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Using Sound Actuarial Principles to Enhance Financial Well-Being

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In theory, achieving a state of financial well-being is a relatively straightforward process. It is achieved through a combination of

1. accumulating sufficient assets and
2. properly managing those assets to accomplish one's financial goals.

In practice, however, neither of these tasks is particularly easy, and they both involve difficult tradeoffs.

Management of financial assets involves many decisions. For example, individuals or households must decide

- How to invest and protect their assets
- How much of their assets they can currently consume (spend)
- How much they must save to balance current consumption needs/desires with future consumption needs/desires

Proper asset management is enhanced by developing and following a good financial plan. A good financial plan should involve development of a reasonable budget and a process to keep spending/savings on track to meet financial goals. This essay discusses how an approach utilizing sound actuarial principles can accomplish these goals, even when actual future experience invariably deviates from assumed experience, and why it is worthwhile to perform the calculations required by this approach rather than using simple rule-of-thumb methods. Throughout this essay, when reference is made to calculations performed for an individual, it is also meant to apply for a household.

Developing a Financial Plan

The first step in developing a financial plan is to determine one's financial goals. This will generally involve some thought and analysis of desired lifestyle, both before and after retirement, and what that desired lifestyle might cost.

The second step is to make reasonable assumptions about the future and how to accomplish the goals.

The third step is to consider actions to take if the assumptions are wrong.

The next three sections of this essay will discuss how three sound actuarial principles can be utilized in a financial plan to accomplish financial goals.

## Actuarial Principle No. 1: Match Assets with Liabilities

The problem of how much one can spend annually for the rest of one's life and how much must be saved to accomplish financial goals is essentially an actuarial problem that can be solved by an actuarial solution.

Fortunately, we can apply the same actuarial principles used for pension plan funding and measuring Social Security actuarial balances to this problem. The basic equation, using present values (PV), for this purpose is:

$$\text{Accumulated savings} + \text{PV future income} =$$
$$\text{PV expected non-recurring expenses} +$$
$$\text{PV future annual spending budgets}$$

This can be illustrated as shown in Figure 1. This is the classic actuarial balance equation that matches assets with liabilities.

Figure 1 Example of a Balance Equation Used for Financial Planning

Accumulated savings	PV future income	PV expected non-recurring expenses	PV future annual spending budgets
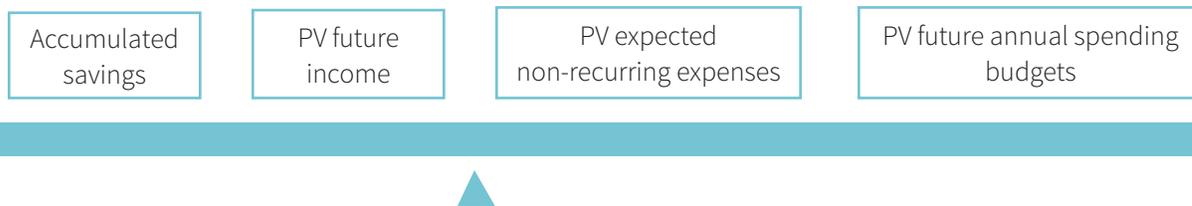
The assets, represented on the left side of the equation, include not only the value of current accumulated savings, but also the present value of future income expected to be received, such as the present value of future employment wages, the present value of future expected Social Security benefits and the present value of future home sale proceeds.

The liabilities are represented on the right side of the equation, and include the present value of future expected non-recurring expenses and the present value of future annual spending budgets. Expected non-recurring expenses may include long-term care expenses, unexpected expenses and bequest motives. Expected non-recurring expenses may also include items such as mortgage payments or expected education expenses for children. This equation tells us that the present value of one's current and future spending is a function of one's assets.

To develop an initial spending/savings budget, an individual, with possible help from a financial adviser, will need to select reasonable assumptions about the future, including future discount rates (assumed rates of investment return), rates of future inflation and mortality (or expected period of retirement). On my website,[1] I recommend selecting a discount rate that is approximately consistent with discount rates used to develop current immediate annuity purchase rates, based on the presumption that an individual could, if desired, settle their liabilities by purchase of an immediate annuity. I also recommend an inflation assumption of the discount rate −2% and planning on living until age 95, or life expectancy if greater.

Once relevant assumptions about the future have been selected, the present value of the individual's expected future income from all sources is calculated and added to the individual's current accumulated savings. The sum is the individual's total assets.

The next step in the initial budget determination process is to estimate the present value of non-recurring expenses.

The final step is to choose the desired/expected pattern of future budgets. Examples of desired/expected patterns of future budgets include:

- Budgets expected to increase each year with inflation
- Annual post-retirement budgets that differ from annual pre-retirement budgets in real dollar terms
- Budgets not expected to increase each year with inflation

Once the desired/expected pattern of future annual budgets has been selected, the initial year's actuarially determined budget can be determined by subtracting the present value of future expected non-recurring expenses from the assets and solving the actuarial balance equation presented earlier for the current budget and the present value of future budgets.

Like pension calculations, actuarially determined spending/savings budget calculations can be relatively simple or quite complicated. For example, the present value of future annual budgets can include different components for different types of expected annual expenses, such as essential non-health-related

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expenses, essential health-related expenses and non-essential expenses, with different future increase assumptions applying to each of these components of future expenses. While such complications may make the calculations somewhat more difficult, they will also make them more realistic and consistent with expectations about the future.

It is important to note that any excess of income over spending expected during a current or future year is assumed to be saved, so not only will the actuarial approach develop an annual spending budget, it will also develop a savings budget for years when income is expected to exceed spending (such as during a period of employment preceding retirement). This is extremely important, for example, in determining how much an individual should be saving each year to meet retirement goals.

An example of how this actuarial principle can be used to develop a reasonable spending/savings budget for someone who has yet to retire is included in the appendix.

Actuarial Principle No. 2: Perform Annual Valuations, Monitor Results and Make Appropriate Adjustments

The budget process is not a "set and forget" exercise. The budget should be updated each year, using what actuaries call the annual valuation process, to keep the individual on track to meet financial goals. This is done by adjusting for experience that deviates from the assumptions made the previous year. It also provides an opportunity to adjust for changes in one's situation, for changes in assumptions about the future, or for changes in expected or desired financial goals.

The annual valuation process also provides an opportunity to monitor actual spending and saving versus the budget. If spending is consistently more than the actuarially determined spending budget (and therefore savings are less than budgeted savings), one may wish to take actions such as increasing the sources of income or decreasing the spending goals.

Actuarial Principle No. 3: Modeling "What If" Scenarios and Planning for Experience Deviations

One thing we know for certain is that actual future experience will not exactly follow assumed experience; not even actuaries can predict the future. Therefore, an important part of financial planning is to see what happens to the budget if, for example, investments lose significant value or employment is terminated prior to desired retirement date. The financial plan should consider what actions may be taken in the event of such circumstances.

Why Use the Actuarial Approach?

Developing a budget using the actuarial approach does involve calculating present values and may even involve some algebra. By comparison, rule-of-thumb saving and withdrawal approaches (such as, the recommendation to accumulate savings equal to 10 times or more of final pay, or spend 4% of accumulated savings) do appear to be much simpler on the surface. But experts who advocate these rule-of-thumb approaches will also say, for example,

- Make sure medical expenses are part of your plan
- Don't forget to include unexpected expenses in your plan
- Remember that you can use your home equity to finance your retirement

These types of expenses or sources of income are frequently ignored in the simple rule-of-thumb approaches, making such methods less reliable.

Unfortunately, planning one's spending for the rest of one's lifetime is a fairly complicated process and involves doing some math. Developing a good budget should be a function of each individual's specific situation and financial goals, not the situation or financial goals of some average person. The actuarial approach described in this essay is a comprehensive process that will allow an individual to include best estimates of all future expenses and all assets. By comparison, simple rule-of-thumb approaches can easily cause one to either be too conservative or too aggressive in their saving and spending.

Conclusion

In my experience, mathematically inclined individuals are able to do the calculations described in this essay, especially when using the spreadsheet tools available on my website. You don't need to be an actuary to do these calculations. Some individuals will be intimidated by the number crunching required and should probably seek assistance from a financial adviser. Some financial advisers use actuarial principles to help their clients with their financial planning, while many do not. If your financial adviser doesn't use these principles or similar approaches that consider all your assets, liabilities and financial goals, you might want to consider finding an adviser who does.

Appendix
Development of Mary's Age 55 Spending/Saving Budget

MARY'S DATA
- Mary is age 55 and divorced
- She is employed and her current gross pay is $100,000 a year
- Her employer matches her 401(k) contributions $.50 for each dollar up to 6% of pay
- The current value of her home is $400,000

MARY'S FINANCIAL GOALS
- Full retirement at age 65
- Maximizing her Social Security benefits
- Not becoming a burden on her daughter
- Not outliving her assets
- Approximately maintaining her pre-retirement standard of living when she retires
- Appropriately balancing pre-retirement spending with expected post-retirement spending
- Not leaving large amounts of assets to her daughter at her death

MARY'S ASSETS
- Accumulated savings, 401(k) and personal assets, of $200,000
- The present value of her future employment income
- The present value of a frozen single life fixed dollar pension benefit of $10,000 per year that she expects to commence at age 65
- The present value of her estimated future Social Security benefit of $44,058 per year commencing in 15 years at age 70

- The present value of future employer matching contributions to the 401(k) plan
- The present value of proceeds from future home sales

MARY'S ASSUMPTIONS
For present value calculations, Mary, with assistance from her financial adviser, has selected these assumptions:

- Annual discount rate of 4%
- Annual rate of inflation of 2%
- Her employment will continue until she retires, and her gross pay will increase annually at the rate of inflation
- She will defer into her employer's 401(k) plan at least the minimum to receive the maximum matching contribution
- She will downsize to a condominium at age 80 and use half of her home equity at that time to fund her annual expenses
- She will sell her condominium when she needs to enter an assisted living/nursing home facility
- The current value of her home or condominium will increase in value at an annual rate of inflation plus 1%
- She will live until age 95
- Her expenses (excluding saving) will drop by 25% in real dollars when she retires at age 65, as she will no longer have a mortgage payment and no longer have work-related expenses
- Her taxes will be somewhat lower
- Her future essential expenses (excluding health-related expenses) will increase with inflation, her future essential health-related expenses will increase with inflation +2% and her future non-essential expenses will remain constant in nominal dollars; based on her expected distribution of such expenses, her total annual expenses will increase by inflation −0.5% each year after retirement
- She will have to live the last three years of her life (age 92–95) in an assisted living facility; the current cost of a three-year stay in her geographic area is $180,000 and she believes this cost will increase in the future by inflation plus 2% each year
- When she moves into the assisted living facility, her other annual expenses will be reduced to zero
- The present value of her future unexpected expenses will be $50,000
- $41,658 in present value ($200,000 in future dollars)

Figure 2 Mary's Actuarial Balance Sheet

Total Assests		Total Liabilities	
Accumulated savings	$200,000	PV future unexpected expenses	$50,000
Present value (PV) of pension payments	$121,492	PV future long-term care expenses	$180,000
PV of employer 401(k) matching contributions	$26,474	PV of future funeral expenses/ bequest	$41,658
PV of future wages	$917,753	PV of future pre-retirement spending budgets	$758,129
PV of Social Security payments	$489,233	PV of future post-retirement spending budgets	$1,022,133
PV of home sale proceeds @ age 80	$157,082	PV of other expenses	0
PV of home sale proceeds @ age 92	$139,886		
PV of other sources of income	$0		
Total	**$2,051,920**	**Total**	**$2,051,920**

will be sufficient to cover funeral expenses and leave a small inheritance to her daughter

Figure 2 shows Mary's assets and liabilities at her current age of 55, based on her assumptions. All annual income items and budgets are assumed to be paid as of the beginning of each year, except for the 401(k) plan matching contributions from her employer, which are assumed to be paid at the end of each year.

Using the first actuarial principle discussed in this essay and the assumptions mentioned previously, Mary determines her current (age 55) spending budget (which includes taxes and insurance premiums to protect her assets) to be $82,607. Her savings budget for the year is therefore $17,393 ($100,000 − $82,607). These amounts are expected to increase with inflation each year until she retires. If all assumptions are realized in the future and she spends exactly her spending budget each year, at age 65 her annual

spending budget will decrease to $75,523 in nominal dollars ($61,955 in age 55 dollars). This amount will be 75% of her inflation-adjusted age 55 spending budget and will be about 63% of her expected age 64 gross salary of $119,509. Her accumulated savings at age 65 (including accumulated employer matching contributions) is expected to be $571,520, or about 4.8 times her expected age 64 gross pay.

Mary's financial plan also includes revisiting her spending/savings budget at the beginning of each year for the rest of her life to keep her spending/ savings on track, monitor results and make appropriate adjustments when necessary. From time to time she will also model the impact of significant deviations from assumed experience and consider alternative courses of action if such deviations were to occur.

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