The best approach to adjustable retirement withdrawals

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A great deal of recent research has focused on strategies that adjust withdrawals in retirement depending on investment experience. But such strategies disrupt retirement plans by causing withdrawals to vary a lot from year to year. I'll examine the prominent approaches for determining what will work best for clients.

A simple example of an adjustable strategy would be to a set percentage of the current portfolio to withdraw each year. This approach contrasts with the classic 4% rule where withdrawals are set at 4% of the initial portfolio and increased by inflation each year, regardless of performance of the underlying portfolio. A problem with basing withdrawals on current portfolio values is that, if the portfolio drops in value from one year to the next, withdrawals will drop by the same percentage. For example, with a $1 million portfolio and a 5% withdrawal rate, a 20% drop in the portfolio will reduce annual withdrawals from $50,000 to $40,000.

Researchers have recognised the need to smooth withdrawals when employing adjustable strategies, and have come up with a variety of different approaches. Wade Pfau analyzed 10 different methods to generate retirement withdrawals, and noted the particular smoothing techniques they employ. The best-known adjustable approach Pfau examined was developed by Jonathan Guyton and William Klinger and described in their *Journal of Financial Planning*. They started with inflation-adjusted withdrawals, akin to the 4% rule, and then prescribed decision rules to move withdrawals above or below this inflation-adjusted path as a function of how the underlying portfolio performs. Their objective was to modify the approach used in the 4% rule to make retirements more sustainable, but without too much year-to-year fluctuation in withdrawals. To some extent, their approach achieves smoothing by taking money from good investment years to support withdrawals when investments don't perform as well.

Economist Laurence Siegel has expressed concern about smoothing approaches that attempt to spread investment impacts forward instead of applying full recognition in the current year. He presented his argument in *Financial Analysts Journal* in an article co-authored with M Barton Waring, which Siegel summarised in an Advisor Perspectives article. These authors contended that withdrawals should adjust immediately for changes in the underlying portfolio and should not be smoothed out or deferred. They pointed out that a series of bad investment years and keeping withdrawals too high can permanently impair a retirement plan. If a smoother pattern of withdrawals is desired, they argue for solving the problem by lowering the stock allocation in the underlying portfolio.

Waring and Siegel named their recommended adjustable approach "annually recalculated virtual annuity" (ARVA). They determined each year's withdrawal rate by calculating a payment factor based on the combination of the current portfolio value, conservatively estimated remaining longevity, and expected investment returns. They applied this payment factor to the current value of the portfolio, so any changes in portfolio value have a full impact on withdrawal amounts, without smoothing.

TESTING THE METHODS

Smoothing is the crucial element in many proposed retirement strategies, so let's examine all sides of the smoothing debate. In the following sections, I model retirement outcomes by first applying Waring and Siegel's ARVA approach. I then compare that to two ARVA variations that use smoothing - the Waring/Siegel recommendation of lowering the stock allocation and a modification I make to ARVA where I limit the amount of year-to-year change in withdrawals. I then model the Guyton/Klinger decision rules and compare outcomes with the ARVA-related approaches. Details of the modeling and assumptions are presented in the Appendix.

My expectation before doing the modeling was that Waring and Siegel's no-smoothing approach would produce the best outcomes. Their ARVA method was published earlier this year and has been scrutinised by other researchers. It is firmly grounded in life-cycle economics principles that have developed over the past 90 years. I expected that applying smoothing techniques would give rise to the types of problems Waring and Siegel warned about. But sometimes research produces surprises...

THE MODEL

I base this example on a 65-year-old female with a 25-year life expectancy and $1 million in retirement savings. Her basic living expenses are $50,000, increasing with inflation each year, and she will receive $35,000 as annual government payments and other lifetime income. She needs to fill a gap of $15,000 in real dollars to pay for basic living expenses. Additional withdrawals can be used for discretionary spending. I limit her investments to stocks and bonds to keep the analysis manageable - no annuities, although annuities could be used to improve results further. The analysis is pre-tax and future dollar figures are discounted for inflation and stated in real terms.

I start with a portfolio invested 50% in stocks, apply the ARVA method for determining each year's withdrawals, do 10,000 Monte Carlo retirement simulations and assess retirement performance using a number of different measures related to income generated, bequests and plan failure.

Next I run simulations where I apply smoothing to the ARVA approach. First, I keep the 50% stock portfolio, calculate ARVA withdrawals and then adjust the withdrawals to reduce the yearly change by 40%. Then I test the Waring/Siegel recommended approach to reduce withdrawal volatility by reducing the stock allocation to 30%, which has the effect of reducing the portfolio standard deviation by 40%.

Figure 1 shows the outcomes.

- The top two rows are upside measures – here, 40% smoothing produces better outcomes than reducing the stock allocation.
- The next two rows relate to plan failure. The more meaningful metric is the average shortfall because it incorporates both the probability and magnitude of failure. It shows some deterioration when we move away from the base case, slightly more for 40% smoothing.
- The consumption change percent measures the average absolute value of changes in consumption expressed as a percentage of total consumption. We see a reduction in consumption volatility when we apply smoothing and a slightly greater reduction by reducing the stock allocation.
- The CE (certainty equivalent) measure applies an economic utility calculation that converts variable year-by-year consumption into a level amount that the recipient would view as equivalent. Although this measure is the most complicated to calculate and explain (see Appendix), it is the most comprehensive performance measure because it recognise three income measures – level, volatility and sustainability. We see that the smoothing approach in the middle column wins out over the stock-reduction approach in the right column.

Figure 1: Smoothing versus reduced stock allocation – Monte Carlo

Performance measure	ARVA 50% stocks no smoothing	Modified ARVA 50% stocks 40% smoothing	vc	/Siegel djustment tocks
Average consumption	$77,607	$77,751		279
Average bequest	$314,820	$311,851		,601
Failure percentage	10.5%	12.8%		2%
Average shortfall	-$3,994	-$5,239		384
Consumption change %	4.7%	3.2%		9%
Average CE consumption	$73,320	$73,225		398

Source: Author's calculations

In determining an overall evaluation of income generation, pay attention to both the CE consumption and consumption-change percent. The latter measure places additional emphasis on year-to-year consumption change, whereas the CE measure assumes each year's consumption utility is independent of prior consumption.

GUYTON/KLINGER

In this section, I test the Guyton/Klinger decision rules approach and compare it to the smoothed version of ARVA. I use the same 50% stock allocation.

The middle column of Figure 2 shows that the Guyton/Klinger approach generates lower average consumption but higher bequest values than the smoothed ARVA method. The shortfall measure is slightly worse for Guyton/Klinger, but the consumption volatility improves. The CE consumption measure, which combines the key income aspects, falls slightly below smoothed ARVA. I chose the 5.25% initial withdrawal rate for the Guyton/Klinger test because that generated the highest CE consumption. In the right most column I show the results for a fixed 5.25% withdrawal rate, and this demonstrates the beneficial impact of applying the Guyton/Klinger decision rules. Without the decision rules, the failure outcomes turn nightmarish. Consumption volatility is low, but that sends a false signal. Consumption stays level at $87,500 until the plans fail in more than half of the simulations. It then drops to $35,000 and remains at that level until death. The impact of the failures does get picked up in the CE consumption measure.

Figure 2: Guyton/Klinger smoothing, 5.25% initial withdrawal rate

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Performance measure	Modified ARVA 50% stocks 40% smoothing	Guyton/Klinger smoothing	fixed wal rate
Average consumption	$77,751	$75,736	352
Average bequest	$311,851	$394,082	,008
Failure percentage	12.8%	13.0%	9%
Average shortfall	-$5,239	-$7,412	,659
Consumption change %	3.2%	1.5%	3%
Average CE consumption	$73,225	$72,306	413

Source: Author's calculations

USING HISTORICAL RETURNS

As an additional test, I did the same analysis as before, but switched from randomly generated returns (Monte Carlo simulations) to historical returns. I wanted to test the impacts of historical year-to-year correlations in stock and bond returns and the interaction between the two asset classes. I ran 10,000 simulations with returns obtained by bootstrapping - building retirement return sequences by randomly selecting two 20-year blocks of returns for each simulation. I also scaled down the returns to produce the same stock and bond average returns used for the randomly generated returns in the earlier simulations.

The results (Figure 3) for the three methods tested are remarkably close to the results with randomly generated returns, with a slight worsening of the failure measures. Incorporating historical return relationships didn't significantly change the outcomes.

Figure 3: Historical data--bootstrapped returns

Performance measure	Modified ARVA 50% stocks 40% smoothing	Waring/Siegel volatility adjustment, 30% stocks	'Klinger thing
Average consumption	$77,552	$73,874	770
Average bequest	$314,795	$272,333	,557
Failure percentage	13.2%	14.3%	8%
Average shortfall	-$5,699	-$6,354	,767
Consumption change %	3.5%	3.8%	5%
Average CE consumption	$72,646	$69,819	464

Source: Author's calculations, Ibbotson®

CONCLUSION

This analysis has been based on a single client scenario and one set of investment assumptions, so caution needs to be applied before stating general conclusions. However, the results caution against following the Waring/Siegel advice and rejecting smoothing. The ARVA approach that they recommend produces excellent results in generating retirement income, but adding smoothing further improves the approach. The analysis of the Guyton/Klinger approach also indicates that methods that anchor to an initial withdrawal rate may also produce good results. There is more work to be done to sort out retirement income strategies.

APPENDIX

1. Client assumptions

65-year-old retired female with a remaining life expectancy of 25 years and $1 million in savings that she can dedicate to generating retirement income. Her basic living expenses are $50,000 per year, increasing with inflation, and she will receive $20,000 annually from the government and an additional inflation-adjusted $15,000 from a source such as a pension or a SPIA. She will use withdrawals from savings to cover the $15,000 gap between basic living expenses and guaranteed lifetime income, and take additional withdrawals for discretionary spending. Her goals are to generate sustainable retirement income and maintain liquidity and flexibility (not a candidate for additional annuity purchase). Leaving a bequest is of secondary importance.

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2. Investment assumptions

For the Monte Carlo analysis in the first part of the article, stocks are assumed to earn an arithmetic average real return of 5% with a 20% standard deviation and bonds (TIPS) are assumed to earn 0% with zero standard deviation (bond ladder approach). These returns are significantly lower than historical averages, reflecting current interest rates and a lower-than-historical equity risk premium.

For the historical return analysis later in the article, I use a bootstrapping technique, building retirement return sequences by randomly selecting blocks of 20-year stock and bond real returns from Ibbotson® data for large-cap stocks and intermediate-term government bonds. Again, I run 10,000 simulations. This approach captures historical serial correlation (if any) within each of the two asset classes and correlation between stock and bonds. (Bonds now behave more like a TIPS fund than a TIPS ladder.) I also scale back stock and bond returns in the historical data to match the average real returns assumed for the Monte Carlo simulations.

In both approaches, allocations are rebalanced annually to maintain the initial allocation.

3. The ARVA method

This approach, developed by Waring and Siegel, can be described based on the Excel PMT function. The maximum allowable withdrawal is recalculated each year as a function of the current portfolio balance, estimated remaining longevity, and expected investment returns. I change the method slightly from that described by the authors, by updating the estimated remaining longevity each year based on a mortality table. For a return assumption, I use my estimated TIPS yield, to be conservative, even though my assumed portfolios contain both stocks and TIPS. The key difference between the ARVA method and traditional approaches like the 4% rule is that ARVA adjusts withdrawals each year to reflect emerging investment experience, whereas traditional approaches determine the pattern of future withdrawals at the start of retirement.

4. Modeling methodology

For each retirement income approach modelled, I generate 10,000 simulated retirements. Withdrawals each year are determined based on the particular retirement income approach being modeled. Investment returns for each year are generated randomly based on average return and standard deviation characteristics or derived from historical data if bootstrapping is used. The date of death for each of the 10,000 simulations is randomly determined based on a Gompertz mortality function calibrated to a life expectancy of age 90 for a 65-year-old.

Although methods that determine withdrawals as a percentage of the current portfolio balance will never completely deplete savings, I use a slightly different approach. If calculated consumption is not sufficient to cover basic living expenses, but there are remaining savings, I take from the savings to cover the expense gap until savings are depleted. This way I can determine the percentage of simulations where savings are depleted.

5. Performance measures

- *Average consumption* – Consumption equals guaranteed income ($35,000) plus annual withdrawals. For each of the 10,000 simulations, I compute the lifetime average of the annual consumption amounts, and then take the average of these averages.
- *Average bequest* – Each of the 10,000 simulations produces a remaining savings at time of death, which can be zero or a positive amount. I calculate the average of the 10,000 bequest amounts.
- *Failure percentage* – Represents the percentage of the 10,000 simulations where savings are insufficient to fully pay for the assumed $50,000 of basic living expenses.
- *Average shortfall* – For each simulation that "fails," I calculate the amount of additional funds that would have been needed to pay for basic living expenses until the end of life. The sum of these amounts is divided by 10,000 to determine an average shortfall for all the simulations (including those with zero shortfall). This is a more useful failure measure than failure percentage because it incorporates both frequency and magnitude, but I also show failure percentage because it is a more commonly used measure.
- *Average CE consumption* – This certainty equivalent (CE) measure is based on an economic utility calculation that converts variable year-by-year consumption into a level amount that the recipient would view as equivalent. The CE amount depends on what economists refer to as the recipient's level of risk aversion. For example, if annual consumption bounced around randomly between $50,000 and $70,000, an individual with low risk aversion would demand close to $60,000 if offered a trade to level consumption. A highly risk averse individual would be willing to accept an amount closer to $50,000. For this analysis, I have assumed a medium/high aversion to variable consumption – that an individual would be willing to accept annual consumption of a level $55,500 in trade for consumption that bounced around randomly between $50,000 and $70,000. This translates to a risk aversion coefficient of 6 based on a CRRA utility function of the form U = (1/(1-RA))*C^(1-RA) to convert consumption into utility. For each of the 10,000 Monte Carlo iterations, I convert each year's consumption into utility, average the utilities based

on the number of years in each iteration and convert to a CE using the inverse of the utility function.

6. Guyton/Klinger decision rules

These authors start with a fixed initial withdrawal rate similar to the classic 4% rule, but vary future withdrawals to respond to future investment experience. However, they use the initial withdrawal rate as an anchor when making future adjustments. They set outer boundaries for withdrawals based on two rules: the "prosperity rule" and the "capital preservation rule." The "prosperity rule" increases withdrawals by 10% in any year that the current withdrawal rate falls to 20% less than its initial level. The "capital preservation rule" applies during the first 15 years of retirement and cuts withdrawals by 10% if the current withdrawal rate rises to be more than 20% above its initial level. Within these boundaries, the decision rules take away the annual planned inflation adjustment if the prior year's investment return was negative and the withdrawal rate based on the current portfolio level is higher than the initial withdrawal rate. Otherwise withdrawals increase with inflation each year as under the 4% (or X %) rule.

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