding large percentages of their wealth in short-term deposits (Coile and Milligan, 2009). Although this strategy guarantees a return on capital, it does not guarantee what is arguably of greater importance, the rate of return on capital. It also means that households earn very low real returns on their portfolios. In our calculations, we first assume that households jointly choose adopt an optimal portfolio allocation and drawdown rate. Recognizing that our optimal asset allocation differs substantially from typical asset allocations adopted by older households, we consider an alternative in which households adopt the average portfolio allocation of households aged over 65 and between the 60th and 80th percentiles of the distribution of financial assets and then choose an optimal drawdown rate, given that asset allocation. When considering this alternative, we are implicitly assuming that our decumulation model does not omit some aspect of risk and preferences that would, in fact, make the observed investment allocation optimal.

3. What are the Required Minimum Distribution Tables?

[11] In some circumstances the household may prefer level or even increasing consumption, for example, if increases in health costs increase the marginal utility of consumption at older ages, if the intertemporal elasticity of consumption is very low, if the rate of time preference is less than the rate of interest, or if the household engages in "precautionary saving" in the face of uncertain investment returns.

An individual who has attained age 70½ during the calendar year and has assets in an IRA or 401(k) is required to make a minimum withdrawal of a specified percentage of the account balance on the previous 31 December. Individuals who fail to make the withdrawals are subject to a tax penalty of 50 percent of the amount he failed to withdraw. The rules do not apply to Roth IRA account balances while the owner is alive.

Single account holders and married account holders who are less than 10 years older than their spouse are required to use the Uniform Life Table in Appendix X Table 3 of IRS publication 590. This table specifies "distribution periods" that vary with age, decreasing from 27.4 years at 70 to 18.7 at 80, 11.4 at 90, and 6.3 at 100. The percentage withdrawal equals 100 divided by the distribution period, so the required minimums at the above ages are 3.65 percent, 5.35 percent, 8.77 percent, and 15.9 percent.

Since this requirement applies only to individuals who have attained age 70½, the IRS does not publish distribution periods for younger ages. But these can be derived from Table 2 in the same publication.[12] Distribution periods for ages 65 to 100, calculated in accordance with the IRS methodology, are reported in Table 1 of this paper.

The distribution periods are the IRS's estimates of the joint life expectancies of couples in which the spouse is ten years younger than the account holder, calculated using life tables that do not distinguish between male and female mortality.[13] (They differ somewhat from life expectancies calculated using Social Security Administration (SSA) cohort life tables.) According to the IRS, the joint life expectancy of a couple in which one spouse is 70½ and the other spouse is up to ten years younger is 27.4 years. Using SSA life tables, we calculate the life expectancy of a couple with population average mortality in which the husband and wife are both 70½ in 2011 to be 19.9 years. If the wife is ten years younger, it is 26.3 years, and for the typical household in which the wife is three years younger than the husband, it is 21.5 years.

The IRS makes no claim that a decumulation strategy based on the RMD tables is optimal for all or any households. Further, although the IRS requires individuals to make withdrawals, households are not required to spend them. The purpose of the legislation is to recover the tax relief granted when the contribution was made and to ensure that tax-advantaged savings are used to fund retirement, rather than to fund a bequest. But the strategy does possess

[12] They are the Table 2 values for spouses exactly 10 years younger than the account holder.
[13] The joint life expectancy is the average number of years that one or both spouses will be alive.

two important characteristics of an optimal strategy. First, the withdrawal rate is expressed as a percentage of remaining wealth. As a result, the dollar amount consumed responds to market returns. Second, the percentage withdrawal rate increases with age, reflecting the age-related decline in remaining life expectancy.

4. Comparing the RMD strategy with alternatives

For typical households age 65, we first calculate an optimal decumulation and asset allocation strategy, given risk preferences, annual mortality risk, financial wealth, Social Security income, marital status, and age difference between husband and wife. We calculate expected utility. We then assume that the household either adopts a decumulation strategy based on the RMD tables or follows one of the rule of thumb strategies described in Section 2. We calculate *strategy equivalent wealth* (SEW), the factor by which age-65 pension wealth must be multiplied so that the household is indifferent between adopting the optimal strategy and the alternative. By construction, SEW can never be less than one. A more sub-optimal strategy will have higher SEW. SEW therefore provides a utility-based means of comparing the RMD strategy with both the optimal strategy and plausible rules-of-thumb.

We report results for the following rules of thumb: (1) consuming the percentages of remaining wealth set out in the RMD tables; (2) spending the interest and dividends, but preserving the capital; (3) consuming 4 percent of initial wealth; and (4) spending down over one's life expectancy. For this last strategy, we assume the household consumes amounts that will, at a risk-free rate of return, exhaust its wealth by its age-65 life expectancy. This is 16.7 years for single males, 19.7 years for single females, 23.5 years for married couples who are both the same age, and 27.4 years for married couples where the wife is six years younger than her husband.

Table 2 reports results for the base case in which the household invests an initial $250,000 in a risk-free asset. The upper panel assumes a risk-free rate of 3 percent, commonly assumed in the decumulation literature (for example, Mitchell, Poterba, Warshawsky, and Brown, 1999). Current yields on long-dated Treasury Inflation Protected Securities are close to zero, and in the lower panel we report results assuming a 1 percent real interest rate. For the "spend the interest" strategy, we assume in both panels that wealth is invested in long-dated corporate bonds yielding a nominal return of 5.5 or 3.5 percent, corresponding to real returns of 3 percent and 1 percent, at an assumed 2.5 percent inflation rate.[14]

At a 3 percent real interest rate, the strategies of using the RMD tables, spending the interest, and following the 4 percent rule all perform substantially worse than the optimal strategy. This is because all three strategies result in less than optimal consumption early in retirement. Households have a preference for greater consumption early in retirement when they are more likely to be alive to enjoy it. In contrast, the strategy of consuming over one's life expectancy is sub-optimal because the household consumes too much early in retirement and too little after its financial wealth is exhausted. Figure 1 shows consumption for ages 65 to 100 for each of the above strategies for an in tact married couple, both the same age and assuming a coefficient of risk aversion of 5.

At the three percent interest rate, at both assumed coefficients of risk aversion, and for all four household types, there is a consistent ordering of the RMD, "spend the interest," and "4 percent" rules, with the "spend the interest" rule performing best and the RMD rule performing worst. The differences in performance are correlated with the amounts of wealth left unconsumed, which are highest for the RMD rule and lowest for the strategy of spending the interest and dividends. SEW is lower at higher assumed coefficients of risk aversion. Under CRRA utility, the coefficient of risk aversion equals the inverse of the intertemporal elasticity of substitution. Households with high coefficients of risk aversion prefer a relatively small decline in consumption during the course of retirement, and therefore are less averse to the flatter-than-optimal consumption paths provided by the above rules.

The cost of following the strategy of spending down over one's life expectancy can be highly sensitive to the assumed coefficient of risk-aversion and the proportion of wealth that is pre-annuitized. At a low coefficient of risk-aversion/high intertemporal elasticity of substitution, the household is relatively sanguine about the risk of surviving long enough to exhaust its financial assets. At a high coefficient of risk aversion, the household can be highly averse to this risk, resulting in a very high-strategy equivalent wealth. In our example, assuming a 3 percent interest rate and assuming that both husband and wife are the same age, increasing the coefficient of risk aversion from 2 to 5 is associated with an increase in SEW from 1.039 to 1.582. But for

[14] As of 30 December 2011, the nominal yield on high-grade corporate bonds was 4.68 percent.

single men and women, SEW is infinitely large at a coefficient of risk aversion of 5, reflecting the lower assumed proportion of pre-annuitized wealth.

Lower interest rates have income and substitution effects on the optimal consumption path, with households both reducing consumption and shifting consumption to earlier in retirement. At lower coefficients of risk aversion, the latter effect is relatively more important. So when γ =2, a reduction in interest rates leaves optimal age 65 consumption unchanged but results in substantial reductions in consumption at older ages. When γ =5, optimal consumption decreases at all ages.

When γ =5, a reduction in interest rates makes the RMD rule less sub-optimal, because households with a low intertemporal elasticity of substitution respond to a reduction in interest rates by reducing the percentage of remaining wealth they consume in each period, bringing that percentage closer to that required by the RMD In contrast, when γ =2, a reduction in interest rates increases the cost of following the RMD. At low interest rates, households with a high intertemporal elasticity of substitution prefer a steeper age-related decline in consumption, reflecting the relative magnitudes of the income and substitution effects. At low interest rates, the strategy of spending the interest is highly sub-optimal at both assumed coefficients of risk aversion because it results in levels of consumption that are far below the optimal. But the 4 percent rule is less sub-optimal, even though, at the lower interest rate, there is now a small probability of the household outliving its wealth, because consumption under the 4 percent rule is closer to the now reduced optimal level.

In results that are not reported, we find that all the rules of thumb are more sub-optimal for households with the same Social Security benefits, but only $100,000 of financial wealth. This results from our preference assumptions. When the household has less financial wealth, the expected present value of Social Security benefits occupies a larger part of the household's extended portfolio. Under the assumption of CRRA utility the household's optimal plan requires a more rapid decumulation of financial assets.

Table 3 reports results for models in which the household chooses an optimal portfolio allocation between stocks and bonds. The upper panel reports results when we assume mean stock returns of 6.5 percent and bond returns of 3 percent. The bottom panel reports results when we reduce bond and expected stock returns by 2 percentage points.[15] At both coefficients of risk aversion, and at both assumed rates of return, the RMD strategy dominates the 4 percent rule. The only exception is single men who slightly prefer the 4 percent rule when they are both risk averse and anticipate low returns. The RMD strategy also outperforms the "spend the interest" strategy except when the household is both risk averse and anticipates unreduced investment returns. The RMD strategy and 4 percent rule perform better at lower assumed interest rates because the amounts consumed are closer to the reduced optimum. The strategy of spending the interest performs worse at lower assumed interest rates because, at lower interest rates, the household substantially reduces consumption.

Figure 2 shows average consumption from age 65 to age 100 for in tact married couples based on 10,000 Monte Carlo simulations, assuming a coefficient of risk aversion of 5 and a bond return of 3 percent. In contrast to Figure 1, which assumed a risk-free rate of return, households optimally choose a consumption plan that, on average, results in increasing consumption early in retirement, reflecting both precautionary saving and the substitution effect resulting from higher expected returns. The RMD strategy still results in the household consuming less than optimal amounts early in retirement. The 4 percent rule results in a level consumption path. Households following this rule are not permitted to increase their consumption should they enjoy higher than expected returns. They therefore have no incentive to invest in stocks. They invest in bonds, and are thus certain that they will not outlive their wealth. On average, the strategy of spending down over one's life expectancy also delivers a consumption path that declines with age. But the average conceals considerable heterogeneity in outcomes.

Figure 3 shows portfolio allocations to equities for in tact married couples based on 10,000 Monte Carlo simulations, again assuming a coefficient of risk aversion of 5 and a bond return of 3 percent. For households consuming the optimal percentage of wealth each period, the optimal stock allocation increases with age, from 66 percent at age 65 to 88 percent at age 100. This reflects the age-related decrease in financial wealth as a percentage of the expected present value of remaining lifetime Social Security benefits. In contrast, the optimal equity allocation of households following the RMD strategy decreases from 78 percent at age 65 to 54 percent at age

[15] We assume 2 percentage point reductions in nominal bond yields and expected stock capital gains, while the dividend yield on stocks remains at 2 percent.,

100 because financial assets are increasing relative to Social Security wealth. Households adopting a strategy of spending the interest invest relatively small proportions of their wealth in stocks, in order to earn higher income returns on bonds. As explained in the previous paragraph, households following the 4 percent rule optimally allocate zero percent of their financial assets to stocks. Households spending down over their life expectancy invest smaller proportions of their wealth in stocks than under the optimal strategy. These results illustrate how choosing a rule of thumb drawdown strategy can distort the household's investment allocation decision.

We now compare the above decumulation strategies, assuming typical portfolio allocations, reporting our results in Table 4. Financial wealth is highly unequally distributed. A small minority of households has accumulated large amounts of wealth and likely has an operative bequest motive.[16] A decumulation strategy based on the RMD is unlikely to be appropriate for such households. In contrast, many retired households hold only small amounts of financial assets. For these households, precautionary and liquidity motives will dominate. Using data from the 2008 wave of the Health and Retirement Study (HRS), a nationally representative panel dataset of older Americans, we calculate the financial wealth, inclusive of IRA and 401(k) balances, of households aged 60-69, who were then entering retirement. We focus on households aged over 65 in the fourth quintile of the distribution of financial wealth, for whom our analysis of HRS data shows had financial wealth from $78,000 to $290,000 in 2008. We calculate that the average portfolio allocation of these households was 46 percent stocks, 8 percent bonds, and 46 percent short-term deposits. As mentioned previously, we assume that short-term deposits yield a 1 percent real return.

For all household types, and at both assumed coefficients of risk aversion, the RMD rule outperforms the strategies of spending the interest and following the 4 percent rule. The poor performance of the "spend the interest" strategy reflects the low decumulation rates that are optimal for households whose portfolios are heavily weighted in favor of short-term deposits. The 4 percent rule performs badly because, with typical portfolio allocations, it exposes households to the risk of outliving their wealth, while offering no upside potential. The RMD strategy performs better wit a typical than with an optimal portfolio because, at the lower expected returns on typical portfolios, the low RMD withdrawal rate is closer to the optimal.

[16] Other households may leave a bequest, but in the absence of a bequest motive, they will not reduce current consumption in order to increase the amount of that bequest.

The RMD strategy is sometimes outperformed by a strategy of spending down over the household's life expectancy. But, as mentioned previously, the effectiveness of this strategy is highly sensitive to the coefficient of risk aversion and proportion of pre-annuitized wealth. At a coefficient of risk aversion of 5, for single individuals who have smaller amounts of pre-annuitized wealth, there is no amount of wealth that would be sufficient to compensate a household for being forced to adopt this strategy.

Table 5 considers high and low mortality rate households. We report results for married couples the same age, for single men, and for single women, who have a coefficient of risk aversion of 5 and choose an optimal portfolio allocation. We show equivalent wealth for whites with a college education, who have lower than average mortality, and blacks with less than a high school education, who have higher than average mortality, relative to the base case reported in Table 3. Relative mortality rates are calculated using the factors reported in Brown, Liebman, and Pollet (2002).

Consistent with Brown (2002), between-group variations in annual mortality risk have only a small effect on strategy equivalent wealth. But within-group variations exceed between-group variations, and the rankings of alternative strategies may differ substantially for particular individuals.

5. Conclusions

The first cohort with substantial amounts of unannutized pension wealth is now entering retirement. They face the challenge of converting that wealth into lifetime income. One solution is to annuitize. But rates of voluntary annuitization remain extremely low. Although a substantial literature shows that annuitization can be welfare enhancing, even at prevailing levels of adverse selection (Mitchell, Poterba, Warshawsky, and Brown, 1999, Brown and Poterba, 2000), it seems likely that the vast majority of households will retain their pension wealth in unannuitized form and gradually decumulate it over their lifetimes.

When deciding how rapidly to decumulate their wealth, households will likely fall back on rules of thumb. We show that two of the rules of thumb that households might plausibly adopt -- spending the interest and dividends while preserving the capital, and consuming a fixed 4 percent of initial wealth – can be highly sub-optimal. A strategy of using the RMD tables often performs better, but still represents a substantial departure from optimality.

The RMD strategy generally results in drawdown rates that are “too low” resulting in a consumption path that, on average, increases with age. In contrast, our optimal strategy results in an age-related decline in consumption, reflecting our choice of a utility function in which the coefficient of risk aversion is related to the intertemporal elasticity of consumption. It is debatable whether and to what extent our assumed intertemporal elasticity of substitution accords with household preferences. If medical costs increase with age, and if medical costs do not substitute for other types of consumption, then households might even prefer a consumption profile that increased with age. The extent to which the RMD level of consumption is too low also depends on the assumed level of asset returns. At lower anticipated returns, the RMD strategy will be less sub-optimal.

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Tables and Figures

Table 1: Required Minimum Distribution Tables

Age	%	Age	%
65	3.13	83	6.13
66	3.22	84	6.45
67	3.31	85	6.76
68	3.42	86	7.09
69	3.53	87	7.46
70	3.65	88	7.87
71	3.77	89	8.33
72	3.91	90	8.77
73	4.05	91	9.26
74	4.20	92	9.80
75	4.37	93	10.42
76	4.55	94	10.99
77	4.72	95	11.63
78	4.93	96	12.35
79	5.13	97	13.16
80	5.35	98	14.08
81	5.59	99	14.93
82	5.85	100	15.87

Note: Authors' calculations based on Uniform Life Tables in Appendix X, Tables 2 and 3, IRS Publication 590

Table 2: Alternative Strategy Equivalent Wealth - No Investment Risk

	Alternative to Optimal Drawdown			
	RMD Tables	Spend Interest	4% Rule	Spend Over Life-Expectancy
Scenario		Three percent real interest rate		
Married Couples				
Same Age				
CRRA = 2	1.343	1.232	1.307	1.039
CRRA = 5	1.279	1.176	1.218	1.582
Wife Six Years Younger				
CRRA = 2	1.266	1.178	1.215	1.043
CRRA = 5	1.206	1.135	1.145	1.368
Single Men				
CRRA =2	1.410	1.259	1.355	1.169
CRRA = 5	1.312	1.186	1.236	N/A
Single Women				
CRRA =2	1.295	1.211	1.265	1.107
CRRA = 5	1.237	1.175	1.182	N/A
Scenario				
Married Couples				
Same Age		One percent real interest rate		
CRRA = 2	1.381	1.635	1.163	1.076
CRRA = 5	1.227	1.478	1.105	1.258
Wife Six Years Younger				
CRRA = 2	1.313	1.534	1.113	1.097
CRRA = 5	1.167	1.389	1.145	1.183
Single Men				
CRRA =2	1.438	1.682	1.196	1.100
CRRA = 5	1.263	1.509	1.101	N/A
Single Women				
CRRA =2	1.324	1.584	1.118	1.068
CRRA = 5	1.188	1.455	1.100	N/A

Notes: We assume population average mortality for the 1946 borth cohort (1952 for wife born six years younger). It is assumed that the husband's Social Security Primary Insurance Amount is $1,000, that the wife is entitled only to a $500 a month spousal benefit, and that if both husband and wife are the same age, they claim benefit at age 65. If the wife is six years younger than her husband, she claims an actuarially reduced $350 a month benefit at age 62. The household has $250,000 in financial assets, the 70th percentile of the distribution of financial wealth for Health and Retirement Study households aged 60-69 in 2008.

Table 3: Alternative Strategy Equivalent Wealth - Optimal Portfolio Allocation

	Alternative to Optimal Drawdown			
	RMD Tables	Spend Interest	4% Rule	Spend Over Life-Expectancy
Scenario	Base case			
Married Couples				
Same Age				
CRRA = 2	1.370	1.590	1.778	1.297
CRRA = 5	1.393	1.361	1.485	1.289
Wife Six Years Younger				
CRRA = 2	1.291	1.533	1.717	1.365
CRRA = 5	1.316	1.312	1.423	1.272
Single Men				
CRRA =2	1.442	1.598	1.783	1.232
CRRA = 5	1.417	1.350	1.473	N/A
Single Women				
CRRA =2	1.329	1.551	1.728	1.243
CRRA = 5	1.333	1.320	1.427	N/A
Scenario	Bond and expected stock returns reduced by two percentage points			
Married Couples				
Same Age				
CRRA = 2	1.312	2.016	1.512	1.337
CRRA = 5	1.276	1.725	1.283	1.265
Wife Six Years Younger				
CRRA = 2	1.234	1.892	1.461	1.422
CRRA = 5	1.206	1.631	1.277	1.274
Single Men				
CRRA =2	1.385	2.056	1.520	1.203
CRRA = 5	1.308	1.719	1.262	N/A
Single Women				
CRRA =2	1.275	1.953	1.462	1.235
CRRA = 5	1.230	1.661	1.242	N/A

Notes: See Table 2. The household adopts an optimal allocation of financial assets between stocks and risk-free bonds.

Table 4: Alternative Strategy Equivalent Wealth - Typical Portfolio Allocation

	Alternative to Optimal Drawdown			
	RMD Tables	Spend Interest	4% Rule	Spend Over Life-Expectancy
Scenario				
Married Couples				
CRRA =2	1.345	1.774	1.483	1.253
CRRA = 5	1.322	1.699	1.373	1.267
Wife Six Years Younger				
CRRA = 2	1.266	1.643	1.407	1.323
CRRA = 5	1.246	1.584	1.330	1.290
Single Men				
CRRA =2	1.415	1.842	1.516	1.114
CRRA = 5	1.355	1.727	1.373	N/A
Single Women				
CRRA =2	1.302	1.723	1.444	1.141
CRRA = 5	1.274	1.649	1.343	N/A

Notes: See Table 2.

Table 5: Alternative Strategy Equivalent Wealth - High and Low Mortality

	Alternative to Optimal Drawdown			
	RMD Tables	Spend Interest	4% Rule	Spend Over Life-Expectancy
Scenario				
Married Couples Same Age				
Population Average Mortality	1.393	1.361	1.485	1.289
Black - Less than High School	1.445	1.371	1.501	1.454
White - College Educated	1.377	1.359	1.482	1.266
Single Men				
Population Average Mortality	1.417	1.350	1.473	N/A
Black - Less than High School	1.482	1.368	1.503	N/A
White - College Educated	1.400	1.348	1.469	N/A
Single Women				
Population Average Mortality	1.333	1.320	1.427	N/A
Black - Less than High School	1.367	1.327	1.436	N/A
White - College Educated	1.321	1.318	1.423	N/A

Notes: See Table 2. We assume the relative mortality rates reported in Brown, Liebman, and Pollet (2002). We further assume CRRA utility with a coefficient of risk-aversion of five.

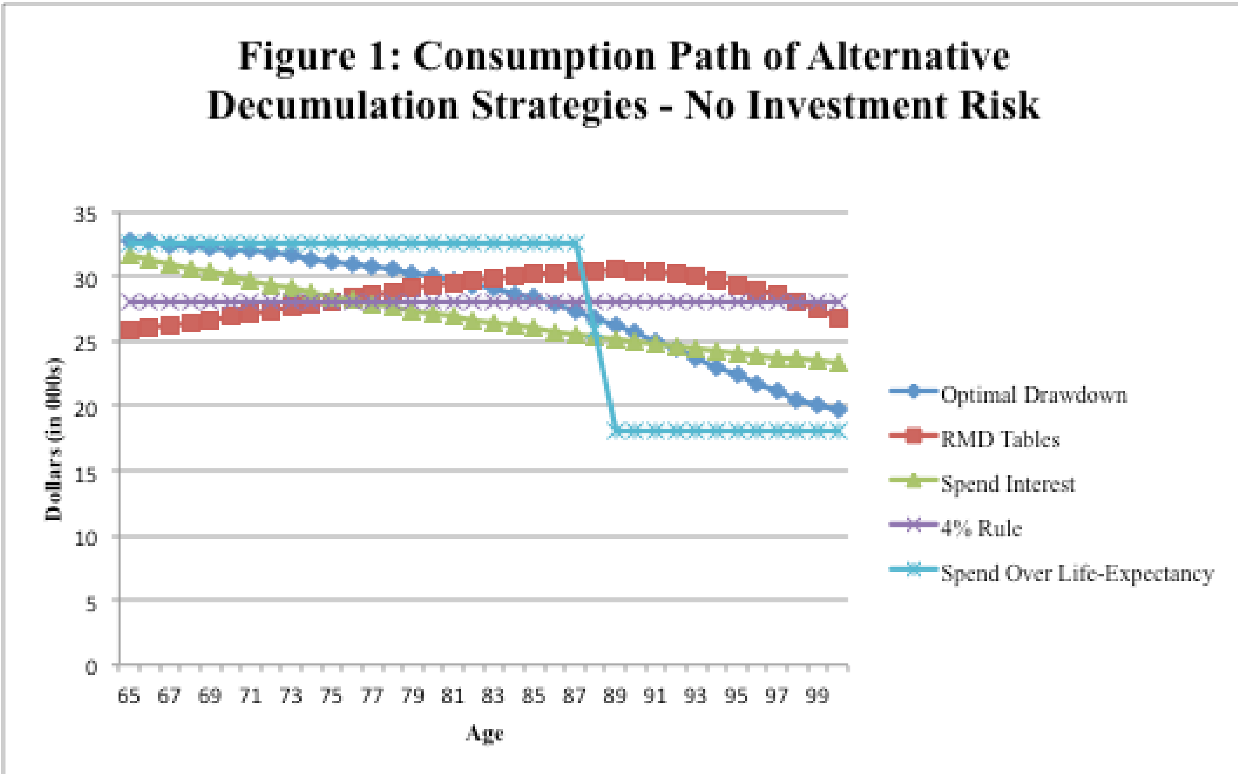
Figure 1: Consumption Path of Alternative Decumulation Strategies - No Investment Risk
Dollars (in 000s)
35
30
25
20
15
10
5
0
65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99
Age
Optimal Drawdown
RMD Tables
Spend Interest
4% Rule
Spend Over Life-Expectancy

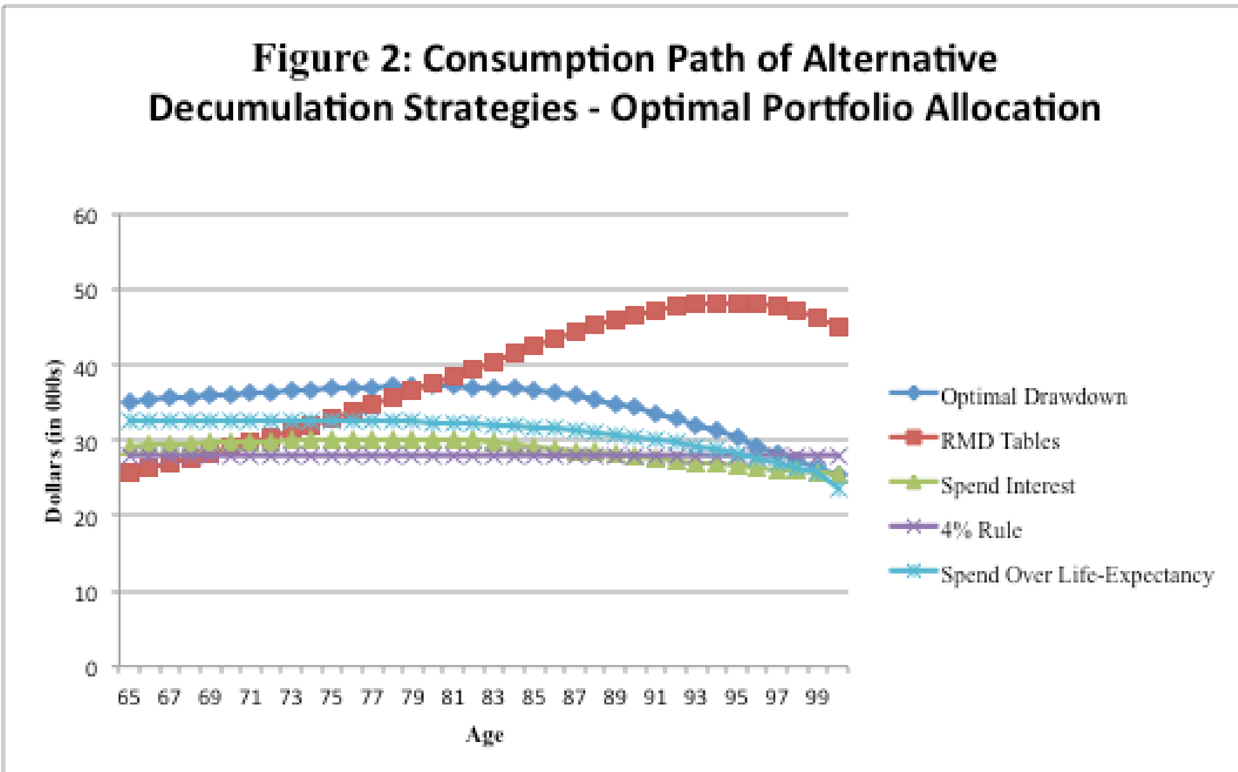
Figure 2: Consumption Path of Alternative Decumulation Strategies - Optimal Portfolio Allocation
Dollars (in 000s)
60
50
40
30
20
10
0
65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99
Age
Optimal Drawdown
RMD Tables
Spend Interest
4% Rule
Spend Over Life-Expectancy

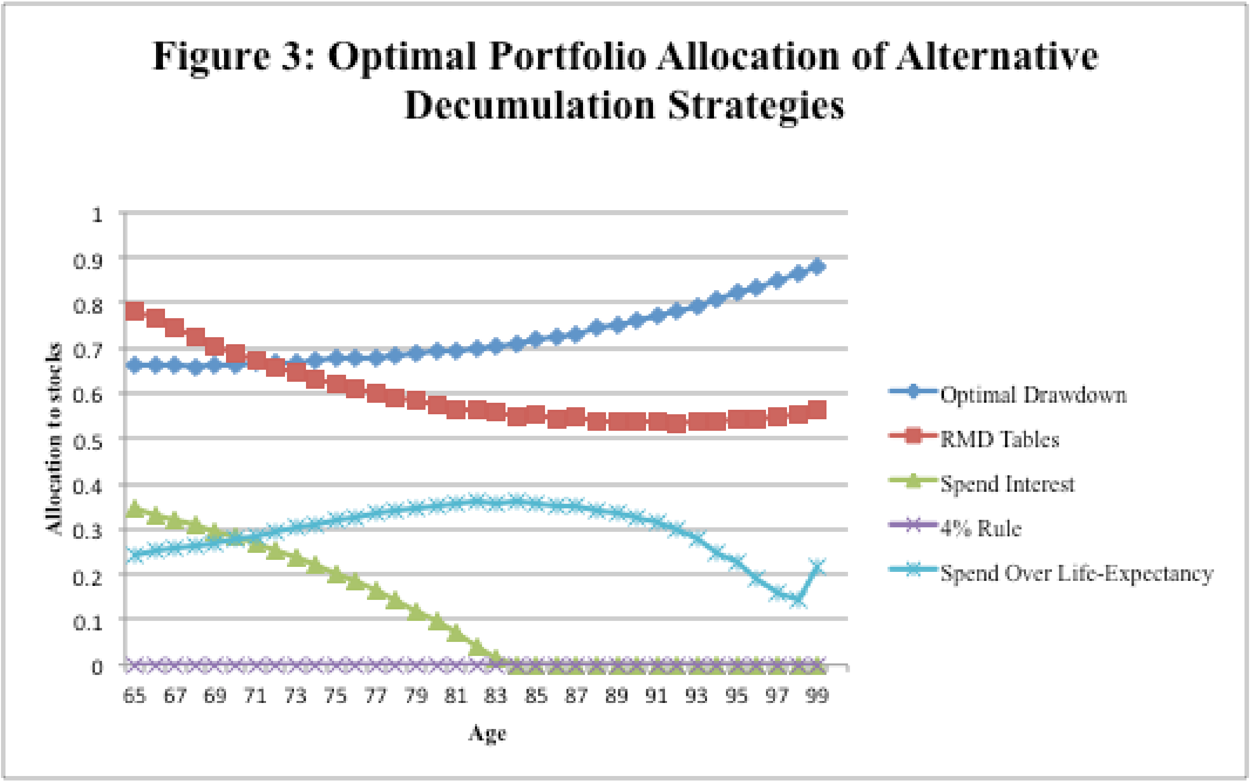
Figure 3: Optimal Portfolio Allocation of Alternative Decumulation Strategies
Allocation to stocks
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95 97 99
Age
Optimal Drawdown
RMD Tables
Spend Interest
4% Rule
Spend Over Life-Expectancy

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