Reorienting Retirement Risk Management

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Chapter 11

Comparing Spending Approaches in Retirement

John Ameriks, Michael Hess, and Liqian Ren

The retirement income challenge – the question of how to optimally generate a sustainable and reliable stream of income in retirement – is one of the biggest unresolved issues facing investors and financial services organizations around the world. The continued confusion, consternation, and debate about the optimal solution for retirement is perhaps surprising, given that solving multi-period consumption and portfolio choice problems under uncertainty is not new to the economics literature. Formal solutions to such problems have been a part of that literature since at least the late 1960s. Yet in both the academic literature and in practice, there is wide variation in solution techniques – both products and methods – used by investors and recommended by advisors and experts. In the academic literature, differences in solutions tend to be driven by differences in assumptions about investor preferences, constraints, costs, and the degree and nature of modeled uncertainty. In practice, solutions may differ for all of the above reasons, plus a host of others, including social conventions, force of habit, or other behavioral or institutional factors.

In this chapter, we take an agnostic, practical look at simulated financial outcomes resulting from the use of different common 'product' or 'drawdown strategy' choices in retirement. Unlike much of the academic literature aimed at comparing retirement income strategies, we do not impose a specific functional form on investor preferences and solve a formal optimization problem; rather we focus on the simulated impact of the chosen strategy on several summary statistics describing various aspects of investment outcomes that real-world retirees seem to care about. There are many merits to formal optimization, but many retirees and practitioners have little notion of the implications of various functional forms for retirement decision-making. In addition, they may have difficulty interpreting or determining whether a summary measure such as a utility metric is, in fact, a good representation of their clients or constituents preferences over various outcomes.

Simulations reveal that these alternative retirement income strategies can produce widely different outcomes in terms of each of the statistics that we measure. Each of these strategies is currently advocated and employed by some group striving to serve the needs of retirees. We interpret this evidence to suggest that future research would benefit by a better understanding and more complete specification of retirees' various needs and objectives. In our view, very productive insights can be derived by building more robust models of retiree preferences that explicitly incorporate the various motivations that appear relevant.

We begin by reviewing some of the previous studies on this topic. We then describe the strategies/products on which we focus and detail the evaluation methodology. Finally, we present and discuss results.

A brief review of prior studies on retirement payouts

Discussion of optimal spend-down in retirement often begins with a focus on payout life annuities. In a standard economic model of risk-averse savers who value only their own lifetime consumption, immediate life annuities can have significant insurance value (Yaari 1965). Economists have subsequently shown that at least partial annuitization may add value even when many restrictive assumptions of the simplified modeling framework are relaxed (Davidoff, Brown, and Diamond 2005; Horneff et al. 2010); even when full annuitization is not indicated, partial annuitization is still generally a part of the optimal spending strategy.

Yet, in practice, investors have been reluctant to adopt annuities and researchers continue to struggle to explain this so-called annuity puzzle. One reason may be that investors typically lose control of annuitized assets, as for all practical purposes, annuitization is irreversible. Such lack of liquidity can be important, if unexpected expenditure shocks such as uninsured medical expenses occur (Sinclair and Smetters 2004; Turra and Mitchell 2008; Ameriks et al. 2009). In addition, in the current environment, many financial services organizations have been forced to turn to taxpayers for financial support, so it is also possible that individuals view as unacceptably high the potential costs of a default by their annuity provider. Another reason, noted by Dushi and Webb (2004) and Mitchell et al. (1999) is the existence of other annuitized resources such as Social Security or employer-sponsored pensions, which could explain why investors may be reluctant to voluntarily annuitize. A further headwind for annuitization is retirees' bequest motives. In the United States, for instance, over half of the elderly plan say they intend to leave a bequest of more than $10,000 (Bernheim 1991; Hurd and Smith 1999). On the other hand, Brown (2001) finds that the bequest motive is not significant in the annuitization decision.

Yet another reason investors may avoid annuitization is that purchasing a traditional fixed annuity with a significant sum of assets precludes investing those assets in equity markets with their historically risk premium over other investments. Of course, variable immediate life annuities (sold in the United States by many insurers) do offer investors the ability to participate in equity market returns while still offering the advantages of higher expected returns via pooled mortality risk as well as the hedge for risk-averse investors who worry about exhausting their assets. Blake, Cairns, and Dowd (2003) show that equity-linked variable annuities should appeal to many investors compared to either a phased withdrawal plan or a fixed payout annuity. Brown and Poterba (2000) demonstrate that equity-linked variable annuities can generate greater utility than fixed annuities for a broad range of risk aversion parameters. While both of these studies take an all-or-nothing approach, Horneff et al. (2010) show that variable annuities can (modestly) enhance an investor's portfolio, particularly if variable annuities can be purchased gradually in retirement allowing both annuities and financial wealth to be held simultaneously. It is perhaps an additional annuity puzzle that immediate variable annuity sales are far below those of standard fixed annuities.

Thus, despite the theory, many real-world investors avoid annuities in favor of holding and managing a portfolio of unannuitized investments. Then their task is to determine a level of 'sustainable' withdrawals during the retirement period (cf. Bengen 1994; Pye 2000).[1] This literature offers a wide range of results, though most propose a broadly diversified investment portfolio of stocks and bonds, together with a 'drawdown rule' amounting to constant inflation-adjusted withdrawals equal to 4–5 percent of the investor's account balance at retirement (taken annually until death or the exhaustion of the retirement portfolio). Such withdrawal strategies may offer some benefits to an investor versus an annuity product, but they also expose the retiree to the risk of running out of money or having to cut consumption substantially.

Another thread in the payouts literature highlights the importance of so-called default arrangements for individual investors (Beshears et al. 2008). Two types of defaults are especially relevant. One type has to do with what is defined as the 'normal' or typical form of benefits provided in defined benefit (DB) plans. It is interesting that these seem to have relatively little effect. Thus, when plan participants in two large pension plans were given choice between an annuity benefit or a lump-sum benefit, very large majorities elected to receive their benefits in the form of a lump sum – despite the fact that the annuity was the normal form or default choice for those benefits (Mottola and Utkus 2007). A second type pertains to the government's rule specifying required minimum distributions (RMDs) that older investors must take from their traditional individual retirement accounts (IRAs) and 401(k)/403(b) retirement plans in order to avoid tax penalties. It appears, based on one large retirement plan provider, that distributions taken according to RMD rules are a large and fast-growing distribution choice of recent retirees (Ameriks 2004). In addition, these rules are cited as the most common reason that retirees offer for withdrawing assets from their IRAs (Holden 2009). In other words, default options may play a role in shaping retirement withdrawal patterns, but more remains to be explored on the topic.

Spending/income models examined

In the last 5 years, deferred variable annuity contracts have become increasingly popular, particularly those that provide so-called living benefits. These usually include a complex combination of guarantees that can incorporate elements of put options on investment returns and deferred life annuities. In this section, we focus on eight spending/income-generating methods we will model and evaluate, including plans that incorporate a specific type of guarantee, namely guaranteed lifetime withdrawal benefits (GLWB). These refer to an annuity that some industry observers argue has the potential to become the 'product of choice' for retirees (see Ibbotson Associates 2007).[2] The eight methods we evaluate include payout funds (endowment-style funds and time-horizon-style funds), balanced mutual fund with fixed real withdrawals, fixed real (inflation-adjusted) immediate annuities, immediate variable annuities (IVA), variable deferred annuities with GLWB, RMDs, half fixed real annuity/half RMD, and half variable immediate annuity /half RMD. We describe each of these methods in detail next.

Payout funds

In the broadest terms, payout funds are pooled investment funds (typically mutual funds) coupled with a specific mechanism for the provision of periodic payments to fund investors. Payout funds are currently offered as daily-valuation mutual funds and can therefore provide investors the same type of daily liquidity as any mutual fund. A net asset value (NAV) for the shares of these funds is struck every trading day, and investors can elect to purchase or sell shares of these funds at that price on that day. Payout funds do not guarantee either a level of payments or returns, but provide either targeted or formulaically determined periodic distributions of fund assets to fund shareholders in combination with a professionally managed investment portfolio. A brief but fairly accurate description of payout funds is that they amount to a prepackaged combination of a specific systematic withdrawal strategy with a mutual fund investment. In fact, a common criticism of the funds is that they 'don't do anything that a motivated investor couldn't do for himself.' This description is also fairly accurate – but of course the key question is whether investors view a prepackaged combination as being a cost-effective or value-added means of implementing a distribution strategy relative to doing so themselves.

In some cases, the payout mechanism bundled with the payout fund is literally implemented as a systematic withdrawal program that a fund investor must proactively enroll in to receive distributions from the 'payout fund.' This design would appear to enable payout rules to differ for different investors in the same fund. But at the time of this writing, no payout funds are implementing distribution schedules rules that rely upon investor-specific data. In other designs, the payouts are made through the fund accounting process of the payout fund itself, and are made to shareholders as periodic distributions per fund share (requiring all shares to be treated equally, and hence all shareholders holding the same number of shares to be treated equally). In this design, distributions are declared and delivered to shareholders in a manner similar to that used to declare and deliver periodic distributions of income, dividends, and capital gains to shareholders. An important aspect of payout funds with this design is that to meet the targeted or formulaically determined distribution amounts, some of the periodic fund distributions may be a return of capital to the investor, and hence *not* interest income, dividends, or realized gains.

The investment management strategies and asset allocation employed in these funds vary across providers, with different providers using different asset allocations, and emphasizing active management, passive management, or the use of alternatives as a part of the underlying investment strategy for the funds. Some providers use only 'traditional' asset classes (long-only stocks, bonds, and cash-like investments), while others are including or at least envisioning the use of alternatives such as long–short strategies, commodities, futures, and other types of investments.

Payout mutual funds first became available to investors beginning in 2006, and as of this writing there were at least six financial services organizations offering some type of payout fund (Baron Funds, Charles Schwab & Co., Fidelity Investments, John Hancock, Russell Investment Company, and Vanguard).[3] The specific design and objectives of payout funds are not uniform across providers. While designs continue to evolve, two basic designs or flavors of these funds appear to have emerged (described later), and we will focus on these two basic outlines in what follows.[4]

ENDOWMENT-STYLE PAYOUT FUNDS

Endowment-style payout funds are designed to provide periodic distributions/payments to fund shareholders on an ongoing basis, and are not tied to a specific investor's age or life expectancy. As with all payout funds, there are no guarantees, and the size of periodic payments can vary as a consequence of investment returns, formulaic adjustments to the periodic payments, the impact of fund expenses, or the provider altering the specified distribution policy. The payout rules or strategies adopted by these funds are nevertheless designed with the goal of providing some payments to shareholders indefinitely.

As mentioned, specific payout mechanisms and the levels of payout available in payout funds vary among providers. In this analysis, we focus on a hypothetical payout fund that distributes payments to shareholders on a quarterly basis. In the simulations to follow, these quarterly payments are set once a year equal to 5 percent of the 12-quarter trailing historical average of the net value of the investment in the fund. There is at least one provider that in practice uses a distribution rule very close to this.

TIME-HORIZON PAYOUTS FUNDS

Instead of being managed to produce payments in perpetuity, time-horizon funds are designed to provide a sequence of formulaically determined payouts over a set period (e.g., 10, 20, or 30 years), fully exhausting invested amounts at the end of that period. There are no investment or payment guarantees; periodic payments may vary due to investment returns, payment adjustments, fund expenses, or to the provider altering the specified distribution policy.

In what follows, we model a time-horizon fund with a 30-year distribution period. The initial target payout rate will be approximately 5 percent, and payments will be distributed on a quarterly basis. Each year, the target payout rate changes (according to the schedule shown in Table 11A.1), and the quarterly distribution amounts are recalculated.

Systematic distributions from a balanced mutual fund

In addition to the payout funds, we also examine a strategy based on fixed inflation-adjusted withdrawals from a typical balanced mutual fund. Despite the popularity of this kind of drawdown rule in financial planning circles and in the popular press (cf. Updegrave 2007), we are not aware of any fund company that currently offers a service that will automatically compute and implement inflation-adjusted annual withdrawals as a distribution option on a standard mutual fund. Most companies will allow a shareholder to specify a dollar or percentage amount to distribute from the fund on a periodic basis, but the fund investor must then compute the required inflation adjustment to the payments each year and then submit those revised instructions to the fund provider.

In our modeling, we assume the shareholder withdraws an amount equal to 5 percent of initial wealth at the time of investment, with distributions paid on a quarterly basis. Each year, these payments will be adjusted to reflect the previous year's change in inflation.

Fixed lifetime income annuity

Income annuities are a form of insurance intended to address the uncertainty investors face when planning for income for the rest of their lives. In exchange for permanently surrendering access to a portion of their assets, annuitants receive a stream of income as long as they live. Fixed income annuities are different from the first three approaches discussed, in that the annuity provider guarantees that the investors will receive a specific level of income as long as they live. This guarantee removes the uncertainty of longevity risk and the possibility of exhausting assets later in life, but it also introduces some additional costs and risks. The costs include potentially high insurance fees; risks include the loss of liquidity, the possibility of leaving a diminished estate, and the possible failure of the guarantee provider.[5]

In what follows, we model a fixed single-life annuity that adjusts annually for inflation. We assume the investor is a 65-year-old male, and the initial payout amount is based upon an actual January 30, 2009 insurance quote from Vanguard.com. Annuity payments are assumed to be made quarterly, and adjustments to the payout amount be conducted annually based on the change in the consumer price index.

Variable immediate annuity

Similar to fixed income annuities, variable annuities deliver guaranteed income for life, but the income amount is not fixed, instead being subject to the investment performance of the underlying funds relative to the assumed interest rate (AIR). The guarantee of variable income for life introduces many of the same costs and risks as those associated with fixed annuities, plus the additional risk that investment returns will be poor and diminish the value of ongoing payments. When investing in a variable annuity, investors have the opportunity to choose the structure of the underlying investments, and, as mentioned, the distribution amount for a variable annuity is subject to the performance of the underlying funds in relation to the AIR (which the investor also chooses). This gives investors the ability to benefit (via increased payouts) from market returns when times are good, but when market returns are poor, decreased payout amounts are a possibility. In other words, the payout stream will rise if the underlying fund performance is higher than the AIR, and it will fall if the underlying fund performance is lower than the AIR.

In our analysis, we focus on a 65-year-old male investor who purchases a variable annuity with an AIR of 3.5 percent. The initial payout amount is based upon a January 30, 2009, quote from Vanguard.com, and distributions are made on a quarterly basis. Payments are adjusted on a quarterly basis and calculated based on the underlying fund performance relative to the AIR.

Variable annuities with GLWB

A relatively new innovation in variable annuity products is the GLWB rider that can be added to a deferred variable annuity contract.

Two features of a variable annuity with GLWB set it apart from traditional variable annuities. First, the GLWB rider gives investors the ability to protect their retirement income from market declines while still having the opportunity to profit when the market increases. This is a form of a 'put option,' at least with regard to the level of income that can be generated from the investment in the contract. Mechanically, the insurer establishes a 'guaranteed income base' for the contract that is equal to the initial deposit (premium) on the contract. This guaranteed income base cannot decrease as long as withdrawals from the contract are no more than the guaranteed minimum amount. The guaranteed income base can 'step up' on the rider anniversary date should the markets perform well and the remaining investment value in the contract exceed the amount of the initial deposit. The guaranteed income base cannot decline as a result of investment performance. The guaranteed minimum level of withdrawals are expressed as a set fraction of this guaranteed withdrawal base, which the provider guarantees will not decrease (but could increase) over the life of the contract.

A second feature of the GLWB rider is that any remaining *investment value* in the contract (the initial investment, plus returns and any subsequent investments, minus costs and any guaranteed or other withdrawals) can be withdrawn at any time or bequeathed at death, cancelling the contract at that point. Withdrawals in excess of the guaranteed minimum amount can also be taken at any time but reduce the guaranteed income base in the same proportion as such withdrawals reduce the remaining investment value in the contract (potentially to zero if 100 percent of the investment value is withdrawn).

When we consider the 65-year-old male investor, we assume the GLWB rider offers this investor the ability to withdraw 5 percent of the guaranteed income base each year, with distributions being made on a quarterly basis. Each year on the rider anniversary date, the guaranteed income base will be reevaluated based on the net performance of the underlying funds, after the withdrawals and annual rider fees have been deducted. If the investment value in the contract at that point exceeds the guaranteed income base, it will be 'stepped up' from that point forward. We also assume that the investor holds a fixed portfolio allocation throughout retirement, although there has been some evidence that the options embedded in this type of variable annuity structure may impact portfolio allocation (Milevsky and Kyrychenko 2008).

RMD withdrawal plan

We also simulate the results that an investor would achieve by taking distributions from their retirement assets in accordance with the RMD rules published by the Internal Revenue Service (IRS). These rules establish an amount of income that must be distributed (in order to avoid tax penalties) to investors each year, beginning the year after the account owner turns age 70.5. Distribution amounts are a specified proportion of the account that varies with investor age according to IRS tables (listed in Table 11A.1). We also simulate and evaluate two strategies that are a combination of the RMDs rules with the use of fixed real and variable immediate annuities.

Summary of assumptions

Our goal is to focus on the real-world difference in simulated outcomes for retirees pursuing each of these different drawdown strategies. To do so, several additional assumptions are needed regarding investment allocations and fee levels for the strategies described, summarized in Table 11.1. While these are subjective, we believe they are a reasonable reflection of 'standard,' 'typical,' or 'average' investment allocations and fee levels for the products and strategies of interest.

In all cases, to generate asset returns, we use 10,000 simulations of 30-year sequences of assets returns and inflation rates, using a proprietary capital markets simulation engine created and used at Vanguard to simulate asset returns. This model is based on the estimation and simulation of a vector auto-regression model of monthly asset returns, inflation, interest rates, and other economic factors based on data from 1960 through 2008. Additional details on the model can be found in Davis, Wallick, and Aliaga-Diaz (2009); summary statics describing the simulation output and the asset classes we focus on are shown in Table 11.2.

Table 11.1 Descriptive statistics for empirical data analysis

Strategy	Asset allocation (%)					
	US equities	International equities	Nominal fixed	Commodities	Market neutral	Fees (Basis points)
Endowment-style payout funds	35	25	15	10	15	60
Time-horizon payout funds[a]	50	12	38	0	0	67
Balanced mutual fund	48	12	40	0	0	20
Variable annuity with 3.5% assumed interest rate (AIR)	48	12	40	0	0	79
Variable annuity with guaranteed life withdrawal benefit (GLWB)	48	12	40	0	0	100
Required minimum distribution (RMD)	48	12	40	0	0	20
50% in real fixed annuity/50% in RMD[b]	48	12	40	0	0	20
50% in variable annuity with 3.5% AIR/50% in RMD	48	12	40	0	0	50

[a] Asset allocation in first year of payout. See Appendix 11A for detailed glide path.
[b] Asset allocation represents the portion that is RMD portfolio.

Note: Real fixed annuity is not included in the table due to no underlying asset allocation or implicit fees.

Source: Authors' calculations; see text.

Table 11.2 Summary of asset simulations over 30-year horizon

	Median annualized return (%)	Median standard deviation (%)
US equity	9.3	19.1
International equity	10.6	21.8
Nominal fixed income	5.0	6.7
Commodities	6.1	14.6
Market neutral	3.7	6.4

Notes: US equities represented by the MSCI US Broad Market Index; international equities by the MSCI EAFE + EM Index; the broad taxable bond market by Barclays Capital US Aggregate Bond Index; commodity futures by the Dow Jones-AIG Commodity Index; and the market-neutral by the Citigroup 3-Month Treasury Bill Index.

Source: Authors' calculations; see text.

Results and discussion

We display results in three ways, reporting statistics related to the levels of periodic cash flows provided by the strategies, statistics related to the evolution of remaining wealth over the lifetime of the retiree, and data on the internal rates of return (IRRs) of the simulated strategies at different horizons.

Cash flows generated by the strategies

Table 11.3 illustrates the average level and a volatility metric for real cash flows from each of these strategies, for investment horizons of 5, 20, and 30 years after retirement (the volatility metric is a ratio of the mean level of income to the lower semi-variance of income across all simulations; higher is better). The eight different drawdown options are organized in descending order of the median level of simulated cash flow at the 20-year horizon. Results show that, in terms of providing stable real cash flow measured by the ratio of mean cash flow to lower semi-variance, the real annuity and the constant inflation-adjusted withdrawals from a balanced mutual fund appear significantly more attractive than other options.

Figures 11.1 and 11.2 present some summary statistics on volatility in cash flows over the entire 30-year horizon. Figure 11.1 shows the fraction of quarters in which the *nominal* distributions from the strategy are more than 5 percent lower than in a year earlier. The columns are sorted in decreasing order, from highest (most volatile) to lowest, illustrating the relative downside volatility of the IVA, RMDs, time-horizon payout funds, and the IVA/RMD

TABLE 11.3 Total real cash flow excluding ending balance

Strategy	5 years		20 years		30 years	
	Median ($)	Mean/volatility[a]	Median ($)	Mean/volatility[a]	Median ($)	Mean/volatility[a]
Real fixed annuity	0.34	234.1	1.35	183.8	2.03	207.6
Balanced mutual fund	0.25	234.1	0.98	15.0	1.47	4.3
50% in real fixed annuity/50% in RMD	0.17	234.1	1.15	8.2	1.96	5.7
Variable annuity with GLWB	0.25	18.0	0.97	5.8	1.40	4.4
Time-horizon payout funds	0.26	10.7	1.11	4.5	1.77	3.7
Variable annuity with 3.5% AIR	0.37	9.9	1.58	4.4	2.47	3.5
50% in variable annuity with 3.5% AIR/50% in RMD	0.19	9.9	1.26	4.0	2.18	3.2
Required minimum distribution	0.00	0.0	0.94	3.5	1.89	2.9
Endowment-style payout funds	0.24	13.7	0.95	4.2	1.42	3.3

[a]Measured as mean total real cash flow across all simulations divided by the lower semi-variance of the mean total real cash flow across all simulations; higher is better.

Note: See Table 11.1 for definitions.

Source: Authors' calculations; see text.

combination. The GLWB is at the opposite extreme with no nominal downside volatility, with other strategies in the middle range. Figure 11.2 presents data on median *real* annualized growth rates of the distributions of income from each of the strategies, again in decreasing order, showing at the median, RMDs/annuity combinations produce the highest growth in payments, while balanced funds, real annuities, endowment-style payout funds, and the variable annuities with GLWB produce the least average/typical growth.

Table 11.4 shows data on the median balances remaining at three different points in the horizon for investors, and the level of cross-sectional volatility. Here, the time-horizon payout funds have a slightly higher mean-to-semi-variance, with several other strategies following close behind. Yet the relative performance of the various strategies varies widely by time

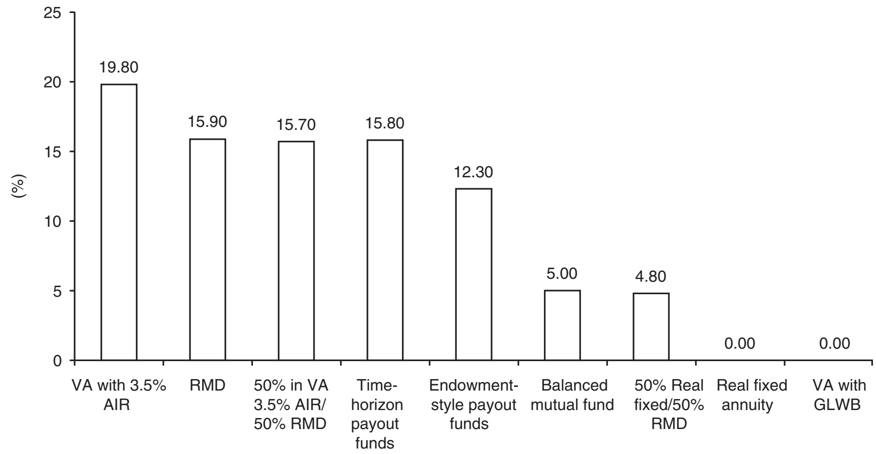

Figure 11.1 Percentage of quarters with 5 percent or more loss in year-over-year cash flow over 30-year horizon (nominal), by type of holding. *Note*: See Table 11.1 for definitions. *Source*: Authors' calculations; see text.

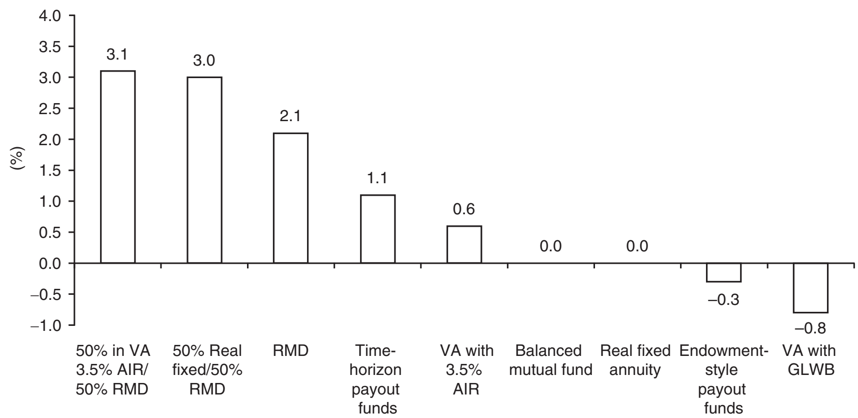

Figure 11.2 Median annualized growth of cash flow over 30-year horizon (real), by type of holding. *Note*: See Table 11.1 for definitions. *Source*: Authors' calculations; see text.

horizon, with perhaps the exception of the endowment-style payout funds that have a median residual balance that is similar at all horizons.

Figure 11.3 presents data on the typical volatility (measured as standard deviation) of the remaining asset balance available to the retiree. The greatest volatility in balance is generated by the time-horizon payout

TABLE 11.4 Median ending portfolio balance (real)

Strategy	5 years		20 years		30 years	
	Median ($)	Mean/ volatility[a]	Median ($)	Mean/ volatility[a]	Median ($)	Mean/ volatility[a]
Time-horizon payout funds	0.95	5.1	0.56	2.7	0.00	0.0
Required minimum distribution	1.26	5.3	1.25	2.5	0.84	2.1
50% in variable annuity with 3.5% AIR/50% in RMD	0.63	5.3	0.62	2.5	0.42	2.1
50% in real fixed annuity/50% in RMD	0.63	5.3	0.62	2.5	0.42	2.1
Endowment-style payout funds	1.00	4.3	0.96	2.2	0.94	1.9
Variable annuity with GLWB	0.94	4.9	0.71	2.0	0.52	1.5
Balanced mutual fund	0.98	4.7	0.89	1.7	0.77	1.3
Variable annuity with 3.5% AIR	0.00	0.0	0.00	0.0	0.00	0.0
Real fixed annuity	0.00	0.0	0.00	0.0	0.00	0.0

[a] Measured as mean total real cash flow across all simulations divided by the lower semi-variance of the mean total real cash flow across all simulations; higher is better.

Note: See Table 11.1 for definitions.

Source: Authors' calculations; see text.

funds. All of the investment-related solutions have very similar volatility levels, while the annuity solutions (trivially) have no volatility, as there is no remaining balance.

Finally, Table 11.5 presents summary data on the real IRRs at different horizons for each of the strategies. The data show that as investor horizons lengthen or shorten, the implications for differences in relative IRRs across the strategies can change quite dramatically. Of course, the starkest examples are the immediate annuities, which produce the worst relative results at short horizons, but the best results at the long horizons. Most of the investment-related strategies produce similar IRRs across the different implementations and product designs, largely a result of the fact that the investment allocations are quite similar across the various products.

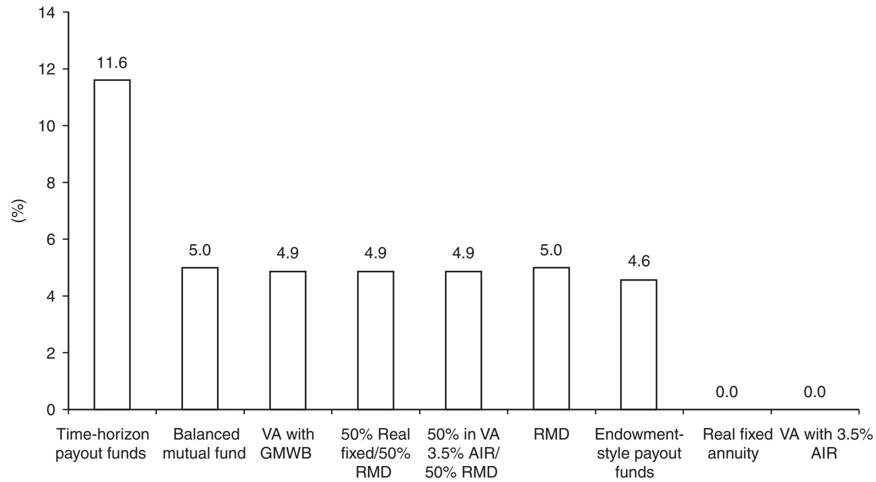

Figure 11.3 Median standard deviation of quarter-over-quarter change of balance over 30-year horizon, by type of holding. *Note*: See Table 11.1 for definitions. *Source*: Authors' calculations; see text.

Conclusion

This simulation exercise shows that different commonly advocated retirement income strategies produce a wide variety of possible outcomes. Some of the largest differences in outcomes are related to the impact of the various drawdown strategies and products on the residual/bequeathable wealth levels. Annuity options obviously provide relative stability of income flows but have strong negative impacts on residual wealth early in retirement. Drawdown strategies lack the pooling of mortality risk provided by the annuity so are less effective at providing stable income over very long horizons, but they tend to offer enhanced residual value of retirement assets upon death at shorter horizons. Insurance guarantees such as the GLWB rider can introduce very limited levels of annuitization that can have some value in the worst states, combining some of the features of drawdown with annuitization.

All of the approaches analyzed are useful to some degree in achieving the objective of providing a source of periodic payments. In addition, it is clear from the simulation analysis that none of the proposed strategies is dominated by any of the others if one admits the possibility that residual wealth levels are of great importance to retirees. The reluctance of retirees to voluntarily annuitize assets is strong evidence that maintaining full control over and possession of their assets is of significant value to many retirees.

TABLE 11.5 Median annual internal rates of return (real) for various holding periods

Strategy	5 years		20 years		30 years	
	Median (%)	Mean/ volatility[a]	Median (%)	Mean/ volatility[a]	Median (%)	Mean/ volatility[a]
Real fixed annuity	−30.4	−286.0	3.2	55.0	5.5	134.3
50% in real fixed annuity/50% in RMD	−4.9	−1.4	4.3	2.6	5.1	4.1
50% in variable annuity with 3.5% AIR/50% in RMD	−4.5	−1.1	4.9	1.8	5.8	2.4
Required minimum distribution	4.7	1.1	4.8	1.8	4.9	2.1
Variable annuity with 3.5% AIR	−28.2	−9.5	4.9	1.7	7.1	2.8
Time-horizon payout funds	4.2	1.0	4.1	1.7	4.0	1.8
Balanced mutual fund	4.6	1.1	4.6	1.6	4.6	1.6
Endowment-style payout funds	4.9	0.9	4.8	1.6	4.8	1.9
Variable annuity with GLWB	3.8	0.9	4.0	1.5	4.0	1.8

[a] Measured as mean IRR across all simulations divided by the lower semi-variance of the mean IRR across all simulations; higher is better.

Note: See Table 11.1 for definitions.

Source: Authors' calculations; see text.

All of these approaches are currently in use in the retirement marketplace. A follow-up question that arises is what specifications of retiree preferences or desires might help explain why individuals appear to embrace investment strategies and solutions that emphasize continued growth of residual assets.

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Opinions expressed herein are those of the authors alone and do not necessarily reflect the views of The Vanguard Group, Inc., its affiliates, management, or trustees. The authors are solely responsible for any errors.

Appendix 11A Glide Path for Asset Allocation

TABLE 11A.1 Payout rates and asset allocation patterns by age

Age	Year	Required minimum distribution (RMD) payout rate (%)	Time-horizon fund payout rate (%)	Time-horizon fund asset allocation		
				US equities (%)	International equities (%)	Bonds (%)
65	1	0.0	5.09	50.3	12.2	37.5
66	2	0.0	5.18	49.5	11.9	38.7
67	3	0.0	5.27	48.6	11.6	39.8
68	4	0.0	5.38	48.0	11.1	41.0
69	5	0.0	5.50	47.3	10.6	42.1
70	6	3.6	5.63	46.8	10.1	43.2
71	7	3.8	5.77	46.2	9.6	44.2
72	8	3.9	5.93	45.9	9.3	44.9
73	9	4.0	6.10	45.5	8.9	45.6
74	10	4.2	6.30	45.2	8.5	46.4
75	11	4.4	6.50	44.8	8.0	47.2
76	12	4.5	6.75	44.4	7.7	48.0
77	13	4.7	7.01	43.9	7.3	48.8
78	14	4.9	7.31	43.2	7.0	49.9
79	15	5.1	7.65	42.5	6.6	50.9
80	16	5.3	8.03	41.8	6.2	52.0
81	17	5.6	8.47	41.1	5.8	53.1
82	18	5.8	8.98	40.2	5.4	54.4
83	19	6.1	9.58	39.3	5.0	55.7
84	20	6.5	10.29	37.7	4.6	57.8
85	21	6.8	11.15	36.0	4.1	59.9
86	22	7.1	12.20	33.7	3.7	62.7
87	23	7.5	13.52	31.3	3.2	65.5
88	24	7.9	15.23	27.4	2.9	69.7
89	25	8.3	17.53	23.5	2.6	73.9
90	26	8.8	20.74	19.6	2.3	78.1
91	27	9.3	25.59	15.7	1.9	82.4
92	28	9.8	33.79	11.8	1.6	86.6
93	29	10.4	50.35	7.9	1.3	90.8
94	30	11.0	100.00	4.0	1.0	95.0

Note: See Table 11.1 for definitions.

Source: Authors' calculations; see text.

Notes

[1] The drawdown methods that these studies recommend are at odds with most rules that arise from standard economic models of consumption and portfolio choice; see in particular Sharpe, Scott, and Watson (2008).

[2] Recent events in the financial markets coupled with the apparent failure or inadequacy of the hedging programs employed by some insurers to back these promises have raised some questions about the viability of these types of products going forward. Providers are already increasing prices for some of these guarantees.

[3] Based on information in the Retirement Income Data Bank maintained by Ernst & Young.

[4] Another type of payout fund appears similar to more common 'income-oriented' mutual funds, differing only in that the income target for the funds is quantified and explicitly targeted. Despite the announced target, the level of income and the periodic payments that the funds will make to shareholders will vary with the amount of income actually earned by the portfolio, just like a typical mutual fund.

[5] Tax considerations may also be important for after-tax investors. Ameriks and Ren (2008) review these issues and provide some additional simulation analysis illustrating the impact of taxes.

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