An Actuarial Approach to Retirement Strategy Metrics

January 2020

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Executive Summary

Because of the complexity involved in the creation of customized individual retirement income plans, retirees tend to rely on simpler approaches that focus primarily on investment portfolio drawdowns. However, these approaches often suffer from a variety of weaknesses. The primary one being a lack of integration with other potential income sources (and related decisions). These include the age to commence Social Security benefits, whether to purchase a guaranteed income annuity with a portion of the retirement savings (immediate or deferred), the asset allocation risk level, whether and when to use home equity, the order of drawdowns based upon applicable income taxes, as well as others. In addition, some basic drawdown approaches are not well designed to accommodate changing spending patterns as one ages, nor the monitoring of liquidity during retirement, or legacy goals at death. Actuarial methods have the potential to be used to assist retirees in analyzing, testing, and comparing alternative comprehensive retirement income strategies incorporating additional sources of potential income and related decisions. In addition, a properly designed application, based on an actuarial method, can also serve an educational purpose even if not used in the final decision process. This paper proposes one such actuarial method for consideration.

Section 1: Background

Though there are many different approaches based on invested assets that can be used to drawdown retirement savings, here are some of the more common ones:

1.The 4% (+/-) Rule: Under this approach, 4% of retirement savings is spent down in the initial year, increasing annually by inflation.[1] The effectiveness of the 4% rule has recently been questioned (some suggesting 3%-3.5%) based on increases in longevity and concerns regarding capital market return expectations.[2]

2. The minimum required distribution (MRD) approach: Under this approach the amount that is spent down each year from retirement assets (both from qualified plans and other savings both before and after age 70 ½) is based on the factor used to determine minimum required distributions under Section 401(a)(9) of the Internal Revenue Code.[3] This approach is subject to large swings in annual drawdowns especially when the investment portfolio has a high allocation to equities. Note that there have been some modifications to the MRD approach proposed that serve to limit annual swings.

3. Time segmented buckets: Under this approach separate investment portfolios are established. Each one representing the amount of estimated retirement savings expected to be needed for a finite number of years. For example, Bucket 1 could cover the first five years, Bucket 2 the next 10 years, and Bucket 3 year 15 and after. The asset allocation for each bucket will differ representing alternative risk levels ranging from conservative to aggressive.

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[1] http://www.retailinvestor.org/pdf/Bengen1.pdf
[2] https://www.onefpa.org/journal/Pages/The%204%20Percent%20Rule%20Is%20Not%20Safe%20in%20a%20Low- Yield%20World.aspx
[3] Uniform table is based on joint and last survivor factor using IRS selected mortality where beneficiary assumed to be 10 years younger

In addition, the buckets are refilled periodically with funds from later buckets. One challenge with this approach is in deciding how much is needed to be allocated for the last bucket based on an unknown life time.

4. Laddering of Fixed Income: Under this approach bonds and other fixed income securities are purchased with maturity dates (often annual) that go out to the retiree's expected longevity equal to each year's expected spending needs. There may be challenges finding securities that may go out far enough in the future, as well as selecting an appropriate life expectancy.

Each investment-oriented retirement asset drawdown approach suffers from at least several of the following:

- a lack of integration among all potential sources of retirement income; Social Security, employer pension, continued employment, home equity, …
- a lack of consideration and modeling of the potential inclusion of fixed income annuities (immediate or deferred). Note other types of guaranteed income products might be considered[4]
- a lack of consideration of the range of potential life expectancies,
- a lack of planning of pre-determined drawdown levels (subject to changes due to inflation and changing spending habits)
- a lack of explicitly measuring potential liquidity and legacy goals

An approach that can determine, analyze, and compare alternative retirement income strategies that does not suffer from these shortfalls has the potential to improve retirement income outcomes.[5] In addition an analytical approach can also provide some financial literacy education on retirement planning that many retirees may lack. This includes an understanding of longevity risk, risk pooling, investment risk, and others.

Section 2: Strategy and Success

The first step is to outline what is meant by a strategy as well as to consider how we could measure a strategy for success.

A retirement income strategy can be defined as being made up of the following components.

The selection of an overall monthly income goal to be generated: this could be constant or subject to increases or decreases as a result of the consideration of inflation or providing for varying levels of income needs at different stages of retirement.

The selection of a Social Security commencement age: there is a range from 62 to 70. For those in good health with sufficient assets to live on prior to benefit commencement, it could be a good decision to delay commencement.

Whether to purchase a guaranteed income product: this could be immediate or deferred. Securing guaranteed income as part of an overall strategy should be considered by some retirees, especially fixed income annuities for those that are risk adverse, are in good health and have no significant legacy goals.

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[4] For an additional fee a guaranteed benefit level can be secured under an investment annuity regardless of the underlying investment performance and longevity of annuity holder. Restrictions usually apply to investment options and permitted annual withdrawal amounts.
[5] For retirees with no significant retirement savings or retirement sources other than Social Security, complex modeling is likely of little value

The investment asset allocation: this is the relative holdings in equity, fixed income or other asset classes. The level of risk that a retiree takes should be at least partially dependent on the level of guaranteed fixed income that can be secured and his or her income goal.

Other decisions where applicable and reasonable assumptions can be developed: examples include purchase of long-term care insurance, drawdown order of investments from accounts subject to different tax treatment, whether to elect if applicable a defined benefit plan lump sum or annuity, whether to utilize a reverse mortgage to produce additional income and whether to continue to work part time for a specified period.

Success may be measured for a retiree based on two components

Achieving an income goal:

The primary measure of success is the likelihood of achieving the desired monthly income goal over an uncertain lifetime in uncertain markets. In addition, any year that an income goal is not likely to be achieved, a measurement should be made of the percentage of the income goal that can be expected. This is particularly crucial in years that the retiree is likely to survive to.

Liquidity/Legacy goal:

A secondary success measurement is the availability of the remaining retirement savings balance that can be used during one's lifetime if needed or as a legacy at death. This should be determined for each future age as a percentage of the retirement balance at the time of initial retirement. This can be determined with or without an adjustment for inflation.

It is important to acknowledge that a specified strategy has different implications for each of the two above components being measured. A strategy that uses a delayed Social Security age, or the purchase of fixed income annuity may provide a high likelihood of achieving the income goal. However, it has the potential for an unfavorable impact on liquidity or legacy goals, most notably in the earlier years of retirement. For many retirees this is an important balance to be considered. Thus, measuring both components is of potential value.

Section 3: Developing the Actuarial Model and Creating An Output

The goal is to create metrics to assist retirees and their advisers in analyzing strategies for success. This will require the creation of a model based on actuarial assumptions.

Modeling (thousands of simulations performed):

1. An expected age at death is generated [6]
2. For each year up to that age of death, the annual income goal is determined.
3. For each year a rate of return is generated[7] as well as investment earning (or losses)
4. For each year a projected income is determined from each applicable source (Social Security, income annuity, investment earnings, …).
5. If the total projected income is greater than that year's income goal, the investment balance is increased by that excess. If the total income expected is less than the income goal than the investment balance will be reduced up to the amount of the shortfall and added to the projected income. However, the investment balance is not reduced below 0.

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[6] Stochastically determined based on probabilities of death at each future age
[7] Stochastically modeled using Monte Carlo simulations and lognormal distributions

6. A determination is made for each year of the projected percentage of the income goal achieved. This will start in the early years at 100% but will likely drop below that level in later years.
7. A determination is made for each year of the projected percentage of the initial investment balance that still remains.[8]

The percentages at each age are averaged [9] over all the simulations. Thus, deriving at each age, a single income goal percentage and a single retirement investment account balance percentage.

In order to create metrics that combine the results from above over all the ages the following steps are taken.

1. The combined income goal metric is determined by weighting at each age the probability of survival to that age. Youngest ages receive the greatest weighting.[10]
2. The combined retirement investment balance metric is determined by weighting by the probability of death at that age. The ages with the highest probability of death receive the greatest weighting.
3. These two raw metrics can be scored on a scale from 1 to 10 to help facilitate comparisons between strategies.

Assumptions Required:

- Rates of return and volatility based on capital market expectations for each investment class as well as correlation between asset classes.
- Inflation expectations
- Mortality tables that are sex distinct and adjusted for the retiree's health.
- Other assumptions may be required depending on model sophistication. Examples include future tax rates, incidence of long-term care needs, and underlying interest rates that would apply to reverse mortgage payouts.

Output:

For each strategy should prepare a graph illustrating the average projections for the income goal and retirement investment balances at each age. This will allow the retiree and adviser to consider the implications of living to certain ages. This should be accompanied by the probability of survival to each age. In addition, for each strategy the two combined metrics should be noted.

EXAMPLE:

We will now consider a hypothetical individual that is ready to retire wishing to create a $6,000 per month total income (increasing annually by 2%). This individual is interested in exploring the impact of some key decisions and how those decisions impact her income and liquidity/legacy goals. These decisions are Social Security commencement age, asset allocation, and annuity purchase options. There are thousands of possible combinations and a more sophisticated version of this model would test a very large number of strategies and identify those that maximize one of the goals (income or liquidity/legacy) based upon a minimum metric goal for the other. However, for purposes of this paper we will demonstrate just three strategies for illustrative purposes only.

Retirement planning elements should include provisions for long-term care needs. In the example it is assumed that the retiree has enough home equity to satisfy those needs if they should materialize. A more sophisticated model

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[8] Can be done on a nominal or inflation adjusted basis
[9] Averages have been used over providing ranges of outcomes. Using ranges with probabilities would require additional explanation and potential make it more difficult to compare alternative strategies.
[10] One might feel that this approach of weighting earlier ages more heavily may not properly account for longevity risk concerns. Alternative weightings might be considered.

could be developed that could help individuals compare strategies that consider use of long-term care insurance as opposed to self-insurance, or a combination of the two. This however would require assumptions regarding incidence and level of long-term care costs.

Retiree Profile

- Female
- Very Healthy
- Date of Birth May 1, 1957 (Age 62)
- Social Security benefit at Social Security Retirement Age is $2,500 (SSRA is 66 and 6 months)
- Savings $1,000,000
- Ready to Retire
- Has home with no mortgage; she will use as reverse mortgage for Long Term Care if needed
- Employer retirement incentive: $5,000 per month payable for 3 years.

Assumptions[11]

- Fixed Income Return/Standard deviation: 2.95/4.4
- Equities Return/Standard deviation: 6.95/15.6
- Inflation: 2.6%
- Mortality: RP 2014 projected to 2019; sex distinct with setbacks/forwards for health. Four year set back for very healthy status
- Immediate Annuity Purchase Rate at age 62: $58.80/year per $1,000 of premium

Strategies to Be Analyzed: All have the following income goal: $6,000 per month with a 2% annual increase

- A: SSRA immediate; 60/40[12] portfolio; no fixed income annuity purchase
- B: SSRA 66; 70/30 portfolio; 250k fixed income annuity purchase
- C: SSRA 70; 80/20 portfolio; 500k fixed income annuity purchase
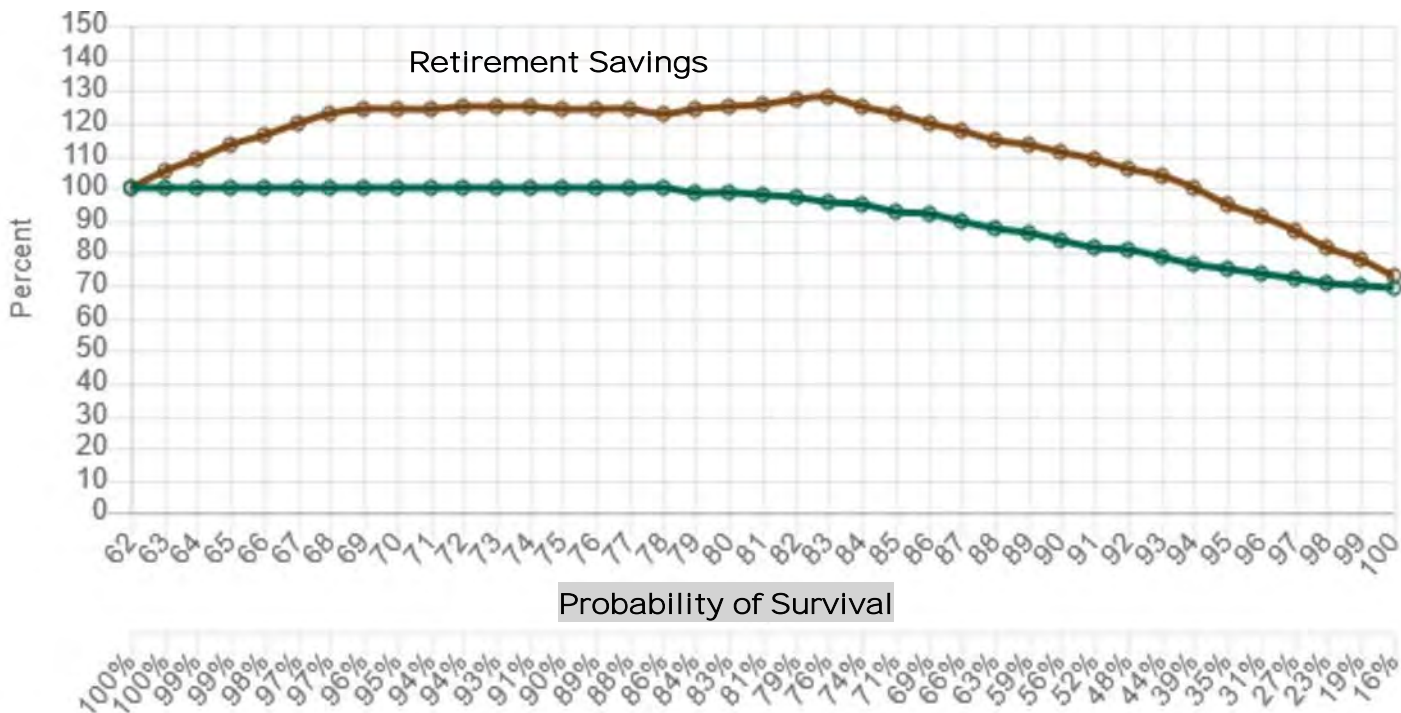
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[11] Assumptions used are illustrative
[12] First number represents equity allocation percentage & second number fixed income allocation percentage

STRATEGY A

Monthly Income is $6,000 with an annual increase of 2.0%.

The Income Score is: 6 out of 10

The Remaining Retirement Savings Score is: 9 out of 10

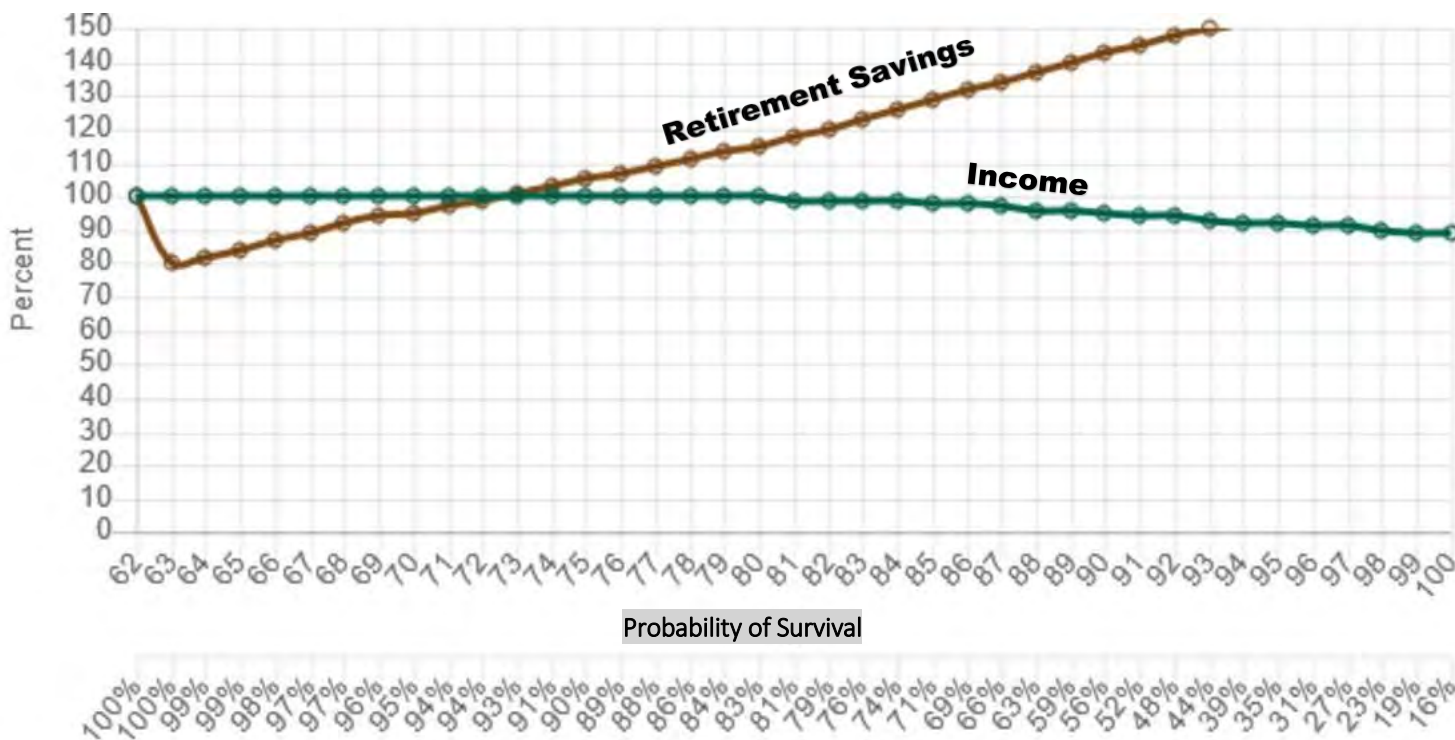**The results are based on the following strategy:**

Social Security: Immediate

Fixed Income Annuity Purchase: $0

Equity Allocation: 60%

Fixed Income Allocation: 40%

STRATEGY B

Monthly Income is $6,000 with an annual increase of 2.0%

The Income Score is: 9 out of 10

The Remaining Retirement Savings Score is: 9 out of 10

The results are based on the following strategy:
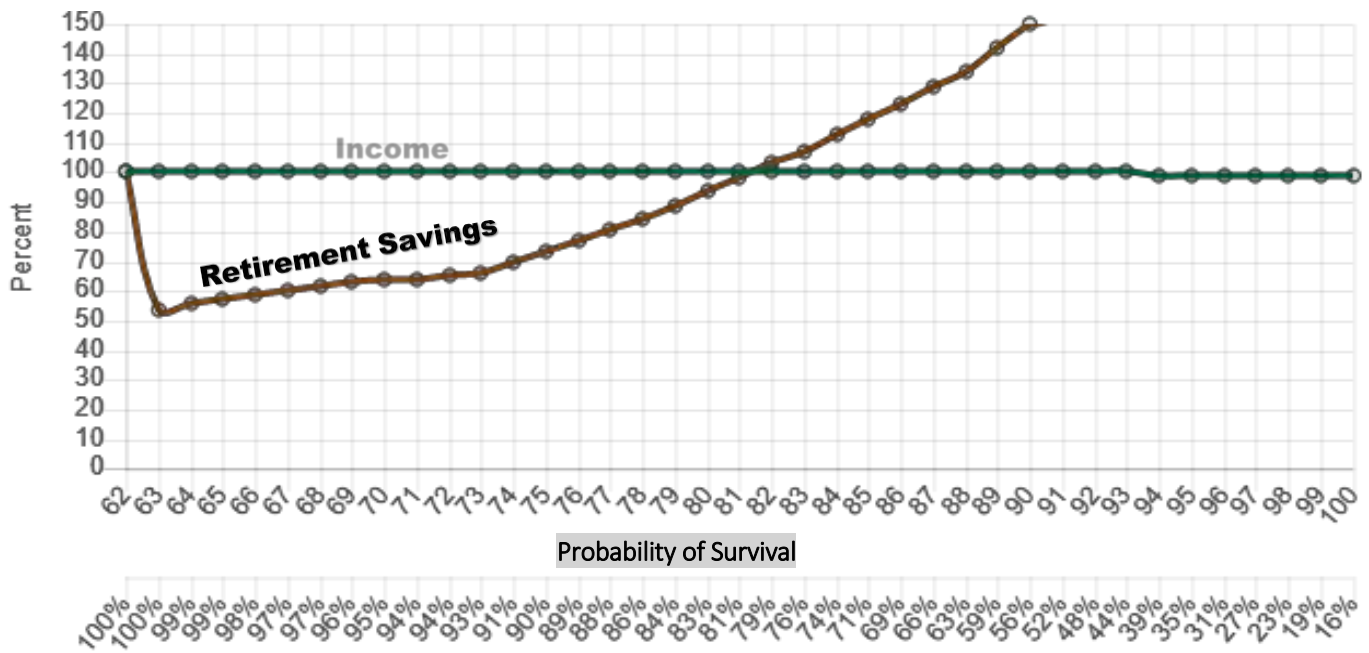
Social Security: Age 66

Fixed Income Annuity Purchase: $250,000

Equity Allocation: 70%

Fixed Income Allocation: 30%

STRATEGY C

Monthly Income is $6,000 with an annual increase of 2.0%

The Income Score is: 10 out of 10

The Remaining Retirement Savings Score is: 7 out of 10

The results are based on the following strategy:

Social Security: Age 70

Fixed Income Annuity Purchase: $500,000

Equity Allocation: 80%

Fixed Income Allocation: 20%

Section 4: Observations

Specific:

- Strategy A provides for a strong retirement savings balance especially through the retiree's life expectancy, but with a tradeoff for low income security.
- Strategy B provides for both a strong income and retirement savings approach. However, the delay of Social Security and purchase of a fixed income annuity would result in lower liquidity and legacy amounts at the earlier ages
- Strategy C has a superior income score due to the delay of Social Security to age 70 and a large fixed income annuity purchase, however does not score well on retirement savings in the earlier years.

General:

- A 100% income goal metric represents a near certainty that the income goal will be achieved at that age
- A 100% or greater investment balance metric indicates that it is likely that at that age the investment balance will be greater than the amount started with.
- For those not concerned about liquidity or legacy the retirement savings metric may not be important.
- To the extent that a high percentage of the income goal (near 100%) is expected through several years beyond life expectancy; the strategy could be considered to be an income generating success, unless followed by a major drop off in income goal.
- Results may indicate significant retirement investment balance projections in years with less than 100% income goals projected. This is attributable to the averaging of results from the many simulations. The investment balance projections are based upon an averaging of the balances from all the simulations; some of which can be $0 or very low. In years that they are $0 or very low the resulting income goal will likely not be 100%. When the income goal percentages are averaged, they will be under 100%.

Income Source:

The following bar graphs illustrate for each of the strategies the sources of projected monthly income at each age. The bottom bar sections represent income that is virtually guaranteed (other income, Social Security, and insured fixed income annuity), and the yellow section is income based upon investment balance and earnings. The top section in green (if any) represents any expected shortfall in the monthly income goal.

Strategy B
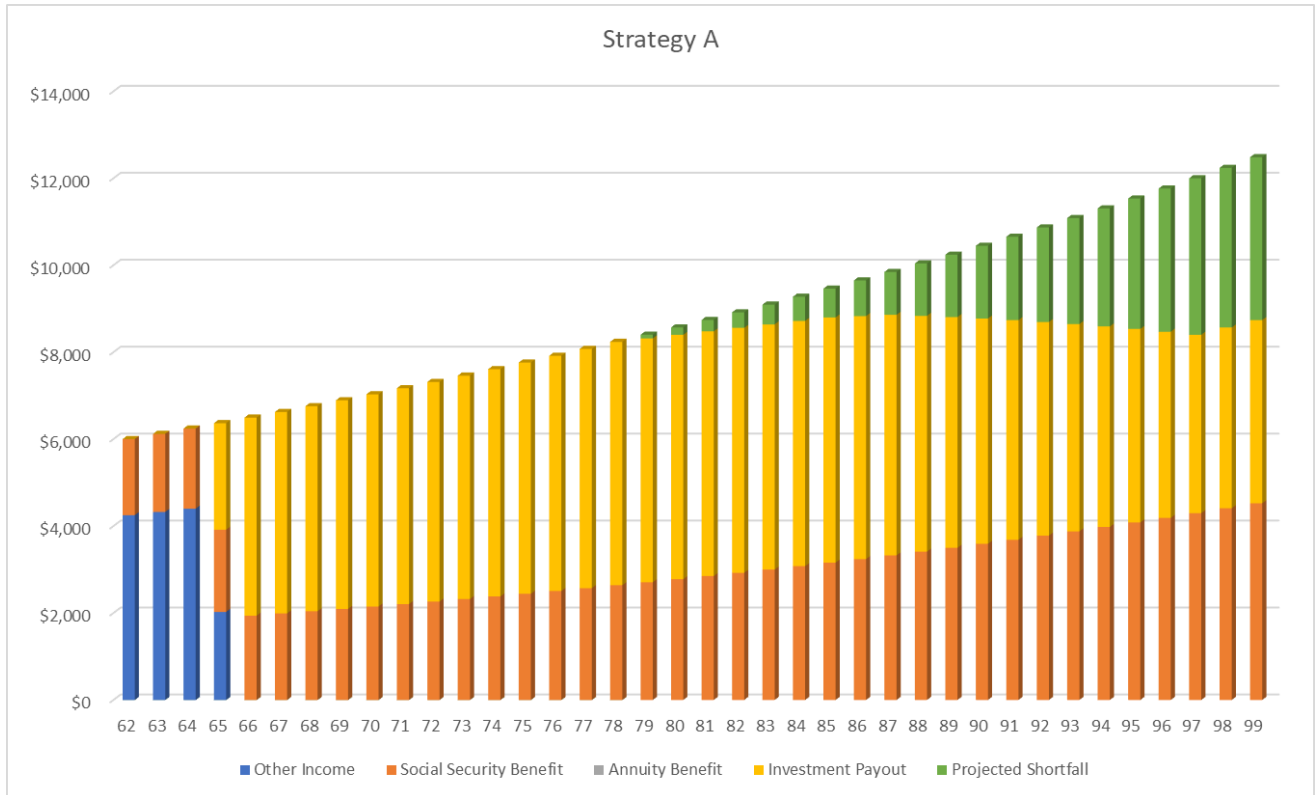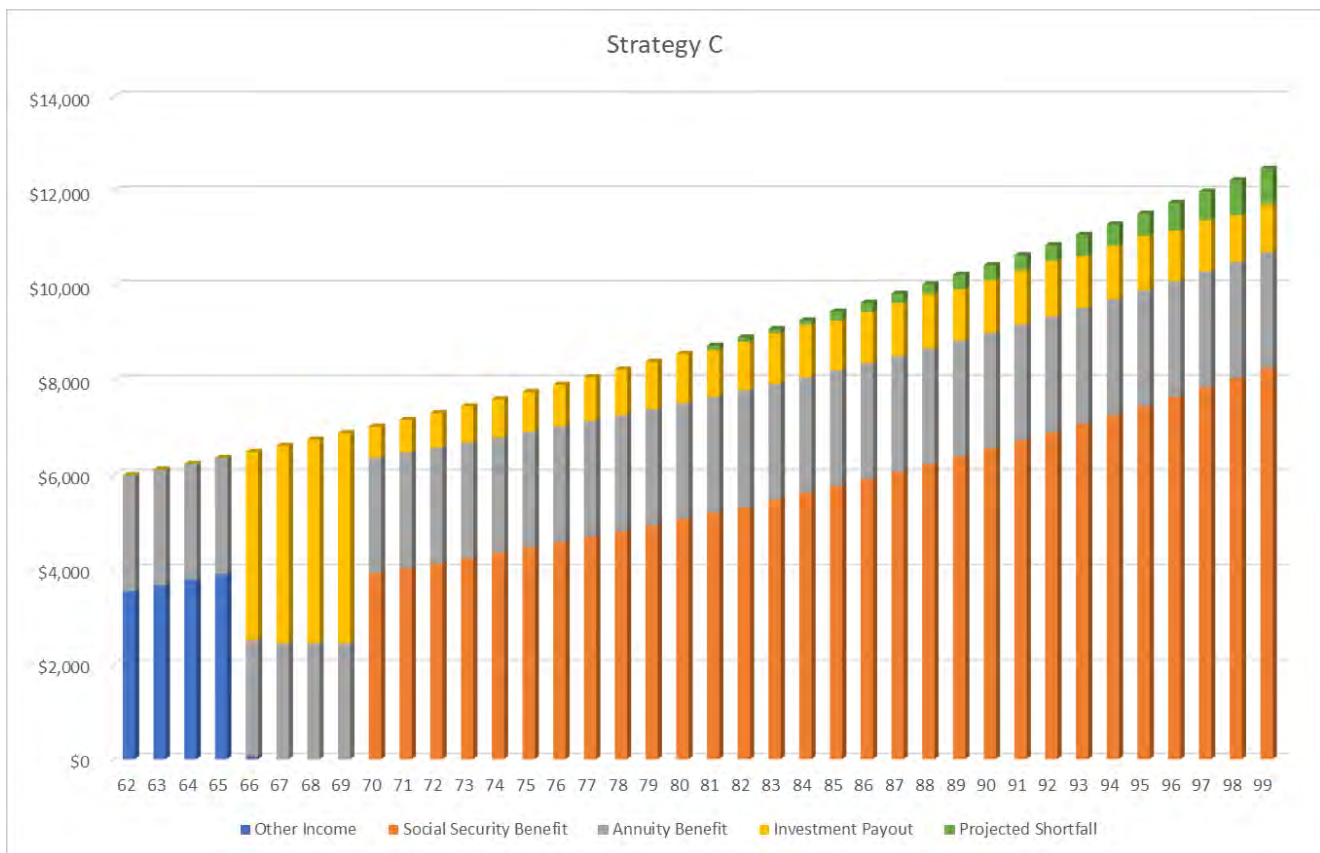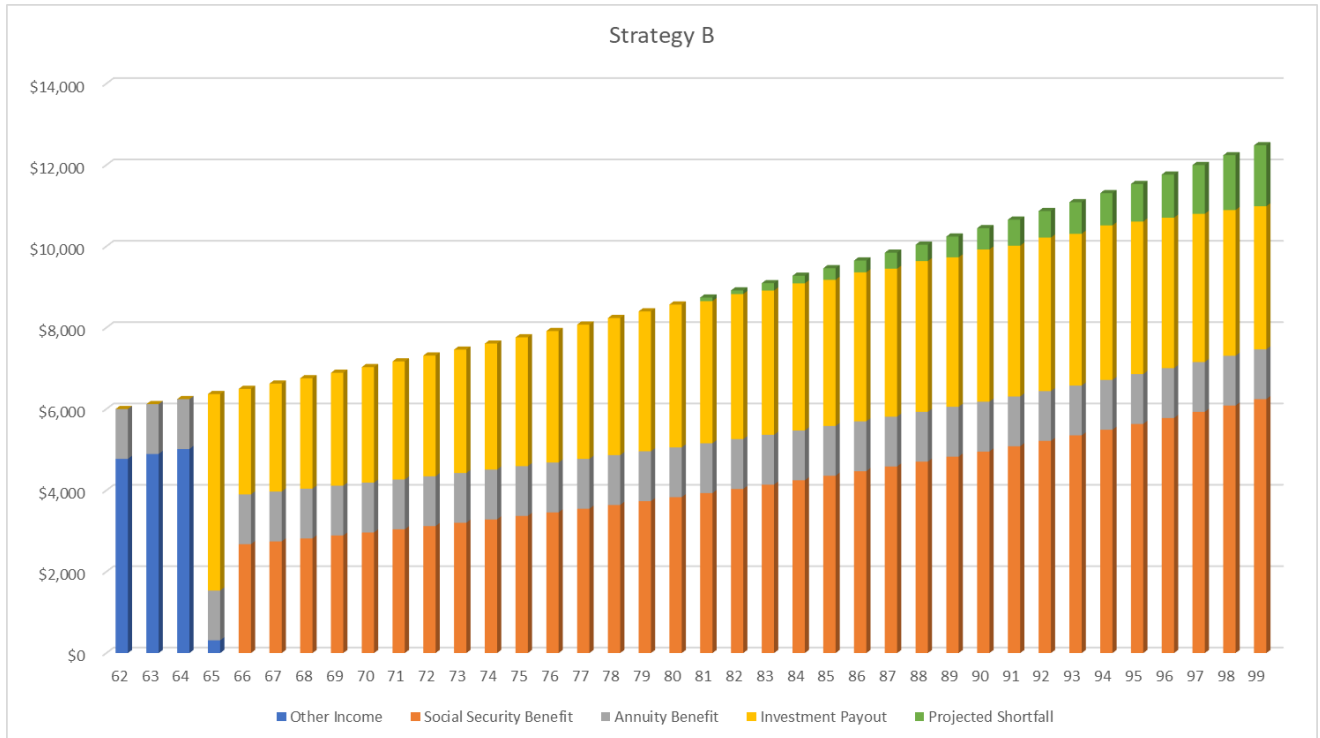
Strategy C

Section 5: Conclusion

The challenge of devising a sound retirement income strategy is a significant one for many retirees. There are many decisions to be made based upon much uncertainty. A quantitative approach to analyzing and developing strategies is of value when used alongside more qualitative considerations. A well designed program using a quantitative approach can also serve an educational purpose. Of course, using modeling based on so many future assumptions needs to be done with caution. Selection of appropriate unbiased assumptions is critical.

This paper illustrated a relatively simple example. There are many strategies that could be considered and potentially many other decisions that could be modeled; examples being joint life analysis, taxation issues as well as the use of home equity. The modeling could also be used for, or adapted to:

- search for strategies that satisfy income or retirement balance metrics
- find the strategy that maximizes the likelihood of achieving an income goal or minimum retirement balance level.
- test for an optimal specific strategy component (i.e. SSRA start date) based on other preset strategy components.
- test the impact on the results of changing assumptions

The approach presented here is only a representative model. There is the potential for others with greater degrees of sophistication.

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