A NEW APPROACH TO BUILDING A SUSTAINABLE RETIREMENT PLAN USING PROVEN ACTUARIAL PRINCIPLES

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INTRODUCTION

In 2020 the COVID-19 pandemic brought us our third significant, though short-lived, bear market in stocks over the past 20 years.[1] During this same 20-year period in the United States

- there were more positive than negative annual returns on equity investments,[2]
- yields decreased on fixed income investments, including annuities,[3]
- government debt increased and is expected to significantly expand in the future unless fiscal policies reverse course,[4]
- life expectancies generally have been getting longer,[5]
- medical and long-term-care costs rose faster than inflation,[6] and
- Social Security's financial position continued to worsen.[7]

In this environment, many retired and near-retired households face significant challenges and risks in managing their assets and implementing spending and investment strategies designed to achieve their retirement spending goals.

Retirement planning is even more challenging today because of the following:

- Fewer private sector workers have been accruing benefits under defined-benefit plans and are now generally expected to be more responsible for managing their retirement through defined-contribution or IRA-type accounts.[8]
- Many individuals lack sufficient financial skills, or the desire, to manage their retirement finances, and they seek an easy answer, a trusted advisor, or some other source to help them.[9]
- There is no shortage of so-called retirement experts who provide conflicting financial advice in the media or on the internet.
- Households have different financial resources, different financial goals, and different risk tolerances.
- Some financial advisors have potential conflicts of interest when it comes to advocating specific strategies.
- Many retirees will experience some form of cognitive decline during retirement.

Moreover, while investing in riskier assets is expected to generate higher returns than less-risky securities, these returns are also expected to be more volatile from year to year. In light of these challenges, risks, and varying financial needs, how should households plan for retirement?

1."The S&P 500 declined: 49.2 percent from March 24, 2000, to Oct. 9, 2002. / 56.8 percent from Oct. 9, 2007, to March 9, 2009. / 33.9 percent in less than five weeks, from Feb. 19 to March 23 [2020]" (Sommer 2020). 2. During the past 20 years there were 4 years of negative S&P returns, 14 years of positive returns (with 10 of those years in excess of 10 percent), and 2 years of flat returns (Macrotrends n.d.a). 3."At the beginning of 2000, the yields on both 10- and 30-year Treasuries were about 6.5 percent. Today, the yield on 10-year Treasuries has dropped to roughly 0.6 percent; the 30-year yield is down to 1.3 percent" (Sommer 2020). 4."By the end of 2020, federal debt held by the public is projected to equal 98 percent of GDP. The projected budget deficits would boost federal debt to 104 percent of GDP in 2021, to 107 percent of GDP (the highest amount in the nation's history) in 2023, and to 195 percent of GDP by 2050." See Congressional Budget Office (2020) for assessment of the potential impact of rising debt on the US economy and Social Security in the future. 5.The life expectancy at birth in the United States increased from 76.75 years in 2000 to 78.93 years in 2020. These data do not include the effects of COVID-19 (Macrotrends n.d.b). 6."Health care inflation has outpaced the CPI in each year [from 2005 through May 31, 2015] except 2008" (Patton 2015). 7. The OASDI 75-year long-range actuarial balance was −1.89 percent in 2000 and −3.21 percent in 2020 (Chu and Burkhalter 2020). In a 2020 American Academy of Actuaries panel discuss, Steve Goss, the chief actuary of Social Security said, "The choice before Congress and the American people is really rather simple. We're going to have to increase the revenue by about one third or reduce the scheduled benefits by about one fourth, or some combination of the two" (Goss quoted in Miller 2020). 8. "The all worker private industry participation rate was 20 percent in March 2009 and 12 percent for March 2019" (Bureau of Labor Statistics 2020). 9. According to the 20th Annual Transamerica Retirement Survey of Workers, "Many workers are guessing their retirement savings needs, one in four has a written financial strategy for retirement and more than half would prefer to rely on outside experts" (Collinson 2020).

Actuarial science offers proven approaches and processes for assessing and mitigating financial risks. This essay recommends adoption of a few basic actuarial principles[10] to help retirees
• quantify their spending liabilities,
• develop a sustainable spending budget process,
• develop a liability-driven investment (LDI)[11] strategy to help them determine how to divide their assets between risky and less-risky investments, and
• establish a strong foundation for retirement planning.

I believe adoption of these basic principles, processes, and strategies can help a retired household develop a sustainable retirement plan that is more consistent than other approaches to help them reach their spending goals while reducing the stress of managing assets during retirement.

This essay outlines a recommended actuarial financial planning approach that I believe is superior to other popularly followed methods, such as the 4 percent rule, in which withdrawing only that percentage from your accounts will avoid depleting your savings, to the more complex Monte Carlo[12] modeling techniques, which as-

sess the likelihood of meeting retirement goals, given a range of possible market outcomes.

I. A FORMULA FOR BETTER RETIREMENT PLANNING

A proven tool for personal financial planning is the household financial balance sheet. Using the traditional accounting format, assets are entered on the left side of the balance sheet and spending liabilities on the right.

For retirees, household assets include accumulated pre-tax savings, amounts in aftertax accounts, the present value of future Social Security benefits, pension benefits, annuity payments, rental income, employment compensation, and any asset (such as a home or other property) that can be sold with net proceeds used to fund expenses in retirement.

Household spending liabilities include all expenses to be incurred during retirement, including the present values of future taxes, long-term-care expenses, and bequests to be left to heirs upon death.

As such, the following is the basic actuarial equation for personal financial planning:

ASSETS			LIABILITIES		
Accumutaled Savings (+)	Present value of income from other sources (=)	Present value of future expected nonrecurring expenses (+)	Present value of future expected recurring expenses (+)	Present value of future unexpected expenses (+)	Rainy-day fund / present value of amounts to be left to heirs

This formula, which equates the total present value of a household's assets with the total present value of its spending liabilities, is similar conceptually to the basic equations used by pension actuaries for pension plan funding or by Social Security actuaries for determining Social Security's long-range actuarial balance. It tells us that the total amount we can spend in retirement (sum of the items on the right side, including bequests) is a func-

tion of the total assets we currently have accumulated in retirement.

The equation helps us broadly classify the risks facing retired and near-retired households into the following two general categories:
1. overspending risks, involving greater-than-expected reductions in assets and/or increases in expenses, and

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10. These basic actuarial principles include (1) assumptions about the future, (2) concept of time value of money, (3) concept of probabilities, (4) mortality, (5) use of present values, (6) use of a generalized individual model that compares assets with liabilities, (7) periodic gain/loss adjustment to reflect experience different from assumptions, and (8) conservatism (Trowbridge 1989).

11. "A liability-driven investment, otherwise known as liability-driven investing, is primarily slated toward gaining enough assets to cover all current and future liabilities" (Kagan 2021). 12. Investopedia defines Monte Carlo Modeling or Simulation as "a planning technique used to calculate the percentage probability of specific scenarios based on set assumptions and standard deviations" (Cussen 2019).

2. underspending risks, involving greater-than-expected increases in assets and/or decreases in expenses. </>

The equation also highlights the importance of both protecting and growing household assets. In addition to investing assets for growth, it is also important to insure assets (e.g., home, health, life, automobile) that may be used to fund future retirement expenses. This sometimes-conflicting responsibility to both protect and grow household assets might require making difficult (but very important) financial decisions, especially in today's low-interest-rate environment.

One can develop a sustainable spending budget to mitigate many of the spending risks facing retirees by restructuring the assets and liabilities that make up the equation, making reasonable assumptions about the future, and using basic actuarial processes.

II. DEVELOPING A SUSTAINABLE SPENDING BUDGET

But what reasonable assumptions should be used when valuing personal spending liabilities in the development of a sustainable spending budget?

Basic financial economics and LDI principles provide guidance on how to determine the market value, or cost, of a liability. The *Pension Actuary's Guide to Financial Economics* defines market liability as "a market value of a reference portfolio comprised of traded securities...[that] matches the [liability] benefit stream in amount, timing and probability of payment" (Joint AAA/SOA Task Force on Financial Economics and the Actuarial Model 2006, 25; emphasis in original).

The closest-traded security for purposes of satisfying this definition for personal financial planning is an inflation-indexed (or inflation-protected) life annuity.[13] This annuity pays an income stream that adjusts for inflation, for life. However, this product (without a cap on inflation adjustments) is currently not available from insurers in the United States.

ONE SOLUTION: We can calculate our own estimates of the investment return, inflation, and longevity assumptions that are approximately consistent with such annuity pricing based on current fixed dollar annuity quotes and sources such as the BlackRock (2020) Cost of Retirement Index (CoRI). These assumptions can be used to value future household essential expenses.

When it comes to discretionary expenses, however, the assumptions used to estimate the value of these liabilities may be even less conservative, since retirees have some flexibility in making these payments. Therefore, some households may wish to assume higher investment returns or shorter lifetime-planning periods, for example when valuing their discretionary expenditures.

III. LIABILITY-DRIVEN INVESTMENT: THE SAFETY-FIRST INVESTMENT STRATEGY

The LDI strategy is sometimes also referred to as the safety-first approach.[14] This strategy, or approach, is when a portfolio of low-risk or guaranteed low-risk assets (the floor portfolio) are used toward funding essential expenses, with any remaining assets (the upside portfolio) placed into higher-risk investments. While several types of assets can reduce investment risk, only a few also can reduce longevity risk by guaranteeing payment for life. I refer to these longevity risk-reducing assets as "guaranteed low-risk assets," which include the following:

1. Social Security and deferral of Social Security benefit commencement
2. Immediate life annuity (single premium immediate annuity, or SPIA)
3. Deferred life annuity (qualified longevity annuity contract, or QLAC)
4. Life annuity option under a defined-benefit pension plan

When they use the safety-first approach for investing, some households may only want to include guaranteed low-risk assets in their floor portfolio while others are comfortable using other low-risk types of investments that do not mitigate longevity risks.

The safety-first investment strategy may be considered a two-bucket approach with the first bucket (the floor portfolio) consisting of assets designed to protect essential

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13. Investopedia indicates that an inflation-protected annuity "is similar to a regular immediate annuity, but its payments are indexed to the rate of inflation. However, oftentimes there is a cap, and investors don't receive payments beyond this percentage rise in the inflation rate" (Kagan 2020).
14. For further discussion of the safety-first approach, see Pfau (2019).

spending while the second bucket (the upside portfolio) is designed to grow assets without jeopardizing essential spending.

In a *Forbes* article, retirement pundit Dirk Cotton (2019a) wrote, "The most important decision you will make in retirement planning is how much of your resources to allocate to the upside and floor portfolios." In another *Forbes* article Mr. Cotton notes, "The correct balance [between floor and upside portfolios] will depend on how willing you are to risk losing your standard of living for the chance of having an even higher one" (Cotton 2019b).

An important component of this decision, and one that will be a good indicator of the household's investment risk tolerance, will be how a household classifies essential versus discretionary expenses. For example, some households that desire a higher standard of living or that feel strongly about investing in equities might be more comfortable understating essential expenses relative to discretionary expenses.

IV. THE ACTUARIAL APPROACH TO RETIREMENT PLANNING

The following three processes integrate the basic actuarial and LDI principles discussed above and make up my recommended actuarial financial planning approach.

PROCESS 1. ANNUAL VALUATION TO DEVELOP HOUSEHOLD ANNUAL SPENDING BUDGET DATA POINTS AND INVESTMENT STRATEGY

- **STEP 1:** Estimate future recurring expenses in retirement (i.e., expenses that a retiree will probably incur fairly constantly throughout retirement).
- **STEP 2:** Estimate future nonrecurring expenses in retirement.
- **STEP 3:** Categorize each expense in Steps 1 and 2 as either essential or discretionary.
- **STEP 4:** Using assumptions consistent with expected amount, timing, and probability of payment for each type of expense, determine the present values needed to fund expected future essential expenses as well as discretionary expenses. For example, the assumptions used to discount future essential expenses would be approximately consistent with assumptions used to price

inflation-adjusted annuities, and assumptions used to discount future discretionary expenses could be more consistent with expectations associated with investments in riskier assets.

- **STEP 5:** Compare the total present value of household assets with the total present value of future household expenses. If the total present value of household assets is greater than the total present value of household expenses,
  - increase the household current and future spending budgets,
  - increase the household rainy-day fund, or
  - increase some combination of the two.
- If the total present value of household assets is less than the total present value of household expenses,
  - increase household assets (e.g., through part-time employment or delayed retirement),
  - decrease household current and future spending budgets,
  - apply reasonable smoothing to household current year's spending budget, or
  - apply some combination of these alternatives.
- **STEP 6:** Compare the present value of household low-risk assets (floor portfolio) and risky assets (upside portfolio) with present values of essential and discretionary expenses outlined in Step 4. This will help develop an investment strategy consistent with the floor and upside portfolios anticipated under the safety-first approach.
- **STEP 7:** Repeat Steps 1–6 at least once a year. The actuarial approach is not a set-and-forget process. While stochastic assumptions can be used in the valuation, typically deterministic assumptions are used (as is true for pension plan valuations and Social Security financial measurements). Because this is a dynamic process, spending budgets can be automatically adjusted from year to year to recognize differences between assumed and actual experience. Actuarially determined budgets also can be smoothed yearly to avoid spending volatility.

PROCESS 2. DOCUMENTATION OF ANNUAL VALUATION

Actuaries generally document their work in an actuarial report. In addition to documenting the calculations involved in developing household spending budgets, it can be helpful to maintain a historical record of household

spending budget calculations. This historical information will provide additional data points that can be used to refine future spending budget determinations.

PROCESS 3. PERIODIC RETIREMENT RISK ASSESSMENT

While we must make assumptions about the future to develop a sustainable retirement plan, we also must be prepared for instances when our assumptions turn out to be incorrect. I recommend periodic stress testing of household financial plans with some what-if analyses to determine the potential negative implications of using incorrect assumptions in the plan, and consider what actions to take now or in the future to mitigate any potential problems.

For example, if household assets are significantly invested in risky assets, build into your model the potential for significant market declines and their impact on future spending budgets. Or, if one of the members in the household has significantly more assets than the other, model the effect of death or divorce on the resulting spending budget of the other member.

V. WHY THE ACTUARIAL APPROACH IS SUPERIOR TO MONTE CARLO AND SYSTEMATIC WITHDRAWAL PLANS

Monte Carlo simulations or models typically used by financial advisors often lack functions that would improve their financial planning. A comparison of the functions offered by a typical Monte Carlo model and the actuarial approach is found in table 1.

Rule-of-thumb systematic withdrawal plans (SWPs) also have shortcomings, in addition to suffering from the same problems as Monte Carlo models that financial advisors typically use. SWPs are used to determine annual withdrawals from invested assets to avoid outliving one's savings, such as the 4 percent rule, the required minimum distribution approach,[15] or the many proposed variations of these methods.

But SWPs do not coordinate with income from other sources such as part-time employment in retirement, and do not address spending goals that involve household nonrecurring expenses. Therefore, using SWPs will produce a suboptimal spending plan in many situations.

TABLE 1: *Functionality Comparison: Typical Monte Carlo Model vs. Actuarial Approach*

	Typical Monte Carlo Model	Actuarial Approach
Reflects all assets and spending liabilities in model?	No	Yes
Permits inputting of different rates of future expected increases for different future expenses?	No	Yes
Recognizes reduction of expenses by X% when first in a couple is expected to die?	No	Yes
Recognizes different lifetime planning periods for different members of a household?	No	Yes
Automatically adjusts plan spending budget for actual experience?	No	Yes
Distinguishes between nonrecurring and recurring expenses?	No	Yes
Distinguishes between essential and discretionary expenses?	No	Yes
Quantifies value of non financial assets?	No	Yes
Quantifies size of floor portfolio necessary to fund essential expenses?	No	Yes
Is transparent and may be calculated relatively easily and at no cost to the household?	No	Yes

15. The required minimum distribution approach is a proposed SWP proposed by Wei Sun and Webb based on IRS required minimum distribution tables. The IRS tables specify the minimum amounts that must be drawn out of IRA and 401(k) accounts to avoid tax penalties.

VI. CONCLUSION

Protecting and investing assets to meet spending goals and to maintain a secure standard of living in retirement is a risky proposition for many households today. Actuarial science offers proven approaches and processes for assessing and mitigating financial risks as well as balancing the need to protect and grow assets during retirement.

This essay advocates a compromise solution by suggesting the building of two investment/asset buckets to fund future expenses: a floor portfolio of low-risk assets to fund essential expenses and an upside portfolio of riskier investments to fund discretionary expenses. While calculating the present values required to implement this approach and associated processes may be difficult for some households, there are websites and blogs available that can facilitate the necessary calculations.[16]

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16. I recommend visiting Steiner and Kalben's blog, How Much Can I Afford to Spend in Retirement? (Steiner and Kalben 2010–21).